

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 GEOTECHNICAL UNIT

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-3300	8.1711301	2	17

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION				GRADATION				ROCK DESCRIPTION				TERMS AND DEFINITIONS							
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6				WELL GRADED: INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE UNIFORM. INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)				HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED 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 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:				ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. 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. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. 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. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL. FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTILING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (R.Q.D.) - 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 RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. 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. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF 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 LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (S.R.Q.) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.							
				POORLY GRADED				CRAYSTALLINE ROCK (CR)								NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.			
GAP-GRADED: INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.				ANGULARITY OF GRAINS				FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.				CRAYSTALLINE ROCK (ICR)							
THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.				MINERALOGICAL COMPOSITION				FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.				NON-CRYSTALLINE ROCK (ICR)							
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.				COMPRESSIBILITY				COASTAL PLAIN SEDIMENTARY ROCK (CP)				COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.							
SOIL LEGEND AND AASHTO CLASSIFICATION				PERCENTAGE OF MATERIAL				WEATHERING				FRESH							
GENERAL CLASS.		GRANULAR MATERIALS (< 5% PASSING #200)		SILT-CLAY MATERIALS (> 85% PASSING #200)		ORGANIC MATERIALS		SLIGHTLY COMPRESSIBLE		MODERATELY COMPRESSIBLE		HIGHLY COMPRESSIBLE		LIQUID LIMIT LESS THAN 30		LIQUID LIMIT 31-50		LIQUID LIMIT GREATER THAN 50	
GROUP CLASS.		A-1 A-3		A-2 A-4 A-5 A-6 A-7		A-1, A-2 A-4, A-5		ORGANIC MATERIAL		GRANULAR SOILS		SILT-CLAY SOILS		OTHER MATERIAL		TRACE		1 - 10%	
SYMBOL		[Pattern]		[Pattern]		[Pattern]		TRACE OF ORGANIC MATTER		2 - 3%		3 - 5%		5 - 10%		10 - 20%		20 - 35%	
% PASSING		50 MX		40 MX		200		LITTLE ORGANIC MATTER		3 - 5%		5 - 12%		MODERATELY ORGANIC		5 - 10%		12 - 20%	
LIQUID LIMIT		6 MX		N.P.		4 MX		HIGHLY ORGANIC		> 10%		> 20%		MODERATELY ORGANIC		> 10%		> 20%	
PLASTIC INDEX		N.P.		0		4 MX		MODERATELY ORGANIC		2 - 3%		3 - 5%		MODERATELY ORGANIC		5 - 10%		12 - 20%	
GROUP INDEX		0		0		4 MX		HIGHLY ORGANIC		> 10%		> 20%		HIGHLY ORGANIC		> 10%		> 20%	
USUAL TYPES OF MAJOR MATERIALS		STONE FRAGS. GRAVEL AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS		MUCK, PEAT		HIGHLY ORGANIC SOILS	
GEN. RATNG AS A SUBGRADE		EXCELLENT TO GOOD		FAIR TO POOR		FAIR TO POOR		FAIR TO POOR		POOR		UNSATURABLE		P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30					
CONSISTENCY OR DENSENESS				MISCELLANEOUS SYMBOLS				ROCK HARDNESS				BENCH MARK							
PRIMARY SOIL TYPE		COMPACTNESS OR CONSISTENCY		RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)		RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)		ROADWAY EMBANKMENT WITH SOIL DESCRIPTION		SPT DMT DPT TEST BORING		SAMPLE DESIGNATIONS		VERY HARD		CAN NOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK.		BENCH MARK: BL-5, MONUMENT, STA. 25+23.76	
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)		VERY LOOSE		< 4		N/A		SOIL SYMBOL		AUGER BORING		S- BULK SAMPLE		HARD		CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.		ELEVATION: 2788.78	
		LOOSE		4 TO 10				ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS		CORE BORING		SS- SPLIT SPOON SAMPLE		MODERATELY HARD		CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.			
		MEDIUM DENSE		10 TO 30				INFERRED SOIL BOUNDARIES		MONITORING WELL		ST- SHELBY TUBE SAMPLE		MEDIUM HARD		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 POINT OF A GEOLOGISTS PICK.			
		DENSE		30 TO 50				INFERRED ROCK LINE		PIEZOMETER INSTALLATION		RS- ROCK SAMPLE		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 PIECES CAN BE BROKEN BY FINGER PRESSURE.			
		VERY DENSE		> 50				ALLUVIAL SOIL BOUNDARY		SLOPE INDICATOR INSTALLATION		RT- RECOMPACTED TRIAXIAL SAMPLE		VERY SOFT		CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.			
GENERALLY SILT-CLAY MATERIAL (COHESIVE)		VERY SOFT		< 2		< 0.25		DIP/DIP DIRECTION OF ROCK STRUCTURES		SPT N-VALUE		CBR - CBR SAMPLE							
		SOFT		2 TO 4		0.25 TO 0.5		[Symbol]		[Symbol]		[Symbol]							
		MEDIUM STIFF		4 TO 8		0.5 TO 1		[Symbol]		[Symbol]		[Symbol]							
		STIFF		8 TO 15		1 TO 2		[Symbol]		[Symbol]		[Symbol]							
		VERY STIFF		15 TO 30		2 TO 4		[Symbol]		[Symbol]		[Symbol]							
		HARD		> 30		> 4		[Symbol]		[Symbol]		[Symbol]							
		[Symbol]		[Symbol]		[Symbol]		[Symbol]		[Symbol]		[Symbol]							
TEXTURE OR GRAIN SIZE				ABBREVIATIONS				FRACTURE SPACING				BEDDING							
U.S. STD. SIEVE SIZE		4		10		40		AR - AUGER REFUSAL		MOD - MODERATELY		TERM		THICKNESS					
OPENING (MM)		7.5		2.0		0.25		CL - CLAY		PMT - PRESSUREMETER TEST		VERY WIDE		> 4 FEET					
		4.75		0.42		0.075		CPT - CONE PENETRATION TEST		SD - SAND, SANDY		WIDE		1.5 - 4 FEET					
		2.0		0.25		0.075		CSE - COARSE		SL - SILT, SILTY		MODERATELY CLOSE		0.16 - 1.5 FEET					
BOULDER (BLDR.)		COBBLE (COB.)		GRAVEL (GR.)		COARSE SAND (CSE, SD.)		C.T. - CORING TERMINATED		SLL - SLIGHTLY		CLOSE		0.03 - 0.16 FEET					
GRAIN SIZE		305		75		2.0		DMT - DILATOMETER TEST		SLI - SLIGHTLY		VERY CLOSE		0.008 - 0.03 FEET					
		12'		3'		0.25		DPT - DYNAMIC PENETRATION TEST		SL - SLIGHTLY									
								e - VOID RATIO		SLI - SLIGHTLY									
SOIL MOISTURE - CORRELATION OF TERMS				EQUIPMENT USED ON SUBJECT PROJECT				INDURATION				NOTES:							
SOIL MOISTURE SCALE (ATTERBERG LIMITS)		FIELD MOISTURE DESCRIPTION		GUIDE FOR FIELD MOISTURE DESCRIPTION		DRILL UNITS:		ADVANCING TOOLS:		HAMMER TYPE:		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.		[Symbol] BITUMINOUS CONCRETE					
LL - LIQUID LIMIT		- SATURATED - (SAT.)		USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE		MOBILE B- _____		CLAY BITS		<input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL		FRIABLE							
PL - PLASTIC LIMIT		- WET - (W)		SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE		BK-51		6" CONTINUOUS FLIGHT AUGER		CORE SIZE:		MODERATELY INDURATED							
OM - OPTIMUM MOISTURE		- MOIST - (M)		SOLID; AT OR NEAR OPTIMUM MOISTURE		CME-45		8" HOLLOW AUGERS		<input type="checkbox"/> B		INDURATED							
SL - SHRINKAGE LIMIT		- DRY - (D)		REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE		CME-550		HARD FACED FINGER BITS		<input type="checkbox"/> N		EXTREMELY INDURATED							
PLASTICITY				EQUIPMENT USED ON SUBJECT PROJECT				INDURATION				NOTES:							
NONPLASTIC		PLASTICITY INDEX (PI)		DRY STRENGTH		PORTABLE HOIST		TUNG-CARBIDE INSERTS		<input checked="" type="checkbox"/> HQ		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.							
LOW PLASTICITY		0-5		VERY LOW		OTHER D-50		CASING [] W/ ADVANCER		HAND TOOLS:		FRAGMENTS WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER, DISINTEGRATES SAMPLE.							
MED. PLASTICITY		6-15		SLIGHT		OTHER _____		TRICONE [] * STEEL TEETH		POST HOLE DIGGER		GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.							
HIGH PLASTICITY		16-25		MEDIUM		OTHER _____		TRICONE [] * TUNG-CARB.		HAND AUGER		GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.							
		26 OR MORE		HIGH		OTHER _____		CORE BIT		SOUNDING ROD		SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.							
COLOR				EQUIPMENT USED ON SUBJECT PROJECT				INDURATION				NOTES:							
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.				EQUIPMENT USED ON SUBJECT PROJECT				INDURATION				NOTES:							