## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

## DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

## SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS SOIL DESCRIPTION TERMS AND DEFINITIONS WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COAR UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE, (ALSO O ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOLLD VIELD SPT REFUSA SUIL IS CONSIDERED TO BE THE ANCONSCILIATED, SETTIC-CHOSCILIATED OF WEATHERED EARTH METERALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 180 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (ASSITTO 1206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS AQUIFER - A WATER BEARING FORMATION OR STRATA. AP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ANGULARITY OF GRAINS CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS: THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS WEATHERED ROCK (WR) HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. SUBANGULAR, SUBROUNDED, OR ROUNDED. VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LIVERS, HIGHLY PLASTIC, A-7-ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL MINERALOGICAL COMPOSITION SOIL LEGEND AND AASHTO CLASSIFICATION T WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT CRYSTALLINE ROCK (CR) INERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS GENERAL WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS CLASS. >85% PASSING \*200) WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN A-1 A-3 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 NON-CRYSTALLINE ROCK (NCR) CROUP COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM SEDIMENTARY ROCK THAT WOULD YELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.

COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD A-2-4 A-2-5 A-2-6 A-2-7 A-6, A-7 CLASS. A-1-a A-1-b A-3 SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE COASTAL PLAIN SEDIMENTARY ROCK SYMBOL LIQUID LIMIT 31-50 LIQUID LIMIT GREATER THAN 50 <u>CORE RECOVERY (REC.)</u> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENJAGE. SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED PERCENTAGE OF MATERIAL PASSING WEATHERING DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT GRANUL AR SILT- CLA GRANUI AF CLAY ORGANIC MATERIAL ROCKS OR CUTS MASSIVE ROCK. SOILS PEAT SOILS SOILS OTHER MATERIAL SOILS ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER FRESH DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE RACE OF ORGANIC MATTER 2 - 3% 3 - 5% HORIZONTAL . LITTLE ORGANIC MATTER N.P. 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN 5 - 12% LITTLE 10 - 20% TOUR LIMIT VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, MODERATELY ORGANIC 5 - 10% 12 - 20% DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF SOILS WITH (V. SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF HIGHLY ORGANIC >20% LITTLE OR HIGHLY 35% AND AROVE THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. OF A CRYSTALLINE NATURE. MODERATE GROUP INDEX ø 0 4 MX 8 MX 12 MX 16 MX No MX 0 GROUND WATER FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE AMOUNTS OF SOILS SLIGH ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO USUAL TYPES STONE FRAGS. SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE GRAVEL AND SAND WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. SLL INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CLAYEY OF MAJOR MATTER GRAVEL AND SAND SOILS CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. **Y**\_\_\_ SAND TERIALS 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 VPW. FAIR TO PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA (MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS AS A EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABL DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED SUBGRADE OW-<u>FLOOD PLAIN (F.P.) - L</u>AND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. WITH FRESH ROCK. P.I. OF A-7-5 ≤ L.L. - 30 : P.I. OF A-7-6 > L.L. ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAQLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH MODERATELY CONSISTENCY OR DENSENES MISCELLANEOUS SYMBOLS SEVERE FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN RANGE OF LINCONFINE MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. COMPACTNESS OR PRIMARY SOIL TYPE PENETRATION RESISTENCE COMPRESSIVE STRENGTH (TONS/FT2 ) ROADWAY EMBANKMENT OPT ONT TEST BORING SAMPLE IF TESTED, WOULD YIELD SPT REFUSAL JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. WITH SOIL DESCRIPTION (N-VALUE) DESIGNATIONS ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCE SEVERE VERY LOOSE LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO (SEV.) IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME GENERALLY - SOIL SYMBOL AUGER BORING ITS LATERAL EXTENT. S- BULK SAMPLE LOOSE 4 TO 10 EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. GRANULAR MEDIUM DENSE 10 TO 30 30 TO 50 N/A ARTIFICIAL FILL OTHER THAN MATERIAL SS- SPLIT SPOON IF TESTED, YIELDS SPT N VALUES > 100 BPF LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. ROADWAY EMBANKMENTS CORE BORING (NON-COHESIVE) MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SAMPLE. VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT VERY DENSE SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. ST- SHELBY TUBE THE MASS IS EFFECTIVELY REDUCED TO SOUL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK (V. SEV.) INFERRED SOIL BOUNDARIES VERY SOF ROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF A (0.25 MONITORING WELL GENERALLY VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF INTERVENING IMPERVIOUS STRATUM 0.25 TO 0.5 INFERRED ROCK LINE RS- ROCK SAMPLE SILT-CLAY MEDIUM STIFF 4 TO 8 PIE 70METER 0.5 TO 1 Δ ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. MATERIAL INSTALLATION RT- RECOMPACTED 1 TO 2 SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS VERY STIFF (COHESIVE) 15 TO 30 ROCK QUALITY DESIGNATION (R.Q.Q.) - 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 2 TO 4 TRIAXIAL SAMPLE SLOPE INDICATOR ALSO AN EXAMPLE.  $\bigcirc$ DIP/DIP DIRECTION OF INSTALLATION CBR - CBR SAMPLE ROCK STRUCTURES ROCK HARDNESS TEXTURE OR GRAIN SIZE <u>SAPROLITE (SAP.) -</u> RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.  $\bigcirc$ SPT N-VALUE CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SOUNDING ROD U.S. STD. SIEVE SIZE REF- SPT REFUSAL OPENING (MM) 4.76 0.42 0.25 0.053 0.075 SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND **ABBREVIATIONS** навп CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL COARSE TO DETACH HAND SPECIMEN. GRAVEL ALLUV. - ALLUVIA SILT CLAY FRAGS. - FRAGMENTS TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS (BLDR.) (COB.) (GR.) (SL.) (CL.) AR - AUGER REFUSAL MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE CSE, SD. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. BRN. - BROWN MED. - MEDIUM EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK, HAND SPECIMENS CAN BE DETACHED 305 12" 2.0 MM IN. 0.05 0.005 BT - BORING TERMINATED PMT - PRESSUREMETER TEST BY MODERATE BLOWS SIZE CL. - CLAY 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 MEDIUN CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CPT - CONE PENETRATION TEST SL. - SILT, SILTY SOIL MOISTURE - CORRELATION OF TERMS HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE CSE. - COARSE A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION POINT OF A GEOLOGISTS PICK. SOIL MOISTURE SCAL CORING TERMINATED TCR - TRICONE REFUSAL WITH 60 BLOWS. GUIDE FOR FIELD MOISTURE DESCRIPTION SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS (ATTERRERG LIMITS) DESCRIPTION DIA. - DIAMETER DPT - DYNAMIC PENETRATION TEST 7 - UNIT WEIGHT <u>STRATA CORE RECOVERY (SREC.)</u> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN 7 - DRY UNIT WEIGHT PIECES CAN BE BROKEN BY FINGER PRESSURE. - VOID RATIO SATURATED USUALLY LIQUID: VERY WET, USUALLY STRATA ROCK QUALITY DESIGNATION IS.R.O.D.1 - 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. F. - FINE (SAT.) FROM BELOW THE GROUND WATER TABLE W - MOISTURE CONTENT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH LIQUID LIMIT V. - VERY SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY I ASTIC FRAC. - FRACTURED VST - VANE SHEAR TEST FINGERNAIL SEMISOLID; REQUIRES DRYING TO EQUIPMENT USED ON SUBJECT PROJECT - WET - (W) RANGE TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER FRACTURE SPACING ATTAIN OPTIMUM MOISTURE PLASTIC LIMIT TERM THICKNESS **TERM** HAMMER TYPE: SPACING BENCH MARK: TBM(S) - BL-3 STA. 15+51.13 (-BL-) ELEV. = 111.16' DRILL UNITS: ADVANCING TOOLS: VERY THICKLY BEDDED > 4 FEET VERY WIDE MORE THAN 10 FEET - MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE BL-4 STA, 18+81.87 (-BL-) ELEV. = 113.77' OPTIMUM MOISTURE AUTOMATIC MANUAL THICKLY BEDDED 1.5 - 4 FEET CLAY BITS 3 TO 10 FEET MOBILE 8-SI SHRINKAGE LIMIT THINLY REDDED 0.16 - 1.5 FEET MODERATELY CLOSE 1 TO 3 FFFT 6° CONTINUOUS FLIGHT AUGER VERY THINLY BEDDED REQUIRES ADDITIONAL WATER TO CORE SIZE: 0.16 TO 1 FEET NOTES: SURVEY BEGAN BY USING BM #2 (RR SPIKE IN OAK TREE STA. 15+51.13 - DRY - (D) THICKLY LAMINATED 0.008 - 0.03 FEET BK-51 VERY CLOSE LESS THAN 0.16 FEET 8 HOLLOW AUGERS (-BL-) 191.61' RT. ELEV. 102.66'). A LEVEL LOOP USING THE ELEVATION AT THINLY LAMINATED \_\_\_\_-B\_\_\_\_ BI -3 WAS PERFORMED TO VERIFY THE ELEVATION OF BM #2. THE PLASTI INDURATION HARD FACED FINGER BITS CME-45 X -N <u>03</u> ELEVATION AT BM \*2 WAS DETERMINED TO BE 102.07'. LEVEL LOOPS FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. PLASTICITY INDEX (PI) DRY STRENGTH TUNG.-CARBIDE INSERTS USING BM \*2 HAVE BEEN ADJUSTED ACCORDINGLY. \_\_\_-H-\_\_ VONPLASTIC 0-5 6-15 VERY LOW CME-550 ATV RUBBING WITH FINGER FREES NUMEROUS GRAINS FRIABLE LOW PLASTICITY CASING W/ ADVANCER SLIGHT GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. HAND TOOLS: MED, PLASTICITY 16-25 MEDIUM PORTABLE HOIST TRICONE STEEL TEETH GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE: POST HOLE DIGGER HIGH 26 OR MORE MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER. TRICONE HAND AUGER OTHER CME 55 TRACK GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE: INDURATED CORE BIT SOUNDING ROD DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED. YEL-BRN, BLUE-GRAY) DIFFICULT TO BREAK WITH HAMMER. VANE SHEAR TEST OTHER MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. OTHER\_ SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE: EXTREMELY INDURATED OTHER SAMPLE BREAKS ACROSS GRAINS.

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