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GEOTECHNICAL ENGINEER

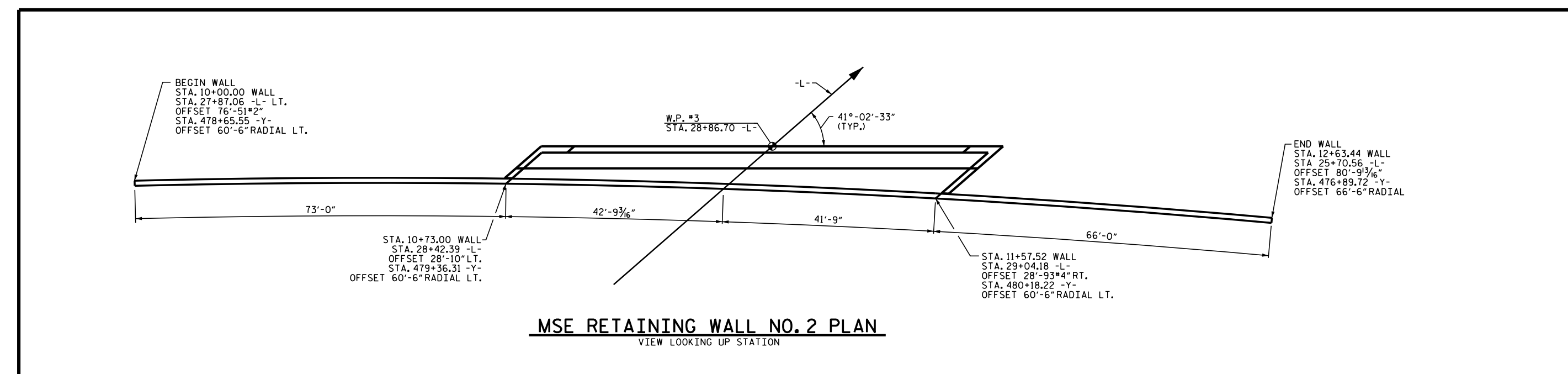
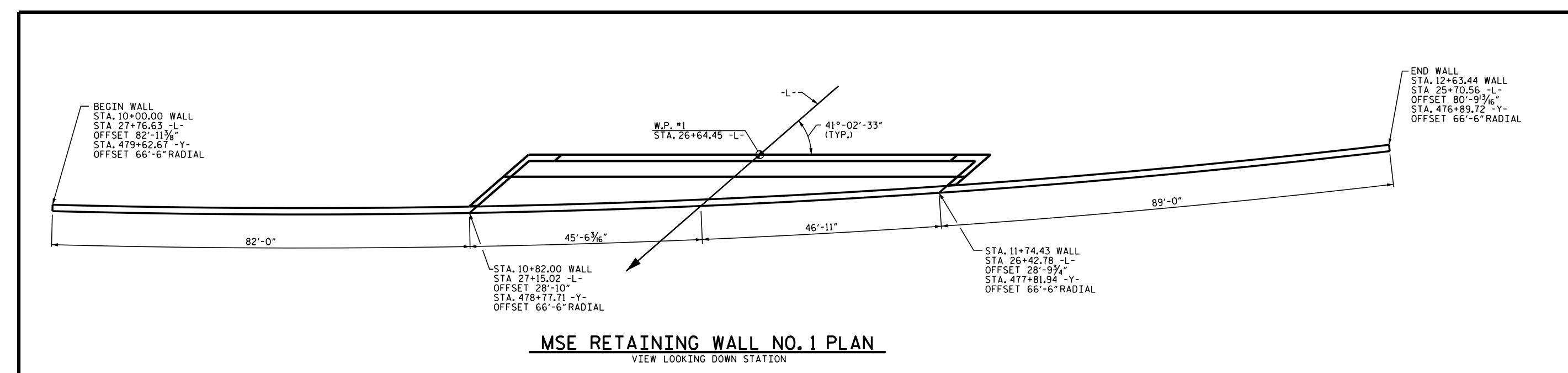
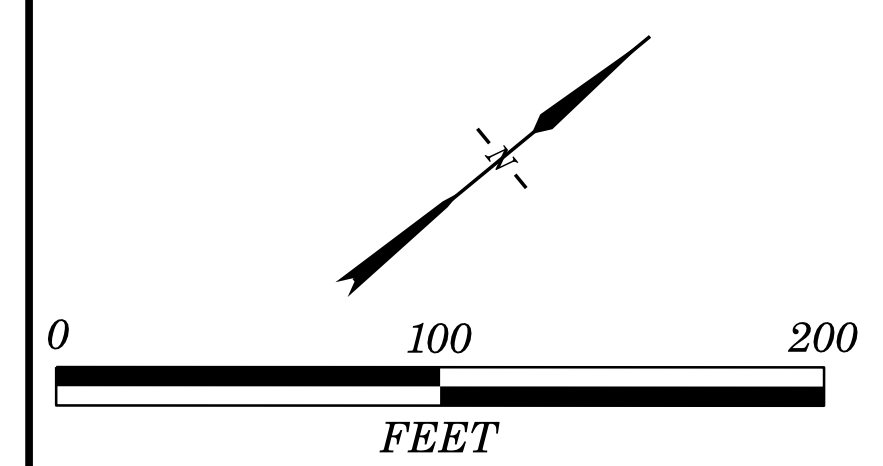
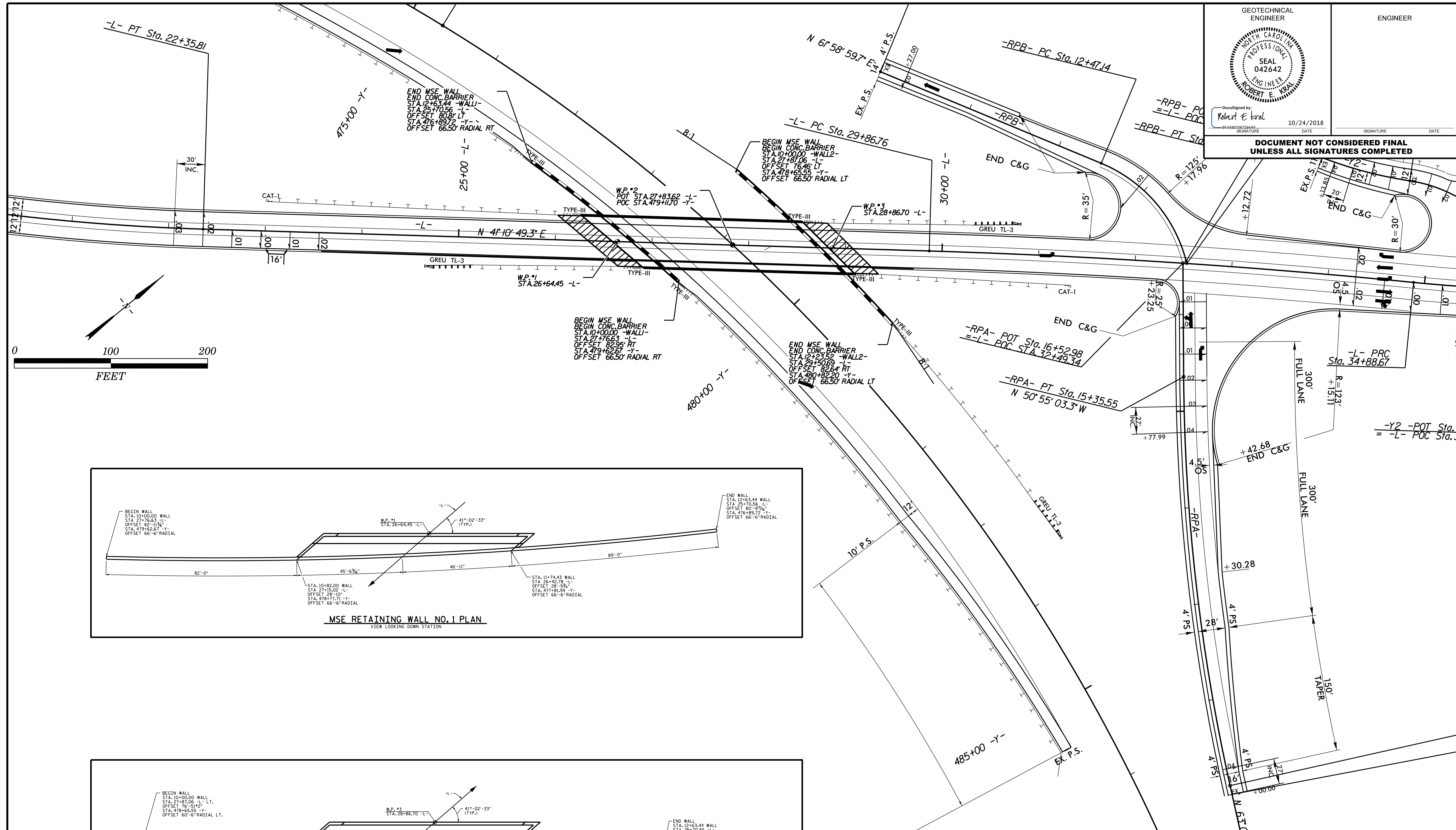
ENGINEER

ROBERT E. KRAL
 PROFESSIONAL SEAL
 042642
 ENGINEER

Documented by Robert E. Kral
 10/24/2018
 DATE

SIGNATURE DATE

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PROJECT NO.: 44390.1.1 (U-5818)
 MCDOWELL COUNTY
 STATION: 27+83.62 -L- / 479+11.70 -Y-
 SHEET 1 OF 4

9751 SOUTHERN PINE BLVD
 CHARLOTTE, NC 28273
 (704) 523-4726

**MSE RETAINING WALL
 NO. 1 AND NO. 2
 LOCATION PLAN**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			1
2			4			

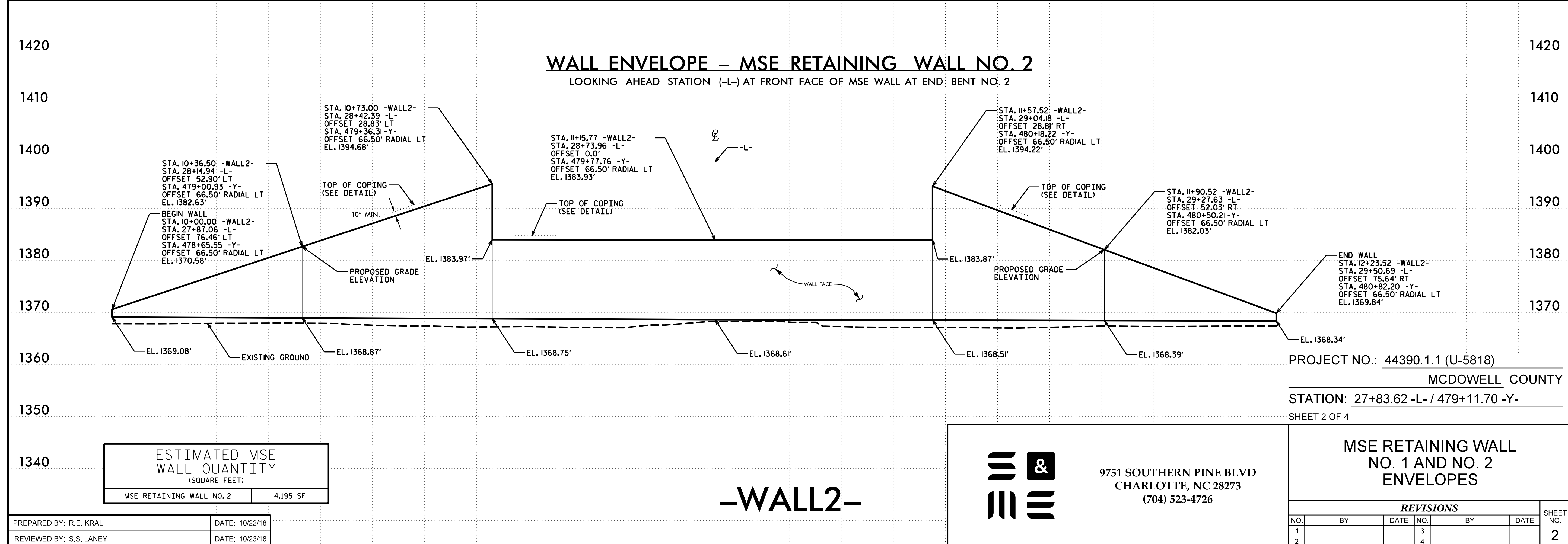
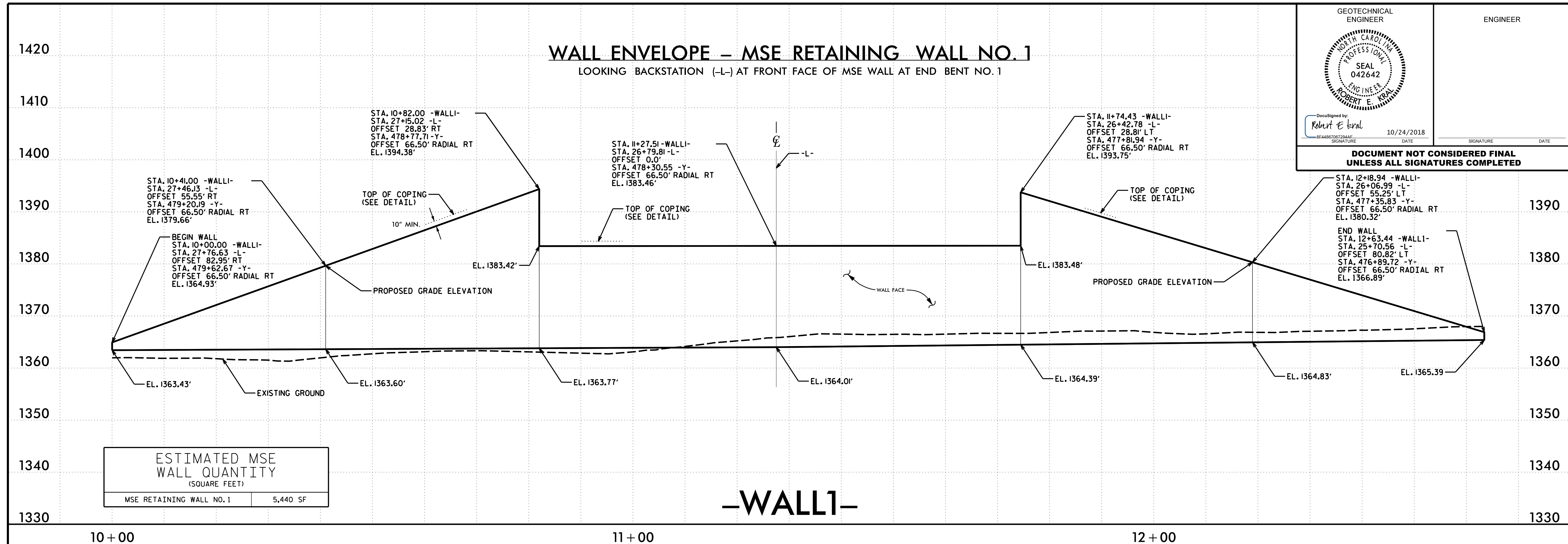
PREPARED BY: R.E. KRAL
 DATE: 10/22/18
 REVIEWED BY: S.S. LANEY
 DATE: 10/23/18

GEOTECHNICAL ENGINEER

ENGINEER

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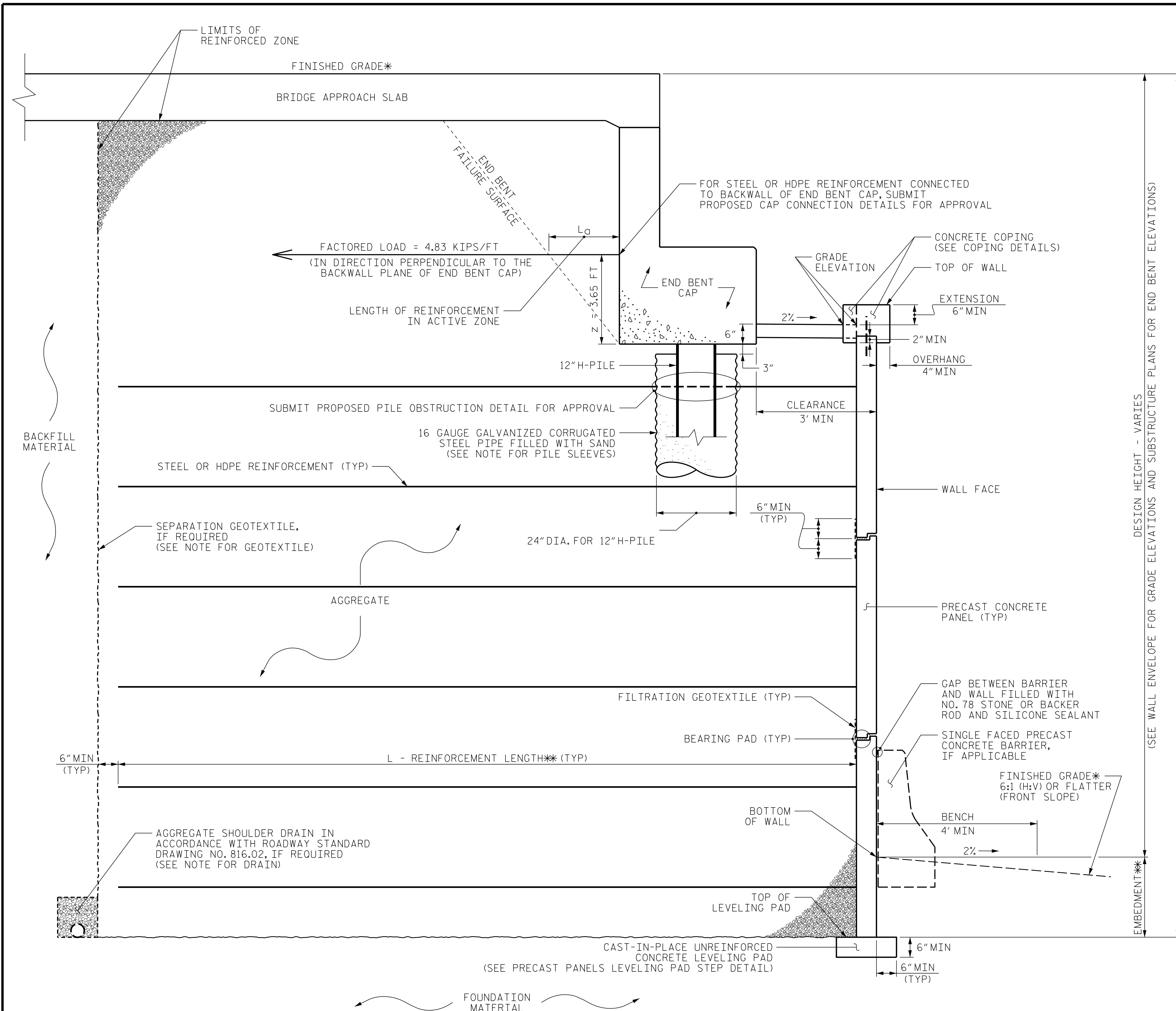


PREPARED BY: R.E. KRAL DATE: 10/22/18
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9751 SOUTHERN PINE BLVD
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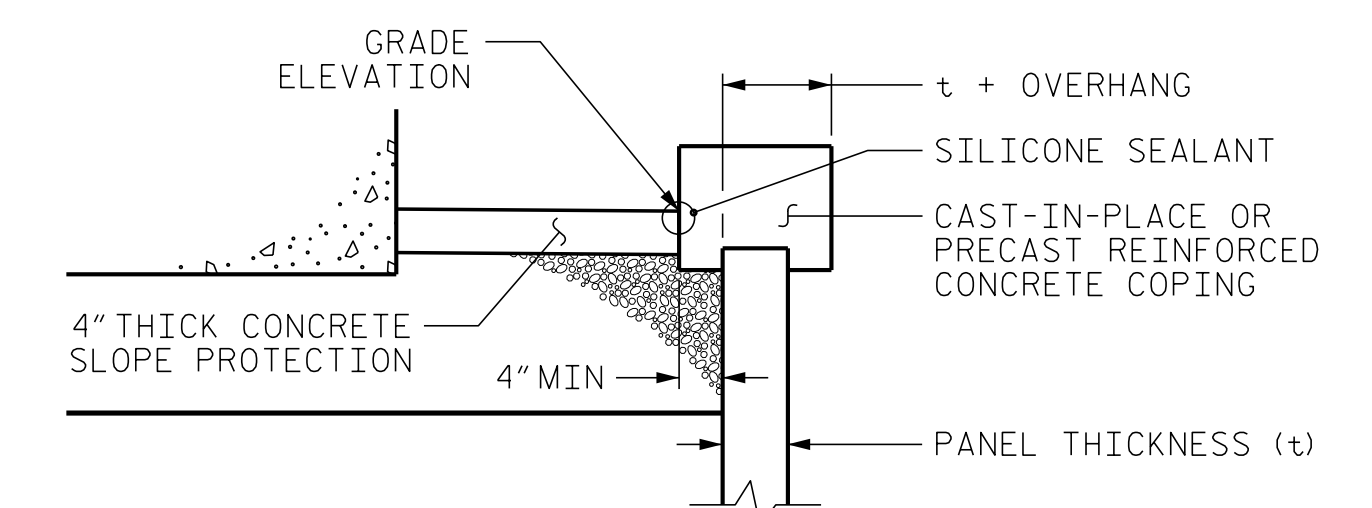
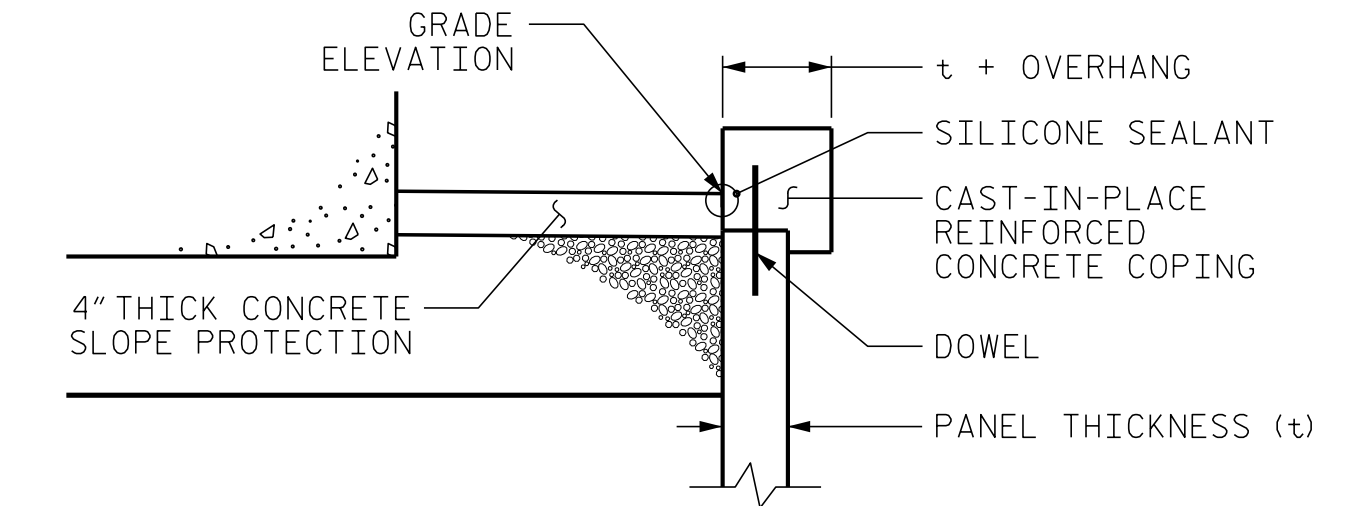
PROJECT NO.: 44390.1.1 (U-5818)
 MCDOWELL COUNTY
 STATION: 27+83.62 -L- / 479+11.70 -Y-
 SHEET 2 OF 4

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			2
2			4			



MSE ABUTMENT WALL WITH PRECAST PANELS - TYPICAL SECTION

*SEE ROADWAY PLANS FOR FINISHED GRADE DETAILS.
 **SEE MSE RETAINING WALLS PROVISION AND IF APPLICABLE,
 MSE WALL NOTES FOR EMBEDMENT AND REINFORCEMENT LENGTH REQUIREMENTS.



COPING DETAILS

AT THE CONTRACTOR'S OPTION, CONNECT COPING TO PANELS WITH DOWELS OR EXTEND COPING DOWN BACK OF PANELS.

GEOTECHNICAL ENGINEER

ENGINEER

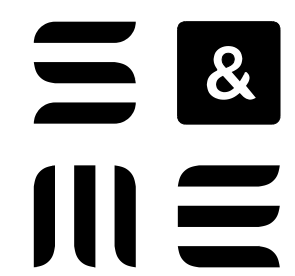
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PROJECT NO.: 44390.1.1 (U-5818)
 MCDOWELL COUNTY
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 SHEET 3 OF 4

PREPARED BY: R.E. KRAL DATE: 10/22/18
 REVIEWED BY: S.S. LANEY DATE: 10/23/18



9751 SOUTHERN PINE BLVD
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NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS

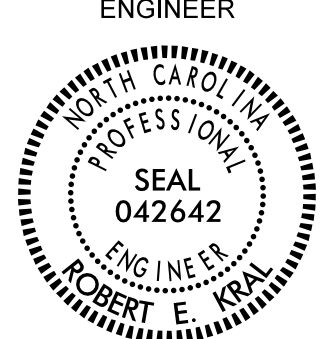
GEOTECHNICAL
 ENGINEERING UNIT

MSE RETAINING WALL NO. 1 AND NO. 2 TYPICAL SECTION

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			3
2			4			

GEOTECHNICAL ENGINEER

ENGINEER



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Robert E. Kral
10/24/2018

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NOTES:

FOR MECHANICALLY STABILIZED EARTH (MSE) RETAINING WALLS, SEE MECHANICALLY STABILIZED EARTH RETAINING WALLS PROVISION.

FOR SINGLE FACED PRECAST CONCRETE BARRIER, SEE ROADWAY PLANS AND SECTION 857 OF THE STANDARD SPECIFICATIONS.

AT THE CONTRACTOR'S OPTION, USE FINE AGGREGATE IN THE REINFORCED ZONE OF RETAINING WALLS NO.1 AND NO.2.

WALL CONTRACTOR SHALL VERIFY THAT AN ARCHITECTURAL FINISH IS OR IS NOT REQUIRED FOR PRECAST CONCRETE PANELS.

A SEPARATION GEOTEXTILE IS REQUIRED AT THE BACK OF THE REINFORCED ZONE FOR RETAINING WALLS NO.1 AND NO.2.

A DRAIN IS REQUIRED FOR RETAINING WALLS NO.1 AND NO.2.

PILE SLEEVES ARE REQUIRED AROUND PILES FOR END BENT NO.1 LOCATED AT STATION 26+64.45 -L-.

PILE SLEEVES ARE REQUIRED AROUND PILES FOR END BENT NO.2 LOCATED AT STATION 28+86.70 -L-.

BEFORE BEGINNING MSE WALL DESIGN FOR RETAINING WALLS NO.1 AND NO.2, SURVEY WALL LOCATION AND SUBMIT A REVISED WALL PROFILE VIEW (WALL ENVELOPE) FOR REVIEW. DO NOT START WALL DESIGN OR CONSTRUCTION UNTIL THE REVISED WALL ENVELOPE IS ACCEPTED.

DESIGN RETAINING WALLS NO.1 AND NO.2 FOR THE FOLLOWING:

- 1) H = DESIGN HEIGHT + EMBEDMENT
- 2) DESIGN LIFE = 100 YEARS
- 3) MAXIMUM FACTORED VERTICAL PRESSURE ON FOUNDATION MATERIAL = 6,553 PSF AT RETAINING WALL NO.1 AND 5,274 PSF AT RETAINING WALL NO.2
- 4) MINIMUM REINFORCEMENT LENGTH (L) = 0.7H OR 6 FT, WHICHEVER IS LONGER
- 5) MINIMUM EMBEDMENT DEPTH BELOW FINISHED GRADE AT FRONT FACE OF WALL = 3.5 FT AT RETAINING WALL NO.1 AND 3 FT AT RETAINING WALL NO.2
- 6) REINFORCED ZONE AGGREGATE PARAMETERS:

AGGREGATE TYPE*	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (φ) DEGREES	COHESION (c) PSF
COARSE	110	38	0
FINE	115	34	0

*SEE MSE RETAINING WALLS PROVISION FOR COARSE AND FINE AGGREGATE MATERIAL REQUIREMENTS.

7) IN-SITU ASSUMED MATERIAL PARAMETERS:

MATERIAL TYPE	UNIT WEIGHT (γ) PCF	FRICTION ANGLE (φ) DEGREES	COHESION (c) PSF
BACKFILL	120	30	0
FOUNDATION	115	32	0

DESIGN RETAINING WALL NO.1 AND NO.2 FOR A LIVE LOAD (TRAFFIC) SURCHARGE.

DESIGN REINFORCEMENT CONNECTED TO END BENT CAPS FOR FACTORED LOAD AND LENGTH OF REINFORCEMENT IN ACTIVE ZONE (L_a) SHOWN. CAST REINFORCEMENT OR CONNECTORS INTO CAP BACKWALL FOR END BENT NO.1 LOCATED AT STATION 26+64.45 -L- AND END BENT NO.2 LOCATED AT STATION 28+86.70 -L-. MAINTAIN A CLEARANCE OF AT LEAST 3" BETWEEN REINFORCEMENT OR CONNECTORS AND REINFORCING STEEL IN CAP.

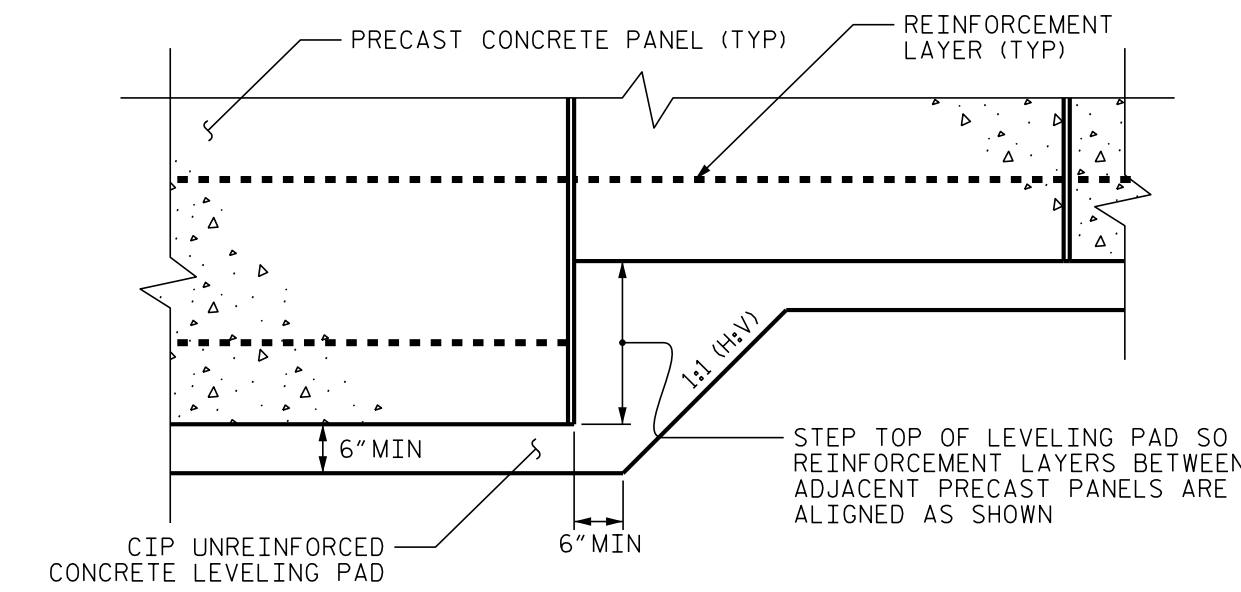
EXISTING OR FUTURE OBSTRUCTIONS SUCH AS FOUNDATIONS, GUARDRAIL, FENCE OR HANDRAIL POSTS, PAVEMENTS, PIPES, INLETS OR UTILITIES MAY INTERFERE WITH REINFORCEMENT FOR RETAINING WALLS NO.1 AND NO.2.

FOUNDATIONS FOR END BENT NO.1 LOCATED AT STATION 26+64.45 -L- AND END BENT NO.2 LOCATED AT STATION 28+86.70 -L- WILL INTERFERE WITH REINFORCEMENT FOR RETAINING WALLS NO.1 AND NO.2, RESPECTIVELY. SEE "FOUNDATION LAYOUT" SHEET FOR FOUNDATION LOCATIONS.

INSTALL PILE SLEEVES FOR END BENT NO.1 LOCATED AT STATION 26+64.45 -L- AND END BENT NO.2 LOCATED AT STATION 28+86.70 -L- WHILE CONSTRUCTING RETAINING WALLS NO.1 AND NO.2. OBSERVE A 1 MONTH WAITING PERIOD AFTER CONSTRUCTING THE MSE ABUTMENT WALL TO WITHIN 1 FT OF THE BOTTOM OF CAP ELEVATION. THEN, INSTALL PILES THROUGH THE CORRUGATED STEEL PIPES AND FILL PIPES WITH LOOSE UNCOMPACTED SAND BEFORE CONSTRUCTING END BENT CAPS.

DO NOT PLACE LEVELING PAD CONCRETE, AGGREGATE OR REINFORCEMENT FOR RETAINING WALL NO.1 AND NO.2 UNTIL EXCAVATION DIMENSIONS AND FOUNDATION MATERIAL ARE APPROVED.

TEMPORARY SHORING IS REQUIRED FOR RETAINING WALLS NO.1 AND NO.2 IN ACCORDANCE WITH THE TEMPORARY SHORING PROVISION. SEE TRAFFIC CONTROL PLANS.



**PRECAST PANELS
LEVELING PAD STEP DETAIL**

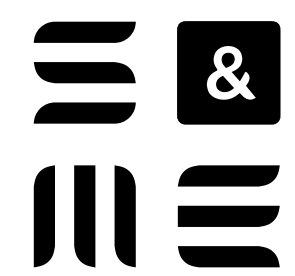
PROJECT NO.: 44390.1.1 (U-5818)

MCDOWELL COUNTY

STATION: 27+83.62 -L- / 479+11.70 -Y-

SHEET 4 OF 4

PREPARED BY: R.E. KRAL	DATE: 10/22/18
REVIEWED BY: S.S. LANEY	DATE: 10/23/18



9751 SOUTHERN PINE BLVD
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**NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS**

**GEOTECHNICAL
ENGINEERING UNIT**

**MSE RETAINING WALL
NO.1 AND NO.2
NOTES**

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	
1			3			4
2			4			

REFERENCE: U-5818

PROJECT: 44390

CONTENTS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-5	PROFILE
6-10	BORE LOG(S)
11	SOIL TEST RESULTS
12-23	CONSOLIDATION AND TRIAXIAL RESULTS

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY MCDOWELL
PROJECT DESCRIPTION SR 1001 (SUGAR HILL RD.)
FROM I-40 WB RAMPS TO 0.3 MI. WEST OF I-40
EB RAMPS
SITE DESCRIPTION MSE WALLS FOR BRIDGE NO.
128 ABUTMENTS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5818	1	23

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

J. SWARTLEY
M. STEPHENSON
R. KRAL

INVESTIGATED BY S&ME, Inc.
DRAWN BY J.R. SWARTLEY
CHECKED BY R. KRAL
SUBMITTED BY S. LANEY
DATE JULY 2018



3201 SPRING FOREST ROAD
RALEIGH, NC 27616
(919) 872-2660

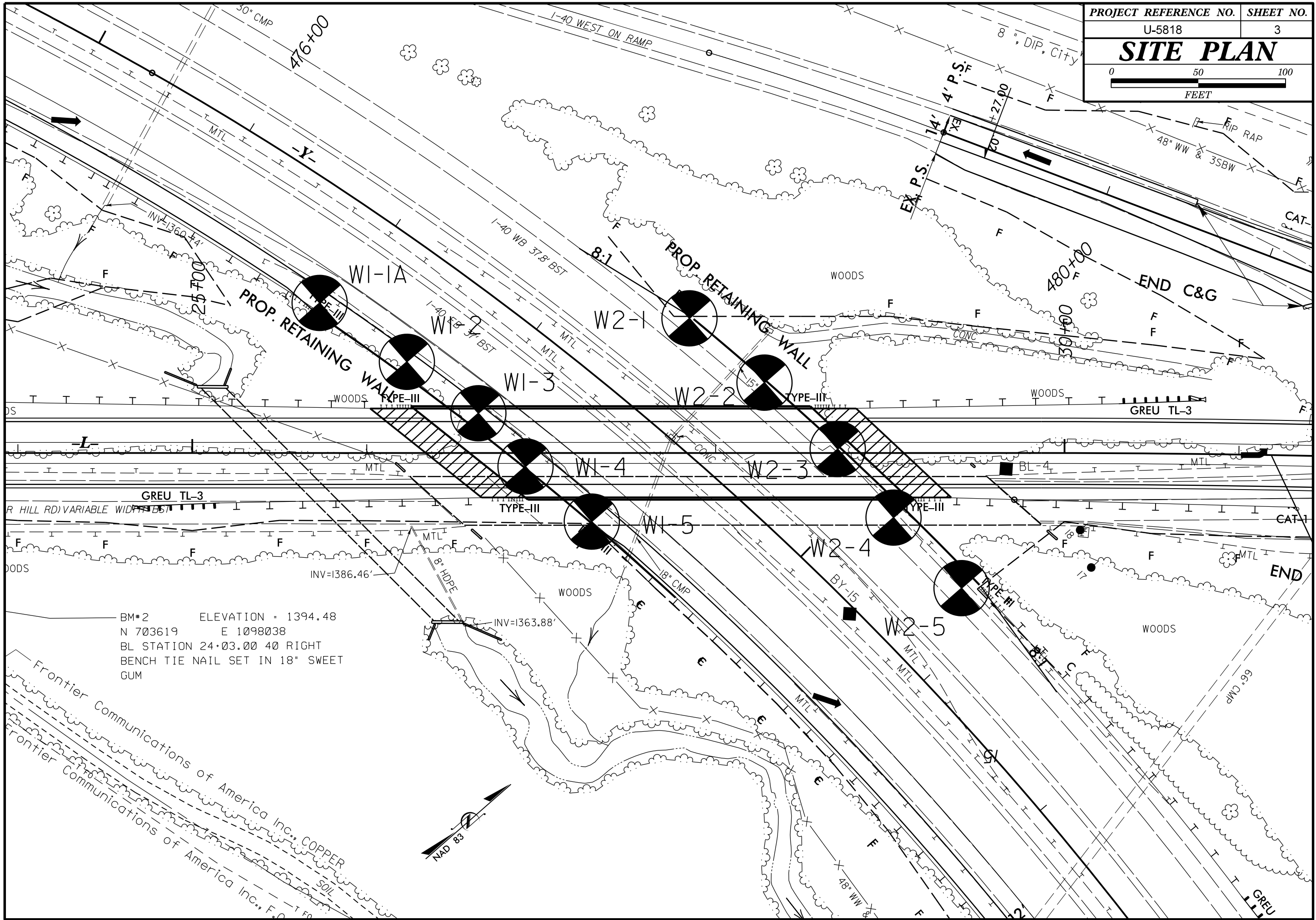


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Stewart S. Laney 08/22/2018
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																																																																																																													
<p>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</p>										<p>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.</p>										<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 DISLOGGED 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 (ROD) - 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 (SROD) - 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>																																																																																																																																																													
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<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p>										<p>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.</p>										<p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>																																																																																																																																																													
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<p>▽ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p>▽ STATIC WATER LEVEL AFTER 24 HOURS</p> <p>▽ PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p>○ SPRING OR SEEP</p>										<p>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. IF TESTED, WOULD YIELD SPT REFUSAL</p>										<p>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. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</p>										<p>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. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</p>																																																																																																																																																													
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<p>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</p> <p>SOIL SYMBOL</p> <p>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</p> <p>INFERRED SOIL BOUNDARY</p> <p>INFERRED ROCK LINE</p> <p>ALLUVIAL SOIL BOUNDARY</p>										<p>DIP & DIP DIRECTION OF ROCK STRUCTURES</p> <p>SPT TEST BORING</p> <p>AUGER BORING</p> <p>CORE BORING</p> <p>MONITORING WELL</p> <p>PIEZOMETER INSTALLATION</p>										<p>SLOPE INDICATOR INSTALLATION</p> <p>CONE PENETROMETER TEST</p> <p>SOUNDING ROD</p> <p>TEST BORING WITH CORE</p> <p>SPT N-VALUE</p>										<p>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.</p>																																																																																																																																																													
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PLASTICITY										FRACURE SPACING										INDURATION										BENCH MARK: *SEE NOTE																																																																																																																																																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NON PLASTIC</th> <th colspan="2">PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td></td> <td>0-5</td> <td></td> <td>VERY LOW</td> </tr> <tr> <td>SLIGHTLY PLASTIC</td> <td>6-15</td> <td></td> <td>SLIGHT</td> </tr> <tr> <td>MODERATELY PLASTIC</td> <td>16-25</td> <td></td> <td>MEDIUM</td> </tr> <tr> <td>HIGHLY PLASTIC</td> <td>26 OR MORE</td> <td></td> <td>HIGH</td> </tr> </table>										NON PLASTIC	PLASTICITY INDEX (PI)		DRY STRENGTH		0-5		VERY LOW	SLIGHTLY PLASTIC	6-15		SLIGHT	MODERATELY PLASTIC	16-25		MEDIUM	HIGHLY PLASTIC	26 OR MORE		HIGH	<p>TERM SPACING</p> <p>VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FOOT VERY CLOSE LESS THAN 0.16 FEET</p>										<p>TERM THICKNESS</p> <p>VERY THICKLY BEDDED 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET</p>										<p>ELEVATION: FEET</p>																																																																																																																																									
NON PLASTIC	PLASTICITY INDEX (PI)		DRY STRENGTH																																																																																																																																																																																								
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COLOR										NOTES:										INDURATION										BENCH MARK: *SEE NOTE																																																																																																																																																													
<p>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.</p>										<p>* ELEVATIONS DERIVED FROM GEOPAK AND *.TIN FILE 'U5818_LS.TNL.TIN' DATED 9/27/17</p> <p>FIAD = FILLED IN AFTER DRILLING</p>										<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p>ELEVATION: FEET</p>																																																																																																																																																													

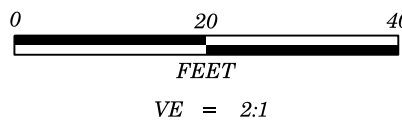


BM*2 ELEVATION = 1394.48
 N 703619 E 1098038
 BL STATION 24+03.00 40 RIGHT
 BENCH TIE NAIL SET IN 18" SWEET
 GUM

Frontier Communications of America Inc., COPPER
 Frontier Communications of America Inc., F.O.

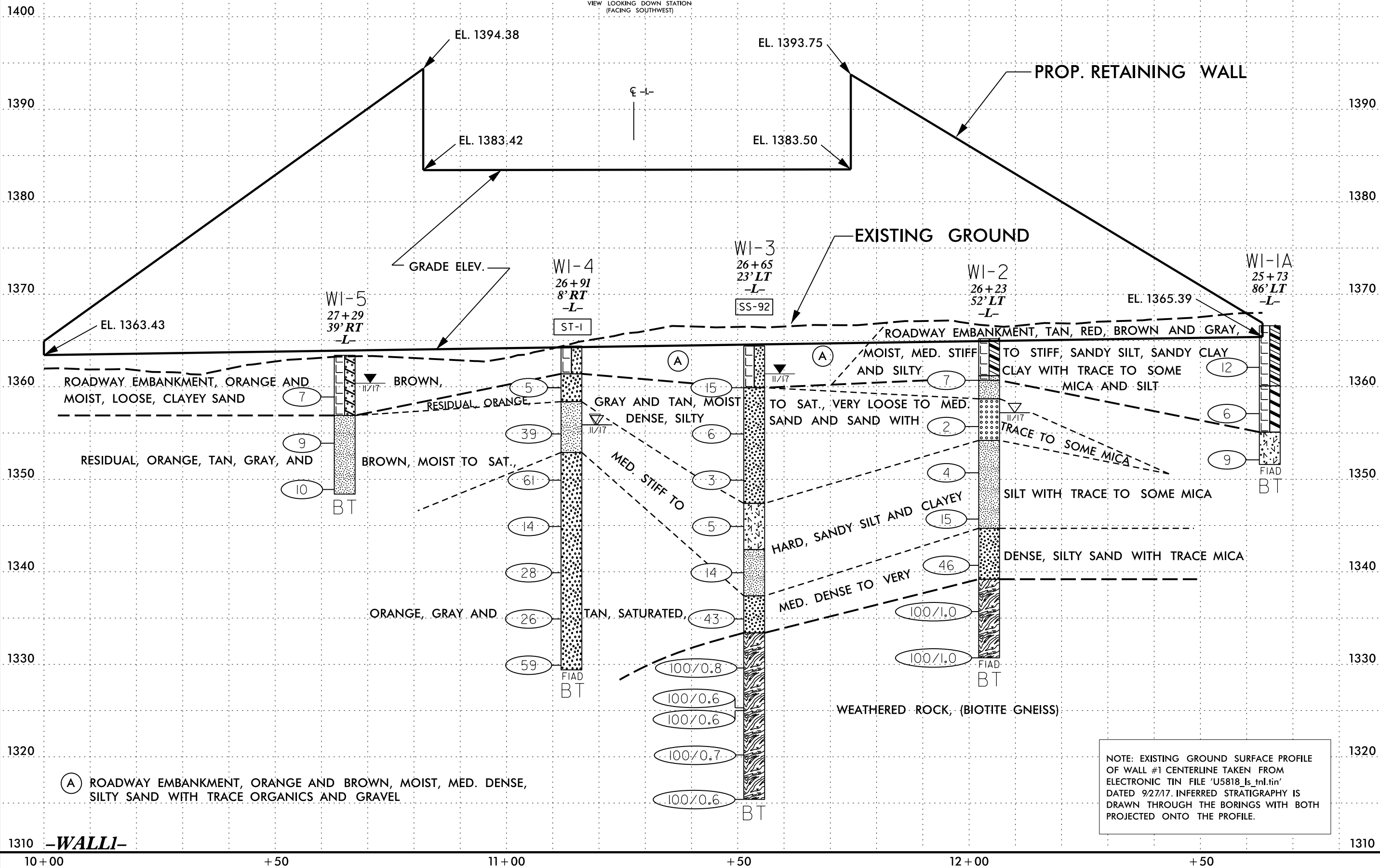
5/14/99

END BENT NO. 1 MSE WALL ENVELOPE (WALL #1)



PROJECT REFERENCE NO.	SHEET NO.
U-5818	4
PROFILE PROJECTED ALONG FACE OF WALL #1	

ELEVATION
VIEW LOOKING DOWN STATION
(FACING SOUTHWEST)

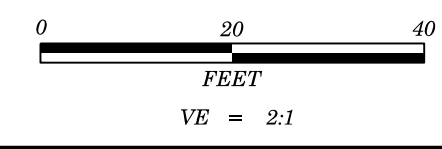


NOTE: EXISTING GROUND SURFACE PROFILE OF WALL #1 CENTERLINE TAKEN FROM ELECTRONIC TIN FILE 'U5818_Is_tnl.tin' DATED 9/27/17. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

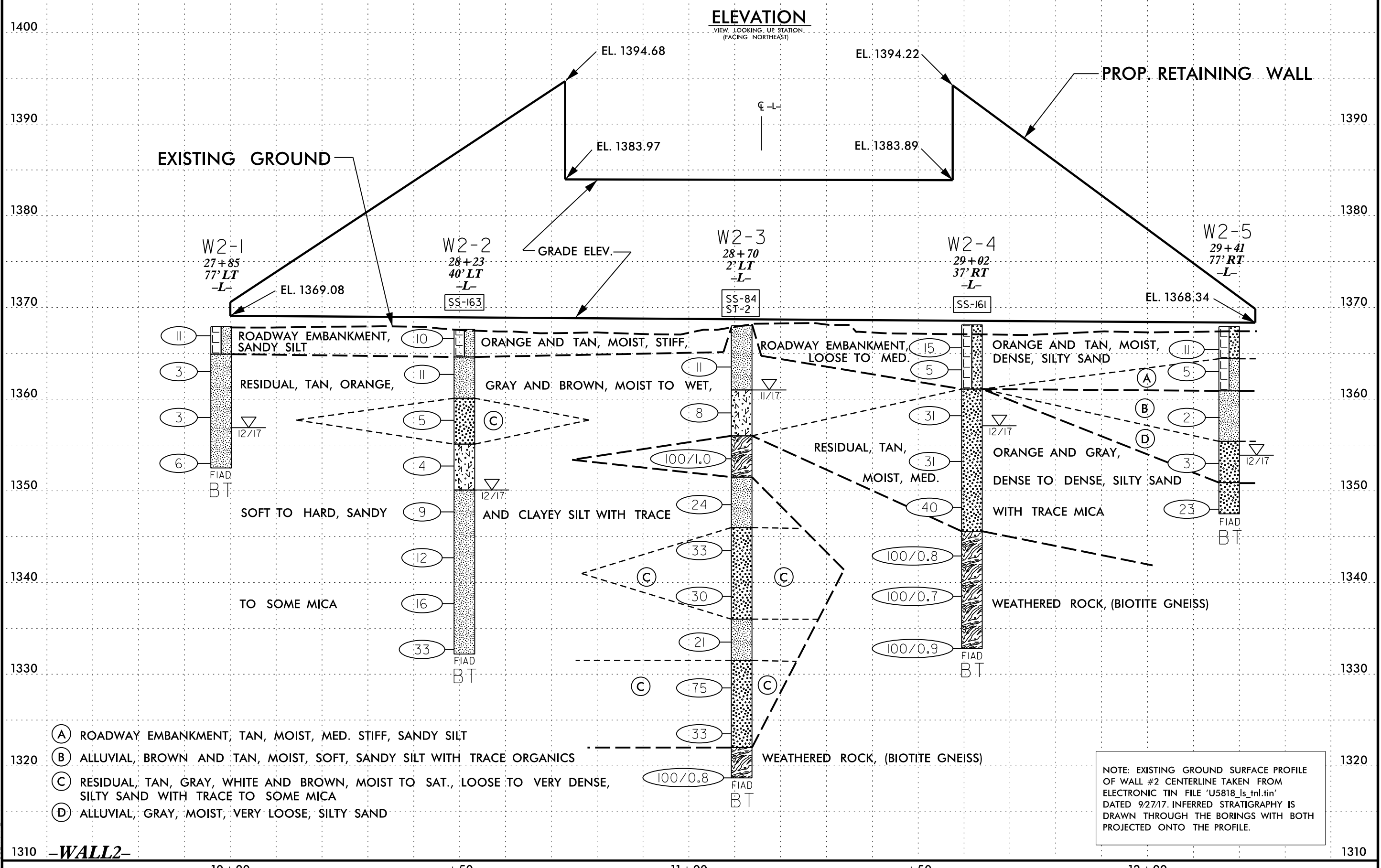
SYSTEMS ENGINEERING

5/14/99
 SYSTEMS DESIGN
 CONSULTANTS
 INCORPORATED

END BENT NO. 2 MSE WALL ENVELOPE (WALL #2)



PROJECT REFERENCE NO.	SHEET NO.
U-5818	5
PROFILE PROJECTED ALONG FACE OF WALL #2	



- (A) ROADWAY EMBANKMENT, TAN, MOIST, MED. STIFF, SANDY SILT
- (B) ALLUVIAL, BROWN AND TAN, MOIST, SOFT, SANDY SILT WITH TRACE ORGANICS
- (C) RESIDUAL, TAN, GRAY, WHITE AND BROWN, MOIST TO SAT., LOOSE TO VERY DENSE, SILTY SAND WITH TRACE TO SOME MICA
- (D) ALLUVIAL, GRAY, MOIST, VERY LOOSE, SILTY SAND

NOTE: EXISTING GROUND SURFACE PROFILE OF WALL #2 CENTERLINE TAKEN FROM ELECTRONIC TIN FILE 'U5818_Is_tnl.tin' DATED 9/27/17. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44390.1.1		TIP U-5818		COUNTY McDOWELL		GEOLOGIST Stephenson, M.									
SITE DESCRIPTION MSE WALLS FOR BRIDGE NO. 128 ABUTMENTS							GROUND WTR (ft)								
BORING NO. W1-1A		STATION 25+73		OFFSET 86 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 1,366.6 ft		TOTAL DEPTH 15.0 ft		NORTHING 703,903		EASTING 1,098,063									
DRILL RIG/HAMMER EFF./DATE SME267 DIEDRICH D-50 74% 10/20/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER Blizzard, B.		START DATE 11/21/17		COMP. DATE 11/21/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
1370															
1365															
1360	1,363.1	3.5	3	5	7								M	1,366.6 GROUND SURFACE	0.0
														ROADWAY EMBANKMENT	
														RED, SANDY CLAY (A-6) WITH TRACE MICA AND SILT	
1355	1,358.1	8.5	3	3	3								M	1,360.1 RED-BROWN, SILTY CLAY (A-7-5)	6.5
														RESIDUAL	
														ORANGE-TAN, SANDY SILT (A-5) WITH TRACE MICA	11.5
	1,353.1	13.5	3	5	4								W	1,351.6 Boring Terminated at Elevation 1,351.6 ft in Stiff Sandy SILT	15.0

WBS 44390.1.1		TIP U-5818		COUNTY McDOWELL		GEOLOGIST Stephenson, M.									
SITE DESCRIPTION MSE WALLS FOR BRIDGE NO. 128 ABUTMENTS							GROUND WTR (ft)								
BORING NO. W1-2		STATION 26+23		OFFSET 52 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 1,365.2 ft		TOTAL DEPTH 34.5 ft		NORTHING 703,919		EASTING 1,098,121									
DRILL RIG/HAMMER EFF./DATE SME267 DIEDRICH D-50 74% 10/20/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER Blizzard, B.		START DATE 11/21/17		COMP. DATE 11/21/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
1370															
1365															
1360	1,361.7	3.5	5	4	3								M	1,365.2 GROUND SURFACE	0.0
														ROADWAY EMBANKMENT	
														TAN-RED, SANDY CLAY (A-6)	
1355	1,356.7	8.5	2	1	1								M	1,361.2 GRAY-TAN, SANDY SILT (A-4) WITH SOME MICA	4.0
														RESIDUAL	4.5
														ORANGE-GRAY-TAN, SILT (A-4) WITH SOME MICA	6.5
	1,351.7	13.5	2	2	2								Sat.	1,358.7 TAN-GRAY, SAND (A-3)	11.0
														RESIDUAL	
														ORANGE-GRAY, SANDY SILT (A-4) WITH SOME MICA	11.0
1350	1,346.7	18.5	3	5	10								W	1,354.2	
														GRAY, SILTY SAND (A-2-5) WITH TRACE MICA	20.5
1345	1,341.7	23.5	18	21	25								W	1,344.7	
														WEATHERED ROCK	26.0
1340	1,336.7	28.5	29	71/0.5									Sat.	1,339.2	
														GRAY, BIOTITE GNEISS	
1335	1,331.7	33.5	31	69/0.5										1,330.7	
														Boring Terminated at Elevation 1,330.7 ft in Weathered Rock (BIOTITE GNEISS)	34.5
														1. Attempted to obtain a Shelby Tube sample at depth 15'-17', no recovery.	

NCDOT BORE DOUBLE 623517016_GEO_U5818.GPJ NC_DOT_GDT 8/22/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44390.1.1		TIP U-5818		COUNTY McDOWELL		GEOLOGIST Stephenson, M.											
SITE DESCRIPTION MSE WALLS FOR BRIDGE NO. 128 ABUTMENTS							GROUND WTR (ft)										
BORING NO. W1-3		STATION 26+65		OFFSET 23 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 1,364.4 ft		TOTAL DEPTH 49.1 ft		NORTHING 703,930		EASTING 1,098,170											
DRILL RIG/HAMMER EFF./DATE SME267 DIEDRICH D-50 74% 10/20/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic											
DRILLER Blizzard, B.		START DATE 11/20/17		COMP. DATE 11/20/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
1365														1,364.4	0.0	GROUND SURFACE	
														1,359.9	4.5	ROADWAY EMBANKMENT ORANGE-BROWN, SILTY SAND (A-2-4) WITH TRACE ORGANICS AND GRAVEL	
1360	1,360.9	3.5	3	9	6											RESIDUAL TAN-GRAY, SILTY SAND (A-2-5) WITH SOME MICA	
1355	1,355.9	8.5	3	3	3												
1350	1,350.9	13.5	WOH	2	1												
1345	1,345.9	18.5	2	2	3									1,347.4	17.0	ORANGE, CLAYEY SILT (A-5) WITH TRACE MICA	
1340	1,340.9	23.5	4	6	8									1,342.4	22.0	ORANGE-BROWN, SANDY SILT (A-4) WITH SOME MICA	
1335	1,335.9	28.5	12	24	19									1,337.4	27.0	TAN-GRAY, SILTY SAND (A-2-4) WITH TRACE MICA	
1330	1,330.9	33.5	25	65	35/0.3									1,333.4	31.0	WEATHERED ROCK GRAY, BIOTITE GNEISS	
1325	1,325.9	38.5	78	22/0.1										100/0.6			
	1,325.6	38.8	85	15/0.1										100/0.6			
1320	1,320.9	43.5	57	43/0.2										100/0.7			
	1,315.9	48.5	91	9/0.1										100/0.6			
														1,315.3	49.1	Boring Terminated at Elevation 1,315.3 ft in Weathered Rock (BIOTITE GNEISS)	

WBS 44390.1.1		TIP U-5818		COUNTY McDOWELL		GEOLOGIST Stephenson, M.											
SITE DESCRIPTION MSE WALLS FOR BRIDGE NO. 128 ABUTMENTS							GROUND WTR (ft)										
BORING NO. W1-4		STATION 26+91		OFFSET 8 ft RT		ALIGNMENT -L-											
COLLAR ELEV. 1,364.4 ft		TOTAL DEPTH 35.0 ft		NORTHING 703,931		EASTING 1,098,211											
DRILL RIG/HAMMER EFF./DATE SME267 DIEDRICH D-50 74% 10/20/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic											
DRILLER Blizzard, B.		START DATE 11/21/17		COMP. DATE 11/21/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
1365														1,364.4	0.0	GROUND SURFACE	
														1,361.4	3.0	ROADWAY EMBANKMENT ORANGE-BROWN, SILTY SAND (A-2-4) WITH TRACE ORGANICS AND GRAVEL	
1360	1,360.9	3.5	2	2	3									1,358.4	6.0	RESIDUAL ORANGE-GRAY-TAN, SILTY SAND (A-2-4) WITH TRACE MICA	
1355	1,355.9	8.5	9	15	24									1,352.9	11.5	TAN-GRAY, FINE SANDY SILT (A-4) WITH TRACE MICA	
1350	1,350.9	13.5	10	23	38											ORANGE-GRAY, SILTY SAND (A-2-4) WITH TRACE MICA	
1345	1,345.9	18.5	4	5	9												
1340	1,340.9	23.5	10	13	15												
1335	1,335.9	28.5	5	12	14												
1330	1,330.9	33.5	18	29	30												
														1,329.4	35.0	Boring Terminated at Elevation 1,329.4 ft in Silty SAND	
															Other Samples: ST-1 (6.0 - 8.0)		

NCDOT BORE DOUBLE 623517016_GEO_U5818.GPJ NC_DOT_GDT 8/22/18

GEOTECHNICAL BORING REPORT BORE LOG

WBS 44390.1.1		TIP U-5818		COUNTY McDOWELL		GEOLOGIST Stephenson, M.	
SITE DESCRIPTION MSE WALLS FOR BRIDGE NO. 128 ABUTMENTS							GROUND WTR (ft)
BORING NO. W1-5		STATION 27+29		OFFSET 39 ft RT		ALIGNMENT -L-	
COLLAR ELEV. 1,363.4 ft		TOTAL DEPTH 15.0 ft		NORTHING 703,938		EASTING 1,098,260	
DRILL RIG/HAMMER EFF./DATE SME267 DIEDRICH D-50 74% 10/20/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic	
DRILLER Blizzard, B.		START DATE 11/20/17		COMP. DATE 11/20/17		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
1365																
														1,363.4	0.0	GROUND SURFACE
																ROADWAY EMBANKMENT ORANGE-BROWN, CLAYEY SAND (A-2-6)
1360	1,359.9	3.5	3	3	4							M				
														1,356.9	6.5	RESIDUAL ORANGE-GRAY-TAN, SANDY SILT (A-4) WITH SOME MICA
1355	1,354.9	8.5	4	4	5							W				
1350	1,349.9	13.5	5	4	6							W				
																Boring Terminated at Elevation 1,348.4 ft in Stiff Sandy SILT

WBS 44390.1.1		TIP U-5818		COUNTY McDOWELL		GEOLOGIST Swartley, J. R.	
SITE DESCRIPTION MSE WALLS FOR BRIDGE NO. 128 ABUTMENTS							GROUND WTR (ft)
BORING NO. W2-1		STATION 27+85		OFFSET 77 ft LT		ALIGNMENT -L-	
COLLAR ELEV. 1,367.9 ft		TOTAL DEPTH 15.4 ft		NORTHING 704,057		EASTING 1,098,209	
DRILL RIG/HAMMER EFF./DATE SME267 DIEDRICH D-50 74% 10/20/2017			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic	
DRILLER Blizzard, B.		START DATE 12/11/17		COMP. DATE 12/11/17		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
1370																
														1,367.9	0.0	GROUND SURFACE
																ROADWAY EMBANKMENT ORANGE, SANDY SILT (A-4)
1365	1,367.9	0.0	3	5	6							M				
														1,364.9	3.0	RESIDUAL TAN-ORANGE, SANDY SILT (A-4)
1360	1,364.0	3.9	2	2	1							M				
1360	1,359.0	8.9	1	1	2											
1355	1,354.0	13.9	2	3	3							W				
																Boring Terminated at Elevation 1,352.5 ft in Medium Stiff Sandy SILT

NCDOT BORE DOUBLE 623517016_GEO_U5818.GPJ NC_DOT_GDT_8/22/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44390.1.1		TIP U-5818		COUNTY McDOWELL		GEOLOGIST Swartley, J. R.											
SITE DESCRIPTION MSE WALLS FOR BRIDGE NO. 128 ABUTMENTS							GROUND WTR (ft)										
BORING NO. W2-2		STATION 28+23		OFFSET 40 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 1,367.6 ft		TOTAL DEPTH 35.4 ft		NORTHING 704,065		EASTING 1,098,265											
DRILL RIG/HAMMER EFF./DATE SME267 DIEDRICH D-50 74% 10/20/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER Blizzard, B.		START DATE 12/11/17		COMP. DATE 12/11/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
1370															1,367.6	GROUND SURFACE	0.0
1365	1,367.6	0.0	3	4	6	10						M		1,364.6	ROADWAY EMBANKMENT TAN, SANDY SILTY (A-4)	3.0	
1360	1,363.7	3.9	3	3	8	11						M		1,360.1	RESIDUAL TAN, SANDY SILT (A-4)	7.5	
1355	1,358.7	8.9	2	2	3	5						▽		1,355.1	TAN, SILTY SAND (A-2-4)	12.5	
1350	1,353.7	13.9	2	2	2	4						SS-163	49%	1,350.1	TAN-ORANGE, CLAYEY SILT (A-5)	17.5	
1345	1,348.7	18.9	2	4	5	9						W			TAN-GRAY, SANDY SILT (A-4)		
1340	1,343.7	23.9	3	5	7	12						W					
1335	1,338.7	28.9	4	4	12	16						W					
	1,333.7	33.9	7	13	20	33						W					
																Boring Terminated at Elevation 1,332.2 ft in Hard Sandy SILT	35.4

WBS 44390.1.1		TIP U-5818		COUNTY McDOWELL		GEOLOGIST Stephenson, M.											
SITE DESCRIPTION MSE WALLS FOR BRIDGE NO. 128 ABUTMENTS							GROUND WTR (ft)										
BORING NO. W2-3		STATION 28+70		OFFSET 2 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 1,368.0 ft		TOTAL DEPTH 49.3 ft		NORTHING 704,072		EASTING 1,098,321											
DRILL RIG/HAMMER EFF./DATE SME267 DIEDRICH D-50 74% 10/20/2017			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER Blizzard, B.		START DATE 11/17/17		COMP. DATE 11/17/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
1370															1,368.0	GROUND SURFACE	0.0
1365	1,364.5	3.5	3	4	7	11						M		1,361.0	RESIDUAL TAN-GRAY, SANDY SILT (A-4) WITH SOME MICA	7.0	
1360	1,359.5	8.5	2	3	5	8						W		1,356.0	TAN-GRAY, CLAYEY SILT (A-5) WITH SOME MICA	12.0	
1355	1,354.5	13.5	36	64/1.0										1,351.5	WEATHERED ROCK GRAY-TAN, BIOTITE GNEISS	16.5	
1350	1,349.5	18.5	12	11	13	24						W		1,346.0	RESIDUAL BROWN-GRAY, SANDY SILT (A-4) WITH SOME MICA	22.0	
1345	1,344.5	23.5	6	15	18	33						SS-84	25%	1,341.5	TAN-GRAY, SILTY SAND (A-2-4) WITH SOME MICA		
1340	1,339.5	28.5	8	9	21	30						Sat.		1,336.0	TAN-GRAY, SANDY SILTY (A-4) WITH TRACE MICA	32.0	
1335	1,334.5	33.5	6	10	11	21						W		1,331.5	GRAY-WHITE-BROWN, SILTY SAND (A-2-4) WITH TRACE MICA	36.5	
1330	1,329.5	38.5	20	32	43	75						Sat.		1,322.0	WEATHERED ROCK GRAY-BROWN, BIOTITE GNEISS	46.0	
1325	1,324.5	43.5	10	15	18	33						Sat.					
1320	1,319.5	48.5	40	60/0.3										1,318.7	Boring Terminated at Elevation 1,318.7 ft in Weathered Rock (BIOTITE GNEISS)	49.3	

NCDOT BORE DOUBLE 623517016_GEO_U5818.GPJ_NC_DOT.GDT 8/22/18

Other Samples:
ST-2 (10.0 - 12.0)

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 44390.1.1		TIP U-5818		COUNTY McDOWELL		GEOLOGIST Swartley, J. R.											
SITE DESCRIPTION MSE WALLS FOR BRIDGE NO. 128 ABUTMENTS							GROUND WTR (ft)										
BORING NO. W2-4		STATION 29+02		OFFSET 37 ft RT		ALIGNMENT -L-											
COLLAR ELEV. 1,368.1 ft		TOTAL DEPTH 35.3 ft		NORTHING 704,070		EASTING 1,098,372											
DRILL RIG/HAMMER EFF./DATE SME267 DIEDRICH D-50 74% 10/20/2017		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic													
DRILLER Blizzard, B.		START DATE 12/07/17		COMP. DATE 12/07/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
1370														1,368.1	0.0	PAVEMENT	
1365	1,366.6	1.5	6	5	10								M	1,368.1		ROADWAY EMBANKMENT ORANGE, SILTY SAND (A-2-4)	
	1,364.2	3.9	2	2	3								M				
1360	1,359.2	8.9	7	9	22									1,361.1	7.0	RESIDUAL TAN-ORANGE, SILTY SAND (A-2-4), WITH TRACE MICA	
1355	1,354.2	13.9	12	16	15												
1350	1,349.2	18.9	12	18	22								Sat.				
1345	1,344.2	23.9	30	61	39/0.3									1,345.6	22.5	WEATHERED ROCK GRAY, BIOTITE GNEISS	
1340	1,339.2	28.9	73	27/0.2													
1335	1,334.2	33.9	17	38	62/0.4									1,332.8	35.3		
																	Boring Terminated at Elevation 1,332.8 ft in Weathered Rock (BIOTITE GNEISS)

WBS 44390.1.1		TIP U-5818		COUNTY McDOWELL		GEOLOGIST Swartley, J. R.											
SITE DESCRIPTION MSE WALLS FOR BRIDGE NO. 128 ABUTMENTS							GROUND WTR (ft)										
BORING NO. W2-5		STATION 29+41		OFFSET 77 ft RT		ALIGNMENT -L-											
COLLAR ELEV. 1,367.9 ft		TOTAL DEPTH 20.4 ft		NORTHING 704,073		EASTING 1,098,428											
DRILL RIG/HAMMER EFF./DATE SME267 DIEDRICH D-50 74% 10/20/2017		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic													
DRILLER Blizzard, B.		START DATE 12/07/17		COMP. DATE 12/07/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
1370														1,367.9	0.0	PAVEMENT	
1365	1,366.4	1.5	6	5	6								M	1,367.9		ROADWAY EMBANKMENT TAN, SILTY SAND (A-2-4)	
	1,364.0	3.9	3	3	2								M	1,364.4	3.5	TAN, SANDY SILT (A-4)	
1360	1,359.0	8.9	1	1	1								M	1,360.9	7.0	ALLUVIAL BROWN-TAN, SANDY SILT (A-4) WITH TRACE ORGANICS	
1355	1,354.0	13.9	1	2	1								Sat.	1,355.4	12.5	GRAY, SILTY SAND (A-2-4)	
1350	1,349.0	18.9	7	11	12								Sat.	1,350.9	17.0	RESIDUAL TAN-GRAY, SILTY FINE SAND (A-2-4)	
														1,347.5	20.4		
																	Boring Terminated at Elevation 1,347.5 ft in Medium Dense Silty SAND

NCDOT BORE DOUBLE 623517016_GEO_U5818.GPJ NC_DOT.GDT 8/22/18



SUMMARY OF LABORATORY TEST DATA
Soil Classification and Gradation

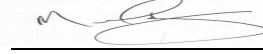
S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-17-016	Date Report:	2/27/2018
State Project No.:	44390.1.1	County:	McDowell
Federal ID No.:	N/A	TIP No.:	U-5818
Project Name:	MSE Walls for Bridge No. 128 Abutments		
Client Name:	Wetherill Engineering, Inc.	Client Address:	1223 Jones Franklin Road, Raleigh, NC 27606

Sample No.	Station	Offset	Alignment	Sample Depth (ft)	AASHTO Classification	Total % Passing				Total Mortar Fraction (%)				LL	PL	PI	Moist. %
						Sieve #				Coarse Sand	Fine Sand	Silt	Clay				
						10	40	60	200								
SS-84	28+70	2 LT	-L-	23.5-25.0	A-2-4 (0)	100	86	68	26.5	32	46	16	6	28	0	N.P.	25.2
SS-92	26+65	23 LT	-L-	18.5-20.0	A-5 (0)	100	87	78	45.8	22	39	27	12	47	0	N.P.	61.9
SS-161	29+02	37 RT	-L-	18.9-20.4	A-2-4 (0)	99	80	62	23.4	37	48	11	4	36	33	3	14.0
SS-163	28+23	40 LT	-L-	13.9-15.4	A-5 (0)	100	96	82	45.7	18	47	27	8	49	47	2	48.9

References / Comments / Deviations: ND=Not Determined.

AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT AASHTO T89: Determining the Liquid Limit of Soils
 AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils AASHTO T265: Laboratory Determination of Moisture Content of Soils
 AASHTO M145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

<u>Mal Krajan, ET</u>		<u>104-01-0703</u>	<u>Stewart Laney, PE</u>	<u>Project Manager</u>
Technician Name:	Signature	Certification #	Technical Responsibility:	Position

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SUMMIT Engineering Laboratory & Testing, Inc.

COMPANY NAME AND CERTIFICATION NO. SUMMIT (119-0705)

NCDOT Project 623517016 Phase 01 Tested By: F. Gonzalez

Project Name Sugar Hill Road (U-5818)
Marion, NC Checked By Mimi Hourani

Client S&ME, Inc. - Charlotte Date: 2/12/2018

TEST RESULTS

Boring No.	W1-4	W2-3				
Sample No.	ST-1	ST-2				
Depth (ft)	6-8	10-12				
Retained #4 Sieve %	0	0				
Passing #10 Sieve %	98	100				
Passing #40 Sieve %	94	98				
Passing #200 Sieve %	41	49				

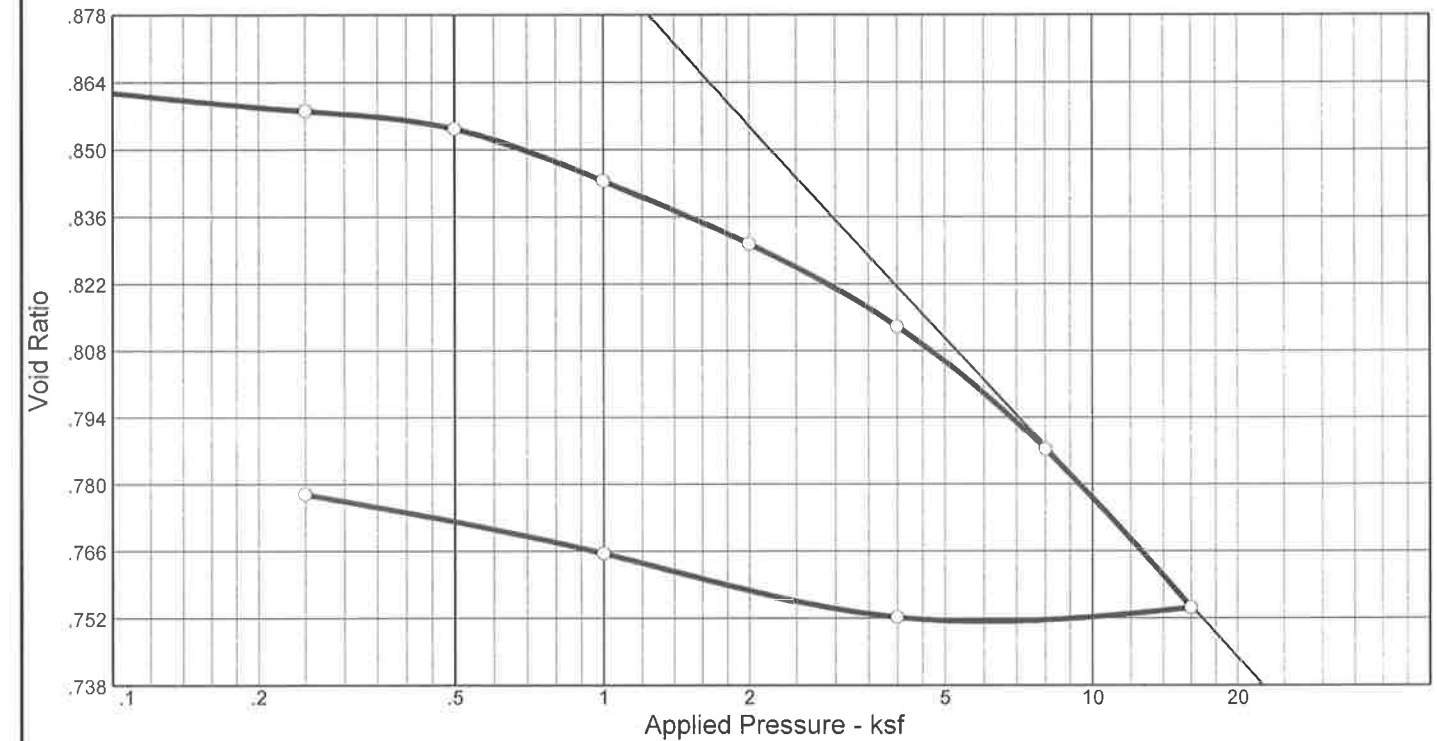
MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	12.3	8.2				
Fine Sand Ret - #270 %	59.2	58.4				
Silt 0.05 - 0.005 mm %	22.2	27.0				
Clay < 0.005 mm %	6.2	6.3				
Passing #40 Sieve %	95.5	98.2				
Passing #200 Sieve %	41.8	49.1				

Liquid Limit	NP	41				
Plasticity Index	NP	3				
AASHTO Classification	A-4(0)	A-5(0)				

Mimi Hourani
Lab Manager

Consolidation Test Report



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.323									
2	0.50	0.636									
3	1.00	0.009									
4	2.00	0.021									
5	4.00	0.246									
6	8.00	0.073									
7	16.00	0.072									
8	4.00	0.568									
9	1.00	0.528									
10	0.25	0.547									

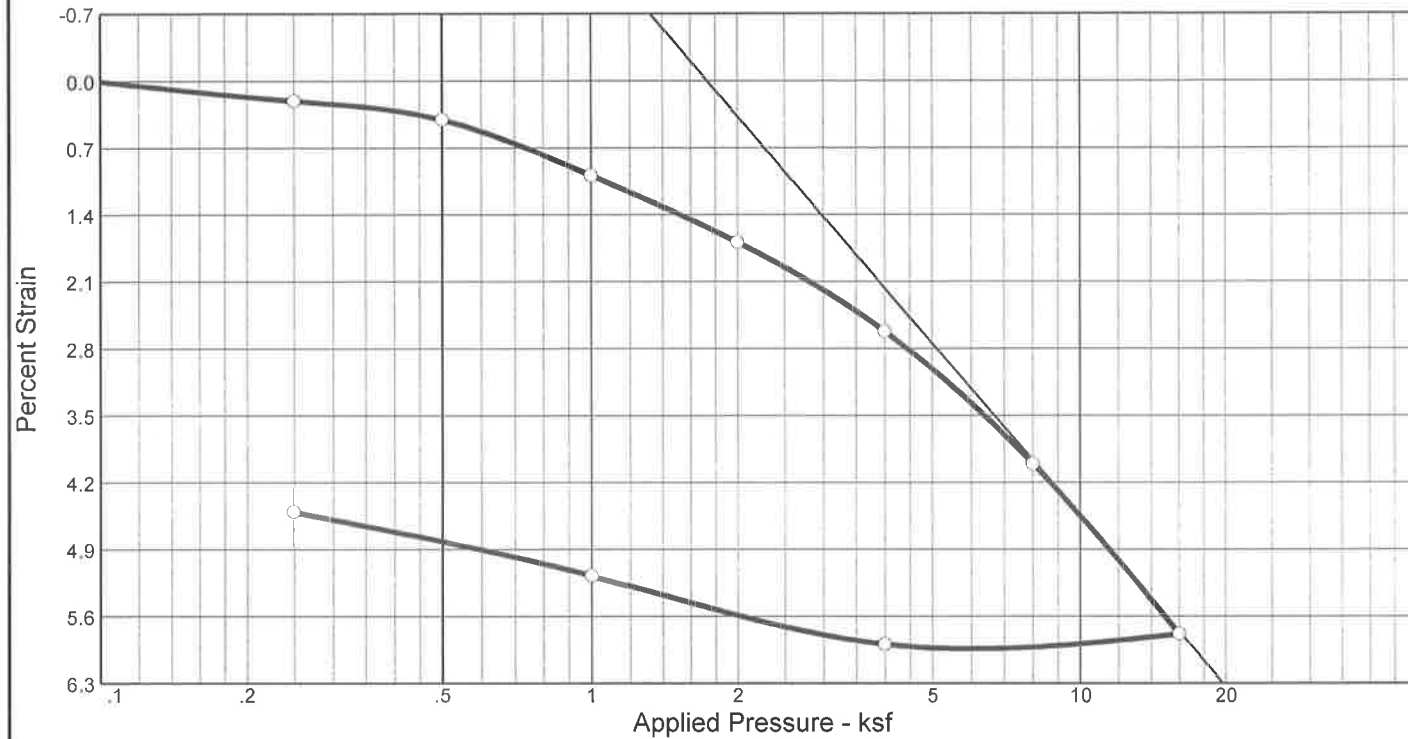
MATERIAL DESCRIPTION										USCS		AASHTO	
Grey-Brown Silty Sand										SM		A-5(0)	
LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
41	3	2.70		90.5		27.0 %	28.1 %	84.6 %	97.6 %	0.862	0.778	2.40	0.11

Preparation Process:										D2435 Method	C _r	Swell Press. (ksf)	Heave %
Condition of Test:										0.02			

Project No. 623517016.01 Client: S&ME, Inc. - Charlotte										Remarks:			
Project: Sugar Hill Road Marion, NC													
Location: W 2-3 UD @ 10'-12' (ST-2)													
Summit Engineering Ft. Mill, South Carolina										Checked By:			
										Title:			
										Figure			

CONSOLIDATION TEST DATA

Consolidation Test Report



Client: S&ME, Inc. - Charlotte
 Project: Sugar Hill Road
 Marion, NC
 Project Number: 623517016.01

Sample Data

Source:
 Sample No.:
 Elev. or Depth: Sample Length(in./cm.):
 Location: W 2-3 UD @ 10'-12' (ST-2)
 Description: Grey-Brown Silty Sand
 Liquid Limit: 41 Plasticity Index: 3
 USCS: SM AASHTO: A-5(0) Figure No.:
 Testing Remarks:

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 148.14 g.	Consolidometer # = 1	Wet w+t = 149.46 g.
Dry w+t = 116.65 g.		Dry w+t = 116.65 g.
Tare Wt. = .00 g.	Spec. Gravity = 2.70	Tare Wt. = .00 g.
Height = 1.00 in.	Height = 1.00 in.	
Diameter = 2.50 in.	Diameter = 2.50 in.	
Weight = 148.14 g.	Defl. Table = 1	
Moisture = 27.0 %	Ht. Solids = 0.5371 in.	Moisture = 28.1 %
Wet Den. = 115.0 pcf	Dry Wt. = 116.65 g.	Dry Wt. = 116.65 g.*
Dry Den. = 90.5 pcf	Void Ratio = 0.862	Void Ratio = 0.778
	Saturation = 84.6 %	

* Final dry weight used in calculations

End-of-Load Summary

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C _v (in.²/min.)	C _α	Void Ratio	% Compression / Swell
start	0.00000				0.862	
0.25	0.00230	0.00030	0.323		0.858*	0.2 Compr.*
0.50	0.00490	0.00060	0.636		0.854*	0.4 Compr.*
1.00	0.01110	0.00100	0.009		0.843*	1.0 Compr.*
2.00	0.01910	0.00140	0.021		0.830*	1.7 Compr.*
4.00	0.02970	0.00170	0.246		0.813*	2.6 Compr.*
8.00	0.04520	0.00230	0.073		0.787*	4.0 Compr.*
16.00	0.06530	0.00310	0.072		0.754*	5.8 Compr.*
4.00	0.06140	0.00250	0.568		0.752*	5.9 Compr.*
1.00	0.05320	0.00200	0.528		0.766*	5.2 Compr.*
0.25	0.04560	0.00160	0.547		0.778*	4.5 Compr.*

*CALCULATED USING D₁₀₀ INSTEAD OF FINAL READING

C_c = 0.11 P_c = 2.40 ksf C_r = 0.02

Coefficients of Consolidation and Secondary Consolidation											
No.	Load (ksf)	C _v (in.²/min.)	C _α	No.	Load (ksf)	C _v (in.²/min.)	C _α	No.	Load (ksf)	C _v (in.²/min.)	C _α
1	0.25	0.323									
2	0.50	0.636									
3	1.00	0.009									
4	2.00	0.021									
5	4.00	0.246									
6	8.00	0.073									
7	16.00	0.072									
8	4.00	0.568									
9	1.00	0.528									
10	0.25	0.547									

MATERIAL DESCRIPTION										USCS	AASHTO		
Grey-Brown Silty Sand										SM	A-5(0)		
LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
41	3	2.70		90.5		27.0 %	28.1 %	84.6 %	97.6 %	0.862	0.778	2.40	0.11
Preparation Process:										D2435 Method	C _r	Swell Press. (ksf)	Heave %
Condition of Test:											0.02		
Project No. 623517016.01 Client: S&ME, Inc. - Charlotte										Remarks:			
Project: Sugar Hill Road Marion, NC													
Location: W 2-3 UD @ 10'-12' (ST-2)													
Summit Engineering Ft. Mill, South Carolina										Checked By:			
										Title:			
										Figure			

Pressure: 0.25 ksf TEST READINGS Load No. 1

No.	Elapsed Time	Dial Reading
1	0.00	0.00000
2	0.10	0.00210
3	0.25	0.00220
4	0.50	0.00230
5	1.00	0.00230
6	2.00	0.00230
7	4.00	0.00230
8	8.00	0.00230
9	15.00	0.00230

Void Ratio = 0.858 Compression = 0.2 % >>> CALCULATED USING D_{100}
 $D_0 = 0.00164$ $D_{90} = 0.00200$ $D_{100} = 0.00204$
 C_v at 0.7 min. = 0.323 in.²/min.

Pressure: 0.50 ksf TEST READINGS Load No. 2

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00230	11	60.00	0.00490
2	0.10	0.00450	12	120.00	0.00490
3	0.25	0.00460			
4	0.50	0.00460			
5	1.00	0.00460			
6	2.00	0.00460			
7	4.00	0.00470			
8	8.00	0.00470			
9	15.00	0.00480			
10	30.00	0.00490			

Void Ratio = 0.854 Compression = 0.4 % >>> CALCULATED USING D_{100}
 $D_0 = 0.00373$ $D_{90} = 0.00400$ $D_{100} = 0.00403$
 C_v at 0.3 min. = 0.636 in.²/min.

Pressure: 1.00 ksf TEST READINGS Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00490	11	60.00	0.01090
2	0.10	0.01020	12	120.00	0.01100
3	0.25	0.01030	13	240.00	0.01110
4	0.50	0.01030			
5	1.00	0.01040			
6	2.00	0.01040			
7	4.00	0.01050			
8	8.00	0.01050			
9	15.00	0.01080			
10	30.00	0.01080			

Void Ratio = 0.843 Compression = 1.0 % >>> CALCULATED USING D_{100}
 $D_0 = 0.00912$ $D_{90} = 0.00980$ $D_{100} = 0.00988$
 C_v at 22.3 min. = 0.009 in.²/min.

Pressure: 2.00 ksf TEST READINGS Load No. 4

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.01110	11	60.00	0.01840
2	0.10	0.01730	12	120.00	0.01880
3	0.25	0.01740	13	240.00	0.01900
4	0.50	0.01750	14	480.00	0.01910
5	1.00	0.01760	15	720.00	0.01910
6	2.00	0.01770			
7	4.00	0.01800			
8	8.00	0.01820			
9	15.00	0.01820			
10	30.00	0.01830			

Void Ratio = 0.830 Compression = 1.7 % >>> CALCULATED USING D_{100}
 $D_0 = 0.01582$ $D_{90} = 0.01680$ $D_{100} = 0.01691$
 C_v at 9.8 min. = 0.021 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 5

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.01910	11	60.00	0.02920
2	0.10	0.02710	12	120.00	0.02940
3	0.25	0.02720	13	240.00	0.02970
4	0.50	0.02770			
5	1.00	0.02780			
6	2.00	0.02790			
7	4.00	0.02810			
8	8.00	0.02850			
9	15.00	0.02860			
10	30.00	0.02880			

Void Ratio = 0.813 Compression = 2.6 % >>> CALCULATED USING D_{100}
 $D_0 = 0.02484$ $D_{90} = 0.02607$ $D_{100} = 0.02620$
 C_v at 0.8 min. = 0.246 in.²/min.

Pressure: 8.00 ksf TEST READINGS Load No. 6

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.02970	11	60.00	0.04380
2	0.10	0.04030	12	120.00	0.04400
3	0.25	0.04070	13	240.00	0.04450
4	0.50	0.04130	14	480.00	0.04470
5	1.00	0.04150	15	720.00	0.04480
6	2.00	0.04200	16	960.00	0.04520
7	4.00	0.04230			
8	8.00	0.04260			
9	15.00	0.04300			
10	30.00	0.04320			

Void Ratio = 0.787 Compression = 4.0 % >>> CALCULATED USING D_{100}
 $D_0 = 0.03768$ $D_{90} = 0.03981$ $D_{100} = 0.04005$
 C_v at 2.7 min. = 0.073 in.²/min.

Pressure: 16.00 ksf TEST READINGS Load No. 7

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.04520	11	60.00	0.06300
2	0.10	0.05820	12	120.00	0.06330
3	0.25	0.05900	13	240.00	0.06390
4	0.50	0.05930	14	480.00	0.06460
5	1.00	0.05990	15	720.00	0.06480
6	2.00	0.06050	16	960.00	0.06520
7	4.00	0.06080	17	1200.00	0.06530
8	8.00	0.06150	18	1440.00	0.06530
9	15.00	0.06200			
10	30.00	0.06230			

Void Ratio = 0.754 Compression = 5.8 % >>> CALCULATED USING D_{100}
 $D_0 = 0.05472$ $D_{90} = 0.05750$ $D_{100} = 0.05781$
 C_v at 2.6 min. = 0.072 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 8

No.	Elapsed Time	Dial Reading
1	0.00	0.06530
2	0.10	0.06150
3	0.25	0.06140
4	0.50	0.06140
5	1.00	0.06140
6	2.00	0.06140
7	4.00	0.06140
8	8.00	0.06140
9	15.00	0.06140

Void Ratio = 0.752 Compression = 5.9 % >>> CALCULATED USING D_{100}
 $D_0 = 0.05917$ $D_{90} = 0.05890$ $D_{100} = 0.05887$
 C_v at 0.3 min. = 0.568 in.²/min.

Pressure: 1.00 ksf TEST READINGS Load No. 9

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.06140	11	60.00	0.05320
2	0.10	0.05430	12	120.00	0.05320
3	0.25	0.05390			
4	0.50	0.05380			
5	1.00	0.05380			
6	2.00	0.05370			
7	4.00	0.05370			
8	8.00	0.05360			
9	15.00	0.05330			
10	30.00	0.05320			

Void Ratio = 0.766 Compression = 5.2 % >>> CALCULATED USING D_{100}
 $D_0 = 0.05299$ $D_{90} = 0.05185$ $D_{100} = 0.05173$
 C_v at 0.4 min. = 0.528 in.²/min.

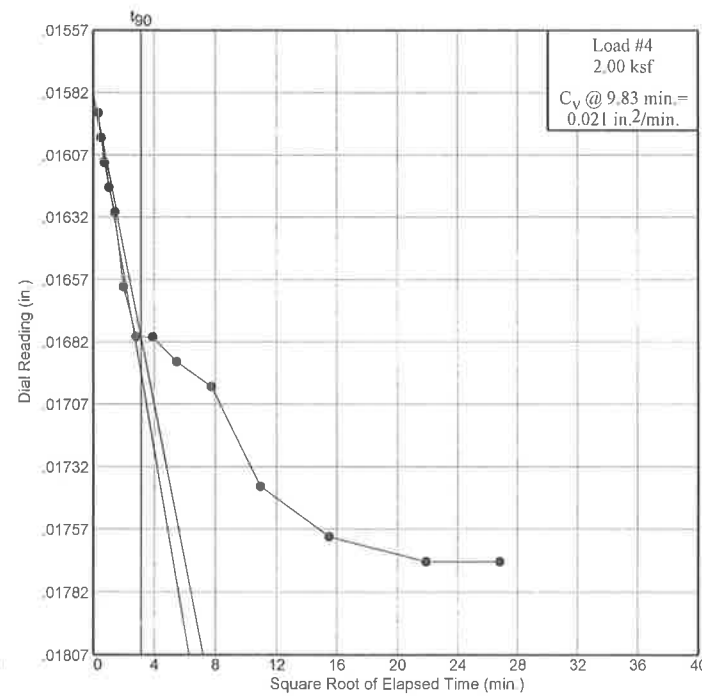
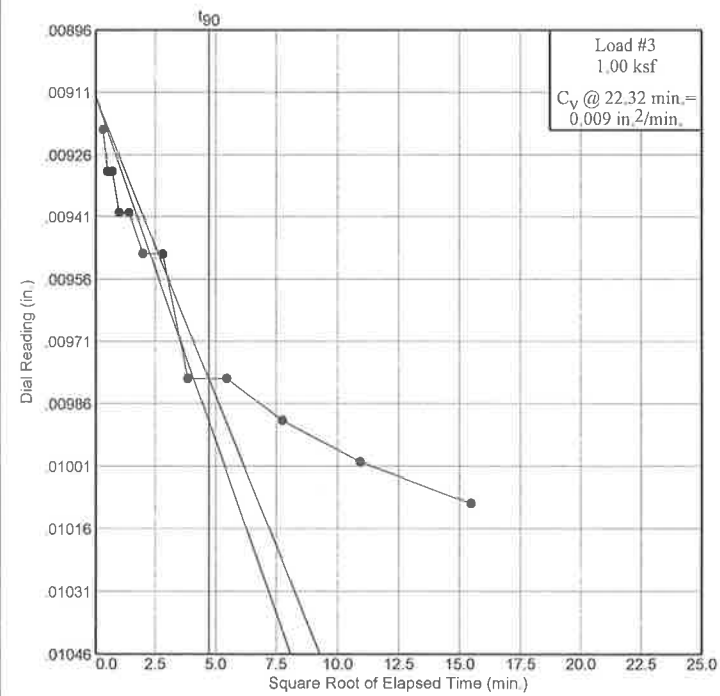
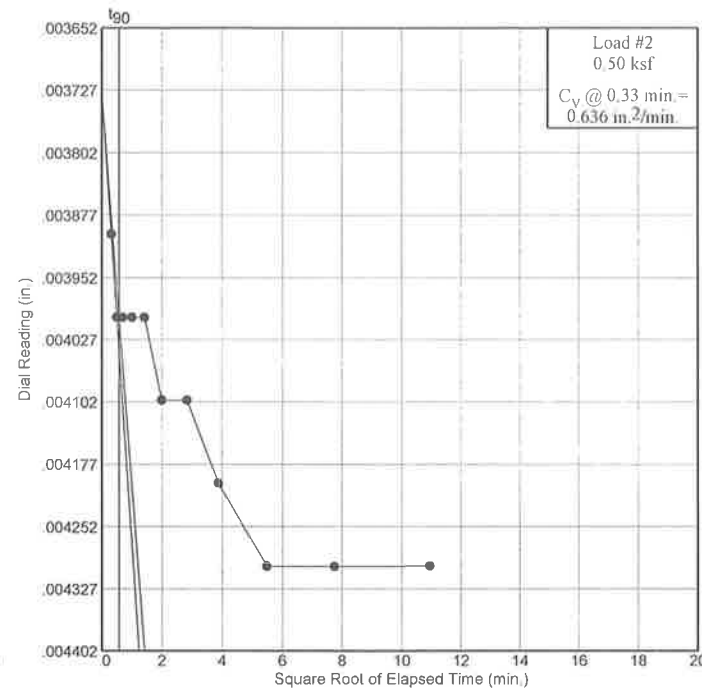
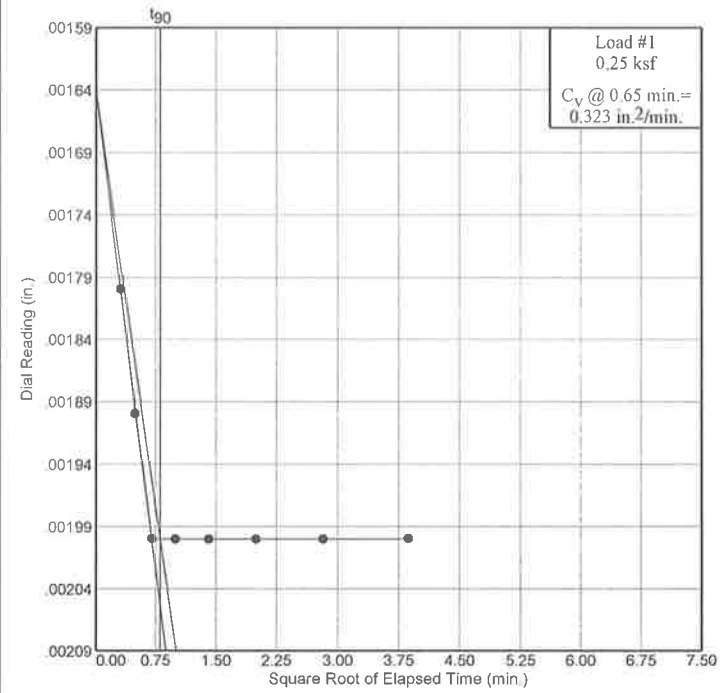
Pressure: 0.25 ksf TEST READINGS Load No. 10

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.05320	11	60.00	0.04610
2	0.10	0.04740	12	120.00	0.04600
3	0.25	0.04690	13	240.00	0.04590
4	0.50	0.04680	14	480.00	0.04580
5	1.00	0.04670	15	720.00	0.04580
6	2.00	0.04670	16	960.00	0.04570
7	4.00	0.04660	17	1440.00	0.04560
8	8.00	0.04650			
9	15.00	0.04650			
10	30.00	0.04640			

Void Ratio = 0.778 Compression = 4.5 % >>> CALCULATED USING D_{100}
 $D_0 = 0.04666$ $D_{90} = 0.04525$ $D_{100} = 0.04510$
 C_v at 0.4 min. = 0.547 in.²/min.

Dial Reading vs. Time

Project No.: 623517016.01
 Project: Sugar Hill Road
 Marion, NC
 Location: W 2-3 UD @ 10'-12' (ST-2)

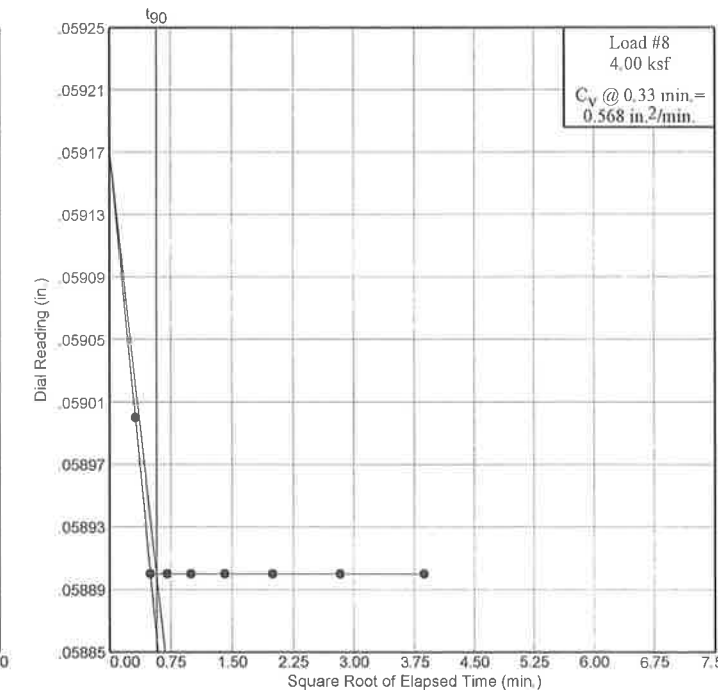
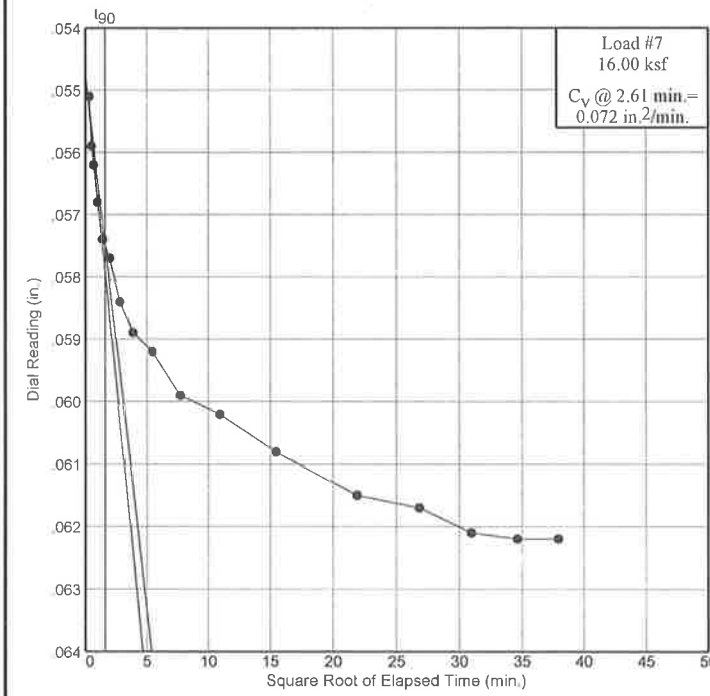
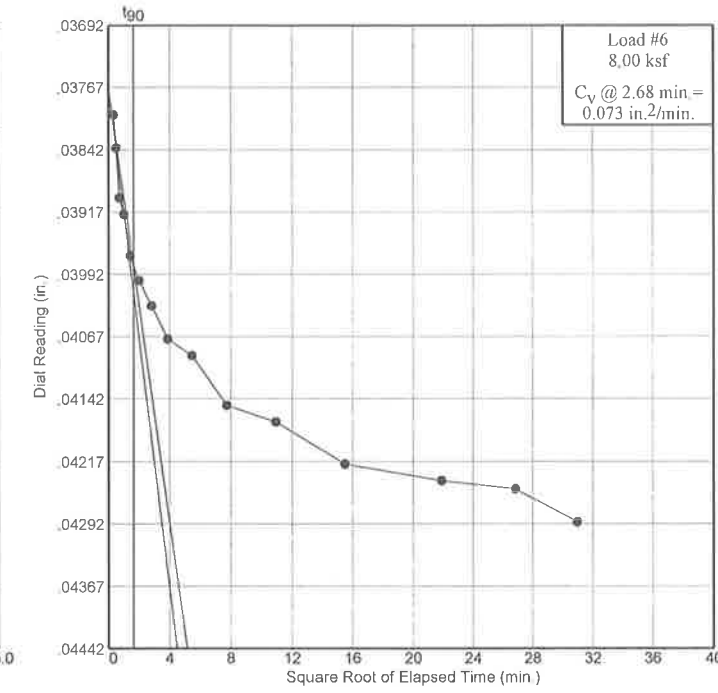
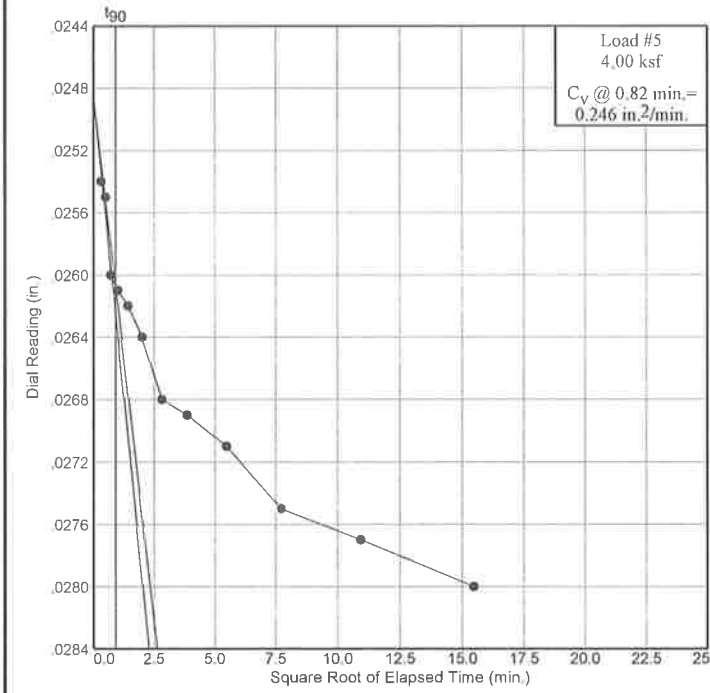


Summit Engineering
 Ft. Mill, South Carolina

Figure

Dial Reading vs. Time

Project No.: 623517016.01
 Project: Sugar Hill Road
 Marion, NC
 Location: W 2-3 UD @ 10'-12' (ST-2)

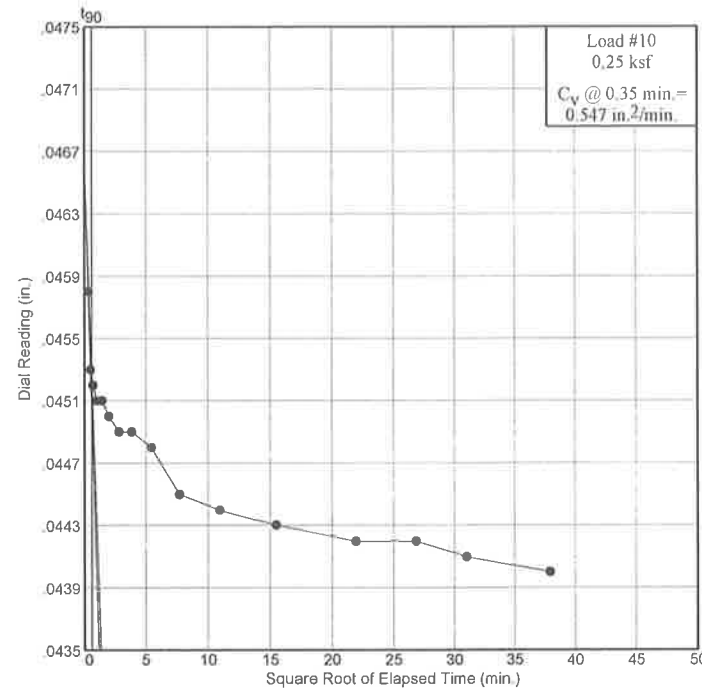
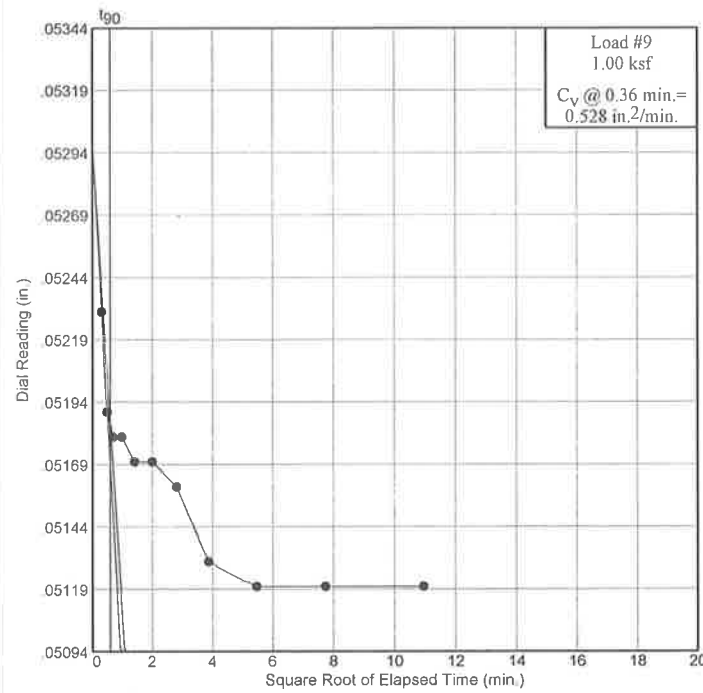


Summit Engineering
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Figure

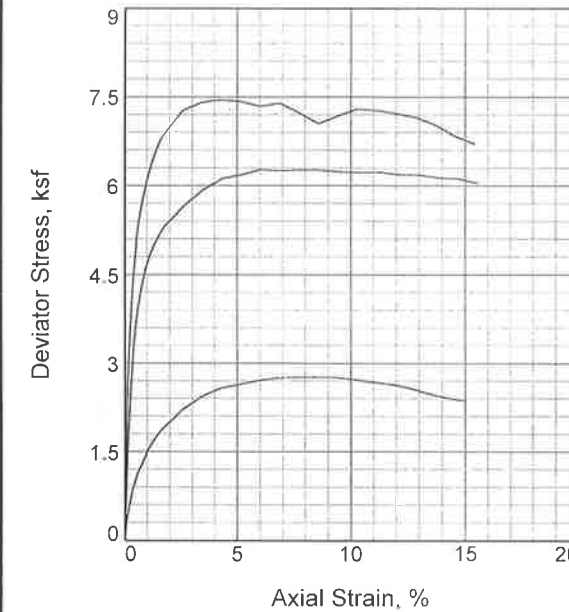
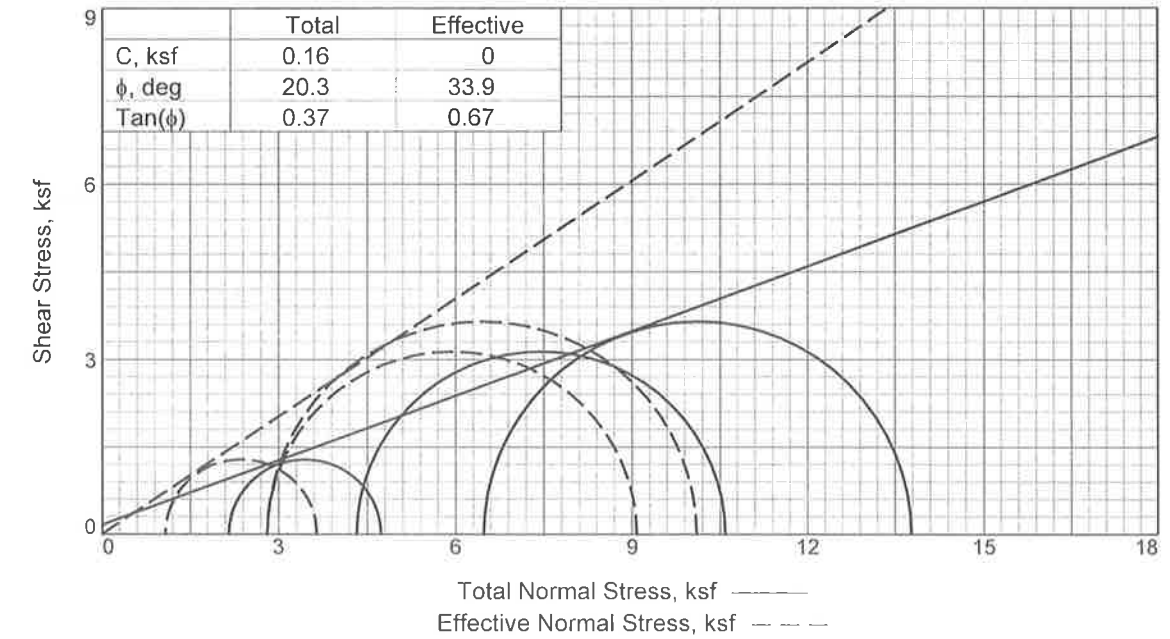
Dial Reading vs. Time

Project No.: 623517016.01
 Project: Sugar Hill Road
 Marion, NC
 Location: W 2-3 UD @ 10'-12' (ST-2)



Summit Engineering
 Ft. Mill, South Carolina

Figure



Sample No.	1	2	3
Initial			
Water Content, %	46.2	39.0	33.1
Dry Density, pcf	75.7	78.7	85.0
Saturation, %	100.0	90.4	89.0
Void Ratio	1.2753	1.1897	1.0263
Diameter, in.	2.880	2.886	2.875
Height, in.	6.028	5.991	6.016
At Test			
Water Content, %	44.8	35.0	32.1
Dry Density, pcf	77.0	87.6	91.4
Saturation, %	100.0	100.0	100.0
Void Ratio	1.2363	0.9668	0.8855
Diameter, in.	2.867	2.779	2.813
Height, in.	5.980	5.805	5.849
Strain rate, %/min.	0.07	0.07	0.07
Back Pressure, psi	60.00	60.00	60.00
Cell Pressure, psi	75.00	90.00	105.00
Fail. Stress, ksf	2.6	6.3	7.3
Total Pore Pr., ksf	9.7	10.2	12.3
Ult. Stress, ksf			
Total Pore Pr., ksf			
σ_1 Failure, ksf	3.6	9.1	10.1
σ_3 Failure, ksf	1.1	2.8	2.8

Type of Test:
 CU with Pore Pressures
Sample Type: Shelby Tube
Description: Grey-Brown Silty Sand

LL= 41 PL= 38 PI= 3
Assumed Specific Gravity= 2.76
Remarks:

Client: S&ME, Inc. - Charlotte

Project: Sugar Hill Road
 Marion, NC
Location: W 2-3 UD @ 10'-12' (ST-2)

Proj. No.: 623517016.01 **Date Sampled:** 01-22-18

TRIAXIAL SHEAR TEST REPORT
 Summit Engineering
 Ft. Mill, South Carolina

Figure

Tested By: FG

Checked By: MH

TRIAxIAL COMPRESSION TEST
CU with Pore Pressures

2/13/2018
2:09 PM

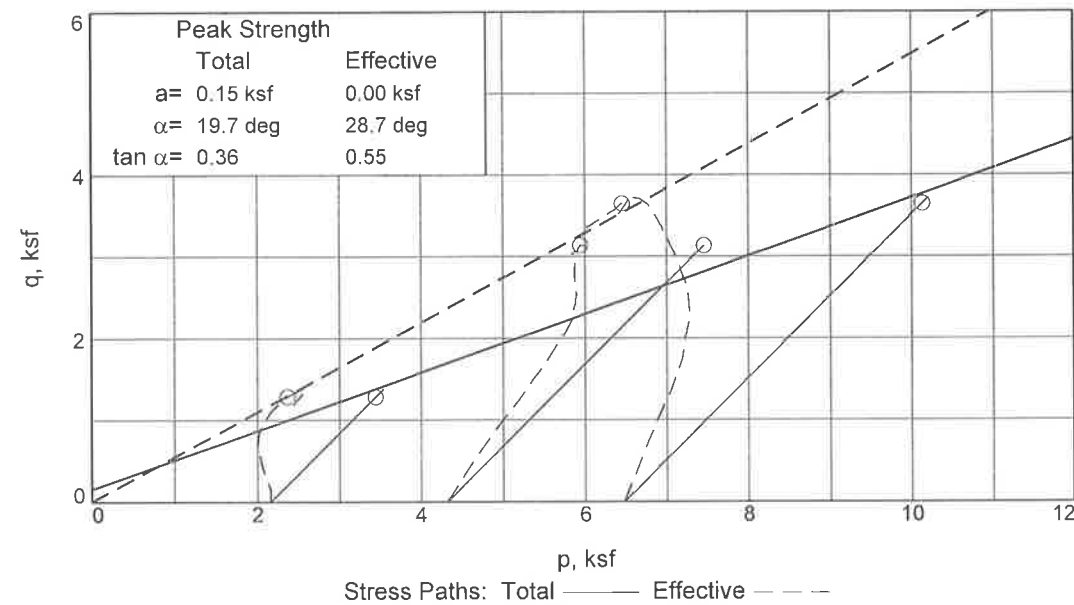
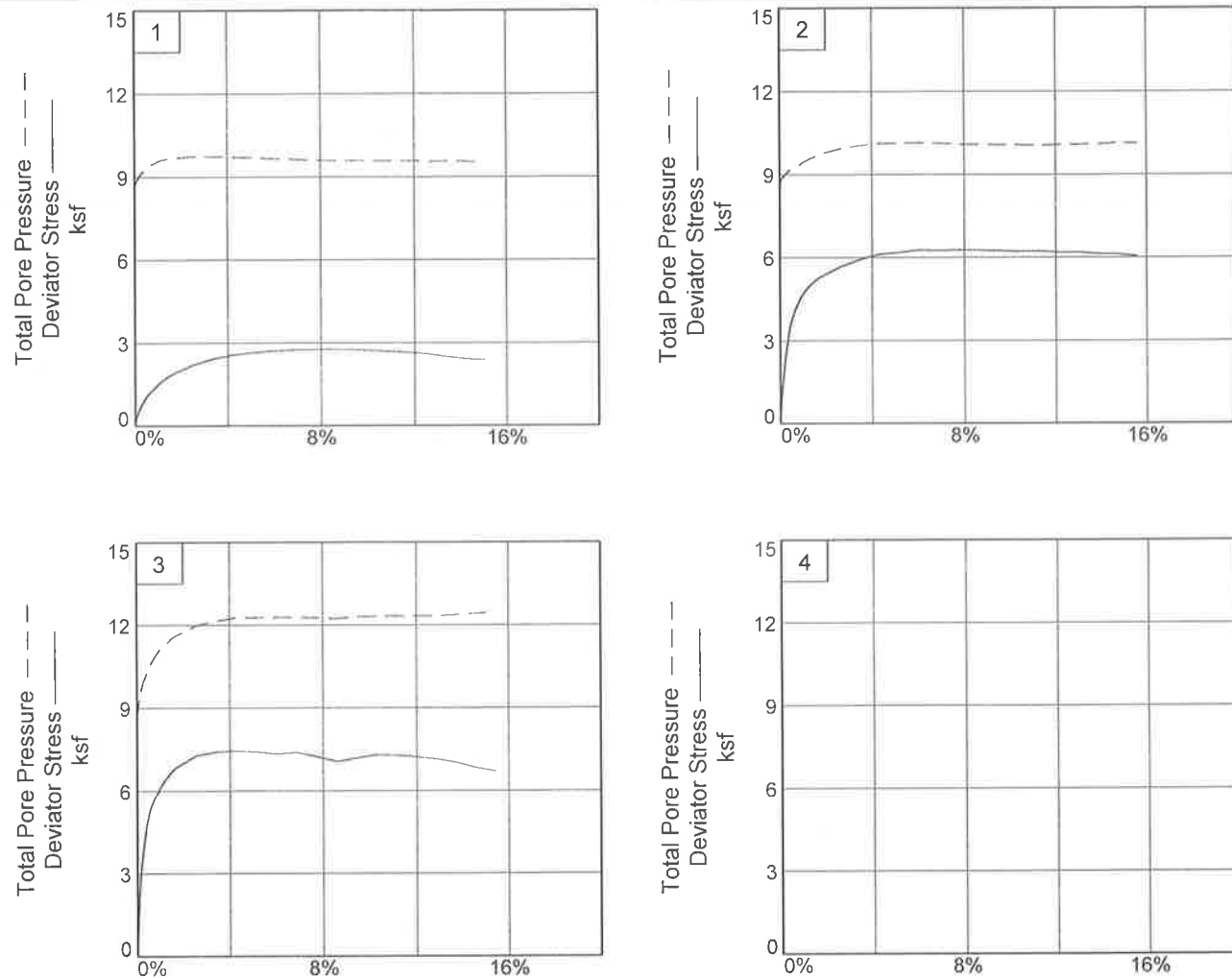
Date: 01-22-18
Client: S&ME, Inc. - Charlotte
Project: Sugar Hill Road
Marion, NC
Project No.: 623517016.01
Location: W 2-3 UD @ 10'-12' (ST-2)
Description: Grey-Brown Silty Sand
Remarks:
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.76 **LL=**41 **PL=**38 **PI=**3
Test Method: ASTM D 4767 Method B

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1141.220			1130.220
Moisture content: Dry soil+tare, gms.	780.570			780.570
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	46.2	47.4	44.8	44.8
Moist specimen weight, gms.	1141.22			
Diameter, in.	2.880	2.899	2.867	
Area, in. ²	6.514	6.600	6.454	
Height, in.	6.028	6.033	5.980	
Net decrease in height, in.		-0.005	0.053	
Net decrease in water volume, cc.			20.000	
Wet density, pcf	110.7	110.1	111.6	
Dry density, pcf	75.7	74.7	77.0	
Void ratio	1.2753	1.3070	1.2363	
Saturation, %	100.0	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.02 cm
Consolidation cell pressure = 75.00 psi (10.80 ksf)
Consolidation back pressure = 60.00 psi (8.64 ksf)
Consolidation effective confining stress = 2.16 ksf
Strain rate, %/min. = 0.07
Fail. Stress = 2.57 ksf at reading no. 23



Client: S&ME, Inc. - Charlotte
Project: Sugar Hill Road
Location: W 2-3 UD @ 10'-12' (ST-2)
Project No.: 623517016.01

Figure _____

Summit Engineering

Tested By: FG Checked By: MH

Summit Engineering

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	2.16	2.16	1.00	60.00	2.16	0.00
1	0.0040	13.8	14	0.1	0.31	2.00	2.31	1.15	61.10	2.16	0.15
2	0.0100	23.9	24	0.2	0.53	1.84	2.38	1.29	62.20	2.11	0.27
3	0.0150	30.9	31	0.3	0.69	1.74	2.43	1.39	62.90	2.09	0.34
4	0.0200	36.9	37	0.3	0.82	1.66	2.48	1.50	63.50	2.07	0.41
5	0.0250	42.0	42	0.4	0.93	1.58	2.52	1.59	64.00	2.05	0.47
6	0.0290	46.4	46	0.5	1.03	1.53	2.56	1.67	64.40	2.04	0.52
7	0.0340	50.7	51	0.6	1.12	1.47	2.59	1.77	64.80	2.03	0.56
8	0.0390	54.5	55	0.7	1.21	1.41	2.62	1.86	65.20	2.02	0.60
9	0.0450	57.7	58	0.8	1.28	1.37	2.65	1.93	65.50	2.01	0.64
10	0.0500	60.9	61	0.8	1.35	1.32	2.67	2.02	65.80	2.00	0.67
11	0.0550	64.1	64	0.9	1.42	1.30	2.71	2.09	66.00	2.00	0.71
12	0.0590	67.3	67	1.0	1.49	1.27	2.75	2.17	66.20	2.01	0.74
13	0.0640	69.9	70	1.1	1.54	1.24	2.78	2.25	66.40	2.01	0.77
14	0.0690	72.6	73	1.2	1.60	1.21	2.81	2.32	66.60	2.01	0.80
15	0.0740	74.9	75	1.2	1.65	1.20	2.85	2.38	66.70	2.02	0.83
16	0.0790	77.3	77	1.3	1.70	1.18	2.88	2.44	66.80	2.03	0.85
17	0.0840	79.5	80	1.4	1.75	1.17	2.92	2.50	66.90	2.04	0.87
18	0.0890	81.6	82	1.5	1.79	1.15	2.95	2.56	67.00	2.05	0.90
19	0.0940	83.7	84	1.6	1.84	1.14	2.98	2.62	67.10	2.06	0.92
20	0.1000	85.7	86	1.7	1.88	1.12	3.00	2.67	67.20	2.06	0.94
21	0.1500	101.0	101	2.5	2.20	1.07	3.26	3.06	67.60	2.16	1.10
22	0.2040	112.6	113	3.4	2.43	1.07	3.49	3.28	67.60	2.28	1.21
23	0.2540	120.2	120	4.2	2.57	1.08	3.65	3.38	67.50	2.36	1.28
24	0.3050	124.7	125	5.1	2.64	1.11	3.75	3.38	67.30	2.43	1.32
25	0.3500	128.5	129	5.9	2.70	1.14	3.84	3.37	67.10	2.49	1.35
26	0.4050	132.0	132	6.8	2.75	1.17	3.91	3.35	66.90	2.54	1.37
27	0.4500	134.0	134	7.5	2.76	1.20	3.96	3.31	66.70	2.58	1.38
28	0.5000	135.1	135	8.4	2.76	1.21	3.97	3.28	66.60	2.59	1.38
29	0.5550	136.2	136	9.3	2.76	1.21	3.97	3.28	66.60	2.59	1.38
30	0.6050	135.8	136	10.1	2.72	1.22	3.95	3.22	66.50	2.59	1.36
31	0.6500	135.0	135	10.9	2.68	1.22	3.91	3.19	66.50	2.57	1.34
32	0.7050	134.0	134	11.8	2.64	1.22	3.86	3.15	66.50	2.54	1.32
33	0.7510	132.3	132	12.6	2.58	1.24	3.82	3.08	66.40	2.53	1.29
34	0.8010	128.5	129	13.4	2.48	1.24	3.72	3.01	66.40	2.48	1.24
35	0.8500	125.8	126	14.2	2.41	1.25	3.66	2.92	66.30	2.46	1.20
36	0.9000	124.4	124	15.1	2.36	1.25	3.61	2.88	66.30	2.43	1.18

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1124.920			1093.070
Moisture content: Dry soil+tare, gms.	809.500			809.500
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	39.0	38.5	35.0	35.0
Moist specimen weight, gms.	1124.92			
Diameter, in.	2.886	2.796	2.779	
Area, in. ²	6.542	6.140	6.064	
Height, in.	5.991	6.016	5.805	
Net decrease in height, in.		-0.025	0.211	
Net decrease in water volume, cc.			28.400	
Wet density, pcf	109.3	115.7	118.3	
Dry density, pcf	78.7	83.5	87.6	
Void ratio	1.1897	1.0637	0.9668	
Saturation, %	90.4	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²
 Membrane thickness = 0.02 cm
 Consolidation cell pressure = 90.00 psi (12.96 ksf)
 Consolidation back pressure = 60.00 psi (8.64 ksf)
 Consolidation effective confining stress = 4.32 ksf
 Strain rate, %/min. = 0.07
 Fail. Stress = 6.27 ksf at reading no. 26

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	4.32	4.32	1.00	60.00	4.32	0.00
1	0.0050	44.6	45	0.1	1.06	4.13	5.19	1.26	61.30	4.66	0.53
2	0.0100	78.7	79	0.2	1.87	4.02	5.88	1.46	62.10	4.95	0.93
3	0.0150	105.1	105	0.3	2.49	3.95	6.43	1.63	62.60	5.19	1.24
4	0.0200	126.0	126	0.3	2.98	3.87	6.86	1.77	63.10	5.36	1.49
5	0.0240	142.3	142	0.4	3.37	3.83	7.20	1.88	63.40	5.51	1.68
6	0.0290	155.3	155	0.5	3.67	3.77	7.44	1.97	63.80	5.61	1.83
7	0.0340	165.7	166	0.6	3.91	3.73	7.64	2.05	64.10	5.69	1.96
8	0.0390	174.3	174	0.7	4.11	3.70	7.81	2.11	64.30	5.76	2.06
9	0.0440	181.7	182	0.8	4.28	3.66	7.94	2.17	64.60	5.80	2.14
10	0.0490	188.0	188	0.8	4.43	3.63	8.06	2.22	64.80	5.84	2.21
11	0.0530	193.6	194	0.9	4.56	3.57	8.13	2.28	65.20	5.85	2.28
12	0.0580	198.6	199	1.0	4.67	3.53	8.20	2.32	65.50	5.86	2.33
13	0.0630	202.8	203	1.1	4.76	3.48	8.25	2.37	65.80	5.87	2.38
14	0.0680	207.1	207	1.2	4.86	3.46	8.32	2.41	66.00	5.89	2.43
15	0.0730	210.9	211	1.3	4.95	3.41	8.36	2.45	66.30	5.89	2.47
16	0.0780	214.3	214	1.3	5.02	3.38	8.40	2.48	66.50	5.89	2.51
17	0.0830	217.4	217	1.4	5.09	3.36	8.44	2.52	66.70	5.90	2.54
18	0.0880	220.2	220	1.5	5.15	3.31	8.46	2.55	67.00	5.89	2.57
19	0.0930	222.8	223	1.6	5.21	3.28	8.49	2.59	67.20	5.89	2.60
20	0.0980	225.3	225	1.7	5.26	3.25	8.51	2.62	67.40	5.88	2.63
21	0.1030	227.5	228	1.8	5.31	3.23	8.53	2.65	67.60	5.88	2.65
22	0.1530	245.0	245	2.6	5.66	3.04	8.70	2.86	68.90	5.87	2.83
23	0.2030	258.6	259	3.5	5.93	2.92	8.85	3.03	69.70	5.89	2.96

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
24	0.2520	269.2	269	4.3	6.11	2.85	8.97	3.14	70.20	5.91	3.06
25	0.3030	274.8	275	5.2	6.18	2.82	9.01	3.19	70.40	5.91	3.09
26	0.3520	281.1	281	6.1	6.27	2.81	9.08	3.23	70.50	5.94	3.14
27	0.4020	282.9	283	6.9	6.25	2.84	9.09	3.20	70.30	5.96	3.13
28	0.4520	286.2	286	7.8	6.27	2.87	9.13	3.19	70.10	6.00	3.13
29	0.5030	288.7	289	8.7	6.26	2.88	9.14	3.17	70.00	6.01	3.13
30	0.5520	290.1	290	9.5	6.23	2.88	9.11	3.16	70.00	6.00	3.12
31	0.6040	292.3	292	10.4	6.22	2.89	9.11	3.15	69.90	6.00	3.11
32	0.6530	295.5	296	11.2	6.23	2.91	9.14	3.14	69.80	6.02	3.11
33	0.7020	296.4	296	12.1	6.19	2.89	9.08	3.14	69.90	5.99	3.09
34	0.7540	299.2	299	13.0	6.18	2.88	9.06	3.15	70.00	5.97	3.09
35	0.8030	299.6	300	13.8	6.13	2.87	9.00	3.14	70.10	5.93	3.07
36	0.8530	301.9	302	14.7	6.12	2.82	8.94	3.17	70.40	5.88	3.06
37	0.9040	301.2	301	15.6	6.04	2.82	8.86	3.14	70.40	5.84	3.02

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1160.080			1151.370
Moisture content: Dry soil+tare, gms.	871.710			871.710
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	33.1	36.1	32.1	32.1
Moist specimen weight, gms.	1160.08			
Diameter, in.	2.875	2.846	2.813	
Area, in. ²	6.492	6.360	6.213	
Height, in.	6.016	6.051	5.849	
Net decrease in height, in.		-0.035	0.202	
Net decrease in water volume, cc.			35.100	
Wet density, pcf	113.2	117.5	120.7	
Dry density, pcf	85.0	86.3	91.4	
Void ratio	1.0263	0.9966	0.8855	
Saturation, %	89.0	100.0	100.0	

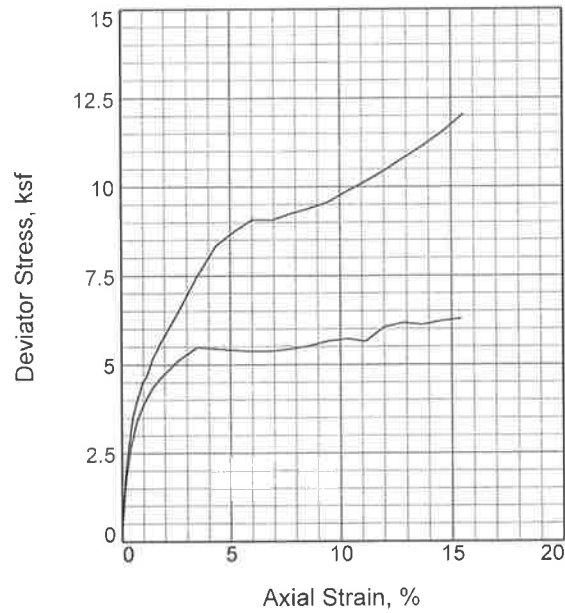
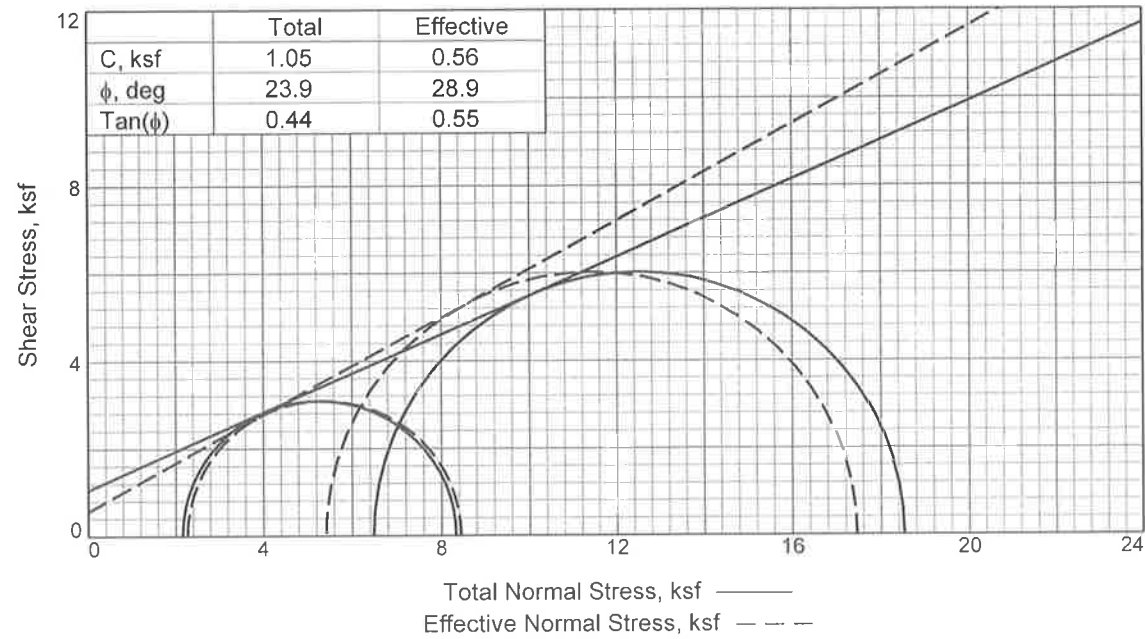
Test Readings for Specimen No. 3

Membrane modulus = 0.124105 kN/cm²
 Membrane thickness = 0.02 cm
 Consolidation cell pressure = 105.00 psi (15.12 ksf)
 Consolidation back pressure = 60.00 psi (8.64 ksf)
 Consolidation effective confining stress = 6.48 ksf
 Strain rate, %/min. = 0.07
 Fail. Stress = 7.30 ksf at reading no. 31

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	6.48	6.48	1.00	60.00	6.48	0.00
1	0.0040	63.5	64	0.1	1.47	6.03	7.50	1.24	63.10	6.77	0.74
2	0.0080	115.8	116	0.1	2.68	5.70	8.38	1.47	65.40	7.04	1.34
3	0.0130	151.0	151	0.2	3.49	5.44	8.94	1.64	67.20	7.19	1.75
4	0.0180	176.4	176	0.3	4.08	5.20	9.27	1.78	68.90	7.24	2.04
5	0.0230	195.6	196	0.4	4.52	5.03	9.54	1.90	70.10	7.28	2.26

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
6	0.0280	210.9	211	0.5	4.86	4.84	9.70	2.01	71.40	7.27	2.43
7	0.0320	223.4	223	0.5	5.15	4.68	9.83	2.10	72.50	7.25	2.57
8	0.0370	233.8	234	0.6	5.38	4.54	9.92	2.19	73.50	7.23	2.69
9	0.0420	242.6	243	0.7	5.58	4.39	9.97	2.27	74.50	7.18	2.79
10	0.0470	250.4	250	0.8	5.76	4.28	10.03	2.35	75.30	7.16	2.88
11	0.0520	257.2	257	0.9	5.91	4.16	10.07	2.42	76.10	7.12	2.95
12	0.0570	263.8	264	1.0	6.05	4.08	10.13	2.49	76.70	7.10	3.03
13	0.0620	269.6	270	1.1	6.18	3.97	10.16	2.56	77.40	7.07	3.09
14	0.0670	275.0	275	1.1	6.30	3.89	10.19	2.62	78.00	7.04	3.15
15	0.0720	279.9	280	1.2	6.41	3.82	10.22	2.68	78.50	7.02	3.20
16	0.0770	284.1	284	1.3	6.50	3.76	10.26	2.73	78.90	7.01	3.25
17	0.0820	288.3	288	1.4	6.59	3.69	10.27	2.79	79.40	6.98	3.29
18	0.0870	291.8	292	1.5	6.66	3.61	10.28	2.84	79.90	6.95	3.33
19	0.0910	295.3	295	1.6	6.74	3.57	10.31	2.89	80.20	6.94	3.37
20	0.0960	298.2	298	1.6	6.80	3.51	10.31	2.93	80.60	6.91	3.40
21	0.1020	301.3	301	1.7	6.86	3.47	10.33	2.98	80.90	6.90	3.43
22	0.1510	321.9	322	2.6	7.27	3.14	10.41	3.32	83.20	6.77	3.63
23	0.2020	331.2	331	3.5	7.41	2.97	10.38	3.50	84.40	6.67	3.71
24	0.2510	335.7	336	4.3	7.45	2.87	10.31	3.60	85.10	6.59	3.72
25	0.3010	337.4	337	5.1	7.42	2.85	10.27	3.60	85.20	6.56	3.71
26	0.3520	336.9	337	6.0	7.34	2.84	10.18	3.59	85.30	6.51	3.67
27	0.4020	342.4	342	6.9	7.39	2.84	10.23	3.61	85.30	6.53	3.70
28	0.4520	338.2	338	7.7	7.23	2.87	10.10	3.52	85.10	6.48	3.62
29	0.5030	332.6	333	8.6	7.05	2.89	9.94	3.43	84.90	6.42	3.52
30	0.5520	342.0	342	9.4	7.18	2.82	10.00	3.54	85.40	6.41	3.59
31	0.6020	350.9	351	10.3	7.30	2.81	10.10	3.60	85.50	6.46	3.65
32	0.6530	353.0	353	11.2	7.27	2.79	10.06	3.60	85.60	6.43	3.63
33	0.7030	353.9	354	12.0	7.22	2.79	10.01	3.58	85.60	6.40	3.61
34	0.7530	354.0	354	12.9	7.15	2.79	9.94	3.56	85.60	6.37	3.57
35	0.8030	351.2	351	13.7	7.02	2.75	9.77	3.55	85.90	6.26	3.51
36	0.8530	345.2	345	14.6	6.83	2.71	9.54	3.52	86.20	6.12	3.42
37	0.9030	342.0	342	15.4	6.70	2.66	9.37	3.52	86.50	6.02	3.35



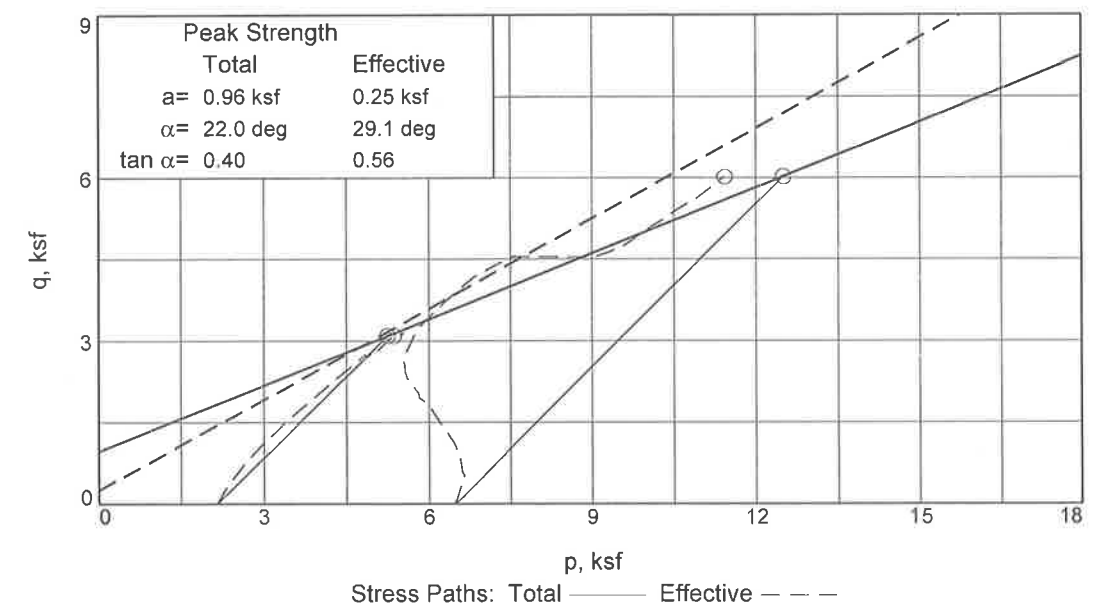
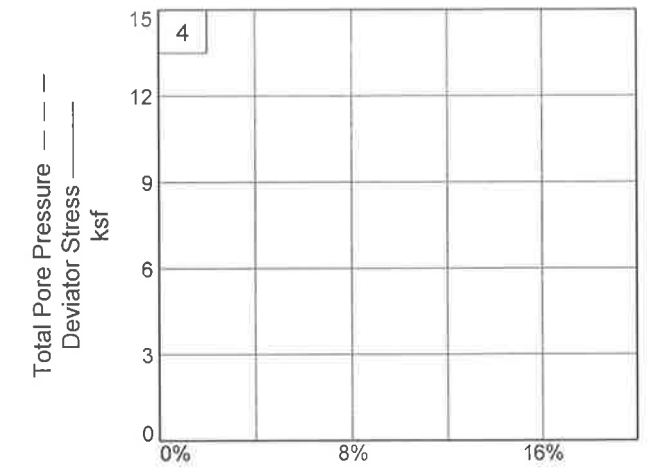
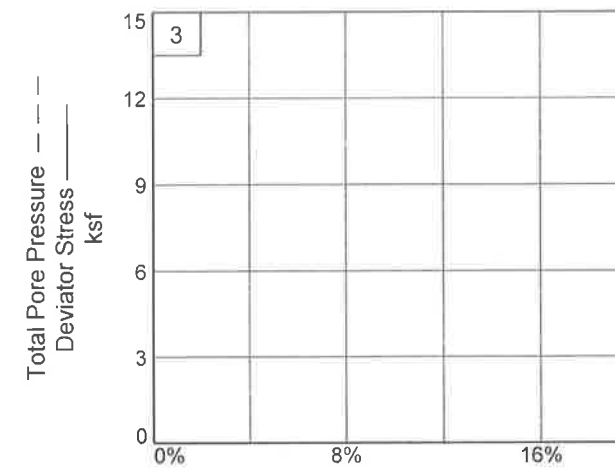
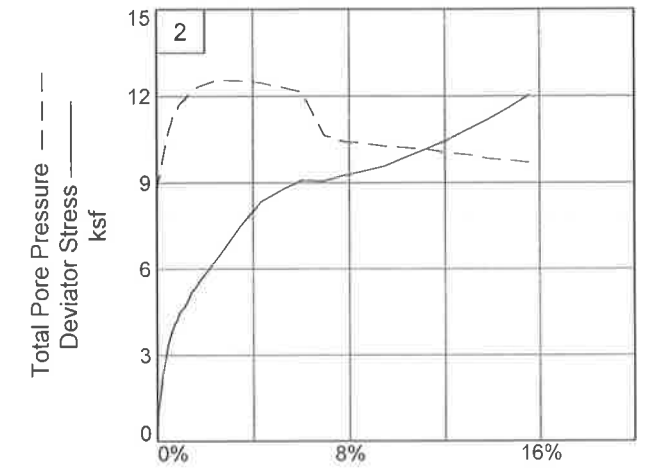
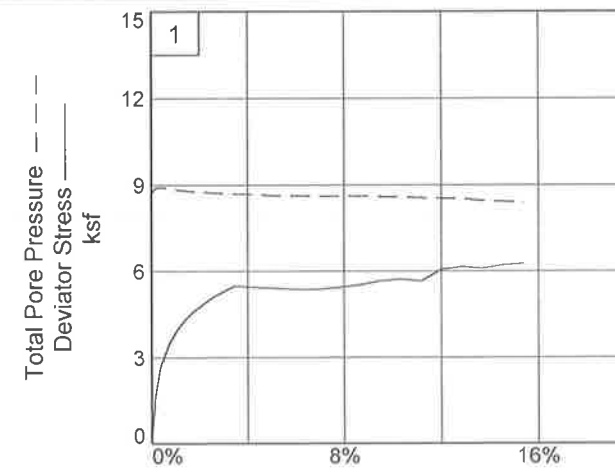
	Sample No. 1	Sample No. 2
Initial		
Water Content, %	29.9	18.2
Dry Density, pcf	88.4	107.9
Saturation, %	88.9	87.5
Void Ratio	0.9073	0.5618
Diameter, in.	2.850	2.845
Height, in.	6.054	6.003
At Test		
Water Content, %	24.2	18.7
Dry Density, pcf	101.9	112.1
Saturation, %	100.0	100.0
Void Ratio	0.6536	0.5042
Diameter, in.	2.699	2.839
Height, in.	5.852	5.807
Strain rate, %/min.	0.07	0.07
Back Pressure, psi	60.00	60.00
Cell Pressure, psi	75.00	105.00
Fail. Stress, ksf	6.2	12.0
Total Pore Pr., ksf	8.5	9.7
Ult. Stress, ksf		
Total Pore Pr., ksf		
$\bar{\sigma}_1$ Failure, ksf	8.4	17.5
$\bar{\sigma}_3$ Failure, ksf	2.3	5.4

Type of Test: CU with Pore Pressures
Sample Type: Shelby Tube
Description: Dark Grey-Brown Silty Sand
 LL= NP PI= NP
 Assumed Specific Gravity= 2.70
Remarks:

Client: S&ME, Inc. - Charlotte
Project: Sugar Hill Road
 Marion, NC
Location: W 1-4 UD @ 6'-8' (ST-1)
Proj. No.: 623517016.01 **Date Sampled:** 01-22-18
TRIAXIAL SHEAR TEST REPORT
 Summit Engineering
 Ft. Mill, South Carolina

Figure _____

Tested By: FG Checked By: MH



Client: S&ME, Inc. - Charlotte
Project: Sugar Hill Road
Location: W 1-4 UD @ 6'-8' (ST-1)
Project No.: 623517016.01

Figure _____

Tested By: FG Checked By: MH

Summit Engineering

TRIAxIAL COMPRESSION TEST
CU with Pore Pressures

2/13/2018
2:34 PM

Date: 01-22-18
Client: S&ME, Inc. - Charlotte
Project: Sugar Hill Road
Marion, NC
Project No.: 623517016.01
Location: W 1-4 UD @ 6'-8' (ST-1)
Description: Dark Grey-Brown Silty Sand
Remarks:
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.70 **LL=**NP **PL=** **PI=**NP
Test Method: ASTM D 4767 Method B

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1163.540			1112.790
Moisture content: Dry soil+tare, gms.	895.920			895.920
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	29.9	25.6	24.2	24.2
Moist specimen weight, gms.	1163.54			
Diameter, in.	2.850	2.695	2.699	
Area, in. ²	6.379	5.706	5.722	
Height, in.	6.054	6.000	5.852	
Net decrease in height, in.		0.054	0.148	
Net decrease in water volume, cc.			12.300	
Wet density, pcf	114.8	125.2	126.6	
Dry density, pcf	88.4	99.7	101.9	
Void ratio	0.9073	0.6906	0.6536	
Saturation, %	88.9	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.02 cm
Consolidation cell pressure = 75.00 psi (10.80 ksf)
Consolidation back pressure = 60.00 psi (8.64 ksf)
Consolidation effective confining stress = 2.16 ksf
Strain rate, %/min. = 0.07
Fail. Stress = 6.17 ksf at reading no. 35

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	2.16	2.16	1.00	60.00	2.16	0.00
1	0.0030	24.0	24	0.1	0.60	2.03	2.63	1.30	60.90	2.33	0.30
2	0.0050	32.9	33	0.1	0.83	2.00	2.83	1.41	61.10	2.42	0.41
3	0.0090	55.7	56	0.2	1.40	1.93	3.33	1.73	61.60	2.63	0.70
4	0.0140	74.6	75	0.2	1.87	1.90	3.77	1.99	61.80	2.84	0.94
5	0.0190	90.1	90	0.3	2.26	1.89	4.15	2.20	61.90	3.02	1.13
6	0.0230	102.9	103	0.4	2.58	1.89	4.47	2.37	61.90	3.18	1.29
7	0.0280	113.7	114	0.5	2.85	1.89	4.73	2.51	61.90	3.31	1.42
8	0.0330	122.8	123	0.6	3.07	1.90	4.97	2.62	61.80	3.44	1.54
9	0.0380	130.7	131	0.6	3.27	1.92	5.18	2.71	61.70	3.55	1.63
10	0.0430	137.6	138	0.7	3.44	1.93	5.37	2.78	61.60	3.65	1.72
11	0.0480	143.6	144	0.8	3.58	1.94	5.53	2.84	61.50	3.74	1.79
12	0.0530	148.8	149	0.9	3.71	1.96	5.67	2.89	61.40	3.81	1.86
13	0.0580	154.0	154	1.0	3.84	1.96	5.80	2.96	61.40	3.88	1.92
14	0.0630	158.5	159	1.1	3.95	1.97	5.92	3.00	61.30	3.95	1.97
15	0.0680	163.0	163	1.2	4.05	1.97	6.03	3.06	61.30	4.00	2.03
16	0.0730	166.5	167	1.2	4.14	1.99	6.13	3.08	61.20	4.06	2.07
17	0.0780	170.2	170	1.3	4.23	1.99	6.21	3.13	61.20	4.10	2.11
18	0.0830	173.8	174	1.4	4.31	2.00	6.31	3.15	61.10	4.16	2.16
19	0.0880	176.9	177	1.5	4.39	2.00	6.39	3.19	61.10	4.19	2.19
20	0.0930	179.9	180	1.6	4.46	2.02	6.47	3.21	61.00	4.24	2.23
21	0.0980	183.0	183	1.7	4.53	2.02	6.54	3.25	61.00	4.28	2.26
22	0.1030	185.7	186	1.8	4.59	2.02	6.61	3.28	61.00	4.31	2.30
23	0.1520	208.4	208	2.6	5.11	2.07	7.18	3.46	60.60	4.63	2.55
24	0.2030	225.7	226	3.5	5.48	2.10	7.59	3.61	60.40	4.84	2.74
25	0.2530	225.8	226	4.3	5.44	2.13	7.57	3.55	60.20	4.85	2.72
26	0.3020	226.3	226	5.2	5.40	2.17	7.58	3.48	59.90	4.88	2.70
27	0.3530	227.1	227	6.0	5.37	2.17	7.55	3.47	59.90	4.86	2.69
28	0.4020	229.3	229	6.9	5.37	2.19	7.56	3.46	59.80	4.88	2.69
29	0.4520	233.7	234	7.7	5.43	2.19	7.62	3.48	59.80	4.90	2.71
30	0.5040	240.0	240	8.6	5.52	2.19	7.71	3.52	59.80	4.95	2.76
31	0.5530	248.0	248	9.4	5.65	2.20	7.85	3.57	59.70	5.03	2.83
32	0.6030	253.2	253	10.3	5.72	2.22	7.93	3.58	59.60	5.08	2.86
33	0.6530	252.7	253	11.2	5.65	2.25	7.90	3.52	59.40	5.07	2.83
34	0.7030	273.3	273	12.0	6.05	2.26	8.31	3.68	59.30	5.29	3.03
35	0.7530	281.3	281	12.9	6.17	2.28	8.44	3.71	59.20	5.36	3.08
36	0.8030	281.4	281	13.7	6.11	2.35	8.46	3.60	58.70	5.40	3.06
37	0.8530	289.5	290	14.6	6.22	2.38	8.60	3.62	58.50	5.49	3.11
38	0.9030	295.3	295	15.4	6.29	2.40	8.69	3.61	58.30	5.55	3.14

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1277.950			1282.930
Moisture content: Dry soil+tare, gms.	1081.060			1081.060
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	18.2	21.4	18.7	18.7
Moist specimen weight, gms.	1277.95			
Diameter, in.	2.845	2.862	2.839	
Area, in. ²	6.357	6.432	6.329	
Height, in.	6.003	5.991	5.807	
Net decrease in height, in.		0.012	0.184	
Net decrease in water volume, cc.			29.200	
Wet density, pcf	127.6	129.7	133.0	
Dry density, pcf	107.9	106.9	112.1	
Void ratio	0.5618	0.5771	0.5042	
Saturation, %	87.5	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²

Membrane thickness = 0.02 cm

Consolidation cell pressure = 105.00 psi (15.12 ksf)

Consolidation back pressure = 60.00 psi (8.64 ksf)

Consolidation effective confining stress = 6.48 ksf

Strain rate, %/min. = 0.07

Fail. Stress = 12.04 ksf at reading no. 39

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	6.48	6.48	1.00	60.00	6.48	0.00
1	0.0030	47.5	48	0.1	1.08	6.11	7.19	1.18	62.60	6.65	0.54
2	0.0050	50.8	51	0.1	1.15	6.03	7.19	1.19	63.10	6.61	0.58
3	0.0090	77.2	77	0.2	1.75	5.69	7.44	1.31	65.50	6.56	0.88
4	0.0140	99.5	100	0.2	2.26	5.33	7.59	1.42	68.00	6.46	1.13
5	0.0190	117.3	117	0.3	2.66	5.00	7.66	1.53	70.30	6.33	1.33
6	0.0230	132.1	132	0.4	2.99	4.71	7.70	1.64	72.30	6.21	1.50
7	0.0260	144.3	144	0.4	3.27	4.48	7.75	1.73	73.90	6.11	1.63
8	0.0300	155.3	155	0.5	3.52	4.28	7.79	1.82	75.30	6.03	1.76
9	0.0350	164.7	165	0.6	3.72	4.09	7.81	1.91	76.60	5.95	1.86
10	0.0390	172.6	173	0.7	3.90	3.87	7.77	2.01	78.10	5.82	1.95
11	0.0440	180.7	181	0.8	4.08	3.77	7.85	2.08	78.80	5.81	2.04
12	0.0500	188.0	188	0.9	4.24	3.63	7.87	2.17	79.80	5.75	2.12
13	0.0530	194.7	195	0.9	4.39	3.50	7.89	2.25	80.70	5.69	2.19
14	0.0580	201.0	201	1.0	4.53	3.38	7.91	2.34	81.50	5.65	2.26
15	0.0660	206.0	206	1.1	4.63	3.28	7.92	2.41	82.20	5.60	2.32
16	0.0710	212.5	213	1.2	4.78	3.20	7.97	2.49	82.80	5.58	2.39
17	0.0750	218.0	218	1.3	4.90	3.11	8.01	2.57	83.40	5.56	2.45
18	0.0800	223.4	223	1.4	5.01	3.05	8.07	2.64	83.80	5.56	2.51
19	0.0820	228.6	229	1.4	5.13	3.00	8.12	2.71	84.20	5.56	2.56
20	0.0870	233.5	234	1.5	5.23	2.92	8.16	2.79	84.70	5.54	2.62
21	0.0920	238.1	238	1.6	5.33	2.88	8.21	2.85	85.00	5.55	2.67
22	0.0980	243.1	243	1.7	5.44	2.84	8.27	2.92	85.30	5.56	2.72
23	0.1020	247.6	248	1.8	5.53	2.81	8.34	2.97	85.50	5.58	2.77

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
24	0.1500	290.6	291	2.6	6.44	2.58	9.02	3.50	87.10	5.80	3.22
25	0.2000	338.7	339	3.4	7.44	2.59	10.03	3.87	87.00	6.31	3.72
26	0.2520	382.8	383	4.3	8.33	2.66	11.00	4.13	86.50	6.83	4.17
27	0.3040	406.2	406	5.2	8.76	2.84	11.60	4.09	85.30	7.22	4.38
28	0.3500	424.8	425	6.0	9.08	3.01	12.09	4.02	84.10	7.55	4.54
29	0.4030	427.9	428	6.9	9.06	4.52	13.58	3.00	73.60	9.05	4.53
30	0.4530	441.1	441	7.8	9.25	4.69	13.95	2.97	72.40	9.32	4.63
31	0.5020	451.9	452	8.6	9.39	4.78	14.17	2.96	71.80	9.48	4.70
32	0.5500	464.2	464	9.5	9.56	4.87	14.43	2.96	71.20	9.65	4.78
33	0.6030	484.8	485	10.4	9.89	4.92	14.81	3.01	70.80	9.87	4.94
34	0.6540	503.9	504	11.3	10.17	5.00	15.17	3.04	70.30	10.08	5.09
35	0.7000	522.7	523	12.1	10.46	5.08	15.54	3.06	69.70	10.31	5.23
36	0.7530	547.0	547	13.0	10.83	5.16	15.99	3.10	69.20	10.57	5.42
37	0.8040	570.8	571	13.8	11.19	5.28	16.47	3.12	68.30	10.88	5.59
38	0.8530	596.5	597	14.7	11.58	5.34	16.92	3.17	67.90	11.13	5.79
39	0.9040	626.7	627	15.6	12.04	5.41	17.45	3.22	67.40	11.43	6.02