

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS  
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-3866	33312.1.1	2	9

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 (ASHTO T208, 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: <i>VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HEAVY PLASTIC, A-7-6</i>		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) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.  ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.		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:  WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.  CRYSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.  NON-CRYSTALLINE ROCK (NCR)  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.  COASTAL PLAIN SEDIMENTARY ROCK (CP)  COASTAL PLAIN SEDIMENTS INCORPORATED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.		ALLOUVIUM (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. FLOAI - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED 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, MOTTLING 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 IN 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.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.	
SOIL LEGEND AND AASHTO CLASSIFICATION				MINERALOGICAL COMPOSITION			
GENERAL CLASS.		GRANULAR MATERIALS (<5% PASSING #200)		SILT-CLAY MATERIALS (>5% PASSING #200)		ORGANIC MATERIALS	
GROUP CLASS.	A-1, A-1-b, A-2, A-2-4, A-2-5, A-2-6, A-2-7	A-3, A-4, A-5, A-6, A-7	A-1, A-2, A-3, A-4, A-5, A-6, A-7				
SYMBOL							
% PASSING	50 MX, 30 MX, 10 MX, 5 MX	40 MX, 30 MX, 20 MX, 10 MX	30 MX, 20 MX, 10 MX, 5 MX				
LIQUID LIMIT	6 MX	40 MX, 30 MX, 20 MX, 10 MX	40 MX, 30 MX, 20 MX, 10 MX				
PLASTIC INDEX	0	0, 4 MX, 8 MX, 12 MX, 16 MX, 20 MX	0, 4 MX, 8 MX, 12 MX, 16 MX, 20 MX				
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL AND SAND	FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND	SILTY SOILS, CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD	FAIR TO POOR	POOR	UNSUITABLE			
P.I. OF A-7-5 ≤ L.L. - 30 + P.I. OF A-7-6 > L.L. - 30							
CONSISTENCY OR DENSENESS				MISCELLANEOUS SYMBOLS			
PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )				
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE, LOOSE, MEDIUM DENSE, DENSE, VERY DENSE	<4, 4 TO 10, 10 TO 30, 30 TO 50, >50	N/A				
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT, SOFT, MEDIUM STIFF, STIFF, VERY STIFF, HARD	<2, 2 TO 4, 4 TO 8, 8 TO 15, 15 TO 30, >30	<0.25, 0.25 TO 0.5, 0.5 TO 1, 1 TO 2, 2 TO 4, >4				
				ROADWAY EMBANKMENT WITH SOIL DESCRIPTION, SOIL SYMBOL, ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS, INFERRED SOIL BOUNDARIES, INFERRED ROCK LINE, ALLUVIAL SOIL BOUNDARY, DIP/DIP DIRECTION OF ROCK STRUCTURES, SOUNDING ROD, TEST BORING, AUGER BORING, CORE BORING, MONITORING WELL, PIEZOMETER INSTALLATION, SLOPE INDICATOR INSTALLATION, SPT N-VALUE, SPT REFUSAL, SAMPLE DESIGNATIONS, S- BULK SAMPLE, SS- SPLIT SPOON SAMPLE, ST- SHELBY TUBE SAMPLE, RS- ROCK SAMPLE, RT- RECOMPACTED TRIAXIAL SAMPLE, CBR - CBR SAMPLE			
TEXTURE OR GRAIN SIZE				ABBREVIATIONS			
U.S. STD. SIEVE SIZE OPENING (MM)							
BOULDER (BLD.), COBBLE (COB.), GRAVEL (GR.), COARSE SAND (CSE. SD.), FINE SAND (F. SD.), SILT (SL.), CLAY (CL.)							
GRAIN SIZE							
SOIL MOISTURE - CORRELATION OF TERMS				EQUIPMENT USED ON SUBJECT PROJECT			
SOIL MOISTURE SCALE (ATTERBERG LIMITS)		FIELD MOISTURE DESCRIPTION		GUIDE FOR FIELD MOISTURE DESCRIPTION			
LL - LIQUID LIMIT, PL - PLASTIC LIMIT, OM - OPTIMUM MOISTURE, SL - SHRINKAGE LIMIT		SATURATED (SAT.), WET (W), MOIST (M), DRY (D)		USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE; SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE; SOLID; AT OR NEAR OPTIMUM MOISTURE; REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE			
PLASTICITY				DRILL UNITS: MOBILE B-47, BK-51, CME-45C, CME-550, PORTABLE HOIST, OTHER			
NONPLASTIC, LOW PLASTICITY, MED. PLASTICITY, HIGH PLASTICITY		PLASTICITY INDEX (PI), DRY STRENGTH		ADVANCING TOOLS: CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 8" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING w/ ADVANCER, TRICONE 2 1/8" STEEL TEETH, TRICONE TUNG-CARB., OTHER			
COLOR				HAMMER TYPE: AUTOMATIC, MANUAL; CORE SIZE: B, H; HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST, OTHER			
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.				FRACTURE SPACING: TERM, SPACING; BEDDING: TERM, THICKNESS; INDURATION: FRIABLE, MODERATELY INDURATED, INDURATED, EXTREMELY INDURATED			