



January 31, 2017

DRMP, Inc.
5950 Fairview Road, Suite 320
Charlotte, North Carolina 28210

Attention: Mr. Mike Hage, P.E.

Reference: **Retaining Wall Recommendations Letter**
US 74 Superstreet Conversion, TIP W-5520
WBS Element 50092.1.FS1
Union County, North Carolina
S&ME Project No. 1335-14-075
NC PE Firm License No. F-0176

Dear Mr. Hage:

The purpose of this letter report is to provide retaining wall information and recommendations to the design team for the subject project. The information contained in this report pertains to the retaining wall located at approximately STA 205+10 -L2-. Our services were performed in general accordance with the approved scope of services in the Subconsultant Amendment 1 for Professional Services dated May 2, 2016.

❖ Project Overview

A new cast-in-place concrete retaining wall will be constructed beginning at Station 205+10 for the US 74 Superstreet Conversion project in Union County, North Carolina. See the Site Plan (Sheet 2) for retaining wall location along -L2-. The retaining wall will provide grade separation between US 74 and the existing business situated on the western side of the alignment. The proposed wall will be approximately 250 feet long and will provide up to approximately four feet of grade separation.

❖ Exploration and Subsurface Conditions

Field Exploration

Subsurface conditions were evaluated during our field investigation on May 25, 2016. Four hand auger borings with Dynamic Cone Penetrometer (DCP) testing were performed along the retaining wall alignment by a geotechnical staff professional. The hand auger/DCP testing was performed to depths ranging between 7 and 8.5 feet below existing grades, with DCP testing performed at approximate 1-foot intervals. Representative portions of each soil sample were placed in glass jars and taken to our laboratory for subsequent classification testing.

The soils were classified in the field by S&ME personnel in general accordance with the American Association of State Highway and Transportation Officials (AASHTO) system. The results of the classifications, as well as the field test results, are presented on the attached boring logs. Similar soils were grouped into strata on the logs. The strata contact lines represent approximate boundaries between the soil types; the actual transition between the soil types in the field may be gradual in both the horizontal and vertical directions.

Laboratory testing consisting of grain-size distribution, Atterberg Limits, and moisture content tests were performed on representative soil samples to confirm visual soil classifications and estimate the engineering properties of the soils tested. A summary of the laboratory testing results and detailed results sheets are attached.

Subsurface Conditions

Surface Materials: Borings W-1, W-2, and W-4 encountered between 1 and 2 inches of topsoil. The pavement section at Boring W-3 was cored using a 6-inch diameter hollow-wall drill bit and encountered of 1 ¾ inches of asphalt underlain by 6 inches of ABC stone.

Roadway Embankment: Roadway embankment material was encountered in Borings W-1, W-2, and W-4 to depths of 1 to 3 feet. The roadway embankment consisted of medium stiff to stiff, moist to dry sandy silt (AASHTO classification A-4) and medium stiff to stiff, dry sandy clay (A-6). Average DCP blow counts ranged from 7 to 15 blows per increment (bpi).

Artificial Fill: Artificial fill soils were encountered beneath the existing pavements in Boring W-3, and beneath the roadway embankment material in Borings W-1, W-2, and W-4. These materials were encountered to a depth of about 4 to 5.5 feet. The artificial fill consisted of medium stiff, moist to wet sandy clay (A-6), and soft to stiff, moist to wet silty clay and clay (A-7-5 and A-7-6). Average DCP blow counts ranged from 5 to 11 bpi.

Alluvial Soils: Alluvial soils were encountered in each of the borings beneath the artificial fill materials. The alluvium consisted of soft to stiff, moist to saturated sandy clay (A-6), and medium stiff to stiff, moist to saturated clay (A-7-6). Average DCP blow counts ranged from 4 to 17 bpi. In addition, the alluvial soils in Borings W-1 encountered organic matter consisting of wood debris.

Residual Soils: Underlying the alluvial materials in Borings W-2, W-3, and W-4, residual soils were encountered to the termination depths. The residual soils consisted of medium stiff to stiff, moist sandy clay (A-6) and medium stiff to stiff saturated clay (A-7-6). Average DCP blow counts ranged from 5 to greater than 25 bpi.

Groundwater: Borings W-1, W-2, and W-4 encountered groundwater at the termination of field activities at depths of 5, 3, and 5 feet, respectively. Groundwater was not encountered in Boring W-3. Due to site safety concerns, subsequent water level measurements were not attempted. Please note that water levels tend to fluctuate with seasonal and climatic variations, as well as with some types of construction operations. Therefore, water may be encountered during construction operations at depths or elevations different than indicated in this study.

❖ Retaining Wall Recommendations

We understand plans are to use the NCDOT Standard Cast-In-Place Gravity Retaining Wall standard detail (attached) to design the subject retaining wall. The appropriate wall height (3 to <6 feet) and loading case (no slope case with traffic surcharge) should be selected for when using this standard. The soil conditions encountered generally do not meet the assumed in-situ soil parameters which the Standard Design Drawing is based upon. As such, we recommend that 2 feet of material be undercut from beneath the wall foundation elevation and replaced with a Class 2 (Type I or II) material to provide a more suitable subgrade. Also, although some organic matter was observed in the southernmost boring (W-1), the organic concentration was relatively low and not anticipated to effect the performance of the retaining wall due to the relatively small wall height.

❖ Closure

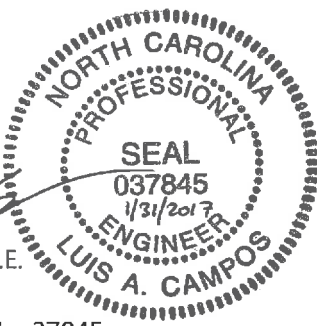
The information provided in this letter is based on our understanding of the project, information given in this report and on our interpretation of the information provided. We have made our recommendations based on our experience with similar subsurface conditions and similar projects. These analyses apply to the specific project discussed in this report; therefore, any changes in the project information should be provided to us so we may review our conclusions and make any appropriate modifications.

This report has been prepared for the exclusive use of the client for specific application to the subject project and project site. It has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, expressed or implied, is made.

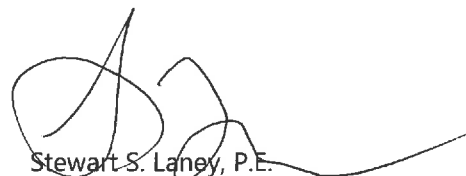
S&ME appreciates the opportunity to assist you during this phase of the project. If you should have questions concerning this report, or if we may be of further assistance, please contact us.

Sincerely,

S&ME, Inc.



Luis A. Campos, P.E.
Project Engineer
NC Registration No. 37845



Stewart S. Laney, P.E.
Senior Project Engineer
NC Registration No. 31013

Senior Reviewed By: Kristen H. Hill, P.E., P.G.



Attachments

Soil and Rock Legend
Site Plan
Hand Auger/DCP Boring Logs
Retaining Wall Profile
Cast-In-Place (CIP) Gravity Retaining Wall standard detail
Laboratory Test Results
Cast-In-Place (CIP) Gravity Retaining Wall special provision

Attachments

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 1 OF 2)

| SOIL DESCRIPTION | | | | | | | | | | | | |
|--|--|--|----------------|---------------------------------|----------------|----------------|--|----------------|----------------|----------------|-------------------|---|
| 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 ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 | | | | | | | | | | | | |
| SOIL LEGEND AND AASHTO CLASSIFICATION | | | | | | | | | | | | |
| GENERAL CLASS. | GRANULAR MATERIALS (<= 35% PASSING #200) | | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | |
| GROUP CLASS. | A-1 | | A-3 | A-2 | | A-4 | A-5 | A-6 | A-7 | A-1, A-2 | A-4, A-5 | A-6, A-7 |
| SYMBOL | | | | | | | | | | | | |
| % PASSING | 50 MX 30 MX 15 MX | | 50 MX 10 MX | 35 MX | 35 MX | 35 MX | 35 MX | 36 MN | 36 MN | 36 MN | 36 MN | GRANULAR SOILS |
| MATERIAL PASSING #40 LL PI | - 6 MX | | - NP | 40 MX 10 MX | 41 MN 10 MX | 40 MX 11 MN | 41 MN 11 MN | 40 MX 10 MX | 41 MN 11 MN | 40 MX 11 MN | 41 MN 11 MN | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER |
| GROUP INDEX | 0 | | 0 | 0 | 0 | 4 MX | 8 MX | 12 MX | 16 MX | NO MX | | HIGHLY ORGANIC SOILS |
| 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 SUBGRADE | EXCELLENT TO GOOD | | | | | | FAIR TO POOR | | FAIR TO POOR | POOR | UNSATURABLE | |
| PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30 | | | | | | | | | | | | |

| GRADATION | | | |
|---|--|-------------------|----------------------|
| WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES. | | | |
| ANGULARITY OF GRAINS | | | |
| THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED. | | | |
| MINERALOGICAL COMPOSITION | | | |
| MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE. | | | |
| COMPRESSIBILITY | | | |
| SLIGHTLY COMPRESSIBLE | LL < 31 | | |
| MODERATELY COMPRESSIBLE | LL = 31 - 50 | | |
| HIGHLY COMPRESSIBLE | LL > 50 | | |
| PERCENTAGE OF MATERIAL | | | |
| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS | OTHER MATERIAL |
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE 1 - 10% |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE 10 - 20% |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME 20 - 35% |
| HIGHLY ORGANIC | > 10% | > 20% | HIGHLY 35% AND ABOVE |
| GROUND WATER | | | |
| | WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING | | |
| | STATIC WATER LEVEL AFTER 24 HOURS | | |
| | PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA | | |
| | SPRING OR SEEP | | |

| CONSISTENCY OR DENSENESS | | | |
|--|--|--|--|
| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) |
| 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 1.0 1 TO 2 2 TO 4 > 4 |

| MISCELLANEOUS SYMBOLS | | | |
|-----------------------|--|--|---|
| | ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION | | 25/825 DIP & DIP DIRECTION OF ROCK STRUCTURES |
| | SOIL SYMBOL | | SPT DMT VST PMT TEST BORING |
| | ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT | | AUGER BORING |
| | INFERRED SOIL BOUNDARY | | CORE BORING |
| | INFERRED ROCK LINE | | MONITORING WELL |
| | ALLUVIAL SOIL BOUNDARY | | PIEZOMETER INSTALLATION |
| | SLOPE INDICATOR INSTALLATION | | CONE PENETROMETER TEST |
| | SOUNDING ROD | | TEST BORING WITH CORE |
| | SPT N-VALUE | | |

| TEXTURE OR GRAIN SIZE | | | | | | | |
|-----------------------------------|------------------|--------------|------------------------|-------------------|------------|------------|--|
| U.S. STD. SIEVE SIZE OPENING (MM) | 4 | 10 | 40 | 60 | 200 | 270 | |
| | 4.75 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 | |
| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE. SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) | |
| GRAIN SIZE | MM 305 IN. 12 | 75 3 | 2.0 | 0.25 | 0.05 | 0.005 | |

| RECOMMENDATION SYMBOLS | | |
|------------------------|--------------------------------------|--|
| | UNDERCUT | |
| | SHALLOW UNDERCUT | |
| | UNCLASSIFIED EXCAVATION - ACCEPTABLE | |

| SOIL MOISTURE - CORRELATION OF TERMS | | |
|--|----------------------------|---|
| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION |
| LL LIQUID LIMIT PLASTIC RANGE (PI) PL | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |
| | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE |
| OM OPTIMUM MOISTURE SHRINKAGE LIMIT SL | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE |

| ABBREVIATIONS | | |
|--------------------------------|--------------------------|----------------------------------|
| AR - AUGER REFUSAL | MED. - MEDIUM | VST - VANE SHEAR TEST |
| BT - BORING TERMINATED | MICA - MICACEOUS | WEA - WEATHERED |
| CL - CLAY | MOD. - MODERATELY | U - UNIT WEIGHT |
| CPT - CONE PENETRATION TEST | NP - NON PLASTIC | U _d - DRY UNIT WEIGHT |
| CSE. - COARSE | ORG. - ORGANIC | SAMPLE ABBREVIATIONS |
| DME - DILATOMETER TEST | PMT - PRESSUREMETER TEST | S - BULK |
| DPT - DYNAMIC PENETRATION TEST | SAP. - SAPROLITIC | SS - SPLIT SPOON |
| e - VOID RATIO | SD. - SAND, SANDY | ST - SHELBY TUBE |
| F - FINE | SL. - SILT, SILTY | RS - ROCK |
| FOSS. - FOSSILIFEROUS | SLI. - SLIGHTLY | RT - RECOMPACTED TRIAXIAL |
| FRAC. - FRACTURED, FRACTURES | TCR - TRICONE REFUSAL | CBR - CALIFORNIA BEARING RATIO |
| FRAGS. - FRAGMENTS | w - MOISTURE CONTENT | |
| HI. - HIGHLY | V - VERY | |





| PLASTICITY | | |
|--|--------------|----------|
| PLASTICITY INDEX (PI) | DRY STRENGTH | |
| NON PLASTIC | 0-5 | VERY LOW |
| SLIGHTLY PLASTIC | 6-15 | SLIGHT |
| MODERATELY PLASTIC | 16-25 | MEDIUM |
| HIGHLY PLASTIC | 26 OR MORE | HIGH |
| COLOR | | |
| 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. | | |

| EQUIPMENT USED ON SUBJECT PROJECT | | |
|--|--|---|
| DRILL UNITS: | ADVANCING TOOLS: | HAMMER TYPE: |
| <input type="checkbox"/> CME-45C | <input type="checkbox"/> CLAY BITS | <input type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL |
| <input type="checkbox"/> CME-55 | <input type="checkbox"/> 6' CONTINUOUS FLIGHT AUGER | CORE SIZE: |
| <input type="checkbox"/> CME-550 | <input type="checkbox"/> 8" HOLLOW AUGERS | <input type="checkbox"/> -B _____ <input type="checkbox"/> -H _____ |
| <input type="checkbox"/> VANE SHEAR TEST | <input type="checkbox"/> HARD FACED FINGER BITS | <input type="checkbox"/> -N _____ |
| <input type="checkbox"/> PORTABLE HOIST | <input type="checkbox"/> TUNG.-CARBIDE INSERTS | HAND TOOLS: |
| <input type="checkbox"/> | <input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER | <input type="checkbox"/> POST HOLE DIGGER |
| <input type="checkbox"/> | <input type="checkbox"/> TRICONE _____ ' STEEL TEETH | <input checked="" type="checkbox"/> HAND AUGER |
| <input type="checkbox"/> | <input type="checkbox"/> TRICONE _____ ' TUNG.-CARB. | <input type="checkbox"/> SOUNDING ROD |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> CORE BIT | <input type="checkbox"/> VANE SHEAR TEST |
| <input type="checkbox"/> | | <input type="checkbox"/> |

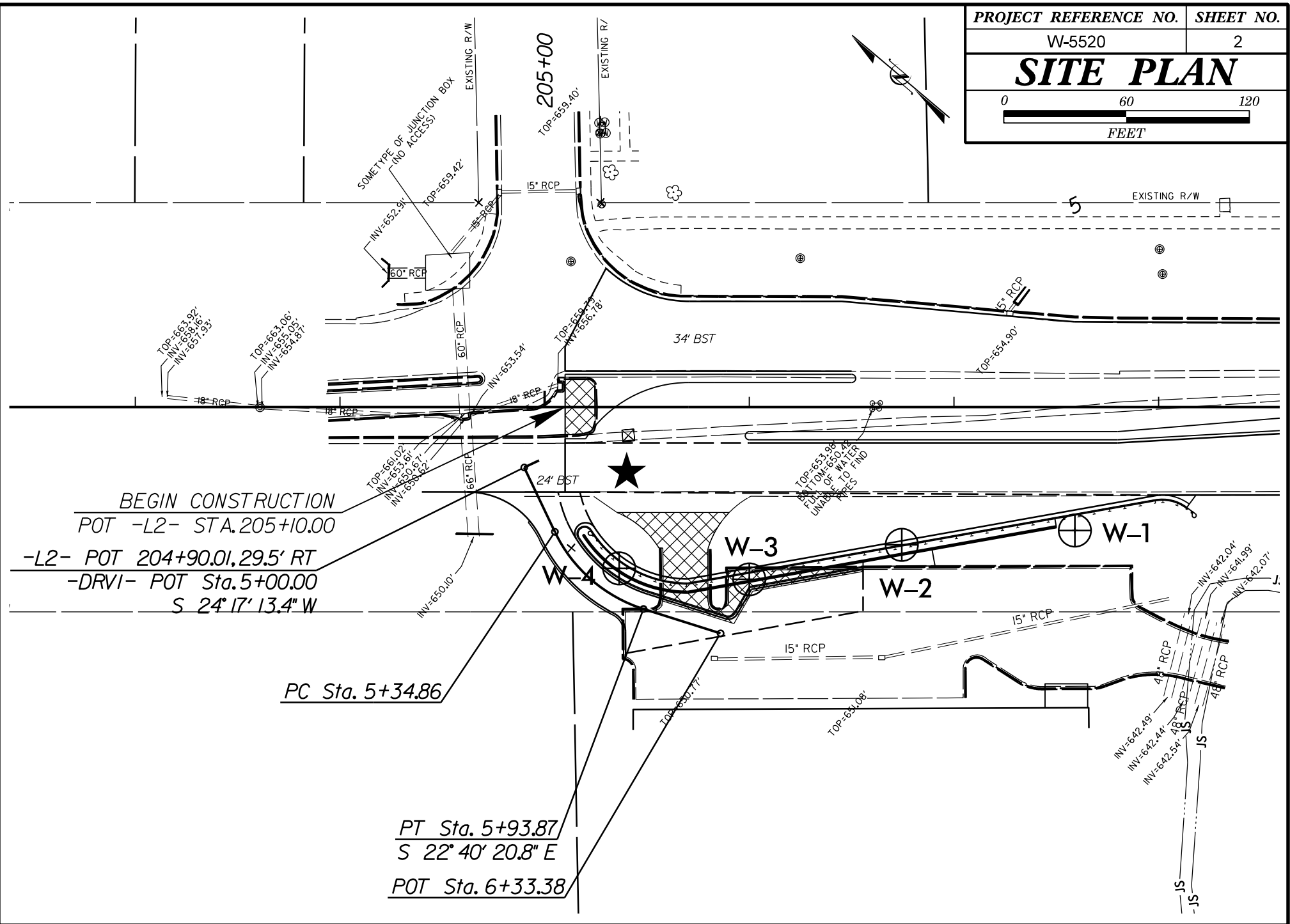
**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS (PAGE 2 OF 2)

| ROCK DESCRIPTION | | TERMS AND DEFINITIONS | |
|--|---|--|-------------------|
| <p>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. 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:</p> | | <p>ALLUVIUM (ALLUV.) - SOILS THAT 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, SUCH 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 THAT 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 DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - 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 (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - 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 THAT 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, THAT 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 BPF 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 PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 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 (SRQD) - 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 (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p> | |
| WEATHERED ROCK (WR) |  | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. | |
| 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 CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. | |
| WEATHERING | | | |
| FRESH | | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. | |
| VERY SLIGHT (V SL.) | | ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. | |
| SLIGHT (SL.) | | ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. | |
| MODERATE (MOD.) | | SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. | |
| MODERATELY SEVERE (MOD. SEV.) | | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> | |
| SEVERE (SEV.) | | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</i> | |
| VERY SEVERE (V SEV.) | | ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i> | |
| COMPLETE | | ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. | |
| ROCK HARDNESS | | | |
| VERY HARD | | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. | |
| HARD | | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. | |
| 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 GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. | |
| 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 PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. | |
| SOFT | | CAN BE GROOVED 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 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 FINGER NAIL. | |
| FRACTURE SPACING | | BEDDING | |
| TERM | SPACING | TERM | THICKNESS |
| VERY WIDE | MORE THAN 10 FEET | VERY THICKLY BEDDED | 4 FEET |
| WIDE | 3 TO 10 FEET | THICKLY BEDDED | 1.5 - 4 FEET |
| MODERATELY CLOSE | 1 TO 3 FEET | THINLY BEDDED | 0.16 - 1.5 FEET |
| CLOSE | 0.16 TO 1 FOOT | VERY THINLY BEDDED | 0.03 - 0.16 FEET |
| VERY CLOSE | LESS THAN 0.16 FEET | THICKLY LAMINATED | 0.008 - 0.03 FEET |
| | | THINLY LAMINATED | < 0.008 FEET |
| INDURATION | | | |
| FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. | | | |
| FRIABLE | | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. | |
| MODERATELY INDURATED | | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. | |
| INDURATED | | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. | |
| EXTREMELY INDURATED | | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. | |
| BENCH MARK: TOP OF NEARBY CATCH BASIN, STA 205+83 RT | | | |
| ELEVATION: 650.8 FEET | | | |
| NOTES: | | | |

| | |
|-----------------------|-----------|
| PROJECT REFERENCE NO. | SHEET NO. |
| W-5520 | 2 |
| SITE PLAN | |
| | |



BEGIN CONSTRUCTION
POT -L2- STA. 205+10.00
-L2- POT 204+90.01, 29.5' RT
-DRVI- POT Sta. 5+00.00
S 24° 17' 13.4" W

PC Sta. 5+34.86

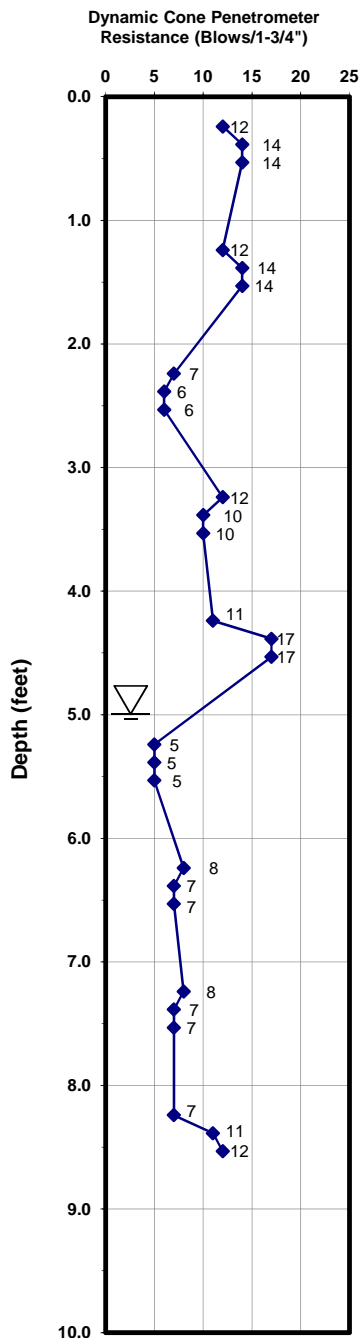
PT Sta. 5+93.87
S 22° 40' 20.8" E
POT Sta. 6+33.38

| | | |
|---|---|---|
| PROJECT: W-5520 US-74 Superstreet Conversion Union County, North Carolina S&ME Project No. 1335-14-075 | | BORING LOG: W-1 |
| DATE PERFORMED: 5/25/2016 PERFORMED BY: JW / TW BORING DEPTH: 8.5 feet WATER LEVEL: 5 feet | NORTHING: 487241 EASTING: 1505158 ELEVATION: 651.2 feet | NOTES: Dynamic Cone Penetrometer Testing performed in general accordance with ASTM STP 399. |

HAND AUGER / DYNAMIC CONE PENETROMETER SOUNDING RECORD

| DEPTH (FEET) | DESCRIPTION |
|--------------|---|
| 0 - 0.1 | Topsoil (1 inch) |
| 0.1 - 2 | ROADWAY EMBANKMENT: Tan Brown Sandy SILT (A-4) , stiff, moist, trace of rock fragments |
| 2 - 4 | ARTIFICIAL FILL: Orange Brown Sandy CLAY (A-6) , medium stiff, moist to wet |
| 4 - 5.5 | ALLUVIUM: Gray Sandy CLAY (A-6) , stiff to medium stiff, moist to wet, trace of wood debris and roots |
| 5.5 - 8 | ALLUVIUM: Gray CLAY (A-7-6) , medium stiff, saturated, trace of wood debris |
| 8 - 8.5 | ALLUVIUM: Tan CLAY (A-7-6) , stiff, saturated |

Hand auger terminated at 8.5 feet due to caving soils.
Groundwater encountered at 5 feet 4 hours after termination.

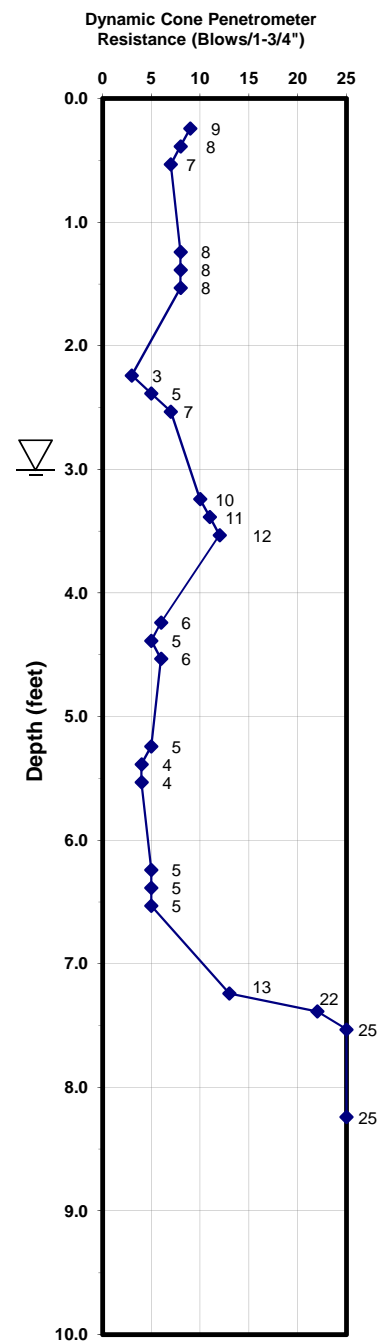


9751 Southern Pine Boulevard
 Charlotte, North Carolina 28723
 Phone: (704) 523-4726 • Fax: (704) 525-3953

| | | |
|---|---|---|
| PROJECT: W-5520 US-74 Superstreet Conversion Union County, North Carolina S&ME Project No. 1335-14-075 | | BORING LOG: W-2 |
| DATE PERFORMED: 5/25/2016 PERFORMED BY: JW / TW BORING DEPTH: 8.2 feet WATER LEVEL: 3 feet | NORTHING: 487301 EASTING: 1505098 ELEVATION: 653.4 feet | NOTES: Dynamic Cone Penetrometer Testing performed in general accordance with ASTM STP 399. |

HAND AUGER / DYNAMIC CONE PENETROMETER SOUNDING RECORD

| DEPTH (FEET) | DESCRIPTION |
|--|--|
| 0 - 0.2 | Topsoil (2 inches) |
| 0.2 - 1 | ROADWAY EMBANKMENT: Tan Brown Sandy SILT (A-4), medium stiff, dry |
| 1 - 3 | ARTIFICIAL FILL: Orange Brown Sandy CLAY (A-6), medium stiff to soft, moist to wet |
| 3 - 4.5 | ARTIFICIAL FILL: Red Brown Silty CLAY (A-7-5), medium stiff, wet |
| 4.5 - 6 | ALLUVIUM: Gray Sandy CLAY (A-6), soft, saturated |
| 6 - 8.2 | RESIDUUM: Orange Brown CLAY (A-7-6), medium stiff to stiff, saturated, trace of rock fragments |
| Hand auger terminated by auger refusal at 8.2 feet. Groundwater encountered at 4.2 feet at termination and at 3 feet 5 hours after termination. | |

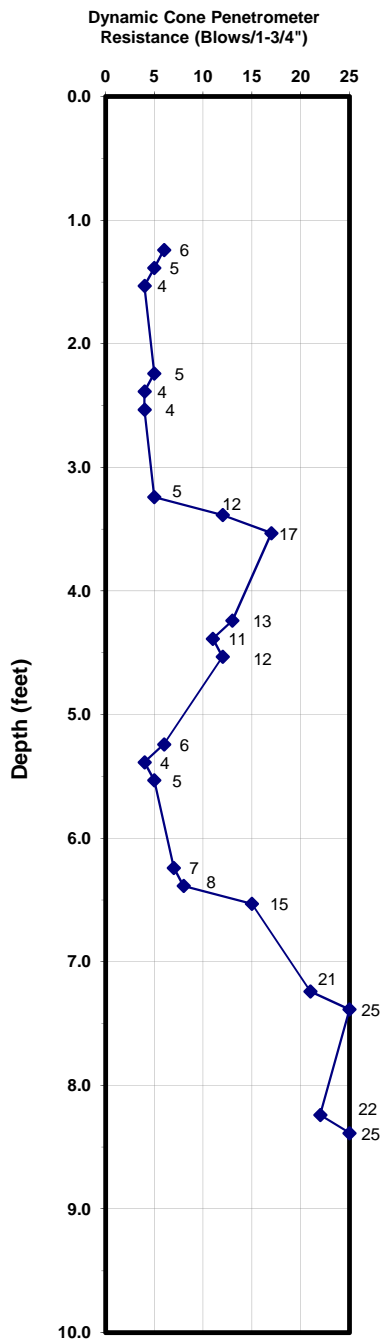


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| | | |
|---|---|---|
| PROJECT: W-5520 US-74 Superstreet Conversion Union County, North Carolina S&ME Project No. 1335-14-075 | | BORING LOG: W-3 |
| DATE PERFORMED: 5/25/2016 PERFORMED BY: JW / TW BORING DEPTH: 8.0 feet WATER LEVEL: Not Encountered | NORTHING: 487335 EASTING: 1505047 ELEVATION: 653.7 feet | NOTES: Dynamic Cone Penetrometer Testing performed in general accordance with ASTM STP 399. |

HAND AUGER / DYNAMIC CONE PENETROMETER SOUNDING RECORD

| DEPTH (FEET) | DESCRIPTION |
|---|--|
| 0 - 0.1 | Asphalt (1.75 inches) |
| 0.1 - 0.6 | ABC Stone (6 inches) |
| 0.6 - 3 | ARTIFICIAL FILL: Orange Brown Silty CLAY (A-7-5) , soft, moist |
| 3 - 4 | ARTIFICIAL FILL: Red Brown CLAY (A-7-6) , medium stiff, moist |
| 4 - 5.5 | ALLUVIUM: Gray Sandy CLAY (A-6) , stiff to medium stiff, moist |
| 5.5 - 8 | RESIDUUM: Tan Brown Sandy CLAY (A-6) , medium stiff to stiff, moist |
| Hand auger terminated at 8 feet in residual soils. Groundwater not encountered. Hand auger refusal encountered on unknown obstructions within fill soils at 2.5, 3.0, and 3.2 feet in offset borings. | |



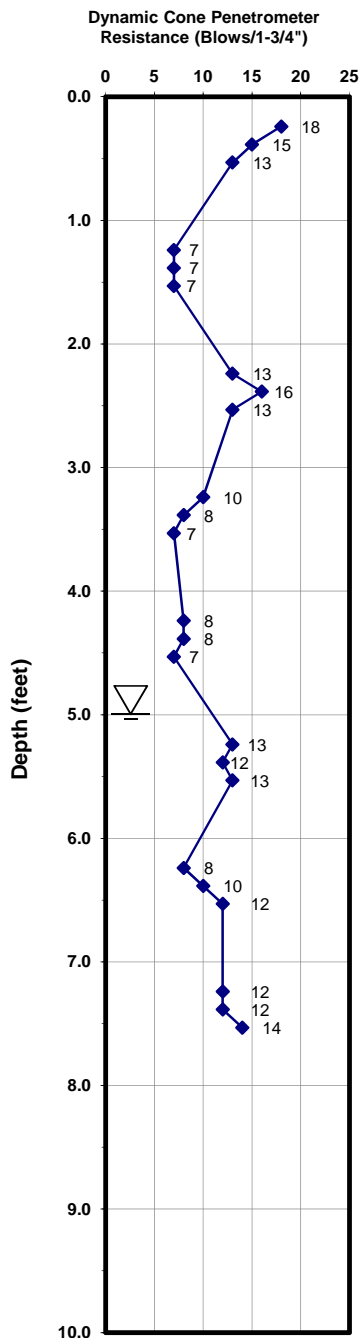
S&ME

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| | | |
|---|---|---|
| PROJECT: W-5520 US-74 Superstreet Conversion Union County, North Carolina S&ME Project No. 1335-14-075 | | BORING LOG: W-4 |
| DATE PERFORMED: 5/25/2016 PERFORMED BY: JW / TW BORING DEPTH: 7 feet WATER LEVEL: 5 feet | NORTHING: 487399 EASTING: 1505000 ELEVATION: 655.5 feet | NOTES: Dynamic Cone Penetrometer Testing performed in general accordance with ASTM STP 399. |

HAND AUGER / DYNAMIC CONE PENETROMETER SOUNDING RECORD

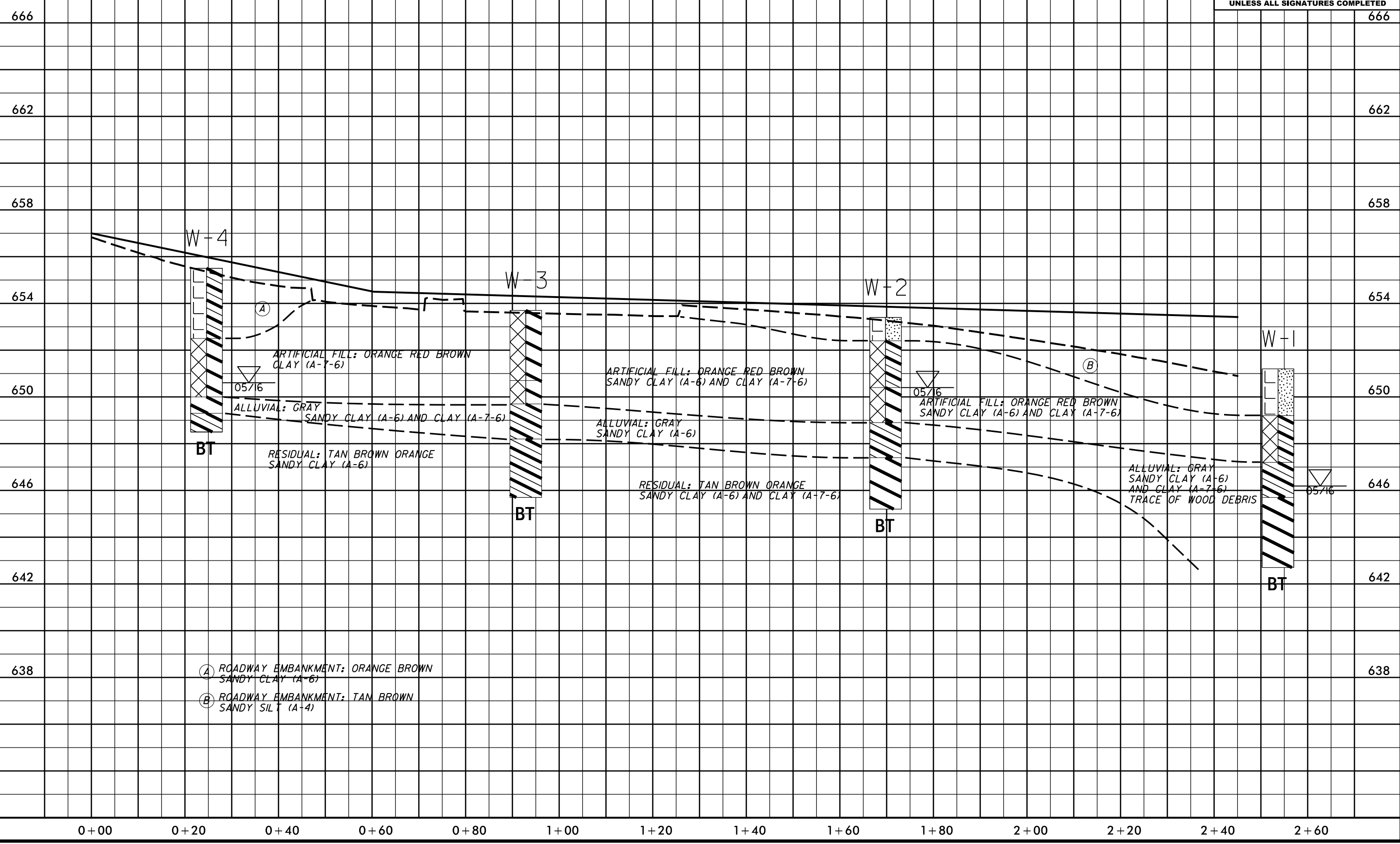
| DEPTH (FEET) | DESCRIPTION |
|--------------|--|
| 0 - 0.2 | Topsoil (2 inches) |
| 0.2 - 3 | ROADWAY EMBANKMENT: Orange Brown Sandy CLAY (A-6) , medium stiff to stiff, dry |
| 3 - 5.5 | ARTIFICIAL FILL: Red Brown CLAY (A-7-6) , medium stiff to stiff, moist |
| 5.5 - 6.2 | ALLUVIUM: Gray CLAY (A-7-6) , stiff, moist to wet |
| 6.2 - 7 | RESIDUUM: Orange Brown Sandy CLAY (A-6) , stiff, moist |



Hand auger terminated at 7 feet in residual soils.
 Groundwater encountered at 5 feet 3 hours after termination.
 Auger refusal encountered at 2.8 feet in offset boring.



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5/14/99
 31-JAN-2017 05:56
 C:\Users\AT\Documents\Projects\W-5520\Drawings\Roadway\Roadway\Roadway.dgn
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 4\GEO\1335-14-075 W-5520 US 74\Latest\Microstation\W5520.Rdy.plt.SME.dgn
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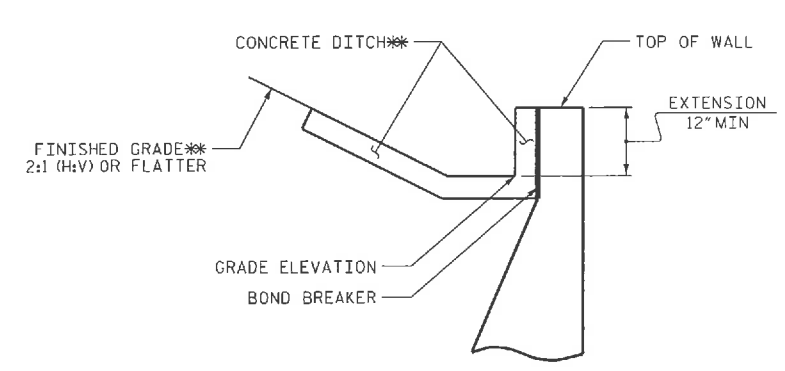
GEOTECHNICAL ENGINEER

ENGINEER

SEAL 037845

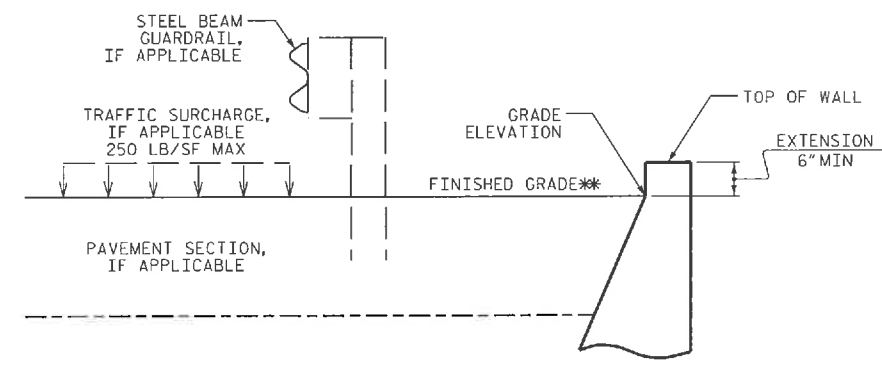
1/31/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



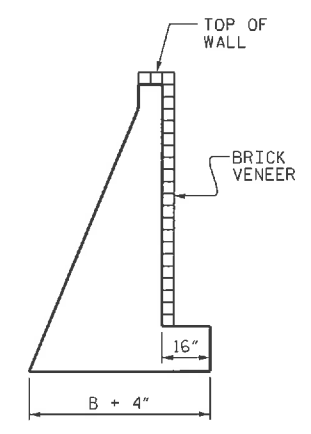
SLOPE CASE

**SEE ROADWAY PLANS FOR CONCRETE DITCH AND FINISHED GRADE DETAILS.



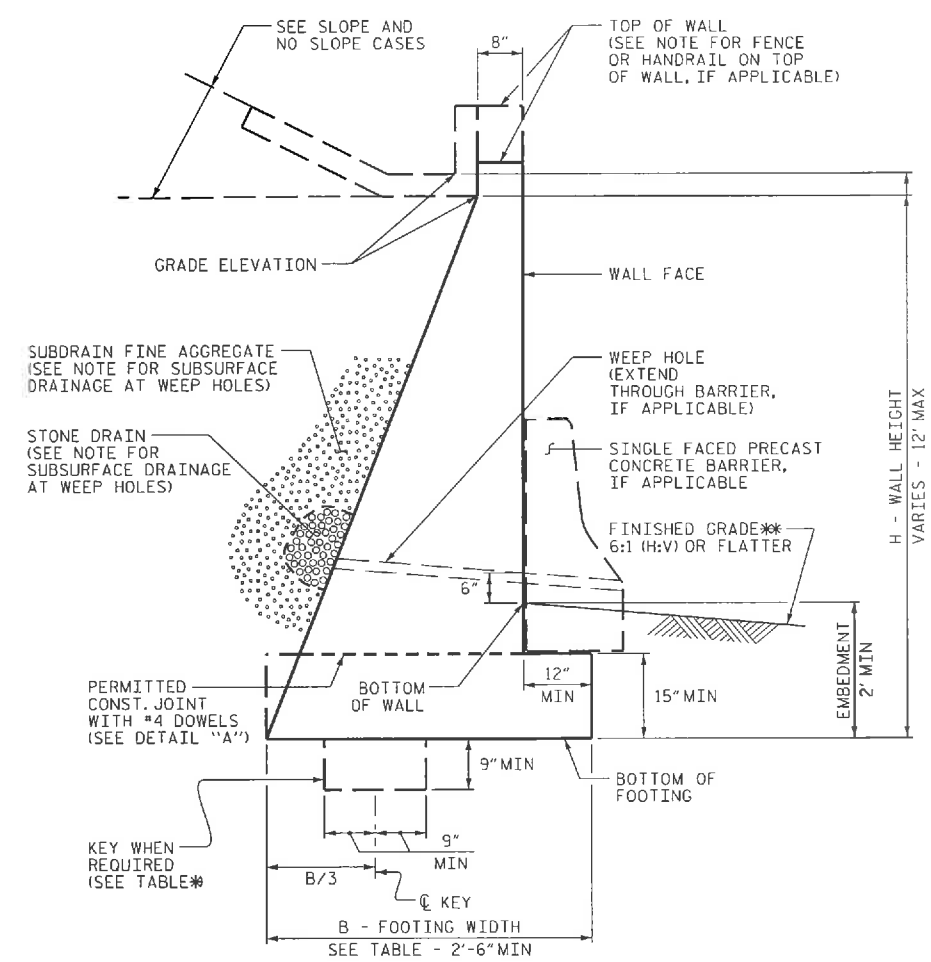
NO SLOPE CASE

**SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.



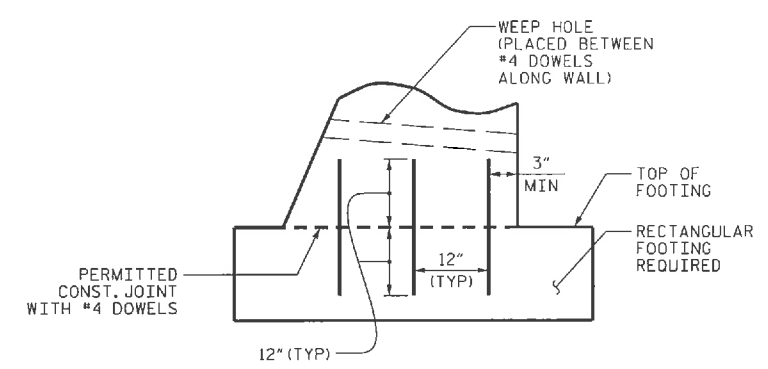
BRICK VENEER DETAIL

(WHEN APPLICABLE)



STANDARD CIP GRAVITY WALL

**SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.



DETAIL "A"

| H (FT) | 3 - < 6 | 6 - 9 | > 9 - 12 |
|---|---------|-------|----------|
| SLOPE CASE | .66 | .70* | .75* |
| NO SLOPE CASE WITH TRAFFIC SURCHARGE | .80 | .75* | .70* |
| NO SLOPE CASE WITHOUT TRAFFIC SURCHARGE | .60 | .60 | .60 |

B/H RATIO (B = 2'-6" MIN)

**KEY IS REQUIRED FOR "SLOPE CASE" OR "NO SLOPE CASE WITH TRAFFIC SURCHARGE" WHEN H IS 6' OR GREATER.

NOTES:

- FOR STANDARD CAST-IN-PLACE (CIP) GRAVITY RETAINING WALLS, SEE CAST-IN-PLACE GRAVITY RETAINING WALLS PROVISION.
- FOR STEEL BEAM GUARDRAIL, SEE ROADWAY PLANS AND SECTION 862 OF THE STANDARD SPECIFICATIONS.
- FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.
- FOR FENCES OR HANDRAILS ON TOP OF WALLS, SEE ROADWAY PLANS FOR FENCE OR HANDRAIL ATTACHMENT DETAILS.
- FOR SUBSURFACE DRAINAGE AT WEAP HOLES, SEE ARTICLE 414-8 OF THE STANDARD SPECIFICATIONS.
- STANDARD CIP GRAVITY WALLS ARE BASED ON THE FOLLOWING IN-SITU ASSUMED SOIL PARAMETERS:
 UNIT WEIGHT, $\gamma = 120$ LB/CF
 FRICTION ANGLE, $\phi = 35$ DEGREES (GROUNDWATER WITHIN 7' OF BOTTOM OF FOOTING)
 FRICTION ANGLE, $\phi = 30$ DEGREES (GROUNDWATER MORE THAN 7' BELOW BOTTOM OF FOOTING)
 COHESION, $c = 0$ LB/SF
- DO NOT USE STANDARD CIP GRAVITY WALLS IF ASSUMED SOIL PARAMETERS ARE NOT APPLICABLE OR GROUNDWATER IS ABOVE BOTTOM OF FOOTING.
- DO NOT USE STANDARD CIP GRAVITY WALLS WHEN VERY LOOSE OR SOFT SOIL OR MUCK IS BELOW WALLS.
- BEFORE BEGINNING STANDARD CIP GRAVITY WALL CONSTRUCTION, SURVEY WALL LOCATIONS AND SUBMIT WALL PROFILE VIEWS (WALL ENVELOPES) FOR REVIEW. FOR WALL ENVELOPES, INCLUDE BOTTOM OF WALL, EXISTING GROUND AND GRADE ELEVATIONS AND OTHER ELEVATIONS AS NEEDED AT INTERVALS OF 25' OR LESS ALONG WALLS. DO NOT START WALL CONSTRUCTION UNTIL WALL ENVELOPES ARE ACCEPTED.
- FOR BRICK VENEERS, SUBMIT BRICK SAMPLES FOR APPROVAL BEFORE BEGINNING STANDARD CIP GRAVITY WALL CONSTRUCTION.
- DO NOT PLACE CONCRETE FOR FOOTINGS UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.
- WHEN CONSTRUCTING STANDARD CIP GRAVITY WALLS WITH A CONSTRUCTION JOINT AS SHOWN IN DETAIL "A", PROVIDE A MINIMUM OF 3 EQUALLY SPACED #4 DOWELS AT INTERVALS OF 1'-6" ALONG WALLS.

PROJECT NO.: W-5520

UNION COUNTY

STATION: 250+19 to 207+50 -L2-

SHEET 8 OF 9

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STANDARD DETAIL NO. 453.01

STANDARD CAST-IN-PLACE (CIP) GRAVITY RETAINING WALL

DATE: 3-17-15

SHEET NO. 8

Particle Size Analysis of Soils

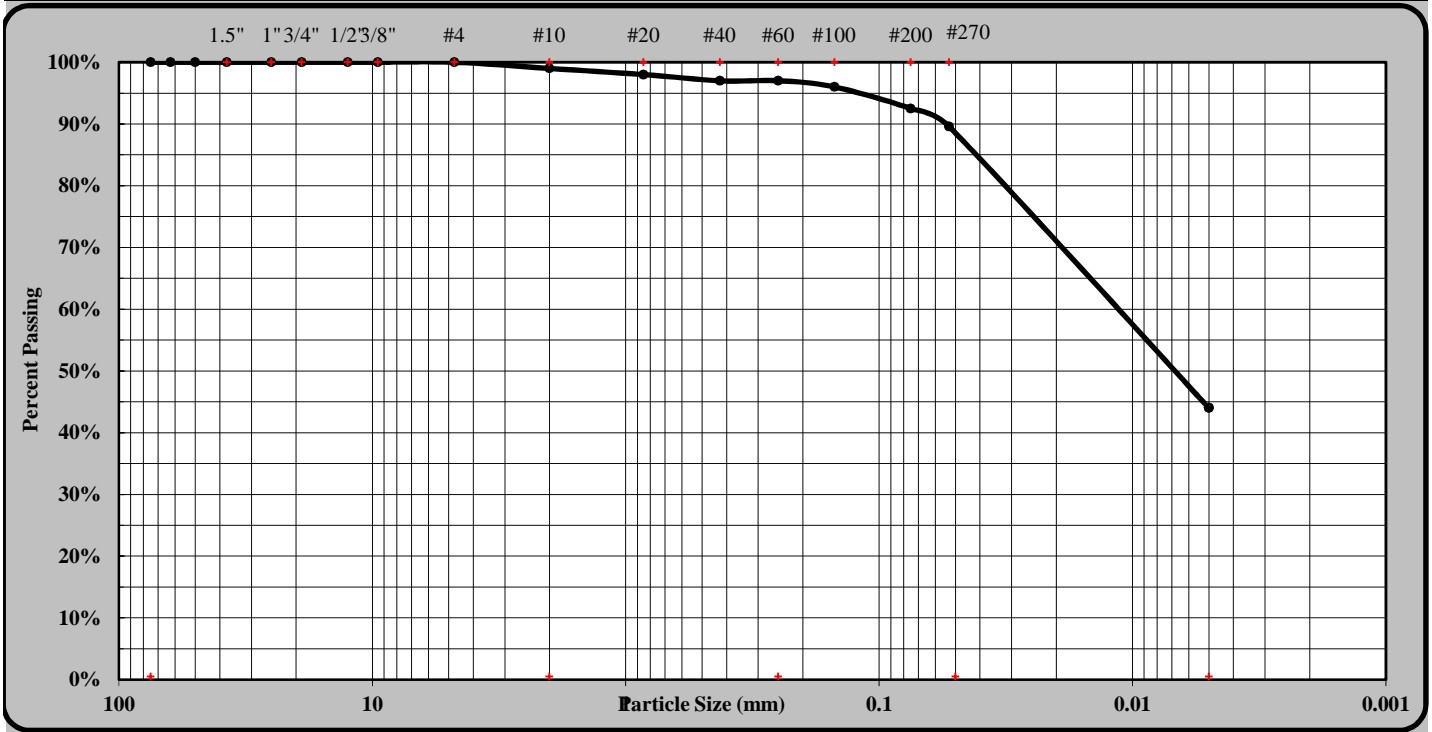
AASHTO T88 as Modified by NCDOT



Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

| | | | |
|---------------------|------------------------------------|------------------|----------|
| S&ME Project #: | 1335-14-075 Phase 01 | Report Date: | 6/9/16 |
| Project Name: | US-74 Superstreet Conversion | Test Date(s): | 6/3-9/16 |
| State Project #: | 50092.1.FS1 | F.A. Project No: | NA |
| Client Name: | DRMP, Inc. | TIP NO: | W-5520 |
| Address: | 5950 Fairview Road, Suite 320 | | |
| Boring #: | W-3 | Sample #: | S-1 |
| Location: | Borehole | Offset: | NA |
| Sample Description: | Orange Brown Silty CLAY A-7-5 (19) | | |



| As Defined by NCDOT | | Fine Sand | | < 0.25 mm and > 0.05 mm | |
|---|-------------------------------------|--------------------------|--------------------------|-------------------------|-------------------------------------|
| Gravel | < 75 mm and > 2.00 mm | Silt | < 0.05 and > 0.005 mm | | |
| Coarse Sand | < 2.00 mm and > 0.25 mm | Clay | < 0.005 mm | | |
| Maximum Particle Size | #10 | Coarse Sand | 2% | Silt | 46% |
| Gravel | 1% | Fine Sand | 7% | Clay | 44% |
| Apparent Relative Density | 2.650 | Moisture Content | 30.9% | % Passing #200 | 92.5% |
| Liquid Limit | 50 | Plastic Limit | 34 | Plastic Index | 16 |
| Soil Mortar (-#10 Sieve) | | | | | |
| Coarse Sand | 2% | Fine Sand | 8% | Silt | 46% |
| | | | | Clay | 44% |
| Description of Sand & Gravel Particles: | Rounded | <input type="checkbox"/> | | Angular | <input checked="" type="checkbox"/> |
| Hard & Durable | <input checked="" type="checkbox"/> | Soft | <input type="checkbox"/> | Weathered & Friable | <input type="checkbox"/> |

References / Comments / Deviations:

Karen Warner
Technician Name

NCDOT 118-06-0305
Certification No.

Laboratory Technician
Position

Date

Luis Campos
Technical Responsibility

Signature

Project Engineer
Position

Date

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Particle Size Analysis of Soils

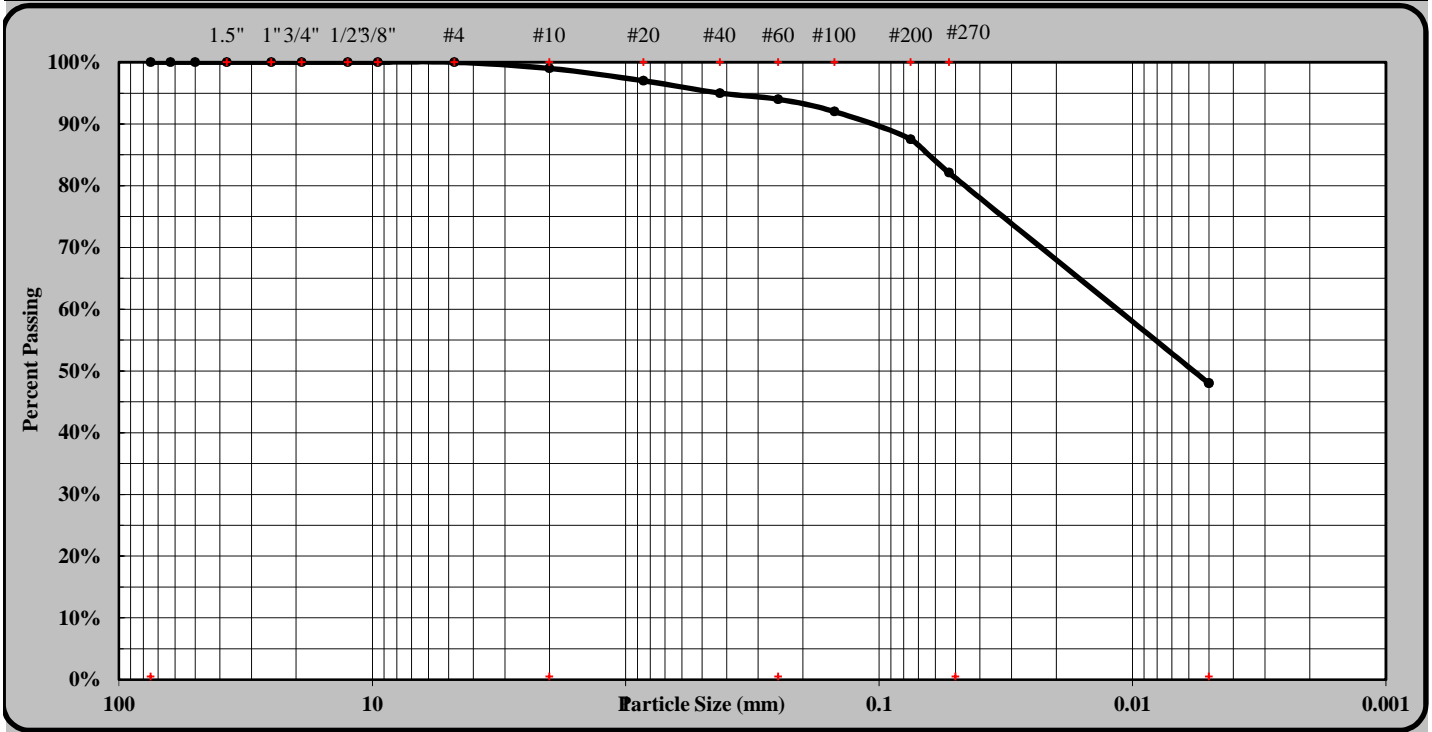
AASHTO T88 as Modified by NCDOT



Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

| | | | |
|---------------------|-------------------------------|------------------|----------|
| S&ME Project #: | 1335-14-075 Phase 01 | Report Date: | 6/9/16 |
| Project Name: | US-74 Superstreet Conversion | Test Date(s): | 6/3-9/16 |
| State Project #: | 50092.1.FS1 | F.A. Project No: | NA |
| Client Name: | DRMP, Inc. | TIP NO: | W-5520 |
| Address: | 5950 Fairview Road, Suite 320 | | |
| Boring #: | W-4 | Sample #: | S-2 |
| Location: | Borehole | Offset: | NA |
| Sample Description: | Red Brown CLAY A-7-6 (28) | | |



| As Defined by NCDOT | | Fine Sand | < 0.25 mm and > 0.05 mm |
|---------------------|-------------------------|-----------|-------------------------|
| Gravel | < 75 mm and > 2.00 mm | Silt | < 0.05 and > 0.005 mm |
| Coarse Sand | < 2.00 mm and > 0.25 mm | Clay | < 0.005 mm |

| | | | | | |
|---------------------------|-------|------------------|-------|----------------|-------|
| Maximum Particle Size | #4 | Coarse Sand | 5% | Silt | 34% |
| Gravel | 1% | Fine Sand | 12% | Clay | 48% |
| Apparent Relative Density | 2.650 | Moisture Content | 30.6% | % Passing #200 | 87.5% |
| Liquid Limit | 57 | Plastic Limit | 29 | Plastic Index | 28 |

| Soil Mortar (-#10 Sieve) | | | | | | | |
|---|-------------------------------------|-----------|--------------------------|---------------------|-----|-------------------------------------|-----|
| Coarse Sand | 5% | Fine Sand | 12% | Silt | 34% | Clay | 49% |
| Description of Sand & Gravel Particles: | Rounded | | <input type="checkbox"/> | Angular | | <input checked="" type="checkbox"/> | |
| Hard & Durable | <input checked="" type="checkbox"/> | Soft | <input type="checkbox"/> | Weathered & Friable | | <input type="checkbox"/> | |

References / Comments / Deviations:

Karen Warner
Technician Name

NCDOT 118-06-0305
Certification No.

Laboratory Technician
Position

Date

Luis Campos
Technical Responsibility

Signature

Project Engineer
Position

Date

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Particle Size Analysis of Soils

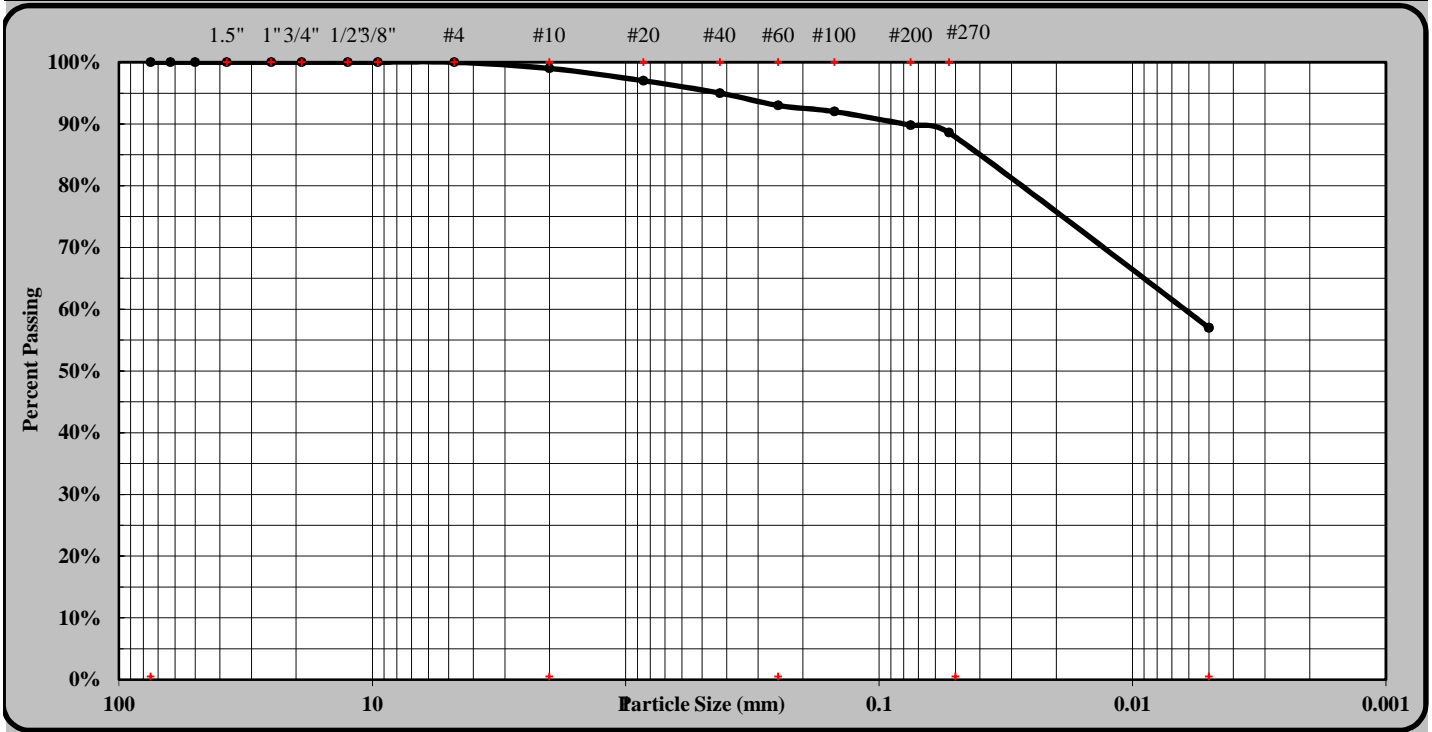
AASHTO T88 as Modified by NCDOT



Quality Assurance

S&ME, Inc. ~ 9751 Southern Pine Boulevard~Charlotte, NC 28273

| | | | |
|---------------------|---------------------------------|------------------|----------|
| S&ME Project #: | 1335-14-075 Phase 01 | Report Date: | 6/9/16 |
| Project Name: | US-74 Superstreet Conversion | Test Date(s): | 6/3-9/16 |
| State Project #: | 50092.1.FS1 | F.A. Project No: | NA |
| Client Name: | DRMP, Inc. | TIP NO: | W-5520 |
| Address: | 5950 Fairview Road, Suite 320 | | |
| Boring #: | W-2 | Sample #: | S-3 |
| Location: | Borehole | Offset: | NA |
| | | Sample Date: | 5/25/16 |
| | | Depth (ft): | 4-4.5' |
| Sample Description: | Red Brown Silty CLAY A-7-5 (36) | | |



| As Defined by NCDOT | | Fine Sand | < 0.25 mm and > 0.05 mm |
|---------------------|-------------------------|-----------|-------------------------|
| Gravel | < 75 mm and > 2.00 mm | Silt | < 0.05 and > 0.005 mm |
| Coarse Sand | < 2.00 mm and > 0.25 mm | Clay | < 0.005 mm |

| | | | | | |
|---------------------------|-------|------------------|-------|----------------|-------|
| Maximum Particle Size | #10 | Coarse Sand | 6% | Silt | 32% |
| Gravel | 1% | Fine Sand | 4% | Clay | 57% |
| Apparent Relative Density | 2.650 | Moisture Content | 34.2% | % Passing #200 | 89.8% |
| Liquid Limit | 67 | Plastic Limit | 33 | Plastic Index | 34 |

| Soil Mortar (-#10 Sieve) | | | | | | | |
|---|-------------------------------------|-----------|--------------------------|------|-----|---------------------|-------------------------------------|
| Coarse Sand | 6% | Fine Sand | 4% | Silt | 32% | Clay | 58% |
| Description of Sand & Gravel Particles: | | Rounded | <input type="checkbox"/> | | | Angular | <input checked="" type="checkbox"/> |
| Hard & Durable | <input checked="" type="checkbox"/> | Soft | <input type="checkbox"/> | | | Weathered & Friable | <input type="checkbox"/> |

References / Comments / Deviations:

Karen Warner
Technician Name

NCDOT 118-06-0305
Certification No.

Laboratory Technician
Position

_____ Date

Luis Campos
Technical Responsibility

Signature

Project Engineer
Position

_____ Date

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CAST-IN-PLACE GRAVITY RETAINING WALLS**(3-17-15)****1.0 GENERAL**

Construct cast-in-place (CIP) gravity retaining walls consisting of CIP concrete supported by and connected to concrete footings. Construct CIP gravity retaining walls based on actual elevations and wall dimensions in accordance with the contract, accepted submittals and if included in the plans, Standard Detail No. 453.01. Define “CIP gravity wall” as a CIP gravity retaining wall.

2.0 MATERIALS

Refer to Division 10 of the *Standard Specifications*.

| Item | Section |
|-----------------------------------|----------------|
| Curing Agents | 1026 |
| Geotextiles, Type 1 | 1056 |
| Joint Materials | 1028 |
| Masonry | 1040 |
| Portland Cement Concrete, Class A | 1000 |
| Reinforcing Steel | 1070 |
| Subdrain Coarse Aggregate | 1044-2 |
| Subdrain Fine Aggregate | 1044-1 |

Use geotextiles and subdrain aggregate for subsurface drainage at weep holes and reinforcing steel for dowels.

3.0 CIP GRAVITY WALL SURVEYS

The plans typically show a plan view, typical sections, details, notes and an elevation or profile view (wall envelope) for each CIP gravity wall. Before beginning CIP gravity wall construction, survey existing ground elevations along wall face locations and other elevations in the vicinity of CIP gravity wall locations as needed. For proposed slopes above or below CIP gravity walls, survey existing ground elevations to at least 10 ft beyond slope stake points. Based on these elevations, finished grades and actual CIP gravity wall dimensions and details, submit wall envelopes for acceptance. Use accepted wall envelopes for construction.

4.0 CONSTRUCTION METHODS

Control drainage during construction in the vicinity of CIP gravity walls. Direct run off away from CIP gravity walls and backfill. Contain and maintain backfill and protect material from erosion.

Excavate as necessary for CIP gravity walls in accordance with the plans. Unless required otherwise in the plans, embed bottom of footings at least 2 ft below bottom of walls shown in the plans. If applicable and at the Contractor’s option, use temporary shoring for wall construction instead of temporary slopes to construct CIP gravity walls. Define “temporary

shoring for wall construction” as temporary shoring not shown in the plans or required by the Engineer including shoring for OSHA reasons or the Contractor’s convenience.

Notify the Engineer when foundation excavation is complete. Do not place concrete for footings until excavation depth and foundation material are approved.

Construct CIP gravity walls at elevations and with dimensions shown in the plans and in accordance with Section 420 of the *Standard Specifications*. Use dowels for construction joints at top of footings as shown in the plans. Extend top of walls at least 6" above where finished grade intersects back of CIP gravity walls.

Unless required otherwise in the plans, provide a Class 2 surface finish for exposed surfaces of CIP gravity walls that meets Subarticle 420-17(F) of the *Standard Specifications*. Construct wall joints at a spacing of 10 ft to 12 ft unless required otherwise in the plans. Make 1/2" thick expansion joints that meet Article 420-10 of the *Standard Specifications* for every third joint and 1/2" deep grooved contraction or sawed joints that meet Subarticle 825-10(B) or 825-10(E) respectively of the *Standard Specifications* for the remaining joints.

Construct 3" diameter weep holes on 10 ft centers along CIP gravity walls. Provide subsurface drainage at weep holes in accordance with Article 414-8 of the *Standard Specifications*. Exit weep holes just above finished grade and slope holes at 1" per foot through CIP gravity walls so water drains out of front of walls. When single faced precast concrete barrier is required in front of and against CIP gravity walls, extend weep holes through barrier at the same slope.

Do not remove forms or backfill behind CIP gravity walls until concrete attains a compressive strength of at least 2,400 psi. Backfill for CIP gravity walls in accordance with Article 410-8 of the *Standard Specifications*.

If a brick veneer is required, construct brick masonry in accordance with Section 830 of the *Standard Specifications*. Anchor brick veneers to CIP gravity walls with approved brick to concrete type anchors in accordance with the manufacturer’s instructions. Space anchors no more than 16" apart in the vertical direction and no more than 32" apart in the horizontal direction with each row of anchors staggered 16" from the row above and below.

5.0 MEASUREMENT AND PAYMENT

CIP Gravity Retaining Walls will be measured and paid in square feet. CIP gravity walls will be measured as the square feet of wall face area with the pay height equal to the difference between top of wall and top of footing elevations. Define “top of wall” as top of CIP concrete.

The contract unit price for *CIP Gravity Retaining Walls* will be full compensation for providing submittals, labor, tools, equipment and CIP gravity wall materials, excavating, backfilling, hauling and removing excavated materials and supplying concrete, dowels, subsurface drainage, weep holes and any incidentals necessary to construct CIP gravity walls. The contract unit price for *CIP Gravity Retaining Walls* will also be full

compensation for brick veneers, if required.

No separate payment will be made for temporary shoring for wall construction. Temporary shoring for wall construction will be incidental to the contract unit price for *CIP Gravity Retaining Walls*.

The contract unit price for *CIP Gravity Retaining Walls* does not include the cost for ditches, fences, handrails, barrier or guardrail associated with CIP gravity walls as these items will be paid for elsewhere in the contract.

Where it is necessary to provide backfill material from sources other than excavated areas or borrow sources used in connection with other work in the contract, payment for furnishing and hauling such backfill material will be paid as extra work in accordance with Article 104-7 of the *Standard Specifications*. Placing and compacting such backfill material is not considered extra work but is incidental to the work being performed.

Payment will be made under:

Pay Item
CIP Gravity Retaining Walls

Pay Unit
Square Foot

