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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-1015	1	44

REFERENCE: R-1015

PROJECT: 34360

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CRAVEN*

PROJECT DESCRIPTION *US 70 (HAVELOCK BYPASS) FROM NORTH OF CARTERET/CRAVEN COUNTY LINE TO NORTH OF PINE GROVE ROAD*

SITE DESCRIPTION *SITE 3 – DUAL BRIDGES NO. 276 AND NO. 277 ON –L– (US 70 – HAVELOCK BYPASS) OVER EAST PRONG OF SLOCUM CREEK –L– STATION 177+67.00*

CONTENTS

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.

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J.K. CRENSHAW

MID ATLANTIC INC.

INVESTIGATED BY *J. K. CRENSHAW*

DRAWN BY *T. LYNN*

CHECKED BY *B. HOWEY*

SUBMITTED BY *B. D. KEANEY*

DATE *JULY, 2018*

HDR

NORTH CAROLINA LICENSED SEAL 2504 GEOLOGIST JARED K. CRENSHAW

DocuSigned by:
Jared Crenshaw 7/31/2018
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SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-1015	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

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-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
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 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (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

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	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	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

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

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.

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
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] D-25
- [X] CME-45B

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16 " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B _____
- [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

ROCK DESCRIPTION

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:

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 YEILD 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 SLI.)	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 (SLI.)	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. *IF TESTED, WOULD YIELD SPT REFUSAL*
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. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
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. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
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 PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
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

BEDDING

TERM	THICKNESS
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

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.

TERMS AND DEFINITIONS

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 (N 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.

BENCH MARK: N/A

ELEVATION: N/A FEET

NOTES:

BORING LOCATIONS AND ELEVATIONS OBTAINED FROM MCKIM & CREED, INC. - 6/28/18

UCP - UNDIVIDED COASTAL PLAIN

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-1015	3

SITE PLAN

0 100 200
FEET

SKEW = 90°

NAD 83

160

165

ALLUVIAL SOILS

TO MOREHEAD CITY

UNDIVIDED COASTAL PLAIN

EBI-A LL

WOODS

N 63° 29' 33.7" W

-L-

EBI-B RL

UNDIVIDED COASTAL PLAIN

TO NEW BERN

MATCH LINE STA 170+000 SEE SHEET 4

POWERLINE EASEMENT

SEE SHEETS 6-9 FOR PROFILE -L-

PROJECT REFERENCE NO.	SHEET NO.
R-1015	4

SITE PLAN

0 100 200
FEET

SKEW = 90°

NAD 83

170 175 180

MATCH LINE STA 170+00 SEE SHEET 3

MATCH LINE STA 184+00 SEE SHEET 5

TO MOREHEAD CITY

BRIDGE NO.276

BRIDGE NO.277

TO NEW BERN

-L-

N 63° 29' 33.7" W

B1-A LL
B2-A LL
B3-A LL
B4-A LL
B5-A LL
B6-A LL
B7-A LL
B8-A LL
B9-A LL
B10-A LL

B1-B RL
B2-B RL
B3-B RL
B4-B RL
B5-B RL
B6-B RL
B7-B RL
B8-B RL
B9-B RL
B10-B RL

ALLUVIAL SOILS
UNDIVIDED COASTAL PLAIN
WOODS
JS

SEE SHEETS 6-9 FOR PROFILE -L-

PROJECT REFERENCE NO.	SHEET NO.
R-1015	5

SITE PLAN

0 100 200

FEET

SKEW = 90°

NAD '83

185 190 195

TO MOREHEAD CITY

ALLUVIAL SOILS

MATCH LINE STA 184+00 SEE SHEET 4

B11-A LL

EB2-A LL

-L-

N 63° 29' 33.7" W

WOODS

B11-B RL

EB2-B RL

ALLUVIAL SOILS

TO NEW BERN

SEE SHEETS 6-9 FOR PROFILE -L-

0	100	200
FEET		

VE = 5

PROJECT REFERENCE NO.	SHEET NO.
R-1015	6

PROFILE – BRIDGE NO. 276
BORINGS PROJECTED ONTO –L–

NOTES:
1. BORINGS AND INFERRED STRATIGRAPHY ARE PROJECTED ONTO –L–
2. GROUNDLINE TAKEN FROM ROADWAY DESIGN FILE DATED 1–30–2018

PROPOSED GRADE

EXISTING GROUNDLINE

NWS EL= 13.8

EB1-A LL
169+52
60' LT
SS-327
SS-336

B1-A LL
170+93
43' LT

B2-A LL
172+47
66' LT

B3-A LL
173+67
69' LT

B4-A LL
174+87
72' LT

B5-A LL
176+29
55' LT

B6-A LL
177+76
59' LT

B7-A LL
179+01
47' LT

B8-A LL
180+38
65' LT
SS-471

B9-A LL
181+77
52' LT
SS-536

Ⓐ **ALLUVIAL:** *Very soft, dark brown, MUCK, contains wood fragments, wet*

Ⓑ **ALLUVIAL:** *Very loose to loose, dark brown, SAND (A-2-4), contains moderate organics, moist*

Ⓒ **UCP:** *Very loose to loose, brown, tan, orange and gray, SAND and clayey SAND (A-2-4, A-2-6, A-3), contains wood fragments, moist to saturated*

Ⓓ **UCP:** *Very soft to soft, green, tan, orange and gray, SILT and sandy CLAY (A-4, A-6), wet*

Ⓔ **COASTAL PLAIN:** *Very soft, gray, sandy SILT and CLAY (A-4, A-7-6), wet (DUPLIN FORMATION)*

Ⓕ **COASTAL PLAIN:** *Very loose to dense, gray and green, SAND and clayey SAND (A-2-6, A-2-4, A-3), contains shell fragments, phosphatic, saturated (DUPLIN FORMATION)*

Ⓖ **COASTAL PLAIN:** *Very soft to medium stiff, gray and green, CLAY and sandy CLAY (A-6, A-7-6), contains shell fragments, wet (DUPLIN FORMATION)*

Ⓗ **COASTAL PLAIN:** *Very loose to very dense, gray, green and tan, SAND (A-2-4, A-2-6, A-3, A-1-b), phosphatic, contains shell and limestone fragments, saturated (RIVER BEND FORMATION)*

Ⓘ **COASTAL PLAIN:** *Stiff to hard, gray and green, sandy SILT (A-4), contains shell fragments, wet (RIVER BEND FORMATION)*

Ⓙ **COASTAL PLAIN:** *Gray and brown, poorly indurated, moderately hard, LIMESTONE (RIVER BEND FORMATION)*

40 30 20 10 0 –10 –20 –30 –40 –50 –60 –70 –80 –90 –100 –110 –120

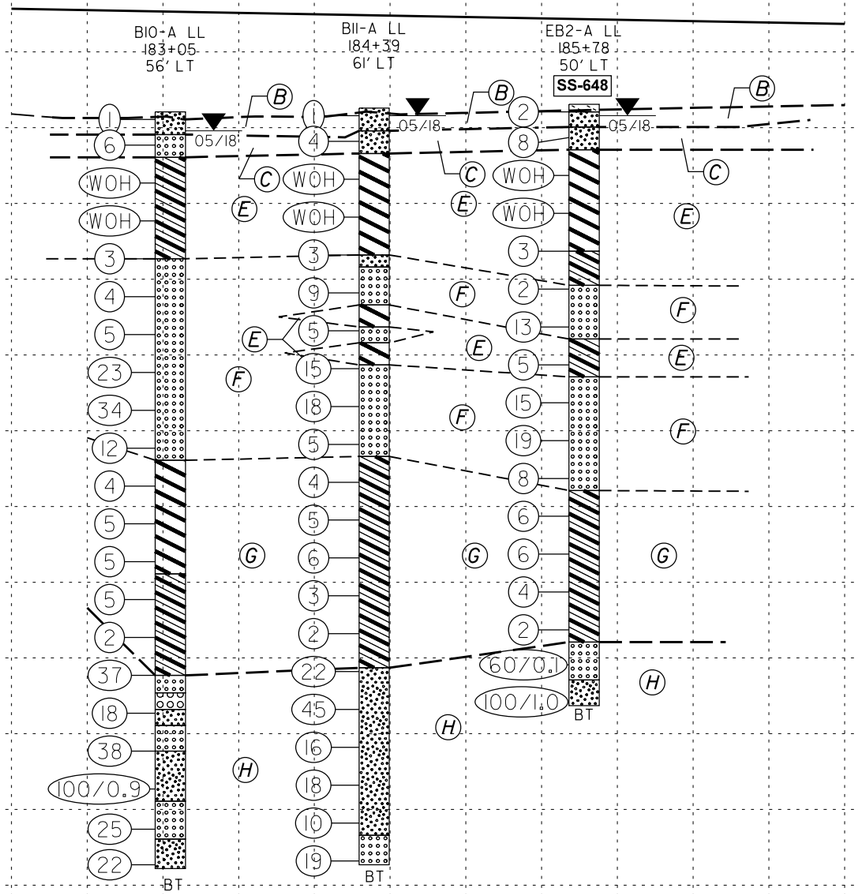
169+00 170+00 171+00 172+00 173+00 174+00 175+00 176+00 177+00 178+00 179+00 180+00 181+00 182+00

PROJECT REFERENCE NO.	SHEET NO.
R-1015	7

PROFILE – BRIDGE NO. 276
BORINGS PROJECTED ONTO –L–

0 100 200
FEET
VE = 5

NOTES:
1. BORINGS AND INFERRED STRATIGRAPHY ARE PROJECTED ONTO –L–
2. GROUNDLINE TAKEN FROM ROADWAY DESIGN FILE DATED 1–30–2018



(B) **ALLUVIAL:** *Very loose, brown, SAND (A-2-4), contains trace to moderate organics, moist*

(C) **UCP:** *Loose, gray and orange, SAND (A-2-4, A-3), with trace clay saturated*

(E) **COASTAL PLAIN:** *Very soft to soft, gray, silty and sandy CLAY (A-6, A-7-6), wet (DUPLIN FORMATION)*

(F) **COASTAL PLAIN:** *Very loose to dense, gray and green, SAND (A-2-4, A-3), contains shell fragments, phosphatic, saturated (DUPLIN FORMATION)*

(G) **COASTAL PLAIN:** *Soft to medium stiff, gray and green, CLAY and sandy CLAY (A-6, A-7-6), contains shell fragments, wet (DUPLIN FORMATION)*

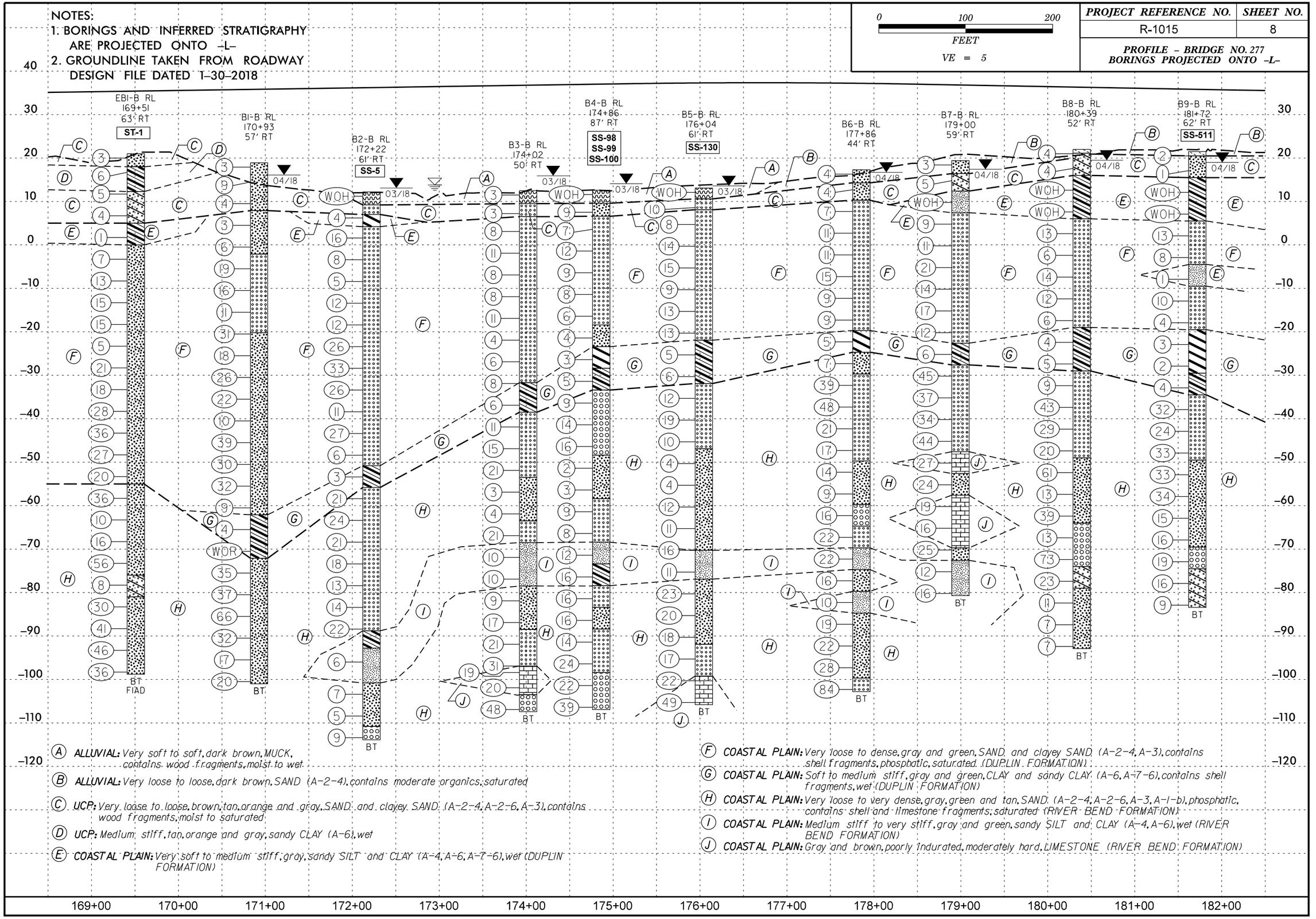
(H) **COASTAL PLAIN:** *Medium dense to very dense, gray, green and tan, SAND (A-2-4, A-3, A-1-b), phosphatic, contains shell and limestone fragments, saturated (RIVER BEND FORMATION)*

NOTES:
1. BORINGS AND INFERRED STRATIGRAPHY ARE PROJECTED ONTO –L–
2. GROUNDLINE TAKEN FROM ROADWAY DESIGN FILE DATED 1–30–2018

0 100 200
FEET
VE = 5

PROJECT REFERENCE NO.	SHEET NO.
R-1015	8

PROFILE – BRIDGE NO. 277
BORINGS PROJECTED ONTO –L–



(A) **ALLUVIAL:** *Very soft to soft, dark brown, MUCK, contains wood fragments, moist to wet*

(B) **ALLUVIAL:** *Very loose to loose, dark brown, SAND (A-2-4), contains moderate organics, saturated*

(C) **UCP:** *Very loose to loose, brown, tan, orange and gray, SAND and clayey SAND (A-2-4, A-2-6, A-3), contains wood fragments, moist to saturated*

(D) **UCP:** *Medium stiff, tan, orange and gray, sandy CLAY (A-6), wet*

(E) **COASTAL PLAIN:** *Very soft to medium stiff, gray, sandy SILT and CLAY (A-4, A-6, A-7-6), wet (DUPLIN FORMATION)*

(F) **COASTAL PLAIN:** *Very loose to dense, gray and green, SAND and clayey SAND (A-2-4, A-3), contains shell fragments, phosphatic, saturated (DUPLIN FORMATION)*

(G) **COASTAL PLAIN:** *Soft to medium stiff, gray and green, CLAY and sandy CLAY (A-6, A-7-6), contains shell fragments, wet (DUPLIN FORMATION)*

(H) **COASTAL PLAIN:** *Very loose to very dense, gray, green and tan, SAND (A-2-4, A-2-6, A-3, A-1-b), phosphatic, contains shell and limestone fragments, saturated (RIVER BEND FORMATION)*

(I) **COASTAL PLAIN:** *Medium stiff to very stiff, gray and green, sandy SILT and CLAY (A-4, A-6), wet (RIVER BEND FORMATION)*

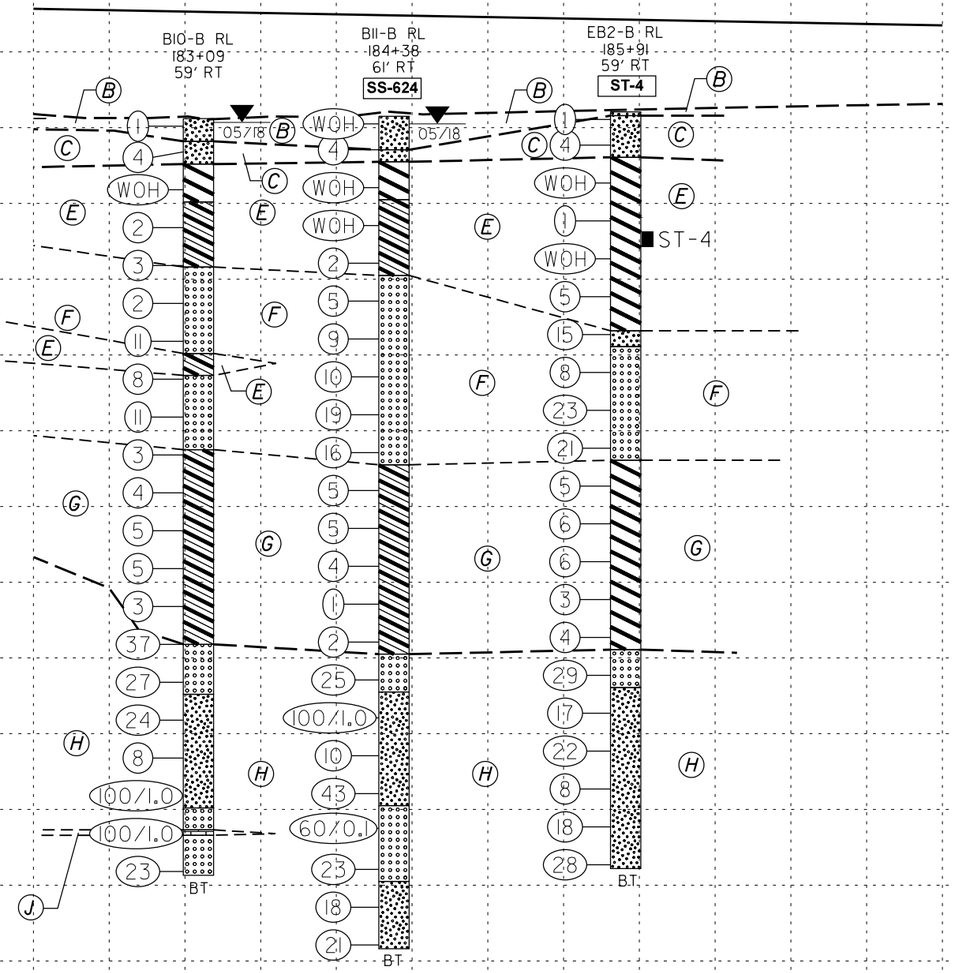
(J) **COASTAL PLAIN:** *Gray and brown, poorly indurated, moderately hard, LIMESTONE (RIVER BEND FORMATION)*

NOTES:
1. BORINGS AND INFERRED STRATIGRAPHY ARE PROJECTED ONTO –L–
2. GROUNDLINE TAKEN FROM ROADWAY DESIGN FILE DATED 1–30–2018

0 100 200
FEET
VE = 5

PROJECT REFERENCE NO.	SHEET NO.
R-1015	9

PROFILE – BRIDGE NO. 277
BORINGS PROJECTED ONTO –L–



(B) **ALLUVIAL:** *Very loose, brown, SAND (A-2-4), contains trace organics, moist*

(C) **UCP:** *Loose, gray, tan and orange, SAND (A-2-4), with trace clay, contains trace organics, saturated*

(E) **COASTAL PLAIN:** *Very soft to medium stiff, green and gray, sandy SILT and CLAY (A-4, A-6, A-7-6), wet (DUPLIN FORMATION)*

(F) **COASTAL PLAIN:** *Very loose to medium dense, gray and green, SAND (A-2-4, A-3), contains shell fragments, phosphatic, saturated (DUPLIN FORMATION)*

(G) **COASTAL PLAIN:** *Very soft to medium stiff, gray and green, CLAY and sandy CLAY (A-6, A-7-6), contains shell fragments, wet (DUPLIN FORMATION)*

(H) **COASTAL PLAIN:** *Loose to very dense, gray, green and tan, SAND (A-2-4, A-3), phosphatic, contains shell and limestone fragments, saturated. (RIVER BEND FORMATION).*

(J) **COASTAL PLAIN:** *Gray, moderately hard, sandy LIMESTONE (RIVER BEND FORMATION)*

PROJECT REFERENCE NO.	SHEET NO.
R-1015	10

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE SECTION

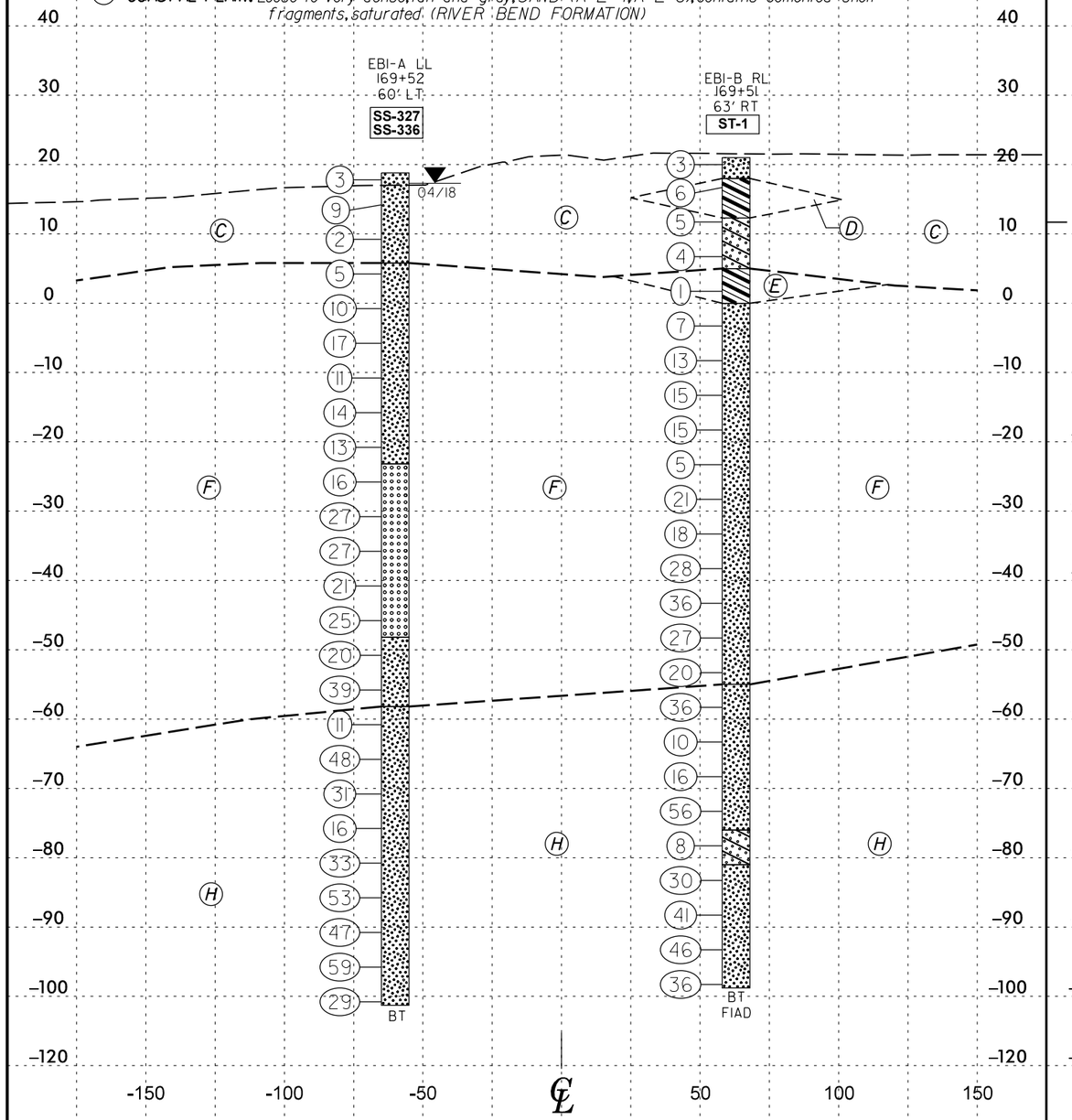
Ⓒ **UCP:** *Very loose to loose, tan, orange and light gray, SAND and clayey SAND (A-2-4, A-2-6), moist to saturated*

Ⓓ **UCP:** *Medium stiff, gray and orange, fine sandy and silty CLAY (A-6), moist to wet*

Ⓔ **COASTAL PLAIN:** *Very soft, gray, sandy CLAY (A-6), wet (DUPLIN FORMATION)*

Ⓕ **COASTAL PLAIN:** *Loose to dense, gray, brown and tan, fine to coarse SAND (A-2-4, A-3), with silt and clay interbeds, contains shell fragments, saturated (DUPLIN FORMATION)*

Ⓗ **COASTAL PLAIN:** *Loose to very dense, tan and gray, SAND (A-2-4, A-2-6), contains cemented shell fragments, saturated (RIVER BEND FORMATION)*



HORIZ. SCALE (FEET) 0 50 100

VE = 2.5

CROSS SECTION – END BENT 1 –L– STA 169+55.33

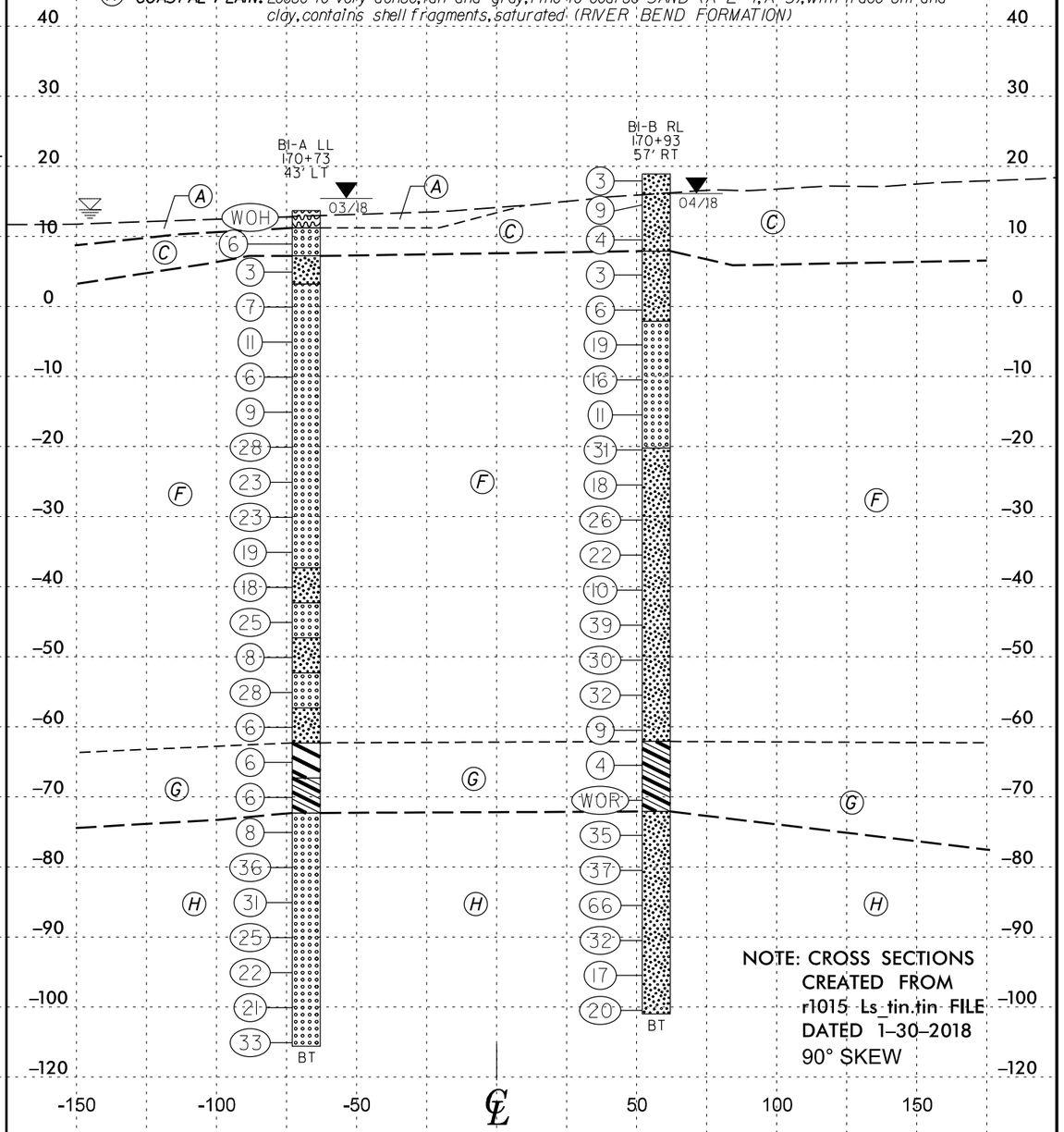
Ⓐ **ALLUVIAL:** *Very soft, dark brown, MUCK, moist*

Ⓒ **UCP:** *Very loose to loose, gray and tan, clayey and silty SAND (A-3, A-2-4), contains wood fragments, moist to saturated*

Ⓕ **COASTAL PLAIN:** *Very loose to dense, gray, tan and brown, SAND and clayey SAND (A-2-6, A-2-4, A-3), phosphatic, contains shell fragments, saturated (DUPLIN FORMATION)*

Ⓖ **COASTAL PLAIN:** *Very soft to medium stiff, green and gray, CLAY and sandy CLAY (A-6, A-7-6), micaceous, wet (DUPLIN FORMATION)*

Ⓗ **COASTAL PLAIN:** *Loose to very dense, tan and gray, fine to coarse SAND (A-2-4, A-3), with trace silt and clay, contains shell fragments, saturated (RIVER BEND FORMATION)*



NOTE: CROSS SECTIONS CREATED FROM r1015 Ls_tin.tin FILE DATED 1-30-2018 90° SKEW

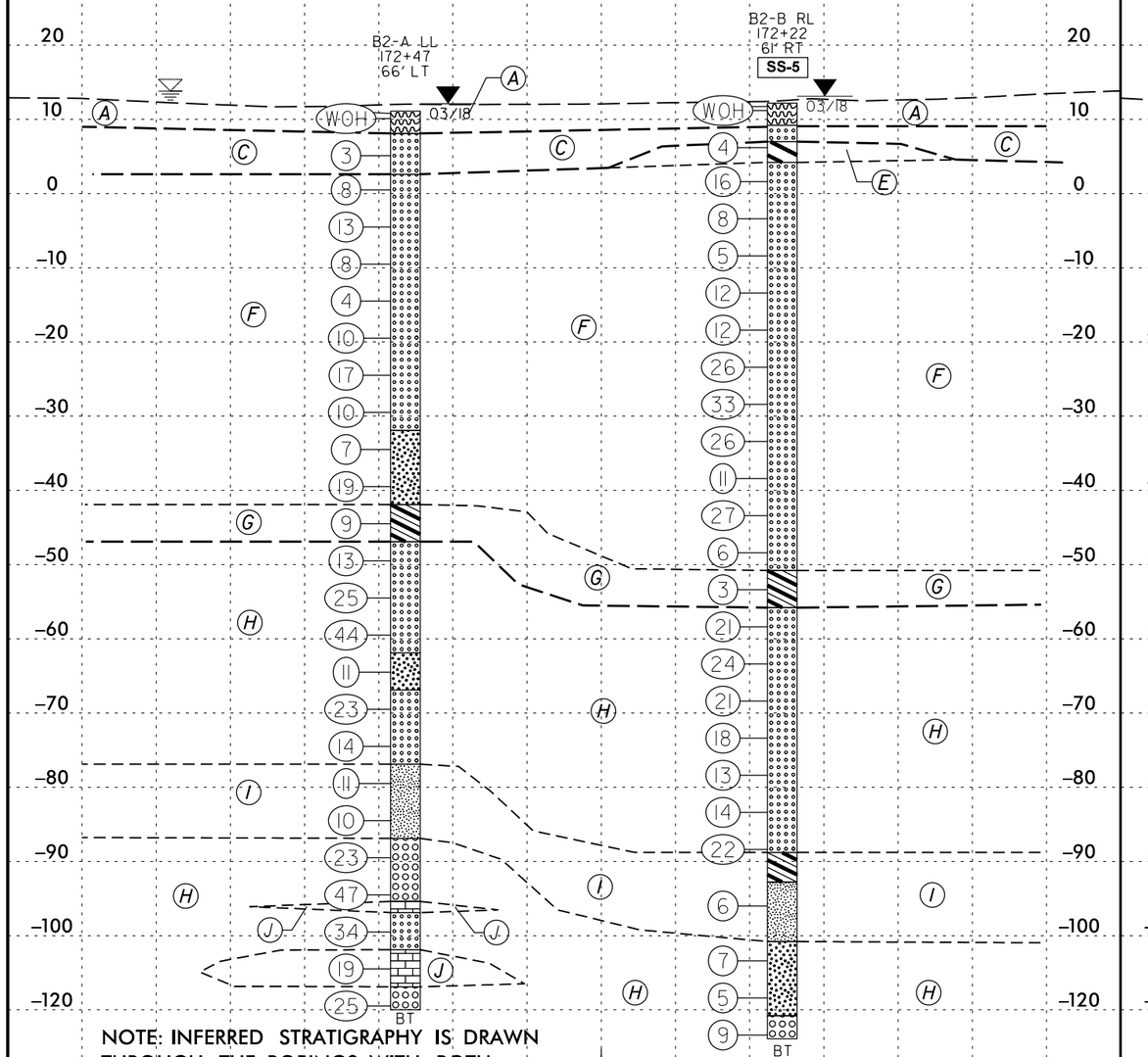
HORIZ. SCALE (FEET) 0 50 100

VE = 2.5

CROSS SECTION – BENT 1 –L– STA 170+91.50

PROJECT REFERENCE NO.	SHEET NO.
R-1015	11

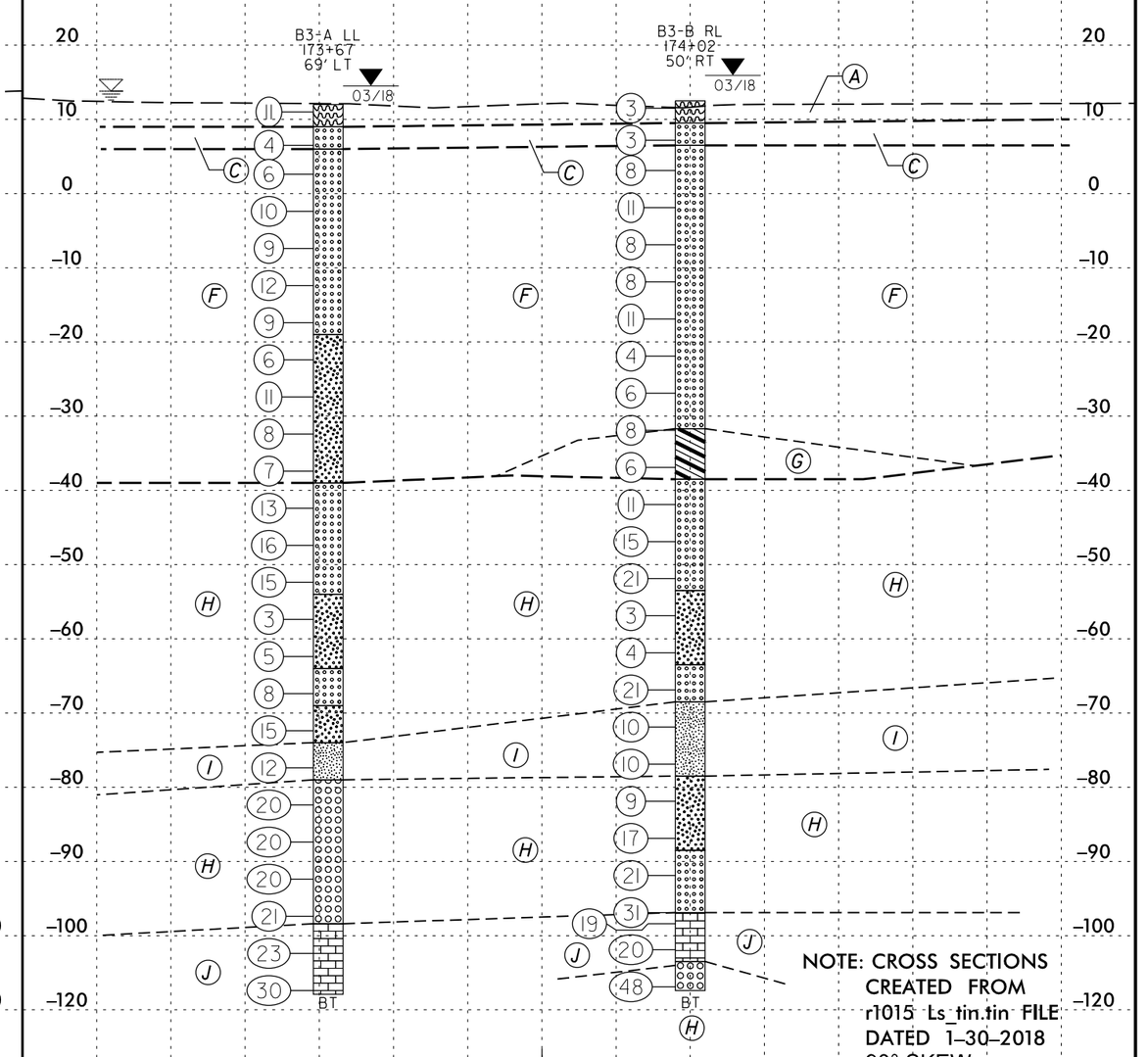
(A) **ALLUVIAL:** *Very soft, dark brown, MUCK, wet*
(C) **UCP:** *Very loose, brown, gray and tan, SAND (A-3), contains wood fragments, saturated*
(E) **COASTAL PLAIN:** *Medium stiff, gray and green, silty CLAY (A-7-6), wet (DUPLIN FORMATION)*
(F) **COASTAL PLAIN:** *Loose to dense, gray and brown, SAND (A-2-4, A-3), phosphatic, contains shell fragments, saturated (DUPLIN FORMATION)*
(G) **COASTAL PLAIN:** *Soft to stiff, gray, sandy CLAY (A-6), wet (DUPLIN FORMATION)*
(H) **COASTAL PLAIN:** *Loose to medium dense, green and gray, SAND (A-1-b, A-2-4, A-3), saturated (RIVER BEND FORMATION)*
(I) **COASTAL PLAIN:** *Medium stiff to very stiff, gray and green, SILT and sandy CLAY (A-4, A-6), wet (RIVER BEND FORMATION)*
(J) **COASTAL PLAIN:** *Gray, sandy, moderately hard, LIMESTONE (RIVER BEND FORMATION)*



HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – BENT 2
–L– STA 172+26+75

(A) **ALLUVIAL:** *Soft to stiff, dark brown, MUCK, contains wood fragments, moist to wet*
(C) **UCP:** *Very loose, tan, SAND (A-3), contains wood fragments, saturated*
(F) **COASTAL PLAIN:** *Loose to medium dense, gray and green, SAND (A-2-4, A-3), phosphatic, contains shell fragments, saturated (DUPLIN FORMATION)*
(G) **COASTAL PLAIN:** *Medium stiff, gray and green, sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)*
(H) **COASTAL PLAIN:** *Very loose to dense, gray and green, SAND (A-1-b, A-2-4, A-3), contains shell and limestone fragments, saturated (RIVER BEND FORMATION)*
(I) **COASTAL PLAIN:** *Stiff, gray and green, sandy SILT (A-4), contains shell fragments, wet (RIVER BEND FORMATION)*
(J) **COASTAL PLAIN:** *Gray, sandy, moderately hard, LIMESTONE (RIVER BEND FORMATION)*



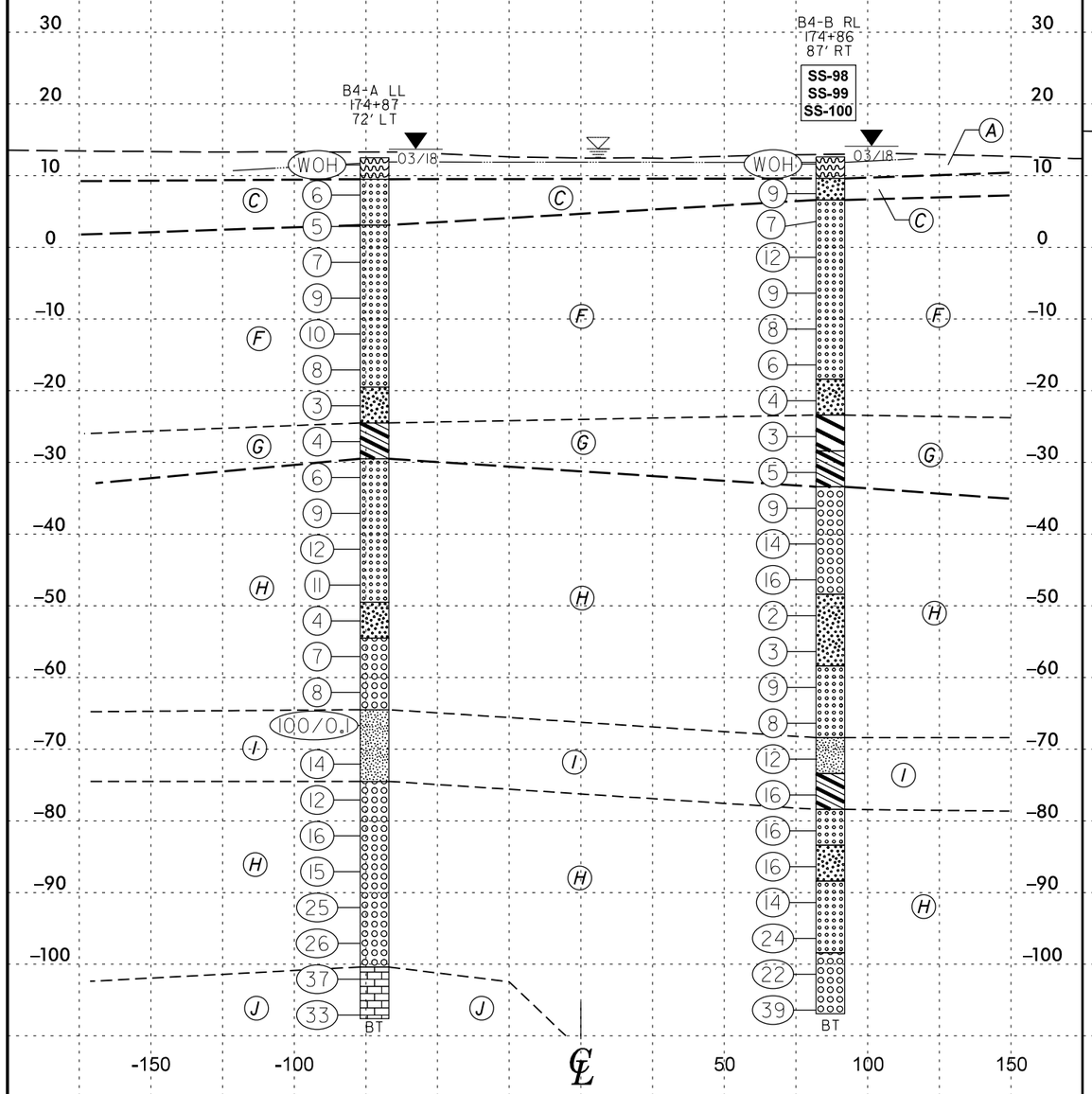
HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – BENT 3
–L– STA 173+61+75

PROJECT REFERENCE NO.	SHEET NO.
R-1015	12

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE SECTION

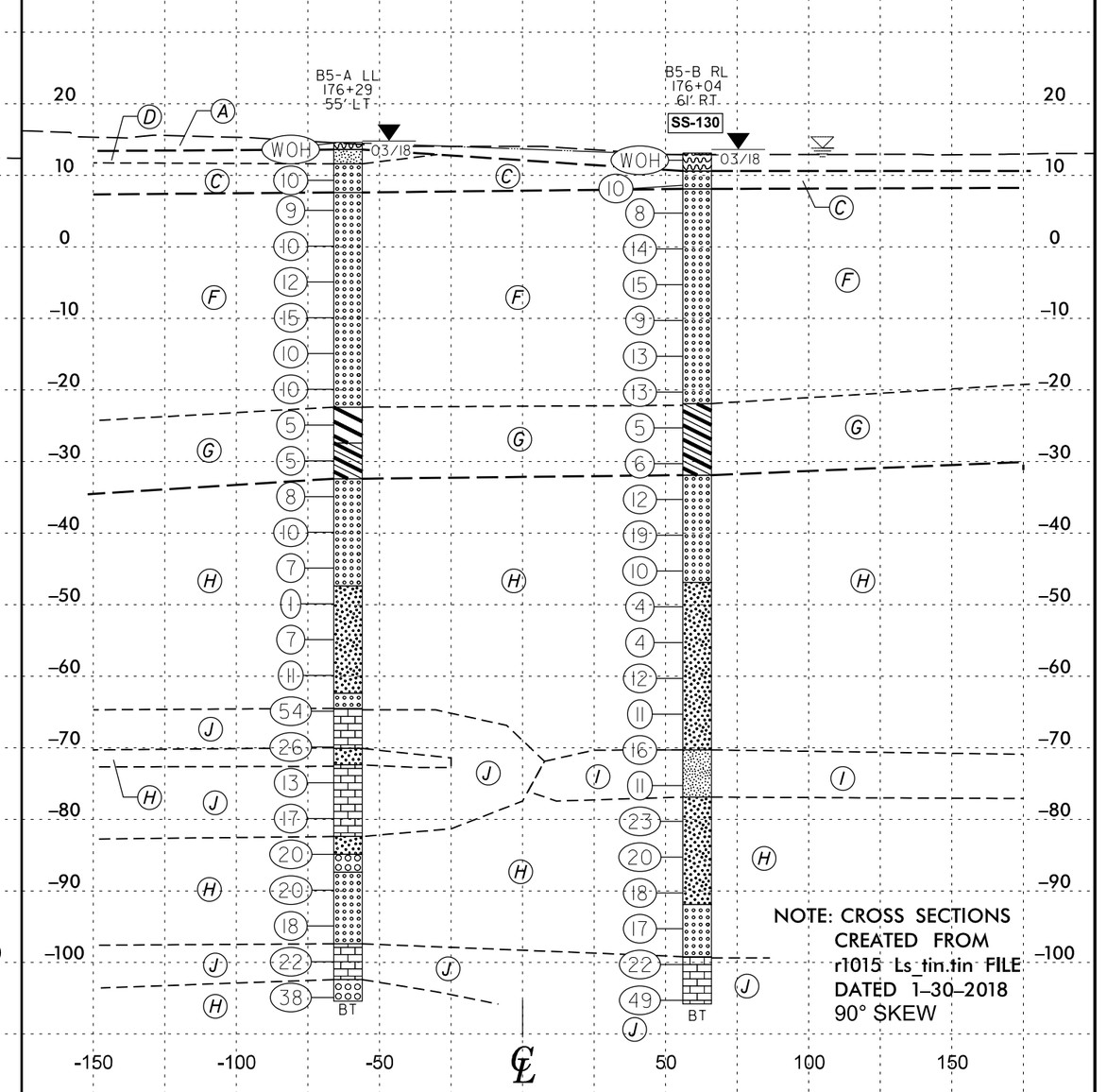
- (A) **ALLUVIAL:** *Very soft, dark brown, MUCK, wet*
- (C) **UCP:** *Loose, tan and brown, SAND (A-2-4, A-3), contains wood fragments, saturated*
- (F) **COASTAL PLAIN:** *Very loose to medium dense, gray and green, SAND (A-2-4, A-3), contains shell fragments, saturated (DUPLIN FORMATION)*
- (G) **COASTAL PLAIN:** *Soft to medium stiff, gray and green, CLAY and sandy CLAY (A-6, A-7-6), contains shell fragments, wet (DUPLIN FORMATION)*
- (H) **COASTAL PLAIN:** *Loose to dense, gray and green, SAND (A-2-4, A-3, A-1-b), with trace clay, contains shell and limestone fragments, saturated (RIVER BEND FORMATION)*
- (I) **COASTAL PLAIN:** *Stiff to hard, green, sandy SILT and sandy CLAY (A-4, A-6), contains shell fragments, wet (RIVER BEND FORMATION)*
- (J) **COASTAL PLAIN:** *Brown and gray, moderately hard, LIMESTONE (RIVER BEND FORMATION)*



HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – BENT 4
–L– STA 174+96.75

- (A) **ALLUVIAL:** *Very soft, dark brown, MUCK, wet*
- (C) **UCP:** *Loose to medium dense, tan, SAND (A-3), contains wood fragments, saturated*
- (D) **UCP:** *Very soft, green, SILT (A-4), wet*
- (F) **COASTAL PLAIN:** *Loose to medium dense, gray and green, SAND (A-3), contains shell fragments, saturated (DUPLIN FORMATION)*
- (G) **COASTAL PLAIN:** *Medium stiff, gray and green, CLAY and sandy CLAY (A-6, A-7-6), contains shell fragments, saturated (DUPLIN FORMATION)*
- (H) **COASTAL PLAIN:** *Very loose to dense, gray and green, SAND (A-2-4, A-3, A-1-b), with trace clay, contains shell and limestone fragments, saturated (RIVER BEND FORMATION)*
- (I) **COASTAL PLAIN:** *Stiff, gray and green, sandy SILT (A-4), wet (RIVER BEND FORMATION)*
- (J) **COASTAL PLAIN:** *Gray and brown, moderately hard, LIMESTONE (RIVER BEND FORMATION)*



NOTE: CROSS SECTIONS CREATED FROM r1015_Ls_tin.tin FILE DATED 1-30-2018 90° SKEW

HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – BENT 5
–L– STA 176+32.00

PROJECT REFERENCE NO.	SHEET NO.
R-1015	13

(A) **ALLUVIAL:** Very soft, brown, MUCK, wet

(B) **ALLUVIAL:** Loose, dark brown, SAND (A-2-4), moist to saturated

(C) **UCP:** Loose, gray and tan, SAND (A-2-4), saturated

(D) **UCP:** Soft, tan, orange and gray, fine sandy, silty CLAY (A-6), wet

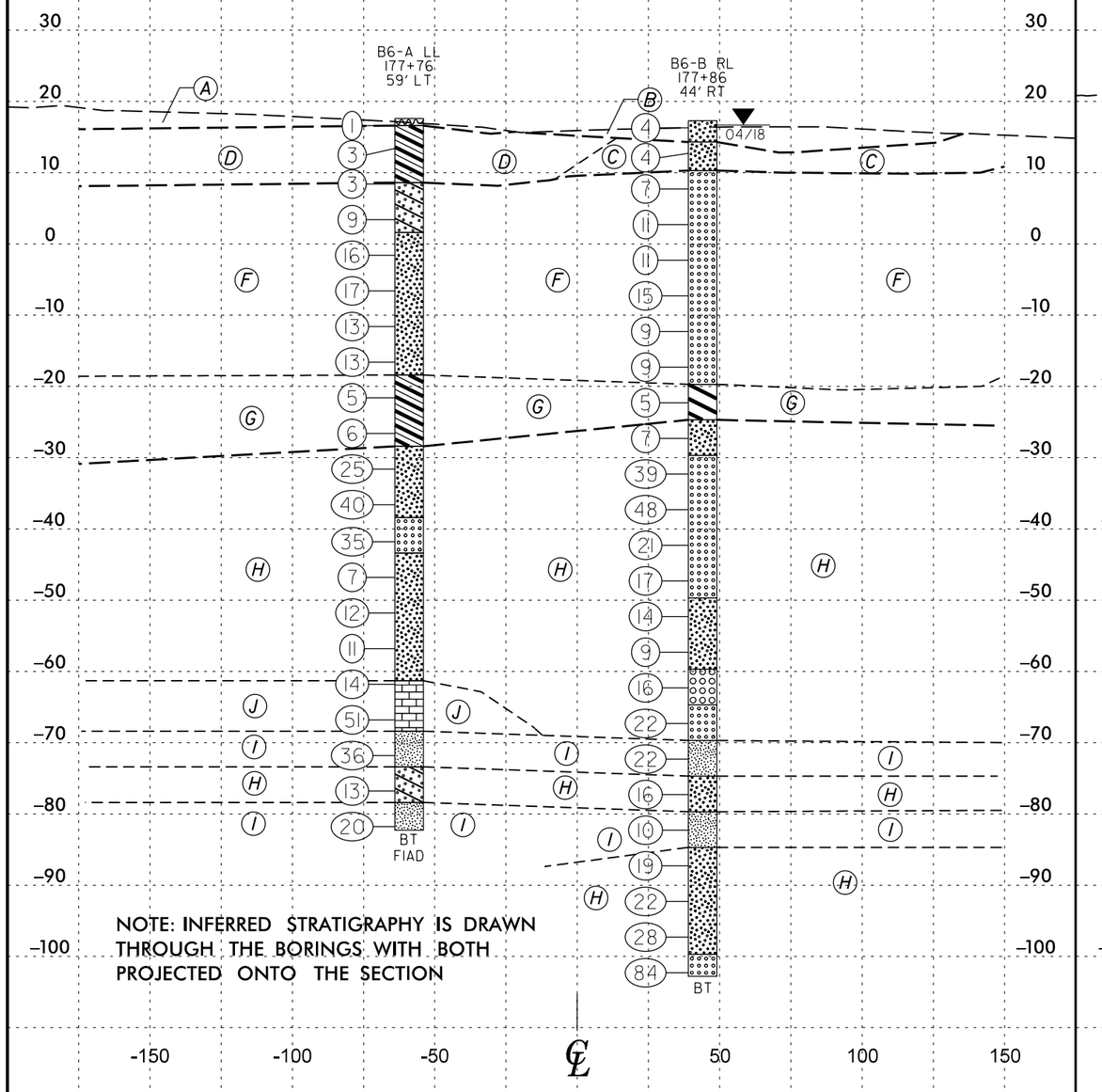
(F) **COASTAL PLAIN:** Very loose to medium dense, gray, SAND and clayey SAND (A-2-6, A-2-4, A-3), phosphatic, contains shell fragments, saturated (DUPLIN FORMATION)

(G) **COASTAL PLAIN:** Medium stiff, green and gray, CLAY and sandy CLAY (A-6, A-7-6), contains shell fragments, wet (DUPLIN FORMATION)

(H) **COASTAL PLAIN:** Loose to very dense, gray, green and tan, SAND (A-2-6, A-2-4, A-3, A-1-b), contains shell and limestone fragments, saturated (RIVER BEND FORMATION)

(I) **COASTAL PLAIN:** Stiff to hard, gray and green, sandy SILT (A-4), contains shell fragments, wet (RIVER BEND FORMATION)

(J) **COASTAL PLAIN:** Gray, sandy, moderately hard, LIMESTONE (RIVER BEND FORMATION)



HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – BENT 6
–L– STA 177+67.00

(B) **ALLUVIAL:** Very loose, brown and gray, SAND (A-2-4), moist

(C) **UCP:** Very loose to loose, tan and orange, SAND and clayey SAND (A-2-4, A-2-6), saturated

(E) **COASTAL PLAIN:** Very soft, gray, sandy SILT (A-4), wet (DUPLIN FORMATION)

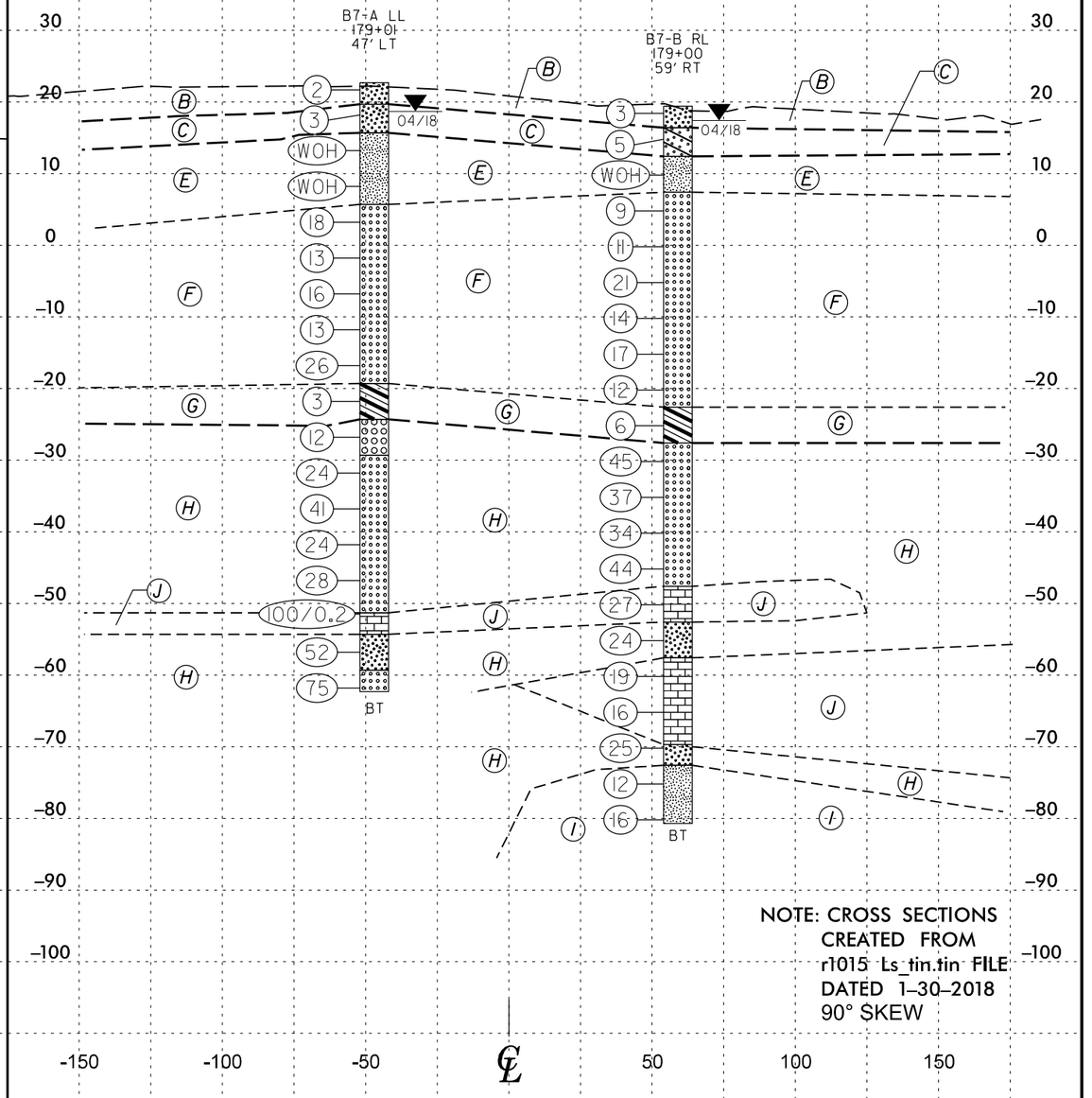
(F) **COASTAL PLAIN:** Loose to medium dense, gray and green, SAND (A-3), contains shell fragments, saturated (DUPLIN FORMATION)

(G) **COASTAL PLAIN:** Soft to medium stiff, gray, sandy CLAY (A-6), contains shell fragments, wet (DUPLIN FORMATION)

(H) **COASTAL PLAIN:** Medium dense to very dense, gray, SAND (A-3, A-1-b, A-2-4), phosphatic, contains shell fragments, saturated (RIVER BEND FORMATION)

(I) **COASTAL PLAIN:** Stiff to very stiff green, sandy SILT (A-4), contains shell fragments, wet (RIVER BEND FORMATION)

(J) **COASTAL PLAIN:** Gray, poorly indurated, moderately hard, LIMESTONE (RIVER BEND FORMATION)

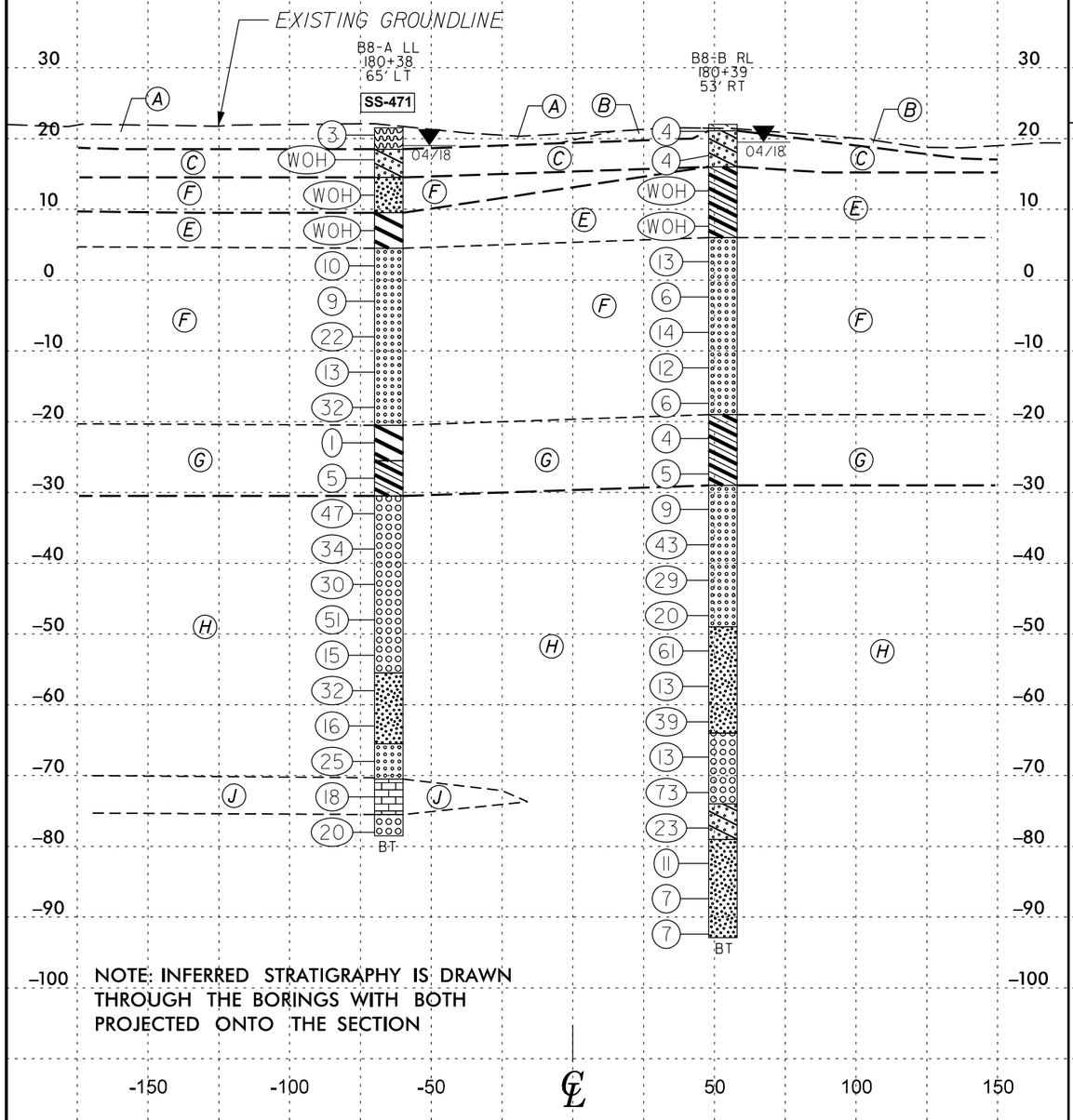


HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – BENT 7
–L– STA 179+02.00

PROJECT REFERENCE NO.	SHEET NO.
R-1015	14

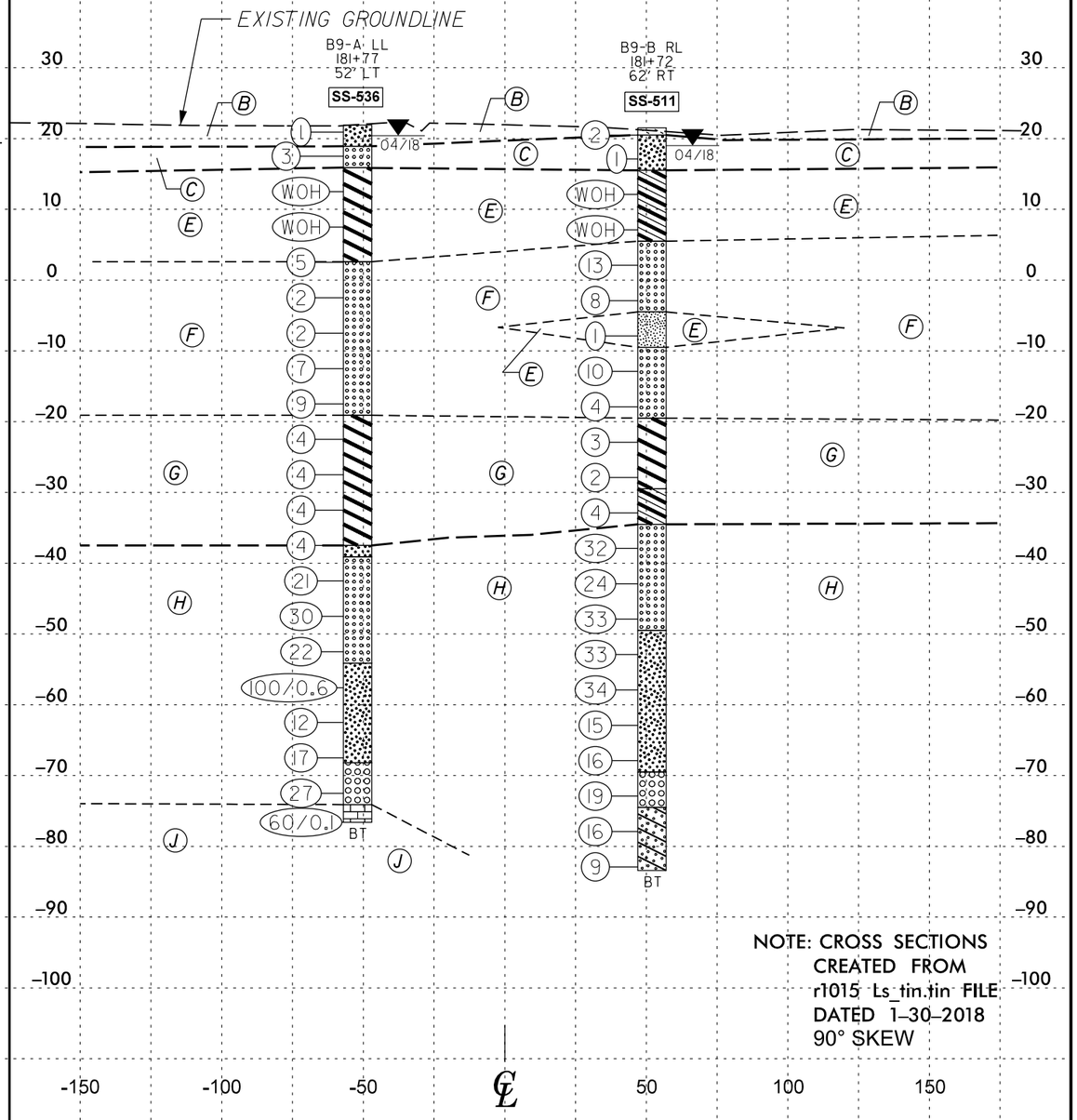
(A) **ALLUVIAL:** Very soft, dark brown, MUCK, moist
(B) **ALLUVIAL:** Very loose, dark brown, SAND 9A-2-4), contains moderate organics, moist
(C) **UCP:** Very loose, brown, tan and orange, clayey SAND (A-2-6), saturated
(E) **COASTAL PLAIN:** Very soft, gray, sandy and silty CLAY (A-6, A-7-6), wet (DUPLIN FORMATION)
(F) **COASTAL PLAIN:** Very loose to dense, gray, SAND (A-2-4, A-3) with clay interbeds, phosphatic, contains shell fragments, saturated (DUPLIN FORMATION)
(G) **COASTAL PLAIN:** Very soft to medium stiff, gray, CLAY and sandy CLAY (A-6, A-7-6), contains shell fragments, wet (DUPLIN FORMATION)
(H) **COASTAL PLAIN:** Loose to very dense, gray and green, SAND and clayey SAND (A-1-b, A-2-6, A-2-4, A-3), phosphatic, contains shell and limestone fragments, saturated (RIVER BEND FORMATION)
(J) **COASTAL PLAIN:** Gray, moderately hard, LIMESTONE (RIVER BEND FORMATION)



HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – BENT 8
–L– STA 180+37.25

(B) **ALLUVIAL:** Very loose, dark brown, SAND (A-2-4), contains moderate organics, moist
(C) **UCP:** Very loose, gray, tan and orange, SAND (A-3, A-2-4), saturated
(E) **COASTAL PLAIN:** Very soft, gray, SILT, CLAY and sandy CLAY (A-4, A-6, A-7-6), wet (DUPLIN FORMATION)
(F) **COASTAL PLAIN:** Very loose to medium dense, gray, SAND (A-3) contains shell fragments, saturated (DUPLIN FORMATION)
(G) **COASTAL PLAIN:** Soft to medium stiff, gray, CLAY and sandy CLAY (A-6, A-7-6), contains shell fragments, wet (DUPLIN FORMATION)
(H) **COASTAL PLAIN:** Loose to very dense, gray and green, SAND and silty to clayey SAND (A-2-6, A-2-4, A-3), phosphatic, contains shell fragments (RIVER BEND FORMATION)
(J) **COASTAL PLAIN:** Gray, moderately hard, LIMESTONE (RIVER BEND FORMATION)



HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – BENT 9
–L– 181+72.25

PROJECT REFERENCE NO.	SHEET NO.
R-1015	15

(B) **ALLUVIAL:** *Very loose, brown, silty SAND (A-2-4), contains trace organics, moist*

(C) **UCP:** *Loose, gray, SAND and silty SAND (A-3, A-2-4), saturated*

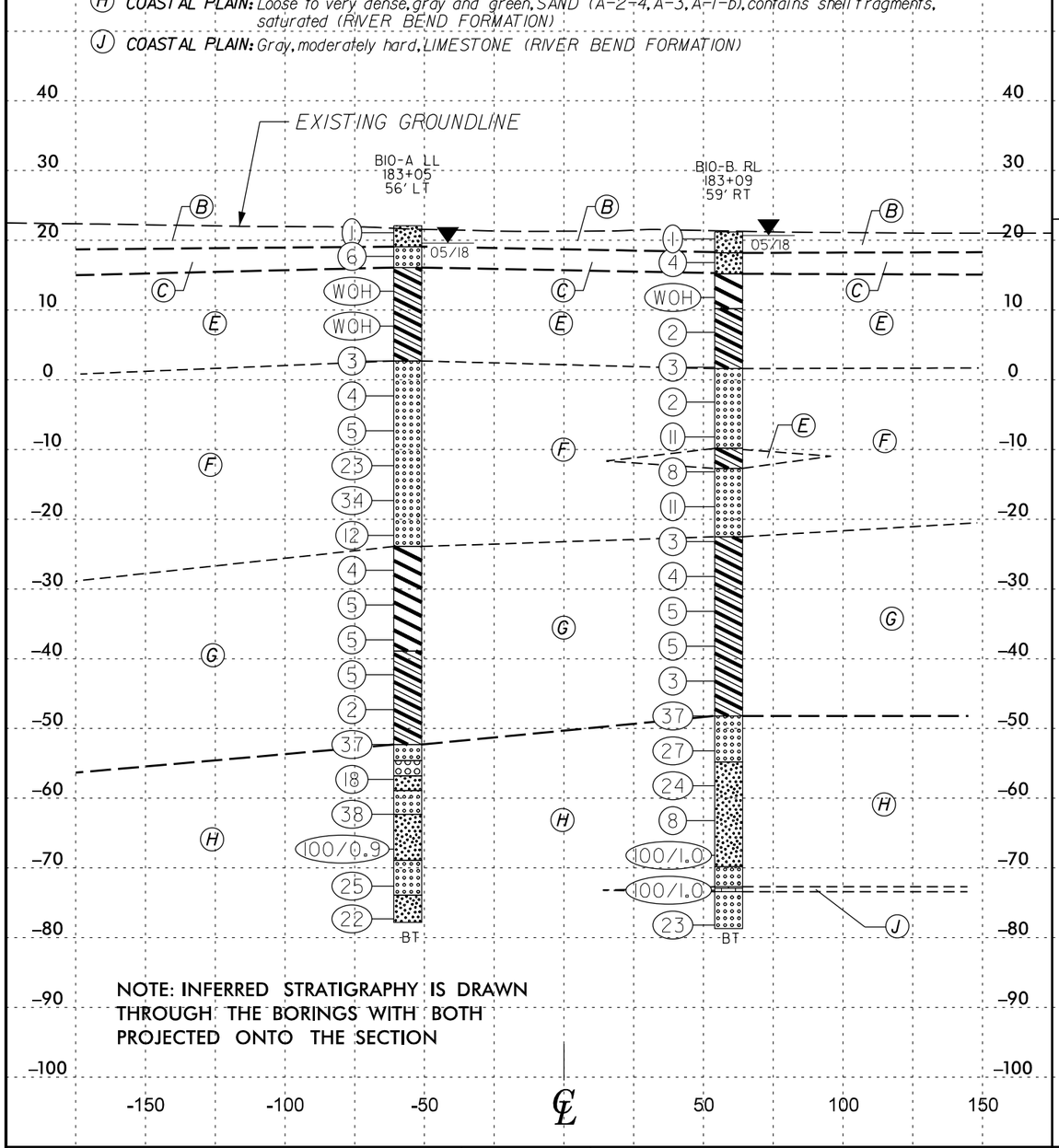
(E) **COASTAL PLAIN:** *Very soft to medium stiff, gray, sandy and silty CLAY (A-6, A-7-6), contains shell fragments, wet (DUPLIN FORMATION)*

(F) **COASTAL PLAIN:** *Very loose to dense, gray, SAND (A-3), with trace clay, contains shell fragments, saturated (DUPLIN FORMATION)*

(G) **COASTAL PLAIN:** *Soft to stiff, gray, silty and sandy CLAY (A-6, A-7-6), contains shell fragments, wet (DUPLIN FORMATION)*

(H) **COASTAL PLAIN:** *Loose to very dense, gray and green, SAND (A-2-4, A-3, A-1-b), contains shell fragments, saturated (RIVER BEND FORMATION)*

(J) **COASTAL PLAIN:** *Gray, moderately hard, LIMESTONE (RIVER BEND FORMATION)*



HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – BENT 10
–L– STA 183+07.25

(B) **ALLUVIAL:** *Very loose, dark brown, silty and clayey SAND (A-2-4), moist*

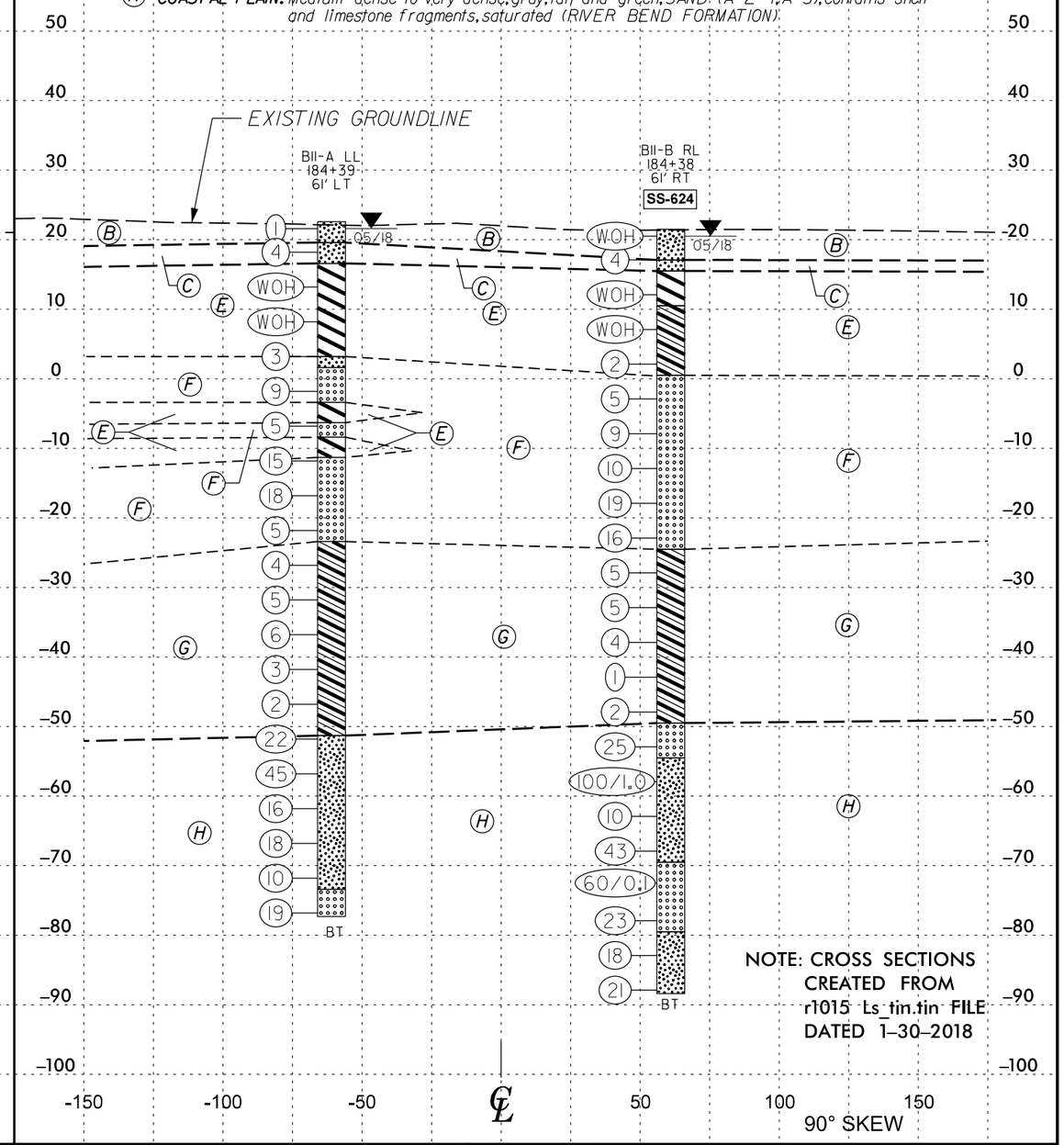
(C) **UCP:** *Loose, gray and orange, SAND (A-2-4), with trace clay, saturated*

(E) **COASTAL PLAIN:** *Very soft to soft, gray, clay and sandy CLAY (A-6, A-7-6), wet (DUPLIN FORMATION)*

(F) **COASTAL PLAIN:** *Loose to medium dense, gray, SAND (A-2-4, A-3), with trace clay, saturated (DUPLIN FORMATION)*

(G) **COASTAL PLAIN:** *Very soft to medium stiff, sandy CLAY (A-6), contains shell fragments, wet (DUPLIN FORMATION)*

(H) **COASTAL PLAIN:** *Medium dense to very dense, gray, tan and green, SAND (A-2-4, A-3), contains shell and limestone fragments, saturated (RIVER BEND FORMATION)*



HORIZ. SCALE (FEET) 0 50 100 | VE = 2.5

CROSS SECTION – BENT 11
–L– STA 184+42.50

PROJECT REFERENCE NO.	SHEET NO.
R-1015	16

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE SECTION

(B) **ALLUVIAL:** *Very loose, brown, silty SAND (A-2-4), some moderately organic, moist*

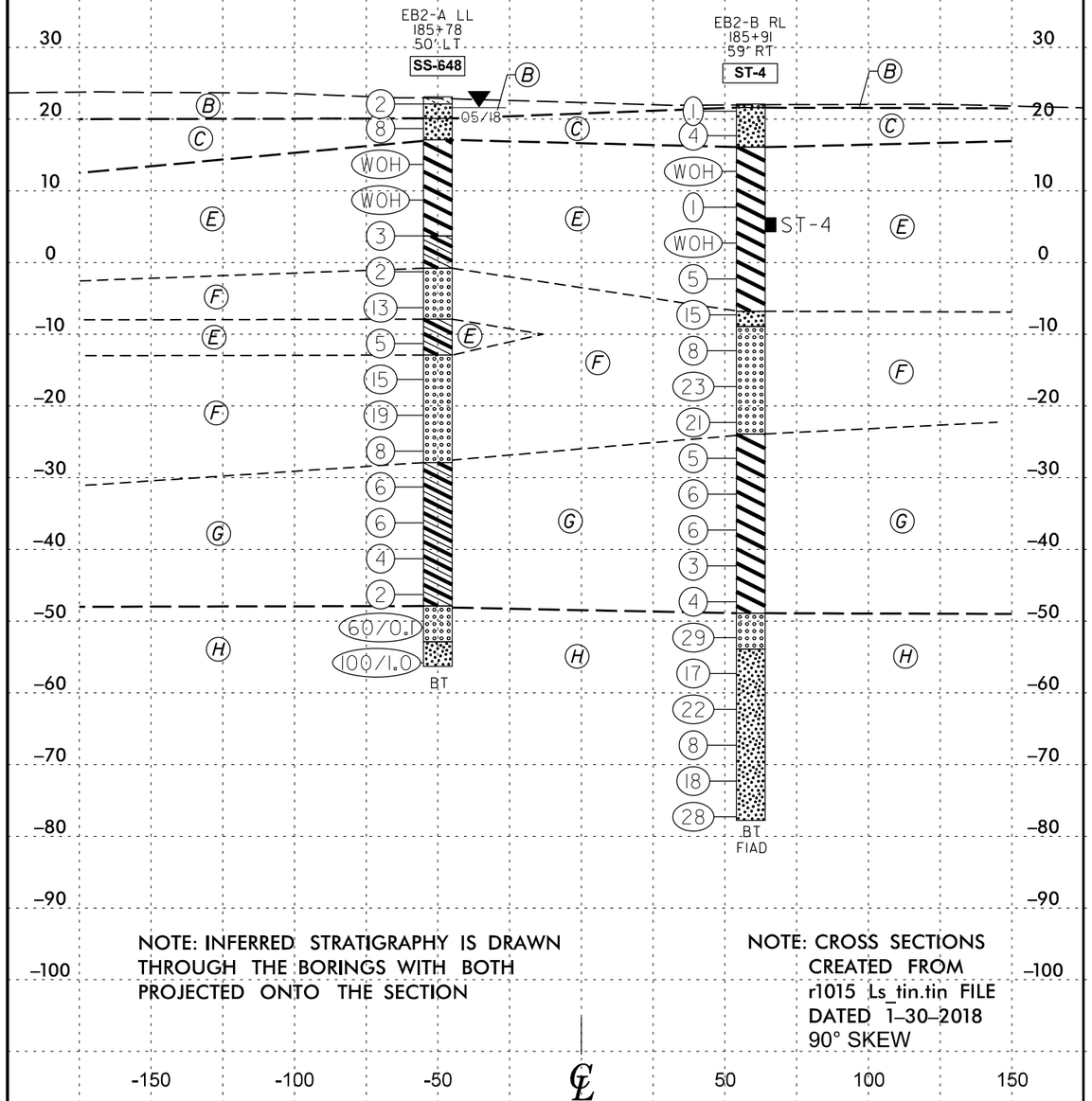
(C) **UCP:** *Loose, gray, tan and orange, SAND (A-2-4), with silt and clay, some with trace organics, saturated*

(E) **COASTAL PLAIN:** *Very soft to medium stiff, gray, CLAY (A-6, A-7-6), with fine sand and silt, wet (DUPLIN FORMATION)*

(F) **COASTAL PLAIN:** *Very loose to medium dense, gray, SAND (A-2-4, A-3), with trace clay, saturated (DUPLIN FORMATION)*

(G) **COASTAL PLAIN:** *Soft to medium stiff, gray, silty and sandy CLAY (A-6, A-7-6), contains shell fragments (DUPLIN FORMATION)*

(H) **COASTAL PLAIN:** *Loose to very dense, green and gray, silty SAND (A-2-4, A-3), phosphatic, contains shell fragments, saturated (RIVER BEND FORMATION)*



NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE SECTION

NOTE: CROSS SECTIONS CREATED FROM r1015 Ls_tin.tin FILE DATED 1-30-2018 90° SKEW

HORIZ. SCALE (FEET) 0 50 100

VE = 2.5

CROSS SECTION – END BENT 2 –L– STA 185+78.67

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Johnson, M.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. EB1-A LL	**STATION** 169+52	**OFFSET** 60 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 18.8 ft	**TOTAL DEPTH** 120.1 ft	**NORTHING** 409,756	**EASTING** 2,625,695	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Fowler, B.	**START DATE** 04/10/18	**COMP. DATE** 04/10/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
30										
25										
20										
	18.8	0.0								18.8 GROUND SURFACE 0.0
15	15.2	3.6	1	1	2	3		M		**UNDIVIDED COASTAL PLAIN** Tan, orange and light gray, silty, fine to coarse SAND (A-2-4(0)), contains wood fragments
10	10.2	8.6	5	5	4	9		Sat.		
5	5.2	13.6	2	1	1	2	SS-327	26%		5.8 13.0
0	0.2	18.6	1	2	3	5		Sat.		**COASTAL PLAIN** Gray, dark brown and tan, phosphatic, fine to coarse SAND (A-2-4, A-3(0)), with trace silt and clay, contains shell fragments (DUPLIN FORMATION)
-5	-4.8	23.6	3	3	7	10		Sat.		
-10	-9.8	28.6	9	8	9	17		Sat.		
-15	-14.8	33.6	4	6	5	11		Sat.		
-20	-19.8	38.6	7	7	7	14		Sat.		
-25	-24.8	43.6	8	6	7	13		Sat.		-23.2 42.0
-30	-29.8	48.6	6	7	9	16		Sat.		
-35	-34.8	53.6	9	11	16	27		Sat.		
-40	-39.8	58.6	8	12	15	27	SS-336	24%		
-45	-44.8	63.6	6	10	11	21		Sat.		
-50	-49.8	68.6	9	11	14	25		Sat.		-48.2 67.0

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
	-54.8	73.6	5	7	13	20		Sat.		Gray, dark brown and tan, phosphatic, fine to coarse SAND (A-2-4, A-3(0)), with trace silt and clay, contains shell fragments (DUPLIN FORMATION) *(continued)*
-55										
	-59.8	78.6	13	17	22	39		Sat.		-58.2 77.0
-60										**COASTAL PLAIN** Gray and tan, fine to coarse SAND (A-2-4), with trace silt and clay, contains shell fragments (RIVER BEND FORMATION)
	-64.8	83.6	7	5	6	11		Sat.		
-65										
	-69.8	88.6	13	21	27	48		Sat.		
-70										
	-74.8	93.6	8	12	19	31		Sat.		
-75										
	-79.8	98.6	9	9	7	16		Sat.		
-80										
	-84.8	103.6	8	13	20	33		Sat.		
-85										
	-89.8	108.6	15	21	32	53		Sat.		
-90										
	-94.8	113.6	17	20	27	47		Sat.		
-95										
	-99.8	118.6	14	23	36	59		Sat.		
-100										
			8	12	17	29		Sat.		-101.3 120.1 Boring Terminated at Elevation -101.3 ft in SAND (River Bend Formation)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Johnson, M.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. EB1-B RL	**STATION** 169+51	**OFFSET** 63 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.0 ft	**TOTAL DEPTH** 119.8 ft	**NORTHING** 409,866	**EASTING** 2,625,752	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 04/11/18	**COMP. DATE** 04/11/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
21.0		0.0								GROUND SURFACE 0.0
	17.7	3.3	2	2	1	3		M		**UNDIVIDED COASTAL PLAIN** Tan, silty, fine SAND (A-2-4)
										18.0 3.0
	12.7	8.3	2	3	3	6		W 29%		Gray and orange, fine sandy CLAY (A-6(3)), with trace silt
										12.3 8.7
	7.7	13.3	WOH	2	3	5		Sat.		Tan and orange, silty, clayey, fine to coarse SAND (A-2-6)
										5.0 16.0
	2.7	18.3	1	2	2	4		Sat.		**COASTAL PLAIN** Gray, fine sandy, silty CLAY (A-6) (DUPLIN FORMATION)
	-2.3	23.3	1	0	1	1		W		0.0 21.0
	-7.3	28.3	4	3	4	7		Sat.		Gray, brown and tan, phosphatic, fine to coarse SAND (A-2-4), with silt and clay interbeds, contains cemented shell fragments (DUPLIN FORMATION)
	-12.3	33.3	4	6	7	13		Sat.		
	-17.3	38.3	4	7	8	15		Sat.		
	-22.3	43.3	8	7	8	15		Sat.		
	-27.3	48.3	1	2	3	5		Sat.		
	-32.3	53.3	7	7	14	21		Sat.		
	-37.3	58.3	7	7	11	18		Sat.		
	-42.3	63.3	8	11	17	28		Sat.		
	-47.3	68.3	8	14	22	36		Sat.		
-50			9	13	14	27		Sat.		

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Johnson, M.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. EB1-B RL	**STATION** 169+51	**OFFSET** 63 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.0 ft	**TOTAL DEPTH** 119.8 ft	**NORTHING** 409,866	**EASTING** 2,625,752	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 04/11/18	**COMP. DATE** 04/11/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
	-52.3	73.3	3	7	13	20		Sat.		Gray, brown and tan, phosphatic, fine to coarse SAND (A-2-4), with silt and clay interbeds, contains cemented shell fragments (DUPLIN FORMATION) *(continued)*
-55										-55.0 76.0
	-57.3	78.3	10	16	20	36		Sat.		**COASTAL PLAIN** Gray and tan, cemented, fine to coarse SAND (A-2-4, A-2-6), with silt and clay, contains shell fragments (RIVER BEND FORMATION)
-60										
	-62.3	83.3	6	5	5	10		Sat.		
-65										
	-67.3	88.3	6	6	10	16		Sat.		
-70										
	-72.3	93.3	13	20	36	56		Sat.		
-75										-76.0 97.0
	-77.3	98.3	4	4	4	8		Sat.		
-80										-81.0 102.0
	-82.3	103.3	12	14	16	30		Sat.		
-85										
	-87.3	108.3	11	17	24	41		Sat.		
-90										
	-92.3	113.3	12	20	26	46		Sat.		
-95										
	-97.3	118.3	10	13	23	36		Sat.		-98.8 119.8

Boring Terminated at Elevation -98.8 ft in SAND (River Bend Formation)

Drill chatter from 111.0' to 113.0'
Strata break in split spoon at a depth of 8.7'
ST 1 taken in offset boring at STA 169+54
58' RT

Other Samples:
ST-1 (4.5 - 6.5)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B1-A LL	**STATION** 170+73	**OFFSET** 43 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 13.7 ft	**TOTAL DEPTH** 119.3 ft	**NORTHING** 409,825	**EASTING** 2,625,595	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 84% 09/05/2017		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Fowler, B.	**START DATE** 03/28/18	**COMP. DATE** 03/29/18	**SURFACE WATER DEPTH** 1.7ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
20											
15										WATER SURFACE (03/28/18)	
	13.7	0.0	WOH	WOH	WOH	0		W		13.7 SWAMP	0.0
10	9.9	3.8	2	1	5	6		Sat.		**ALLUVIAL** Dark brown, sandy MUCK	
5	5.9	7.8	2	1	2	3		Sat.		11.2 **UNDIVIDED COASTAL PLAIN** Tan, SAND (A-3), contains wood fragments	2.5
0	0.9	12.8	4	3	4	7		Sat.		7.2 **COASTAL PLAIN** Gray, tan and brown, phosphatic, fine SAND (A-2-4, A-3), contains shell fragments, with trace clay (DUPLIN FORMATION)	6.5
-5	-4.1	17.8	3	5	6	11		Sat.		3.2	10.5
-10	-9.1	22.8	3	3	3	6		Sat.			
-15	-14.1	27.8	5	4	5	9		Sat.			
-20	-19.1	32.8	7	12	16	28		Sat.			
-25	-24.1	37.8	7	9	14	23		Sat.			
-30	-29.1	42.8	7	10	13	23		Sat.			
-35	-34.1	47.8	7	8	11	19		Sat.			-37.3
-40	-39.1	52.8	4	5	13	18		Sat.			-42.3
-45	-44.1	57.8	7	11	14	25		Sat.			-47.3
-50	-49.1	62.8	4	4	4	8		Sat.			-52.3
-55	-54.1	67.8	8	12	16	28		Sat.			-57.3
-60	-59.1	72.8	4	3	3						

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B1-A LL	**STATION** 170+73	**OFFSET** 43 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 13.7 ft	**TOTAL DEPTH** 119.3 ft	**NORTHING** 409,825	**EASTING** 2,625,595	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 84% 09/05/2017		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Fowler, B.	**START DATE** 03/28/18	**COMP. DATE** 03/29/18	**SURFACE WATER DEPTH** 1.7ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-60						Match Line		Sat.		Gray, tan and brown, phosphatic, fine SAND (A-2-4, A-3), contains shell fragments, with trace clay (DUPLIN FORMATION) *(continued)*
-65	-64.1	77.8	4	3	3	6		W		-62.3 76.0
-70	-69.1	82.8	2	2	4	6		W		Green and gray, micaceous, silty, sandy CLAY (A-7-6, A-6) (DUPLIN FORMATION)
-75	-74.1	87.8	5	4	4	8		Sat.		-67.3 81.0
-80	-79.1	92.8	12	14	22	36		Sat.		-72.3 86.0
-85	-84.1	97.8	11	14	17	31		Sat.		**COASTAL PLAIN** Dark gray, SAND (A-3) (RIVER BEND FORMATION)
-90	-89.1	102.8	9	12	13	25		Sat.		
-95	-94.1	107.8	8	10	12	22		Sat.		
-100	-99.1	112.8	7	9	12	21		Sat.		
-105	-104.1	117.8	8	13	20	33		Sat.		-105.6 119.3
										Boring Terminated at Elevation -105.6 ft in SAND (River Bend Formation)

NCDOT BORE DOUBLE R1015_GEO_SITE 3.GPJ NC_DOT.GDT 7/13/18

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Johnson, M.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B1-B RL	**STATION** 170+93	**OFFSET** 57 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 18.9 ft	**TOTAL DEPTH** 119.9 ft	**NORTHING** 409,924	**EASTING** 2,625,622	**24 HR.** 2.8
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 04/09/18	**COMP. DATE** 04/10/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
25										
20	18.9	0.0	2	1	2	3		M		18.9 GROUND SURFACE 0.0 **UNDIVIDED COASTAL PLAIN** Gray and tan, phosphatic, clayey, silty, fine SAND (A-2-4)
15	15.5	3.4	3	5	4	9		Sat.		
10	10.5	8.4	3	2	2	4		Sat.		7.9 11.0 **COASTAL PLAIN** Gray, tan, dark gray and green, phosphatic, fine to coarse SAND (A-2-4, A-3), with some silt and trace clay, contains shell and wood fragments (DUPLIN FORMATION)
5	5.5	13.4	2	2	1	3		Sat.		
0	0.5	18.4	3	3	3	6		Sat.		-2.1 21.0
-5	-4.5	23.4	5	10	9	19		Sat.		
-10	-9.5	28.4	7	6	10	16		Sat.		
-15	-14.5	33.4	4	5	6	11		Sat.		
-20	-19.5	38.4	8	12	19	31		Sat.		-20.2
-25	-24.5	43.4	7	9	9	18		Sat.		
-30	-29.5	48.4	10	11	15	26		Sat.		
-35	-34.5	53.4	7	8	14	22		Sat.		
-40	-39.5	58.4	6	5	5	10		Sat.		
-45	-44.5	63.4	12	17	22	39		Sat.		
-50	-49.5	68.4	9	13	17	30		Sat.		
-55	-54.5	73.4								

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
-60	-59.5	78.4	8	13	19	32		Sat.		Gray, tan, dark gray and green, phosphatic, fine to coarse SAND (A-2-4, A-3), with some silt and trace clay, contains shell and wood fragments (DUPLIN FORMATION) *(continued)*
-65	-64.5	83.4	4	4	5	9		Sat.		-62.1 81.0 Gray and green, fine sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)
-70	-69.5	88.4	WOH	WOH	4	4		W		
-75	-74.5	93.4	WOR	WOR	WOR	0		W		-72.1 91.0 **COASTAL PLAIN** Tan and gray, fine to coarse SAND (A-2-4), with silt and trace clay, contains shell fragments (RIVER BEND FORMATION)
-80	-79.5	98.4	11	14	21	35		Sat.		
-85	-84.5	103.4	13	18	19	37		Sat.		
-90	-89.5	108.4	21	29	37	66		Sat.		
-95	-94.5	113.4	11	13	19	32		Sat.		
-100	-99.5	118.4	5	8	9	17		Sat.		
	39.1		6	8	12	20		Sat.		-101.0 119.9 Boring Terminated at Elevation -101.0 ft in SAND (River Bend Formation) Potential dissolution cavity from 82.0' to 91.0'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B2-A LL	**STATION** 172+47	**OFFSET** 66 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 11.1 ft	**TOTAL DEPTH** 121.1 ft	**NORTHING** 409,882	**EASTING** 2,625,429	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 84% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 03/28/18	**COMP. DATE** 03/28/18	**SURFACE WATER DEPTH** 0.6ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
15										
10	11.1	0.0	WOH	WOH	WOH	0		W		WATER SURFACE (03/28/18) SWAMP 11.1 0.0 **ALLUVIAL** Dark brown, MUCK
5	6.1	5.0	2	1	2	3		Sat.		8.1 3.0 **UNDIVIDED COASTAL PLAIN** Brown and tan, SAND (A-3), contains wood fragments
0	1.5	9.6	2	2	6	8		Sat.		2.6 8.5 **COASTAL PLAIN** Gray, phosphatic, SAND (A-3, A-2-4), contains shell fragments (DUPLIN FORMATION)
-5	-3.5	14.6	4	6	7	13		Sat.		
-10	-8.5	19.6	3	4	4	8		Sat.		
-15	-13.5	24.6	2	1	3	4		Sat.		
-20	-18.5	29.6	3	5	5	10		Sat.		
-25	-23.5	34.6	5	8	9	17		Sat.		
-30	-28.5	39.6	4	5	5	10		Sat.		
-35	-33.5	44.6	4	4	3	7		Sat.		-31.9 43.0
-40	-38.5	49.6	5	7	12	19		Sat.		
-45	-43.5	54.6	4	4	5	9		W		-41.9 53.0 Gray, sandy CLAY (A-6) (DUPLIN FORMATION)
-50	-48.5	59.6	4	5	8	13		Sat.		-46.9 58.0 **COASTAL PLAIN** Dark gray, green and gray, fine SAND (A-3, A-2-4), contains shell fragments (RIVER BEND FORMATION)
-55	-53.5	64.6	5	11	14	25		Sat.		
-60	-58.5	69.6	12	19	25	44		Sat.		
-65	-63.5	74.6	4	5	6	11		Sat.		-61.9 73.0

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-65						Match Line				
-70	-68.5	79.6	7	10	13	23		Sat.		-66.0 77.1 Dark gray, green and gray, fine SAND (A-3, A-2-4), contains shell fragments (RIVER BEND FORMATION) *(continued)*
-75	-73.5	84.6	4	6	8	14		Sat.		-76.9 88.0 Green, sandy SILT (A-4), contains shell fragments (RIVER BEND FORMATION)
-80	-78.5	89.6	5	4	7	11		W		
-85	-83.5	94.6	4	4	6	10		W		-86.9 98.0 Brown and light gray, SAND (A-1-b), contains shell fragments (RIVER BEND FORMATION)
-90	-88.5	99.6	9	10	13	23		Sat.		
-95	-93.5	104.6	18	28	19	47		Sat.		-95.4 106.5 **COASTAL PLAIN SEDIMENTARY ROCK** -96.9 108.0 Gray, moderately hard, LIMESTONE (RIVER BEND FORMATION)
-100	-98.5	109.6	13	20	14	34		Sat.		**COASTAL PLAIN** Dense, gray, SAND (A-3), contains shell fragments (RIVER BEND FORMATION)
-105	-103.5	114.6	9	9	10	19				-101.9 113.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, moderately hard, sandy LIMESTONE (RIVER BEND FORMATION)
-110	-108.5	119.6	12	11	14	25		Sat.		-106.9 118.0 **COASTAL PLAIN** Gray, SAND (A-1-b), contains shell fragments (RIVER BEND FORMATION) -110.0 121.1 Boring Terminated at Elevation -110.0 ft in SAND (River Bend Formation) Drill chatter at 106.5'

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B2-A LL	**STATION** 172+47	**OFFSET** 66 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 11.1 ft	**TOTAL DEPTH** 121.1 ft	**NORTHING** 409,882	**EASTING** 2,625,429	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 84% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 03/28/18	**COMP. DATE** 03/28/18	**SURFACE WATER DEPTH** 0.6ft	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B2-B RL	**STATION** 172+22	**OFFSET** 61 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 12.2 ft	**TOTAL DEPTH** 126.1 ft	**NORTHING** 409,985	**EASTING** 2,625,508	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 84% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 03/13/18	**COMP. DATE** 03/15/18	**SURFACE WATER DEPTH** 0.9ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										WATER SURFACE (03/13/18)	
	12.2	0.0	WOH	WOH	WOH	0		W		SWAMP	0.0
										12.2 **ALLUVIAL** Dark Brown, MUCK	
	7.2	5.0	1	2	2	4		W		9.2 **UNDIVIDED COASTAL PLAIN** Gray, SAND (A-3)	3.0
										7.0 **COASTAL PLAIN** Gray and green, silty CLAY (A-7-6) (DUPLIN FORMATION)	5.2
	2.6	9.6	3	7	9	16		Sat.		4.2 Gray and brown, phosphatic, fine to coarse SAND (A-3(0)), contains shell fragments (DUPLIN FORMATION)	8.0
	-2.4	14.6	4	4	4	8		Sat.			
	-7.4	19.6	4	2	3	5	SS-5	20%			
	-12.4	24.6	3	6	6	12		Sat.			
	-17.4	29.6	6	6	6	12		Sat.			
	-22.4	34.6	7	12	14	26		Sat.			
	-27.4	39.6	6	13	20	33		Sat.			
	-32.4	44.6	8	11	15	26		Sat.			
	-37.4	49.6	6	5	6	11		Sat.			
	-42.4	54.6	7	13	14	27		Sat.			
	-47.4	59.6	4	3	3	6		Sat.			
	-52.4	64.6	1	2	1	3		W		-50.8 Gray, sandy CLAY (A-6) (DUPLIN FORMATION)	63.0
	-57.4	69.6	6	9	12	21		Sat.		-55.8 **COASTAL PLAIN** Gray, SAND (A-3) (RIVER BEND FORMATION)	68.0
	-62.4	74.6	8	8	16	24		Sat.			

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B2-B RL	**STATION** 172+22	**OFFSET** 61 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 12.2 ft	**TOTAL DEPTH** 126.1 ft	**NORTHING** 409,985	**EASTING** 2,625,508	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 84% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 03/13/18	**COMP. DATE** 03/15/18	**SURFACE WATER DEPTH** 0.9ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-65						Match Line				
	-67.4	79.6	7	10	11	21		Sat.		**COASTAL PLAIN** Gray, SAND (A-3) (RIVER BEND FORMATION) *(continued)*
-70										
	-72.4	84.6	8	9	9	18		Sat.		
-75										
	-77.4	89.6	5	5	8	13		Sat.		
-80										
	-82.4	94.6	4	5	9	14		Sat.		
-85										
	-87.4	99.6	7	13	9	22		W		-88.8 Gray and green, sandy CLAY (A-6) (RIVER BEND FORMATION) 101.0
-90										
-95	-95.0	107.2	2	2	4	6		W		-92.8 Green, sandy SILT (A-4), contains shell fragments (RIVER BEND FORMATION) 105.0
-100										
	-102.4	114.6	WOH	3	4	7		Sat.		-100.8 Gray and green, silty SAND (A-2-4), contains shell fragments (RIVER BEND FORMATION) 113.0
-105										
	-107.4	119.6	2	2	3	5		Sat.		
-110										
	-112.4	124.6	2	5	4	9		Sat.		-110.8 Gray, SAND (A-1-b), contains shell and limestone fragments (RIVER BEND FORMATION) 123.0
										-113.9 Boring Terminated at Elevation -113.9 ft in SAND (River Bend Formation) 126.1

Potential dissolution cavity from 104.6' to 107.2'
Drill chatter at 123.1'
Strata break in split spoon at a depth of 5.2'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B3-A LL	**STATION** 173+67	**OFFSET** 69 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 12.0 ft	**TOTAL DEPTH** 119.9 ft	**NORTHING** 409,933	**EASTING** 2,625,320	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 84% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 03/27/18	**COMP. DATE** 03/27/18	**SURFACE WATER DEPTH** 2.5ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
15										WATER SURFACE (03/27/18)
	12.0	0.0	2	7	4	11		W		12.0 SWAMP 0.0
10										**ALLUVIAL** Dark brown, MUCK, contains wood fragments
	7.5	4.5	4	2	2	4				9.0 3.0
5										**UNDIVIDED COASTAL PLAIN** No recovery - inferred as loose, tan SAND (A-3)
	3.6	8.4	WOH	2	4	6		Sat.		6.0 6.0
0										**COASTAL PLAIN** Gray, phosphatic, SAND (A-3, A-2-4), contains shell fragments (DUPLIN FORMATION)
	-1.4	13.4	5	5	5	10		Sat.		
-5										
	-6.4	18.4	4	5	4	9		Sat.		
-10										
	-11.4	23.4	6	5	7	12		Sat.		
-15										
	-16.4	28.4	4	5	4	9		Sat.		
-20										-19.0 31.0
	-21.4	33.4	3	3	3	6		Sat.		
-25										
	-26.4	38.4	5	5	6	11		Sat.		
-30										
	-31.4	43.4	5	4	4	8		Sat.		
-35										
	-36.4	48.4	WOH	3	4	7		Sat.		-39.0 51.0
-40										**COASTAL PLAIN** Dark gray and green, silty SAND (A-3, A-2-4) (RIVER BEND FORMATION)
	-41.4	53.4	3	5	8	13		Sat.		
-45										
	-46.4	58.4	5	8	8	16		Sat.		
-50										
	-51.4	63.4	5	7	8	15		Sat.		-54.0 66.0
-55										
	-56.4	68.4	2	1	2	3		Sat.		
-60										
	-61.4	73.4	2	2	3	5		Sat.		-64.0 76.0
-65										

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-65						Match Line				
	-66.4	78.4	2	3	5	8		Sat.		Dark gray and green, silty SAND (A-3, A-2-4) (RIVER BEND FORMATION) *(continued)*
-70										-69.0 81.0
	-71.4	83.4	4	5	10	15		Sat.		
-75										-74.0 86.0
	-76.4	88.4	5	4	8	12		W		Green, sandy SILT (A-4) (RIVER BEND FORMATION)
-80										-79.0 91.0
	-81.4	93.4	6	8	12	20		Sat.		Brown and gray, SAND (A-1-b), contains shell fragments (RIVER BEND FORMATION)
-85										
	-86.4	98.4	7	7	13	20		Sat.		
-90										
	-91.4	103.4	7	9	11	20		Sat.		
-95										
	-96.4	108.4	5	9	12	21		Sat.		
-100										-98.4 110.4
	-101.4	113.4	10	11	12	23				**COASTAL PLAIN SEDIMENTARY ROCK** Gray, moderately hard, sandy LIMESTONE (RIVER BEND FORMATION)
-105										
	-106.4	118.4	23	11	19	30				-107.9 119.9
								Sat.		Boring Terminated at Elevation -107.9 ft in LIMESTONE (River Bend Formation) Split spoon from 4.5' to 6.0' resulted in no recovery Drill chatter at 110.4'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B3-B RL	**STATION** 174+02	**OFFSET** 50 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 12.5 ft	**TOTAL DEPTH** 119.9 ft	**NORTHING** 410,056	**EASTING** 2,625,342	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 84% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 03/15/18	**COMP. DATE** 03/16/18	**SURFACE WATER DEPTH** 3.4ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
15										WATER SURFACE (03/15/18)
	12.5	0.0	WOH	2	1	3		Sat.		12.5 SWAMP 0.0
10	8.2	4.3	2	2	1	3		Sat.		**ALLUVIAL** Dark brown, MUCK, contains wood fragments 9.5 / 3.0
5	4.1	8.4	1	3	5	8		Sat.		**UNDIVIDED COASTAL PLAIN** Tan, SAND (A-3), contains wood fragments 6.5 / 6.0
0	-0.9	13.4	3	5	6	11		Sat.		**COASTAL PLAIN** Gray and green, SAND (A-3), contains shell fragments (DUPLIN FORMATION)
-5	-5.9	18.4	5	4	4	8		Sat.		
-10	-10.9	23.4	4	3	5	8		Sat.		
-15	-15.9	28.4	4	5	6	11		Sat.		
-20	-20.9	33.4	3	2	2	4		Sat.		Clay interbed 38.9'-39.1'
-25	-25.9	38.4	3	3	3	6		Sat.		
-30	-30.9	43.4	5	4	4	8		Sat.		-31.7 / 44.2 Gray and green, sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)
-35	-35.9	48.4	2	2	4	6		W		-38.5 / 51.0 **COASTAL PLAIN** Dark gray, green and light gray, SAND (A-3, A-2-4), contains shell and cemented limestone fragments (RIVER BEND FORMATION)
-40	-40.9	53.4	4	4	7	11		Sat.		
-45	-45.9	58.4	5	6	9	15		Sat.		
-50	-50.9	63.4	7	9	12	21		Sat.		-53.5 / 66.0
-55	-55.9	68.4	2	1	2	3		Sat.		
-60	-60.9	73.4	2	1	3	4		Sat.		-63.5 / 76.0
-65										

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-65						Match Line				
	-65.9	78.4	11	10	11	21		Sat.		Dark gray, green and light gray, SAND (A-3, A-2-4), contains shell and cemented limestone fragments (RIVER BEND FORMATION) *(continued)*
-70	-70.9	83.4	4	4	6	10		W		-68.5 / 81.0 Gray and green, sandy SILT (A-4), contains shell fragments (RIVER BEND FORMATION)
-75	-75.9	88.4	4	4	6	10		W		-78.5 / 91.0 Gray, green and light gray, silty SAND (A-2-4, A-3), contains shell and limestone fragments (RIVER BEND FORMATION)
-80	-80.9	93.4	6	3	6	9		Sat.		
-85	-85.9	98.4	10	9	8	17		Sat.		-88.5 / 101.0
-90	-90.9	103.4	10	12	9	21		Sat.		
-95	-95.9	108.4	4	8	23	31		Sat.		-96.9 / 109.4 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, moderately hard LIMESTONE (RIVER BEND FORMATION)
	-97.4	109.9	10	11	8	19		Sat.		
-100	-100.9	113.4	7	11	9	20		Sat.		-103.5 / 116.0 **COASTAL PLAIN** Gray, SAND (A-1-b), contains shell fragments (RIVER BEND FORMATION)
-105	-105.9	118.4	6	17	31	48		Sat.		-107.4 / 119.9 Boring Terminated at Elevation -107.4 ft in SAND (River Bend Formation) Strata break in split spoon at a depth of 44.2'

NCDOT BORE DOUBLE R1015_GEO_SITE 3.GPJ NC_DOT.GDT 7/13/18

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B4-A LL	**STATION** 174+87	**OFFSET** 72 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 12.5 ft	**TOTAL DEPTH** 120.1 ft	**NORTHING** 409,984	**EASTING** 2,625,211	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 84% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Powell, B.	**START DATE** 03/23/18	**COMP. DATE** 03/26/18	**SURFACE WATER DEPTH** 1.2ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) — DEPTH (ft)
20										
15										
	12.5	0.0								WATER SURFACE (03/23/18) 12.5 — SWAMP — 0.0
10			WOH	WOH	WOH	0		W		**ALLUVIAL** Dark brown, MUCK
	8.3	4.2								9.5 — 3.0
5			6	4	2	6		Sat.		**UNDIVIDED COASTAL PLAIN** Tan, SAND (A-3)
	3.9	8.6								3.1 — 9.4
0			1	2	3	5		Sat.		**COASTAL PLAIN** Gray and green, phosphatic, SAND (A-3, A-2-4), contains shell fragments (DUPLIN FORMATION)
	-1.1	13.6								
-5			3	3	4	7		Sat.		
	-6.1	18.6								
-10			3	4	5	9		Sat.		
	-11.1	23.6								
-15			4	5	5	10		Sat.		
	-16.1	28.6								
-20			5	4	4	8		Sat.		-19.5 — 32.0
	-21.1	33.6								
-25			2	1	2	3		Sat.		-24.5 — 37.0 Gray and green, sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)
	-26.1	38.6								
-30			4	2	2	4		W		-29.5 — 42.0
	-31.1	43.6								**COASTAL PLAIN** Dark gray, green and gray, SAND (A-3, A-2-4, A-1-b), contains limestone fragments (RIVER BEND FORMATION)
-35			4	3	3	6		Sat.		
	-36.1	48.6								
-40			3	4	5	9		Sat.		
	-41.1	53.6								
-45			4	5	7	12		Sat.		
	-46.1	58.6								
-50			8	7	4	11		Sat.		
	-51.1	63.6								-49.5 — 62.0
-55			1	2	2	4		Sat.		-54.5 — 67.0
	-56.1	68.6								
-60			4	4	3	7		Sat.		

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-60						Match Line				
	-61.1	73.6	5	3	5	8		Sat.		Dark gray, green and gray, SAND (A-3, A-2-4, A-1-b), contains limestone fragments (RIVER BEND FORMATION) *(continued)*
-65										-64.5 — 77.0
	-66.1	78.6	85	100/0.1		100/0.1		W		Green, SILT (A-4), contains shell fragments (RIVER BEND FORMATION)
-70										
	-71.1	83.6	5	5	9	14		W		
-75										-74.5 — 87.0
	-76.1	88.6	7	5	7	12		Sat.		Brown and gray, phosphatic, SAND (A-1-b), contains limestone and shell fragments (RIVER BEND FORMATION)
-80										
	-81.1	93.6	6	7	9	16		Sat.		
-85										
	-86.1	98.6	7	7	8	15		Sat.		
-90										
	-91.1	103.6	8	8	17	25		Sat.		
-95										
	-96.1	108.6	12	11	15	26		Sat.		
-100										-100.4 — 112.9
	-101.1	113.6	13	15	22	37		Sat.		**COASTAL PLAIN SEDIMENTARY ROCK** Brown and gray, moderately hard, LIMESTONE (RIVER BEND FORMATION)
-105										
	-106.1	118.6	13	14	19	33				-107.6 — 120.1
										Boring Terminated at Elevation -107.6 ft in LIMESTONE (River Bend Formation) Drill chatter from 75.9' to 76.9' and at 106.3' Hard drilling at 112.9' Strata break in split spoon at a depth of 9.4'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B4-B RL	**STATION** 174+86	**OFFSET** 87 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 12.6 ft	**TOTAL DEPTH** 119.5 ft	**NORTHING** 410,126	**EASTING** 2,625,283	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 84% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 03/19/18	**COMP. DATE** 03/20/18	**SURFACE WATER DEPTH** 1.5ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
15										WATER SURFACE (03/19/18)
	12.6	0.0								12.6 SWAMP 0.0
10			WOH	WOH	WOH	0		W		**ALLUVIAL** Dark brown, MUCK
	8.5	4.1								9.6 3.0
5			1	4	5	9		Sat.		**UNDIVIDED COASTAL PLAIN** Tan and brown, SAND (A-2-4), contains wood fragments
	4.6	8.0								6.6 6.0
0			1	3	4	7		Sat.		**COASTAL PLAIN** Gray and green, phosphatic, SAND (A-3, A-2-4), contains shell fragments (DUPLIN FORMATION)
	-0.4	13.0								
-5			3	6	6	12		Sat.		
	-5.4	18.0								
-10			3	4	5	9		Sat.		
	-10.4	23.0								
-15			4	4	4	8		Sat.		
	-15.4	28.0								
-20			2	2	4	6		Sat.		-18.4 31.0
	-20.4	33.0								
-25			2	1	3	4		Sat.		-23.4 36.0
	-25.4	38.0								Gray and green, phosphatic, fine to coarse, highly sandy CLAY (A-7-5(15), A-6(1)), with little silt, contains shell fragments (DUPLIN FORMATION)
-30			WOH	1	2	3	SS-98	38%		-28.4 41.0
	-30.4	43.0								
-35			1	2	3	5	SS-99	32%		-33.4 46.0
	-35.4	48.0								**COASTAL PLAIN** Dark gray, green and brown, fine to coarse SAND (A-1-b(0), A-2-4, A-3), with trace clay, contains cemented shell fragments (RIVER BEND FORMATION)
-40			2	4	5	9	SS-100	15%		
	-40.4	53.0								
-45			5	6	8	14		Sat.		
	-45.4	58.0								
-50			5	6	10	16		Sat.		-48.4 61.0
	-50.4	63.0								
-55			1	1	1	2		Sat.		
	-55.4	68.0								
-60			2	1	2	3		Sat.		-58.4 71.0
	-60.4	73.0								
-65			4	4	5	9		Sat.		

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-65						Match Line				
	-65.4	78.0	6	3	5	8		Sat.		Dark gray, green and brown, fine to coarse SAND (A-1-b(0), A-2-4, A-3), with trace clay, contains cemented shell fragments (RIVER BEND FORMATION) *(continued)*
-70										-68.4 81.0
	-70.4	83.0	4	4	8	12		W		Green, sandy SILT (A-4), contains shell fragments (RIVER BEND FORMATION)
-75										-73.4 86.0
	-75.4	88.0	6	7	9	16		W		Dark gray, phosphatic, sandy CLAY (A-6), contains shell fragments (RIVER BEND FORMATION)
-80										-78.4 91.0
	-80.4	93.0	5	7	9	16		Sat.		Brown, gray and tan, phosphatic, SAND (A-3, A-2-4, A-1-b), contains cemented shell fragments (RIVER BEND FORMATION)
-85										-83.4 96.0
	-85.4	98.0	9	7	9	16		Sat.		
-90										-88.4 101.0
	-90.4	103.0	7	6	8	14		Sat.		
-95										
	-95.4	108.0	10	8	16	24		Sat.		-98.4 111.0
-100										
	-100.4	113.0	11	9	13	22		Sat.		
-105										
	-105.4	118.0	21	18	21	39		Sat.		-106.9 119.5
										Boring Terminated at Elevation -106.9 ft in SAND (River Bend Formation) Drill chatter from 75.7' to 75.9', 84.9' to 86.1', 110.6' and at 117.0'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B5-A LL	**STATION** 176+29	**OFFSET** 55 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 14.6 ft	**TOTAL DEPTH** 120.0 ft	**NORTHING** 410,063	**EASTING** 2,625,092	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 84% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 03/21/18	**COMP. DATE** 03/22/18	**SURFACE WATER DEPTH** 0.2ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) — DEPTH (ft)
20										
15	14.6	0.0	WOH	WOH	WOH	0		W		14.6 — 0.0 WATER SURFACE (03/21/18)
										13.6 — 1.0 **ALLUVIAL** Dark brown, MUCK
10	10.3	4.3	6	6	4	10		W		11.6 — 3.0 **UNDIVIDED COASTAL PLAIN** Green, SILT (A-4) Tan, SAND (A-3), contains wood fragments
5	6.1	8.5	4	4	5	9		Sat.		7.6 — 7.0 **COASTAL PLAIN** Gray, phosphatic, SAND (A-3), contains shell fragments (DUPLIN FORMATION)
0	1.1	13.5	2	4	6	10		Sat.		
-5	-3.9	18.5	4	6	6	12		Sat.		
-10	-8.9	23.5	4	7	8	15		Sat.		
-15	-13.9	28.5	5	4	6	10		Sat.		
-20	-18.9	33.5	4	6	4	10		Sat.		
-25	-23.9	38.5	1	3	2	5		W		-22.4 — 37.0 Gray and green, silty, sandy CLAY (A-7-6, A-6) (DUPLIN FORMATION)
-30	-28.9	43.5	3	2	3	5		Sat.		-27.4 — 42.0
-35	-33.9	48.5	3	4	4	8		Sat.		-32.4 — 47.0 **COASTAL PLAIN** Dark gray, green and gray, SAND (A-3, A-2-4), contains shell fragments (RIVER BEND FORMATION)
-40	-38.9	53.5	5	5	5	10		Sat.		
-45	-43.9	58.5	2	3	4	7		Sat.		
-50	-48.9	63.5	2	1	0	1		Sat.		-47.4 — 62.0
-55	-53.9	68.5	3	2	5	7		Sat.		
-60	-58.9	73.5	3	4	7	11		Sat.		

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-60						Match Line				
-65	-63.9	78.5	4	14	40	54				-62.4 — 77.0 Dark gray, green and gray, SAND (A-3, A-2-4), contains shell fragments (RIVER BEND FORMATION) *(continued)*
-70	-68.9	83.5	6	5	21	26		Sat.		-64.5 — 79.1 Gray, moderately hard, LIMESTONE (RIVER BEND FORMATION)
-75	-73.9	88.5	10	5	8	13				-70.1 — 84.7 Green, fine SAND (A-2-4) (RIVER BEND FORMATION)
-80	-78.9	93.5	6	8	9	17				-72.4 — 87.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray and brown, moderately hard, sandy LIMESTONE (RIVER BEND FORMATION)
-85	-83.9	98.5	6	9	11	20		Sat.		-82.4 — 97.0 **COASTAL PLAIN** Brown and gray, SAND (A-2-4, A-1-b, A-3), contains shell fragments (RIVER BEND FORMATION)
-90	-88.9	103.5	6	5	15	20		Sat.		-84.9 — 99.5
-95	-93.9	108.5	8	8	10	18		Sat.		-87.4 — 102.0
-100	-98.9	113.5	10	8	14	22				-97.4 — 112.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, moderately hard, LIMESTONE (RIVER BEND FORMATION)
-105	-103.9	118.5	24	17	21	38		Sat.		-102.4 — 117.0 **COASTAL PLAIN** Gray, SAND (A-1-b), contains shell fragments (RIVER BEND FORMATION)
										-105.4 — 120.0 Boring Terminated at Elevation -105.4 ft in SAND (River Bend Formation)
										Strata break in split spoon at depths 79.1' and 84.7'

NCDOT BORE DOUBLE R1015_GEO_SITE 3.GPJ NC_DOT.GDT 7/13/18

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J. K.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B5-B RL	**STATION** 176+04	**OFFSET** 61 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 13.1 ft	**TOTAL DEPTH** 118.9 ft	**NORTHING** 410,156	**EASTING** 2,625,166	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 84% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, B.	**START DATE** 03/20/18	**COMP. DATE** 03/21/18	**SURFACE WATER DEPTH** 0.5ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
15										
	13.1	0.0	WOH	WOH	WOH	0				WATER SURFACE (03/20/18) -13.1 0.0 SWAMP
10	9.6	3.5	6	6	4	10		W		**ALLUVIAL** Dark brown, MUCK 10.6 2.5
5	5.7	7.4	3	3	5	8		Sat.		**UNDIVIDED COASTAL PLAIN** Tan, SAND (A-3) 8.1 5.0
0	0.7	12.4	4	6	8	14		Sat.		**COASTAL PLAIN** Gray and green, phosphatic, SAND (A-3), contains shell fragments (DUPLIN FORMATION)
-5	-4.3	17.4	6	7	8	15		Sat.		
-10	-9.3	22.4	3	5	4	9		Sat.		
-15	-14.3	27.4	7	6	7	13		Sat.		
-20	-19.3	32.4	5	7	6	13		Sat.		
-25	-24.3	37.4	WOH	2	3	5		W		-21.9 35.0 Gray and green, sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)
-30	-29.3	42.4	2	2	4	6		Sat.		-31.9 45.0 **COASTAL PLAIN** Dark gray, gray and green, fine to coarse SAND (A-3, A-2-4(0)), with trace silt and clay, contains limestone fragments (RIVER BEND FORMATION)
-35	-34.3	47.4	3	5	7	12		Sat.		
-40	-39.3	52.4	5	8	11	19		Sat.		
-45	-44.3	57.4	4	5	5	10		Sat.		
-50	-49.3	62.4	3	2	2	4		Sat.		-46.9 60.0
-55	-54.3	67.4	1	2	2	4		Sat.		
-60	-59.3	72.4	1	4	8	12	SS-130	16%		
-65	-64.3	77.4								

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-65						Match Line				
	-69.3	82.4	8	6	5	11		Sat.		Dark gray, gray and green, fine to coarse SAND (A-3, A-2-4(0)), with trace silt and clay, contains limestone fragments (RIVER BEND FORMATION) *(continued)*
-70										-70.3 83.4
	-74.3	87.4	5	7	9	16		Sat.		Gray and green, sandy SILT (A-4) (RIVER BEND FORMATION)
-75			4	5	6	11		W		-76.9 90.0
	-79.3	92.4								Gray, phosphatic, SAND (A-2-4, A-3), contains shell fragments (RIVER BEND FORMATION)
-80			8	10	13	23		Sat.		
	-84.3	97.4								
-85			8	10	10	20		Sat.		
	-89.3	102.4								
-90			4	6	12	18		Sat.		-91.9 105.0
	-94.3	107.4								
-95			8	8	9	17		Sat.		
	-99.3	112.4								-99.2 112.3
-100			7	11	11	22				**COASTAL PLAIN SEDIMENTARY ROCK** Gray, moderately hard, LIMESTONE (RIVER BEND FORMATION)
-105	-104.3	117.4	22	23	26	49				-105.8 118.9
										Boring Terminated at Elevation -105.8 ft in LIMESTONE (River Bend Formation) Drill chatter from 84.3' to 85.5' and from 112.3' to 113.9' Strata break in split spoon at a depth of 83.4'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Johnson, M.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B6-A LL	**STATION** 177+76	**OFFSET** 59 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 17.6 ft	**TOTAL DEPTH** 99.9 ft	**NORTHING** 410,125	**EASTING** 2,624,959	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 04/13/18	**COMP. DATE** 04/16/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
20										
	17.6	0.0	WOH	0	1	1		W		17.6 / 0.0 GROUND SURFACE
15										16.6 / 1.0 **ALLUVIAL** Dark brown, MUCK
	14.4	3.2	1	1	2	3		W		**UNDIVIDED COASTAL PLAIN** Tan, orange and gray, fine sandy, silty CLAY (A-6)
10										
	9.4	8.2	WOH	1	2	3		Sat.		8.6 / 9.0 **COASTAL PLAIN** Gray, phosphatic, clayey, fine to coarse SAND (A-2-6, A-2-4), contains shell fragments, with silt and clay (DUPLIN FORMATION)
5										
	4.4	13.2	3	3	6	9		Sat.		
0										
	-0.6	18.2	5	5	11	16		Sat.		1.6 / 16.0
-5										
	-5.6	23.2	6	6	11	17		Sat.		
-10										
	-10.6	28.2	5	5	8	13		Sat.		
-15										
	-15.6	33.2	5	4	9	13		Sat.		
-20										-18.4 / 36.0 Green and gray, fine to medium, sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)
	-20.6	38.2	1	2	3	5		W		
-25										
	-25.6	43.2	3	2	4	6		Sat.		-28.4 / 46.0 **COASTAL PLAIN** Green and gray, phosphatic, fine to coarse, SAND (A-2-4, A-3), with silt and clay, contains shell fragments (RIVER BEND FORMATION)
-30										
	-30.6	48.2	11	11	14	25		Sat.		
-35										
	-35.6	53.2	11	16	24	40		Sat.		-38.4 / 56.0
-40										
	-40.8	58.4	12	17	18	35		Sat.		-43.4 / 61.0
-45										
	-45.8	63.4	4	5	2	7		Sat.		
-50										
	-50.8	68.4	5	6	6	12		Sat.		
-55										
	-55.8	73.4	6	6	5	11		Sat.		
-60										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Johnson, M.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B6-A LL	**STATION** 177+76	**OFFSET** 59 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 17.6 ft	**TOTAL DEPTH** 99.9 ft	**NORTHING** 410,125	**EASTING** 2,624,959	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 04/13/18	**COMP. DATE** 04/16/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-60						Match Line				
	-60.8	78.4	13	7	7	14		Sat.		-61.3 / 78.9 Green and gray, phosphatic, fine to coarse, SAND (A-2-4, A-3), with silt and clay, contains shell fragments (RIVER BEND FORMATION) *(continued)*
-65										**COASTAL PLAIN SEDIMENTARY ROCK** Gray, moderately hard, sandy LIMESTONE (RIVER BEND FORMATION)
	-65.8	83.4	77	21	30	51		Sat.		-68.4 / 86.0
-70										**COASTAL PLAIN** Green, sandy SILT (A-4), contains shell fragments (RIVER BEND FORMATION)
	-70.8	88.4	7	19	17	36		W		-73.4 / 91.0 Brown, clayey SAND (A-2-6), contains shell fragments (RIVER BEND FORMATION)
-75										
	-75.8	93.4	6	5	8	13		Sat.		-78.4 / 96.0 Gray, sandy SILT (A-4) (RIVER BEND FORMATION)
-80										
	-80.8	98.4	3	5	15	20		W		-82.3 / 99.9 Boring Terminated at Elevation -82.3 ft in SILT (River Bend Formation)
										Strata break in split spoon at depths 9.0' and 78.9'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J.K.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B6-B RL	**STATION** 177+86	**OFFSET** 44 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 17.3 ft	**TOTAL DEPTH** 120.1 ft	**NORTHING** 410,221	**EASTING** 2,624,996	**24 HR.** 0.6
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 04/17/18	**COMP. DATE** 04/17/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
20											
	17.3	0.0	WOH	2	2	4		M		17.3 GROUND SURFACE	0.0
15										**ALLUVIAL** Dark brown, SAND (A-2-4)	
	13.7	3.6	4	1	3	4		Sat.		14.3	3.0
10										**UNDIVIDED COASTAL PLAIN** Gray and tan, SAND (A-2-4)	
	8.7	8.6	2	2	5	7		Sat.		10.3	7.0
5										**COASTAL PLAIN** Gray, phosphatic, SAND (A-3), with trace clay in part, contains shell fragments (DUPLIN FORMATION)	
	3.7	13.6	5	4	7	11		Sat.			
0											
	-1.3	18.6	4	5	6	11		Sat.			
-5											
	-6.3	23.6	6	7	8	15		Sat.			
-10											
	-11.3	28.6	3	2	7	9		Sat.			
-15											
	-16.3	33.6	5	5	4	9		Sat.			
-20											
	-21.3	38.6	2	2	3	5		W		-19.7 Gray, silty CLAY (A-7-6), contains shell fragments (DUPLIN FORMATION)	37.0
-25											
	-26.3	43.6	3	3	4	7		Sat.		-24.7 **COASTAL PLAIN** Gray, dark gray, green and tan, silty, poorly indurated SAND (A-2-4, A-3, A-1-b), contains shell and limestone fragments (RIVER BEND FORMATION)	42.0
-30											
	-31.3	48.6	11	19	20	39		Sat.		-29.7	47.0
-35											
	-36.3	53.6	15	20	28	48		Sat.			
-40											
	-41.3	58.6	11	10	11	21		Sat.			
-45											
	-46.3	63.6	5	8	9	17		Sat.			
-50											
	-51.3	68.6	16	8	6	14		Sat.		-49.7	67.0
-55											
	-56.3	73.6	5	4	5	9		Sat.			
-60										-59.7 Gray and green, SILT (A-4) (RIVER BEND FORMATION)	77.0

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J.K.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B6-B RL	**STATION** 177+86	**OFFSET** 44 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 17.3 ft	**TOTAL DEPTH** 120.1 ft	**NORTHING** 410,221	**EASTING** 2,624,996	**24 HR.** 0.6
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 04/17/18	**COMP. DATE** 04/17/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-60						Match Line				
	-61.3	78.6	10	8	8	16		Sat.		Gray, dark gray, green and tan, silty, poorly indurated SAND (A-2-4, A-3, A-1-b), contains shell and limestone fragments (RIVER BEND FORMATION) *(continued)*
-65										-64.7 82.0
	-66.3	83.6	13	13	9	22		Sat.		Gray and green, SILT (A-4) (RIVER BEND FORMATION)
-70										-69.7 87.0
	-71.3	88.6	8	10	12	22		W		Brown, SAND (A-2-4), contains shell fragments (RIVER BEND FORMATION)
-75										-74.7 92.0
	-76.3	93.6	7	7	9	16		Sat.		Gray and green, sandy SILT (A-4) (RIVER BEND FORMATION)
-80										-79.7 97.0
	-81.3	98.6	4	4	6	10		W		Gray and green, SAND (A-2-4, A-3), contains shell fragments (RIVER BEND FORMATION)
-85										-84.7 102.0
	-86.3	103.6	10	10	9	19		Sat.		
-90										
	-91.3	108.6	13	11	11	22		Sat.		
-95										
	-96.3	113.6	9	14	14	28		Sat.		-99.7 117.0
-100										
	-101.3	118.6	30	53	31	84		Sat.		-102.8 120.1
										Boring Terminated at Elevation -102.8 ft in SAND (River Bend Formation)
										Drill chatter from 115.1' to 118.6'

NCDOT BORE DOUBLE R1015_GEO_SITE 3.GPJ NC_DOT.GDT 7/13/18

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J.K.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B7-A LL	**STATION** 179+01	**OFFSET** 47 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.7 ft	**TOTAL DEPTH** 85.0 ft	**NORTHING** 410,192	**EASTING** 2,624,852	**24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 04/18/18	**COMP. DATE** 04/18/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
30										
25	22.7	0.0	WOH	1	1	2		M		22.7 0.0 GROUND SURFACE
20	19.2	3.5	2	2	1	3		Sat.		**ALLUVIAL** Brown, SAND (A-2-4)
15	14.2	8.5	WOH	WOH	WOH	0		W		19.7 3.0 **UNDIVIDED COASTAL PLAIN** Tan and orange, SAND (A-2-4)
10	9.2	13.5	WOH	WOH	WOH	0		W		15.7 7.0 **COASTAL PLAIN** Gray, sandy SILT (A-4) (DUPLIN FORMATION)
5	4.2	18.5	5	7	11	18		Sat.		5.7 17.0 Gray, phosphatic in part, SAND (A-3), with thin clay interbeds, contains shell fragments (DUPLIN FORMATION)
0	-0.8	23.5	5	6	7	13		Sat.		
-5	-5.8	28.5	7	7	9	16		Sat.		
-10	-10.8	33.5	5	8	5	13		Sat.		
-15	-15.8	38.5	9	11	15	26		Sat.		
-20	-20.8	43.5	2	1	2	3		W		-19.3 42.0 Gray, sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)
-25	-25.8	48.5	2	3	9	12		Sat.		-24.3 47.0 **COASTAL PLAIN** Gray, phosphatic, SAND (A-1-b, A-3), contains cemented shell fragments (RIVER BEND FORMATION)
-30	-30.8	53.5	11	12	12	24		Sat.		-29.3 52.0
-35	-35.8	58.5	13	16	25	41		Sat.		
-40	-40.8	63.5	9	10	14	24		Sat.		
-45	-45.8	68.5	10	12	16	28		Sat.		
-50										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J.K.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B7-A LL	**STATION** 179+01	**OFFSET** 47 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.7 ft	**TOTAL DEPTH** 85.0 ft	**NORTHING** 410,192	**EASTING** 2,624,852	**24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 04/18/18	**COMP. DATE** 04/18/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50	-50.8	73.5	35	100/0.2		100/0.2		Sat.		-51.3 74.0 Gray, phosphatic, SAND (A-1-b, A-3), contains cemented shell fragments (RIVER BEND FORMATION) *(continued)*
-55	-55.8	78.5	20	30	22	52		Sat.		-54.3 77.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, moderately hard, LIMESTONE (RIVER BEND FORMATION)
-60	-60.8	83.5	17	38	37	75		Sat.		-59.3 82.0 **COASTAL PLAIN** Green, SAND (A-2-4, A-3) (RIVER BEND FORMATION)
										-62.3 85.0 Boring Terminated at Elevation -62.3 ft in SAND (River Bend Formation)

Match Line

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J.K.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B7-B RL	**STATION** 179+00	**OFFSET** 59 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 19.4 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 410,286	**EASTING** 2,624,901	**24 HR.** 2.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 04/18/18	**COMP. DATE** 04/18/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
19.4		0.0								GROUND SURFACE 0.0
	15.8	3.6	1	2	1	3		M		**ALLUVIAL** Brown and gray, SAND (A-2-4)
16.4										3.0
	10.8	8.6	2	3	2	5		Sat.		**UNDIVIDED COASTAL PLAIN** Tan and orange, clayey SAND (A-2-6)
12.4										7.0
	5.8	13.6	WOH	WOH	WOH	0		W		**COASTAL PLAIN** Gray, SILT (A-4) (DUPLIN FORMATION)
7.4										12.0
	0.8	18.6	4	4	5	9		Sat.		Gray and green, phosphatic, clayey SAND (A-3), contains shell fragments (DUPLIN FORMATION)
	-4.2	23.6	3	5	6	11		Sat.		
	-9.2	28.6	5	9	12	21		Sat.		
	-14.2	33.6	4	7	7	14		Sat.		
	-19.2	38.6	5	8	9	17		Sat.		
	-24.2	43.6	5	6	6	12		Sat.		
	-29.2	48.6	1	3	3	6		Sat.		
	-34.2	53.6	12	23	22	45		Sat.		
	-39.2	58.6	12	13	24	37		Sat.		
	-44.2	63.6	7	13	21	34		Sat.		
			15	21	23					
-22.6										42.0
										Gray, sandy CLAY (A-6) (DUPLIN FORMATION)
-27.6										47.0
										COASTAL PLAIN Gray, SAND (A-3), contains shell fragments (RIVER BEND FORMATION)

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J.K.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B7-B RL	**STATION** 179+00	**OFFSET** 59 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 19.4 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 410,286	**EASTING** 2,624,901	**24 HR.** 2.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 04/18/18	**COMP. DATE** 04/18/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-45						Match Line		Sat.		Gray, SAND (A-3), contains shell fragments (RIVER BEND FORMATION) *(continued)*
	-49.2	68.6	5	6	21	27				
-47.6										67.0
										COASTAL PLAIN SEDIMENTARY ROCK Gray, poorly cemented, moderately hard, LIMESTONE (RIVER BEND FORMATION)
-50	-54.2	73.6	7	10	14	24				
-52.6										72.0
-55								Sat.		Gray and green, SAND (A-2-4) (RIVER BEND FORMATION)
	-59.2	78.6	18	12	7	19				
-57.6										77.0
-60										**COASTAL PLAIN SEDIMENTARY ROCK** Gray, moderately hard, LIMESTONE (RIVER BEND FORMATION)
	-64.2	83.6	5	7	9	16				
-65										
	-69.2	88.6	9	9	16	25				
-69.7										89.1
-70								Sat.		**COASTAL PLAIN** Gray and green, SAND (A-2-4) (RIVER BEND FORMATION)
-72.6										92.0
										Green, sandy SILT (A-4), contains shell fragments (RIVER BEND FORMATION)
-75	-74.2	93.6	5	5	7	12		W		
	-79.2	98.6	3	6	10	16		W		
-80.7										100.1
										Boring Terminated at Elevation -80.7 ft in SILT (River Bend Formation) Drill chatter from 75.1' to 78.6' and 90.9' to 91.9'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Crenshaw, J.K.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B8-A LL	**STATION** 180+38	**OFFSET** 65 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.5 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 410,353	**EASTING** 2,624,780	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 04/19/18	**COMP. DATE** 04/19/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
25										
	21.5	0.0								21.5 GROUND SURFACE 0.0
20			1	1	2	3		M		**ALLUVIAL** Dark brown, MUCK, with wood fragments
	18.0	3.5	WOH	WOH	WOH	0		Sat.		18.5 3.0 **UNDIVIDED COASTAL PLAIN** Tan and orange, clayey SAND (A-2-6)
15										14.5 7.0
	13.0	8.5	WOH	WOH	WOH	0		Sat.		**COASTAL PLAIN** Gray, silty SAND (A-2-4) (DUPLIN FORMATION)
10										9.5 12.0
	8.0	13.5	WOH	WOH	WOH	0		W		Gray, silty CLAY (A-7-6) (DUPLIN FORMATION)
5										4.5 17.0
	3.0	18.5	4	4	6	10		Sat.		Gray, phosphatic, SAND (A-3), contains shell fragments (DUPLIN FORMATION)
0										
	-2.0	23.5	4	4	5	9		Sat.		
-5										
	-7.0	28.5	6	9	13	22		Sat.		
-10										
	-12.0	33.5	5	6	7	13		Sat.		
-15										
	-17.0	38.5	8	17	15	32		Sat.		
-20										
	-22.0	43.5	WOH	WOH	1	1		W		-20.5 42.0 Gray, CLAY and sandy CLAY (A-7-6, A-6), contains shell fragments (DUPLIN FORMATION)
-25										-25.5 47.0
	-27.0	48.5	1	2	3	5		Sat.		
-30										-30.5 52.0
	-32.0	53.5	17	23	24	47	SS-471	19%		**COASTAL PLAIN** Gray and green, phosphatic, fine to coarse SAND (A-1-b(0), A-2-4, A-3), with trace clay, contains shell and limestone fragments (RIVER BEND FORMATION)
-35										
	-37.0	58.5	14	15	19	34		Sat.		
-40										
	-42.0	63.5	12	17	13	30		Sat.		
-45										
	-47.0	68.5	18	19	32	51		Sat.		
-50										
	-52.0	73.5	7	5	10	15		Sat.		
-55										

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
	-57.0	78.5	9	14	18	32		Sat.		-55.5 77.0 Gray and green, phosphatic, fine to coarse SAND (A-1-b(0), A-2-4, A-3), with trace clay, contains shell and limestone fragments (RIVER BEND FORMATION) *(continued)*
-60										
	-62.0	83.5	6	6	10	16		Sat.		
-65										-65.5 87.0
	-67.0	88.5	12	11	14	25		Sat.		
-70										-70.5 92.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, moderately hard, sandy LIMESTONE (RIVER BEND FORMATION)
	-72.0	93.5	14	9	9	18				
-75										-75.5 97.0 **COASTAL PLAIN** Gray, SAND (A-1-b), contains cemented shell fragments (RIVER BEND FORMATION)
	-77.0	98.5	10	8	12	20		Sat.		-78.5 100.0 Boring Terminated at Elevation -78.5 ft in SAND (River Bend Formation) Circulation loss and drill chatter from 85.0' to 88.5'

NCDOT BORE DOUBLE R1015_GEO_SITE 3.GPJ NC_DOT.GDT 7/13/18

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B8-B RL	**STATION** 180+39	**OFFSET** 52 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.0 ft	**TOTAL DEPTH** 114.9 ft	**NORTHING** 410,248	**EASTING** 2,624,726	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 04/23/18	**COMP. DATE** 04/25/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
35										
30										
25										
	22.0	0.0								GROUND SURFACE 0.0
20			1	2	2	4		M		21.1 0.9 **ALLUVIAL** Dark brown, moderately organic SAND (A-2-4)
	18.6	3.4	2	2	2	4		Sat.		**UNDIVIDED COASTAL PLAIN** Brown and orange, clayey, fine SAND (A-2-6)
15										16.0 6.0
	13.6	8.4	WOH	WOH	WOH	0		W		**COASTAL PLAIN** Gray, sandy CLAY (A-6) (DUPLIN FORMATION)
10										
	8.6	13.4	WOH	WOH	WOH	0		W		6.0 16.0
5										Gray, phosphatic, SAND (A-3), with clay interbeds, conatains shell fragments (DUPLIN FORMATION)
	3.6	18.4	4	4	9	13		Sat.		
0										
	-1.4	23.4	3	3	3	6		Sat.		
-5										
	-6.4	28.4	5	6	8	14		Sat.		
-10										
	-11.4	33.4	5	6	6	12		Sat.		
-15										
	-16.4	38.4	3	3	3	6		Sat.		
-20										-19.0 41.0
	-21.4	43.4	WOH	2	2	4		W		Gray, sandy CLAY (A-6), contains shell fragments (DUPLIN FORMATION)
-25										
	-26.4	48.4	2	2	3	5		Sat.		-29.0 51.0
-30										**COASTAL PLAIN**
	-31.4	53.4	2	3	6	9		Sat.		Gray, dark gray and green, phosphatic, clayey, silty SAND (A-3, A-2-4, A-1-b, A-2-6), contains cemented shell fragments and limestone fragments (RIVER BEND FORMATION)
-35										
	-36.4	58.4	10	18	25	43		Sat.		
-40										
	-41.4	63.4	12	14	15	29		Sat.		
-45										

NCDOT BORE DOUBLE R1015_GEO_SITE 3.GPJ NC_DOT.GDT 7/13/18

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B8-B RL	**STATION** 180+39	**OFFSET** 52 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.0 ft	**TOTAL DEPTH** 114.9 ft	**NORTHING** 410,248	**EASTING** 2,624,726	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 04/23/18	**COMP. DATE** 04/25/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-45						Match Line				
	-46.4	68.4	10	8	12	20		Sat.		Gray, dark gray and green, phosphatic, clayey, silty SAND (A-3, A-2-4, A-1-b, A-2-6), contains cemented shell fragments and limestone fragments (RIVER BEND FORMATION) *(continued)*
-50										-49.0 71.0
	-51.4	73.4	41	23	38	61		Sat.		
-55										
	-56.4	78.4	5	5	8	13		Sat.		
-60										
	-61.4	83.4	5	8	31	39		Sat.		-64.0 86.0
-65										
	-66.4	88.4	7	7	6	13		Sat.		-69.0 91.0
-70										
	-71.4	93.4	5	60	13	73		Sat.		-74.0 96.0
-75										
	-76.4	98.4	7	7	16	23		Sat.		-79.0 101.0
-80										
	-81.4	103.4	3	4	7	11		Sat.		
-85										
	-86.4	108.4	3	3	4	7		Sat.		
-90										
	-91.4	113.4	3	3	4	7		Sat.		-92.9 114.9
										Boring Terminated at Elevation -92.9 ft in SAND (River Bend Formation)

Drill chatter and fluid loss at 72.7'
Drill chatter from 84.9' to 88.4' and 97.4'
Hard drilling encountered from 91.0' to 92.0'
Strata break in split spoon at a depth of 0.9'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B9-A LL	**STATION** 181+77	**OFFSET** 52 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.9 ft	**TOTAL DEPTH** 98.5 ft	**NORTHING** 410,310	**EASTING** 2,624,603	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 04/26/18	**COMP. DATE** 04/26/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
25										
	21.9	0.0	1	1	0	1		M		21.9 / 0.0 GROUND SURFACE
20	18.5	3.4	2	2	1	3		Sat.		**ALLUVIAL** Brown, silty SAND (A-2-4), contains trace organics — 18.9 / 3.0
15	13.5	8.4	WOH	WOH	WOH	0		W		**UNDIVIDED COASTAL PLAIN** Gray, SAND (A-3) — 15.9 / 6.0
10	8.5	13.4	WOH	WOH	WOH	0		W		**COASTAL PLAIN** Gray, CLAY (A-7-6) (DUPLIN FORMATION)
5	3.5	18.4	1	2	3	5		Sat.		2.6 / 19.3 Gray, SAND (A-3), contains shell fragments (DUPLIN FORMATION)
0	-1.5	23.4	1	1	1	2		Sat.		
-5	-6.5	28.4	2	0	2	2		Sat.		
-10	-11.5	33.4	2	3	4	7		Sat.		
-15	-16.5	38.4	4	4	5	9		Sat.		
-20	-21.5	43.4	2	2	2	4	SS-536	56%		
-25	-26.5	48.4	1	2	2	4		W		
-30	-31.5	53.4	WOH	1	3	4		W		
-35	-36.5	58.4	1	1	3	4		Sat.		-37.5 / 59.4
-40	-41.5	63.4	8	8	13	21		Sat.		**COASTAL PLAIN** -39.1 / 61.0 Gray and green, clayey SAND (A-2-4, A-3), contains shell fragments and trace limestone fragments (RIVER BEND FORMATION)
-45	-46.5	68.4	14	15	15	30		Sat.		
-50	-51.5	73.4	7	10	12	22		Sat.		-54.1 / 76.0
-55										

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
	-56.5	78.4	20	63	37/0.1	100/0.6				Gray and green, clayey SAND (A-2-4, A-3), contains shell fragments and trace limestone fragments (RIVER BEND FORMATION) *(continued)*
-60	-61.5	83.4	4	4	8	12		Sat.		
-65	-66.5	88.4	6	8	9	17		Sat.		-68.2 / 90.1 Gray, SAND (A-1-b), with limestone fragments
-70	-71.5	93.4	4	15	12	27		Sat.		-74.1 / 96.0 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, moderately hard, sandy LIMESTONE (RIVER BEND FORMATION) — -76.6 / 98.5
-75	-76.5	98.4	60/0.1			60/0.1				Boring Terminated at Elevation -76.6 ft in Moderately Hard Limestone (River Bend Formation)
										Drill chatter at 90.1' Split spoon from 98.4' to 98.5' resulted in no recovery Strata break in split spoon at depths 19.3' and 59.4'

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B9-A LL	**STATION** 181+77	**OFFSET** 52 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.9 ft	**TOTAL DEPTH** 98.5 ft	**NORTHING** 410,310	**EASTING** 2,624,603	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 04/26/18	**COMP. DATE** 04/26/18	**SURFACE WATER DEPTH** N/A	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B9-B RL	**STATION** 181+72	**OFFSET** 62 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.5 ft	**TOTAL DEPTH** 104.9 ft	**NORTHING** 410,410	**EASTING** 2,624,658	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 04/25/18	**COMP. DATE** 04/26/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
25										
	21.5	0.0								21.5 GROUND SURFACE 0.0
20			1	1	1	2		M		20.5 **ALLUVIAL** Dark brown, moderately organic SAND (A-2-4) 1.0
	18.1	3.4	1	1	0	1		Sat.		**UNDIVIDED COASTAL PLAIN** Tan and orange, SAND (A-2-4)
15										15.5 6.0
	13.1	8.4	WOH	WOH	WOH	0		W		**COASTAL PLAIN** Gray, sandy CLAY (A-6) (DUPLIN FORMATION)
10										
	8.1	13.4	WOH	WOH	WOH	0		W		
5										5.5 16.0
	3.1	18.4	5	5	8	13		Sat.		Gray, SAND (A-3) (DUPLIN FORMATION)
0										
	-1.9	23.4	3	4	4	8		Sat.		
-5										-4.5 26.0
	-6.9	28.4	1	0	1	1	SS-511	42%		Gray, fine to coarse, sandy SILT (A-4)(0), with little clay (DUPLIN FORMATION)
-10										-9.5 31.0
	-11.9	33.4	5	5	5	10		Sat.		Gray, SAND (A-3) (DUPLIN FORMATION)
-15										
	-16.9	38.4	4	2	2	4		Sat.		
-20										-19.5 41.0
	-21.9	43.4	2	2	1	3		W		Gray, CLAY and sandy CLAY (A-7-6, A-6), contains shell fragments (DUPLIN FORMATION)
-25										
	-26.9	48.4	1	1	1	2		W		-29.5 51.0
-30										
	-31.9	53.4	3	2	2	4		Sat.		-34.5 56.0
-35										**COASTAL PLAIN** Gray and green, phosphatic, silty SAND (A-1-b, A-3, A-2-4, A-2-6), contains shell and limestone fragments (RIVER BEND FORMATION)
	-36.9	58.4	11	14	18	32		Sat.		
-40										
	-41.9	63.4	9	12	12	24		Sat.		
-45										
	-46.9	68.4	8	15	18	33		Sat.		-49.5 71.0
-50										
	-51.9	73.4	14	13	20	33		Sat.		
-55										

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
	-56.9	78.4	17	17	17	34		Sat.		Gray and green, phosphatic, silty SAND (A-1-b, A-3, A-2-4, A-2-6), contains shell and limestone fragments (RIVER BEND FORMATION) *(continued)*
-60										
	-61.9	83.4	5	4	11	15		Sat.		
-65										
	-66.9	88.4	8	5	11	16		Sat.		-69.5 91.0
-70										
	-71.9	93.4	23	7	12	19		Sat.		-74.5 96.0
-75										
	-76.9	98.4	10	8	8	16		Sat.		
-80										
	-81.9	103.4	5	5	4	9		Sat.		-83.4 104.9
										Boring Terminated at Elevation -83.4 ft in SAND (River Bend Formation)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B10-A LL	**STATION** 183+05	**OFFSET** 56 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.1 ft	**TOTAL DEPTH** 99.9 ft	**NORTHING** 410,364	**EASTING** 2,624,487	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Powell, B.	**START DATE** 04/27/18	**COMP. DATE** 04/30/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
30											
25											
	22.1	0.0	WOH	1	0	1		M		22.1 GROUND SURFACE	0.0
20	18.7	3.4	2	2	4	6		Sat.		19.1 **ALLUVIAL** Brown, silty SAND (A-2-4), contains trace organics	3.0
15	13.7	8.4	WOH	WOH	WOH	0		W		16.1 **UNDIVIDED COASTAL PLAIN** Gray, SAND (A-3)	6.0
10	8.7	13.4	WOH	WOH	WOH	0		W		**COASTAL PLAIN** Gray, sandy CLAY (A-6) (DUPLIN FORMATION)	
5	3.7	18.4	WOH	1	2	3		Sat.		2.7 Gray, SAND (A-3), with trace clay in part, contains shell fragments (DUPLIN FORMATION)	19.4
0	-1.3	23.4	2	2	2	4		Sat.			
-5	-6.3	28.4	2	2	3	5		Sat.			
-10	-11.3	33.4	8	10	13	23		Sat.			
-15	-16.3	38.4	10	16	18	34		Sat.			
-20	-21.3	43.4	10	8	4	12		Sat.			
-25	-26.3	48.4	2	2	2	4		W		-23.9 Gray, silty, sandy CLAY (A-7-6, A-6), contains shell fragments (DUPLIN FORMATION)	46.0
-30	-31.3	53.4	2	2	3	5		W			
-35	-36.3	58.4	1	2	3	5		W			
-40	-41.3	63.4	2	3	2	5		W		-38.9	61.0
-45	-46.3	68.4	WOH	WOH	2	2		W			
-50											

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
	-51.3	73.4	3	10	27	37		Sat.		Gray, silty, sandy CLAY (A-7-6, A-6), contains shell fragments (DUPLIN FORMATION) *(continued)*
-55	-56.3	78.4	4	8	10	18		Sat.		**COASTAL PLAIN** Gray and green, silty, medium to coarse SAND (A-3, A-1-b, A-2-4), contains cemented shell fragments (RIVER BEND FORMATION)
-60	-61.3	83.4	5	9	29	38		Sat.		
-65	-66.3	88.4	9	23	77/0.4	100/0.9		Sat.		
-70	-71.3	93.4	6	7	18	25		Sat.		
-75	-76.3	98.4	5	9	13	22		Sat.		

-52.3 74.4
-54.6 76.7
-56.8 78.9
-58.9 81.0
-62.3 84.4
-68.9 91.0
-73.9 96.0
-77.8 99.9

Boring Terminated at Elevation -77.8 ft in SAND (River Bend Formation)

Loss of circulation at 83.0' and from 84.9' to 88.4'
Caving at 30.0'
Drill chatter at 74.3' and from 89.9' to 90.9'
Strata break in split spoon at depths 19.4', 74.4', 78.9' and 84.4'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B10-B RL	**STATION** 183+09	**OFFSET** 59 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.2 ft	**TOTAL DEPTH** 99.9 ft	**NORTHING** 410,468	**EASTING** 2,624,534	**24 HR.** 0.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Powell, B.	**START DATE** 05/01/18	**COMP. DATE** 05/01/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
25											
	21.2	0.0	WOH	WOH	1	1		M		21.2 GROUND SURFACE	0.0
20										**ALLUVIAL** Brown, silty SAND (A-2-4), contains trace organics	
	17.8	3.4	2	2	2	4		Sat.		18.2	3.0
15										**UNDIVIDED COASTAL PLAIN** Gray, silty SAND (A-2-4)	
	12.8	8.4	WOH	WOH	WOH	0		W		15.2	6.0
10										**COASTAL PLAIN** Gray, silty CLAY (A-7-6, A-6) (DUPLIN FORMATION)	
	7.8	13.4	WOH	1	1	2		W		10.2	11.0
5											
	2.8	18.4	WOH	1	2	3		W		1.6	19.6
0										Gray, SAND (A-3), with trace clay in part (DUPLIN FORMATION)	
	-2.2	23.4	1	1	1	2		Sat.			
-5											
	-7.2	28.4	3	5	6	11		Sat.			
-10											
	-12.2	33.4	WOH	3	5	8		Sat.		-9.8 Gray, sandy CLAY (A-6) (DUPLIN FORMATION)	31.0
-15										-12.7 Gray, SAND (A-3) (DUPLIN FORMATION)	33.9
	-17.2	38.4	4	5	6	11		Sat.			
-20											
	-22.2	43.4	1	1	2	3		W		-22.5 Gray, silty CLAY (A-6), contains trace shell fragments (DUPLIN FORMATION)	43.7
-25											
	-27.2	48.4	2	2	2	4		W			
-30											
	-32.2	53.4	2	2	3	5		W			
-35											
	-37.2	58.4	1	2	3	5		W			
-40											
	-42.2	63.4	2	1	2	3		W			
-45											
	-47.2	68.4	2	8	29	37		W		-48.2	69.4
-50										**COASTAL PLAIN** Gray and green, SAND (A-3, A-2-4), contains cemented shell and limestone fragments (RIVER BEND FORMATION)	
	-52.2	73.4	11	12	15	27		Sat.		-54.8	76.0
-55											

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
	-57.2	78.4	8	9	15	24		Sat.		Gray and green, SAND (A-3, A-2-4), contains cemented shell and limestone fragments (RIVER BEND FORMATION) *(continued)*
-60										
	-62.2	83.4	4	3	5	8		Sat.		
-65										
	-67.2	88.4	20	54	46/0.5	100/1.0				-69.8 91.0
-70										-72.7 93.9
	-72.2	93.4	65	35/0.5		100/1.0				-73.4 **COASTAL PLAIN SEDIMENTARY ROCK** Gray, moderately hard, sandy LIMESTONE (RIVER BEND FORMATION) 94.6
-75										**COASTAL PLAIN** Gray, SAND (A-3), with limestone fragments (RIVER BEND FORMATION)
	-77.2	98.4	15	14	9	23		Sat.		-78.7 99.9
										Boring Terminated at Elevation -78.7 ft in SAND (River Bend Formation)
										Drill chatter from 72.6' to 75.1', 87.7' to 88.4' and 93.9' to 94.6'
										Strata breaks in split spoon at depths 19.6', 33.9', 43.7' and 69.4'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B11-A LL	**STATION** 184+39	**OFFSET** 61 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.6 ft	**TOTAL DEPTH** 99.9 ft	**NORTHING** 410,419	**EASTING** 2,624,364	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Powell, B.	**START DATE** 05/01/18	**COMP. DATE** 05/01/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
30										
25	22.6	0.0	WOH	WOH	1	1		M		22.6 0.0 GROUND SURFACE **ALLUVIAL** Dark brown silty SAND (A-2-4)
20	19.2	3.4	2	3	1	4		Sat.		19.6 3.0 **UNDIVIDED COASTAL PLAIN** Gray and orange, silty SAND (A-2-4), with trace clay
15	14.2	8.4	WOH	WOH	WOH	0		W		16.6 6.0 **COASTAL PLAIN** Gray, CLAY (A-7-6) (DUPLIN FORMATION)
10	9.2	13.4	WOH	WOH	WOH	0		W		
5	4.2	18.4	WOH	1	2	3		W		3.2 19.4 1.6 21.0 Gray, clayey SAND (A-2-4, A-3) (DUPLIN FORMATION)
0	-0.8	23.4	5	4	5	9		Sat.		-3.4 26.0 Gray, CLAY (A-7-6) (DUPLIN FORMATION)
-5	-5.8	28.4	3	3	2	5		Sat.		-6.3 28.9 Gray, SAND (A-3) (DUPLIN FORMATION)
-10	-10.8	33.4	1	5	10	15		Sat.		-8.4 31.0 Gray, CLAY (A-7-6) (DUPLIN FORMATION)
-15	-15.8	38.4	6	9	9	18		Sat.		-11.3 33.9 Gray, SAND (A-3) (DUPLIN FORMATION)
-20	-20.8	43.4	3	2	3	5		Sat.		-23.4 46.0 Gray, silty CLAY (A-6), contains trace shell fragments (DUPLIN FORMATION)
-25	-25.8	48.4	1	2	2	4		W		
-30	-30.8	53.4	2	2	3	5		W		
-35	-35.8	58.4	2	3	3	6		W		
-40	-40.8	63.4	WOH	1	2	3		W		
-45	-45.8	68.4	WOH	1	1	2		W		
-50										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B11-A LL	**STATION** 184+39	**OFFSET** 61 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.6 ft	**TOTAL DEPTH** 99.9 ft	**NORTHING** 410,419	**EASTING** 2,624,364	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Powell, B.	**START DATE** 05/01/18	**COMP. DATE** 05/01/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50	-50.8	73.4	3	5	17	22		Sat.		-51.3 73.9 Gray, silty CLAY (A-6), contains trace shell fragments (DUPLIN FORMATION) *(continued)* **COASTAL PLAIN** Gray and tan, cemented, clayey, fine to coarse SAND (A-2-4, A-3), contains shell and limestone fragments (RIVER BEND FORMATION)
-55	-55.8	78.4	4	5	40	45		Sat.		
-60	-60.8	83.4	12	9	7	16		Sat.		
-65	-65.8	88.4	8	8	10	18		Sat.		
-70	-70.8	93.4	6	3	7	10		Sat.		-73.4 96.0
-75	-75.8	98.4	14	10	9	19		Sat.		-77.3 99.9 Boring Terminated at Elevation -77.3 ft in SAND (River Bend Formation) Strata breaks in split spoon at depths 19.4', 28.9', 33.9' and 73.9'

Match Line

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. B11-B RL	**STATION** 184+38	**OFFSET** 61 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 21.5 ft	**TOTAL DEPTH** 109.9 ft	**NORTHING** 410,528	**EASTING** 2,624,420	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Powell, B.	**START DATE** 05/02/18	**COMP. DATE** 05/02/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
35										
30										
25										
20	21.5	0.0	WOH	WOH	WOH	0		M		21.5 GROUND SURFACE 0.0 **ALLUVIAL** Brown, silty, clayey SAND (A-2-4)
15	18.1	3.4	WOH	2	2	4		Sat.		17.1 4.4 **UNDIVIDED COASTAL PLAIN** Gray and orange, SAND (A-2-4), with trace clay 6.0 15.5 **COASTAL PLAIN** Gray, silty, sandy CLAY (A-7-6, A-6) (DUPLIN FORMATION)
10	13.1	8.4	WOH	WOH	WOH	0		W		10.5 11.0
5	8.1	13.4	WOH	WOH	WOH	0		W		
0	3.1	18.4	1	1	1	2		W		0.5 21.0 Gray, SAND (A-3), with trace clay (DUPLIN FORMATION)
-5	-1.9	23.4	4	3	2	5		Sat.		
-10	-6.9	28.4	2	2	7	9		Sat.		
-15	-11.9	33.4	3	5	5	10		Sat.		
-20	-16.9	38.4	7	9	10	19		Sat.		
-25	-21.9	43.4	5	7	9	16		Sat.		-24.5 46.0 Gray, fine sandy CLAY (A-6)(8), with little silt and trace sand, contains shell fragments (DUPLIN FORMATION)
-30	-26.9	48.4	2	2	3	5		W		
-35	-31.9	53.4	2	2	3	5		W		
-40	-36.9	58.4	2	1	3	4		W		
-45	-41.9	63.4	WOH	WOH	1	1	SS-624	42% W		

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-45						Match Line				
-50	-46.9	68.4	WOH	WOH	2	2		W		Gray, fine sandy CLAY (A-6)(8), with little silt and trace sand, contains shell fragments (DUPLIN FORMATION) *(continued)*
-55	-51.9	73.4	10	11	14	25		Sat.		-49.5 71.0 **COASTAL PLAIN** Gray and green, cemented, silty, fine to medium SAND (A-3, A-2-4), contains shell and limestone fragments (RIVER BEND FORMATION)
-60	-56.9	78.4	62	38/0.5		100/1.0				-54.5 76.0
-65	-61.9	83.4	9	5	5	10		Sat.		
-70	-66.9	88.4	5	7	36	43		Sat.		-69.5 91.0
-75	-71.9	93.4	19	60/0.1		60/0.1				
-80	-76.9	98.4	11	10	13	23		Sat.		-79.5 101.0
-85	-81.9	103.4	6	7	11	18		Sat.		
	-86.9	108.4	6	8	13	21		Sat.		-88.4 109.9 Boring Terminated at Elevation -88.4 ft in SAND (River Bend Formation) Drill chatter from 75.3' tp 76.3', 90.3' to 90.8' and 94.0' to 94.5' Strata break in split spoon and a depth of 4.4'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. EB2-A LL	**STATION** 185+78	**OFFSET** 50 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 23.1 ft	**TOTAL DEPTH** 79.4 ft	**NORTHING** 410,491	**EASTING** 2,624,245	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Powell, B.	**START DATE** 05/02/18	**COMP. DATE** 05/03/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
25										
	23.1	0.0	WOH	1	1	2		M		23.1 GROUND SURFACE 0.0
20	19.7	3.4	2	3	5	8		Sat.		22.1 **ALLUVIAL** 1.0 Dark brown, moderately organic SAND (A-2-4) 20.1 3.0 Brown, silty SAND (A-2-4) 17.1 **UNDIVIDED COASTAL PLAIN** 6.0 Gray, silty SAND (A-2-4)
15	14.7	8.4	WOH	WOH	WOH	0		W		**COASTAL PLAIN** Gray, sandy CLAY (A-7-6, A-6) (DUPLIN FORMATION)
10	9.7	13.4	WOH	WOH	WOH	0		W		
5	4.7	18.4	WOH	1	2	3		W		3.7 19.4
0	-0.3	23.4	WOH	1	1	2		Sat.		-0.8 23.9 Gray, SAND (A-3), contains shell fragments (DUPLIN FORMATION)
-5	-5.3	28.4	2	4	9	13		Sat.		
-10	-10.3	33.4	2	2	3	5		W		-7.9 31.0 Gray, sandy CLAY (A-6), with sand interbeds (DUPLIN FORMATION)
-15	-15.3	38.4	5	7	8	15		Sat.		-12.9 36.0 Gray, SAND (A-3), with trace clay (DUPLIN FORMATION)
-20	-20.3	43.4	8	9	10	19		Sat.		
-25	-25.3	48.4	6	5	3	8		Sat.		-27.9 51.0 Gray, fine sandy CLAY (A-6(9)), with little silt and trace coarse sand, contains shell fragments (DUPLIN FROMATION)
-30	-30.3	53.4	2	3	3	6		Sat.		
-35	-35.3	58.4	2	3	3	6		Sat.		
-40	-40.3	63.4	2	1	3	4		Sat.		
-45	-45.3	68.4	WOH	1	1	2	SS-648	39%		-47.9 71.0 **COASTAL PLAIN** Gray and green, phosphatic, silty, fine to coarse SAND (A-3, A-2-4), contains shell fragments (RIVER BEND FORMATION)
-50	-50.3	73.4	10	60/0.1		60/0.1				-52.9 76.0
-55										

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 276 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. EB2-A LL	**STATION** 185+78	**OFFSET** 50 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 23.1 ft	**TOTAL DEPTH** 79.4 ft	**NORTHING** 410,491	**EASTING** 2,624,245	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Powell, B.	**START DATE** 05/02/18	**COMP. DATE** 05/03/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
	-55.3	78.4	80	20/0.5		100/1.0				-56.3 79.4 Gray and green, phosphatic, silty, fine to coarse SAND (A-3, A-2-4), contains shell fragments (RIVER BEND FORMATION) *(continued)* Boring Terminated at Elevation -56.3 ft in SAND (River Bend Formation) Drill chatter from 74.3' to 75.6' Loss of circulation at 78.4' Strata breaks in split spoon at depths 19.4' and 23.9'

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 185+91	**OFFSET** 59 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.1 ft	**TOTAL DEPTH** 99.9 ft	**NORTHING** 410,594	**EASTING** 2,624,282	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Powell, B.	**START DATE** 05/03/18	**COMP. DATE** 05/04/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
35										
30										
25										
20	22.1	0.0	WOH	WOH	1	1		M		22.1 GROUND SURFACE 0.0 21.6 0.5 **ALLUVIAL** Brown, silty SAND (A-2-4)
	18.7	3.4	WOH	1	3	4		Sat.		**UNDIVIDED COASTAL PLAIN** Tan and orange, SAND (A-2-4), with clay, contains trace organics
15	13.7	8.4	WOH	WOH	WOH	0		W		16.1 6.0 **COASTAL PLAIN** Gray, CLAY (A-7-6), with some fine sand and silt (DUPLIN FORMATION)
10	8.7	13.4	WOH	WOH	1	1		W		
5	3.7	18.4	WOH	WOH	WOH	0		61% W		
0	-1.3	23.4	1	2	3	5		W		
-5	-6.3	28.4	5	7	8	15		Sat.		-6.8 28.9 -8.9 31.0 Gray, clayey SAND (A-2-4, A-3), contains shell fragments, with trace clay (DUPLIN FORMATION)
-10	-11.3	33.4	3	3	5	8		Sat.		
-15	-16.3	38.4	8	11	12	23		Sat.		
-20	-21.3	43.4	10	10	11	21		Sat.		
-25	-26.3	48.4	1	2	3	5		W		-23.9 46.0 Gray, silty CLAY (A-7-6), contains shell fragments (DUPLIN FORMATION)
-30	-31.3	53.4	2	3	3	6		W		
-35	-36.3	58.4	2	3	3	6		W		
-40	-41.3	63.4	1	1	2	3		W		
-45										

NCDOT BORE DOUBLE R1015_GEO_SITE 3.GPJ NC_DOT.GDT 7/13/18

WBS 34360.1.1	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** Grainger, P.	
SITE DESCRIPTION Site 3 - Bridge No. 277 Over East Prong of Slocum Creek on US 70 (Havelock Bypass)				**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 185+91	**OFFSET** 59 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 22.1 ft	**TOTAL DEPTH** 99.9 ft	**NORTHING** 410,594	**EASTING** 2,624,282	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 08/20/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Powell, B.	**START DATE** 05/03/18	**COMP. DATE** 05/04/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-45						Match Line				
	-46.3	68.4	1	1	3	4		W		Gray, silty CLAY (A-7-6), contains shell fragments (DUPLIN FORMATION) *(continued)*
-50	-51.3	73.4	12	15	14	29		W		-48.9 71.0 **COASTAL PLAIN** Gray and green, silty, fine to medium SAND (A-3, A-2-4), phosphatic, contains shell and limestone fragments (RIVER BEND FORMATION)
-55	-56.3	78.4	7	6	11	17		Sat.		-53.9 76.0
-60	-61.3	83.4	3	8	14	22		Sat.		
-65	-66.3	88.4	4	2	6	8		Sat.		
-70	-71.3	93.4	7	9	9	18		Sat.		
-75	-76.3	98.4	14	15	13	28		Sat.		-77.8 99.9 Boring Terminated at Elevation -77.8 ft in SAND (River Bend Formation) Drill chatter from 75.1' to 76.1' Strata break in split spoon at a depth of 0.5' ST-4 taken in offset boring at STA 185+90 63' RT Other Samples: ST-4 (16.1 - 18.1)

PROJECT REFERENCE NO.	SHEET NO.
R-1015	43

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-327	60 LT	169+52	8.6-10.1	A-2-4(0)	NP	NP	9.8	74.1	2.2	13.9	100	99	17.7	26.2	-
SS-336	60 LT	169+52	53.6-55.1	A-3(0)	NP	NP	1.8	90.7	0	7.7	100	99.6	9	23.7	-
SS-5	61 RT	172+22	19.6-21.1	A-3(0)	NP	NP	28.1	69.9	0.3	1.7	99.8	97.1	2.5	20.2	-
SS-98	87 RT	174+86	38.0-39.5	A-7-5(15)	50	29	14.9	31.8	19.5	33.8	92.5	81.5	59.4	37.5	-
SS-99	87 RT	174+86	43.0-44.5	A-6 (1)	35	15	44.1	23.5	11.2	21.2	96.2	68.5	35.9	31.6	-
SS-100	87 RT	174+86	48.0-49.5	A-1-b(0)	NP	NP	71.8	22.4	0.2	5.6	99	49	6.4	14.7	-
SS-130	61 RT	176+04	72.4-73.9	A-2-4(0)	NP	NP	40.6	38.2	9.6	11.3	88.8	64.9	20.9	16.2	-
SS-471	65 LT	180+38	53.5-55.0	A-1-b(0)	NP	NP	82.3	12.6	0	5.7	98.5	43.6	6	19.4	-
SS-536	52 LT	181+77	43.4-44.9	A-7-6(26)	53	35	10.7	25	26.2	38.1	99.1	91.6	75.2	56.4	-
SS-511	62 RT	181+72	28.4-29.9	A-4(0)	NP	NP	43	24.3	16.6	16.1	100	71.9	37.6	41.9	-
SS-624	61 RT	184+38	63.4-64.9	A-6(8)	38	17	8.2	42.8	18	31	97.3	91.2	60.3	41.6	-
SS-648	50 LT	185+78	68.4-69.9	A-6(9)	38	19	5.5	47.1	16.5	30.9	99.4	95.7	58.7	39.4	-
ST-1	58 RT	169+54	4.5-6.5	A-6(3)	34	12	0.2	59.1	6	34.7	100	99.9	45.2	29.2	-
ST-4	63 RT	185+90	16.1-18.1	A-7-6(31)	61	37	0.2	22.9	22.7	54.2	100	99.9	80.5	60.7	-

Photo 1: Looking towards End Bent 2 and up station of -L-

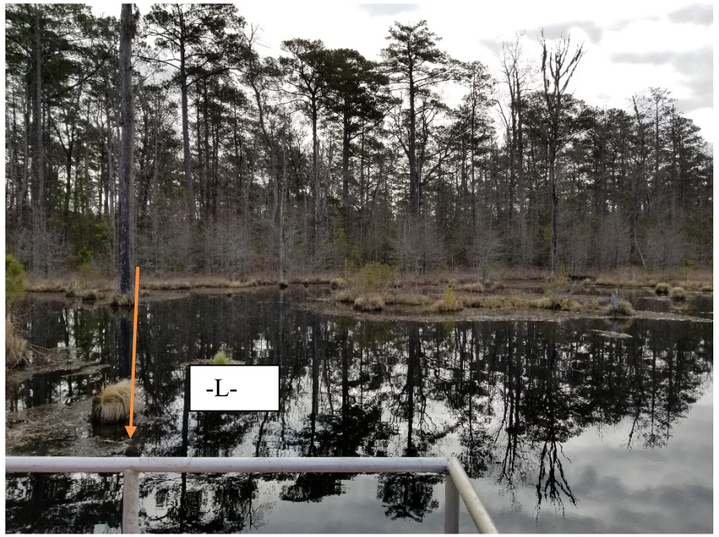


Photo 2: Looking towards End Bent 1 and down station of -L-

Photo 3: Looking upstream at the East Prong of Slocum Creek

Photo 4: Looking downstream at the East Prong of Slocum Creek

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-1015	1	21

REFERENCE: R-1015

PROJECT: 34360

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CRAVEN*

PROJECT DESCRIPTION *US 70 (Havelock Bypass) from North of Pine Grove to North of Carteret County Line*

SITE DESCRIPTION *Site No. 4 – Bridge Nos. 278 and 279 on –L– (US 70 Havelock Bypass) over –RR EY2– (Camp Lejeune Railroad) STA 227+57.02 –L– /22+70.14 –RR EY2–*

CONTENTS

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PERSONNEL

GW Stalls

BR Spiro

MR English

BB Bahhur

KR Cullen

RM Bleifernich

INVESTIGATED BY *GET SOLUTIONS*

DRAWN BY *BB Bahhur, KR Cullen*

CHECKED BY *GW Stalls*

SUBMITTED BY *GW Stalls*

DATE *June 2018*

NORTH CAROLINA PROFESSIONAL SEAL 034336 ENGINEER GERALD W. STALLS

DocuSigned by:
Gerald W. Stalls, Jr.
D9E3B27263A8414...

6/26/2018

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-1015	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

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-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX		50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
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 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (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

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	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	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

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

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.

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
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2.88" STEEL TEETH
- [X] TRICONE 3.25" STEEL TEETH
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

ROCK DESCRIPTION

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:

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 YEILD 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 SLI.)	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 (SLI.)	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. *IF TESTED, WOULD YIELD SPT REFUSAL*
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. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
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. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
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 PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
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

BEDDING

TERM	THICKNESS
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

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.

TERMS AND DEFINITIONS

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 (N 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.

BENCH MARK: BM12 STA 228+71.03 -L-, 242.76' LT., RR SPIKE IN TREE.

ELEVATION: 28.81 FEET

NOTES:

DATE: 6-12-18

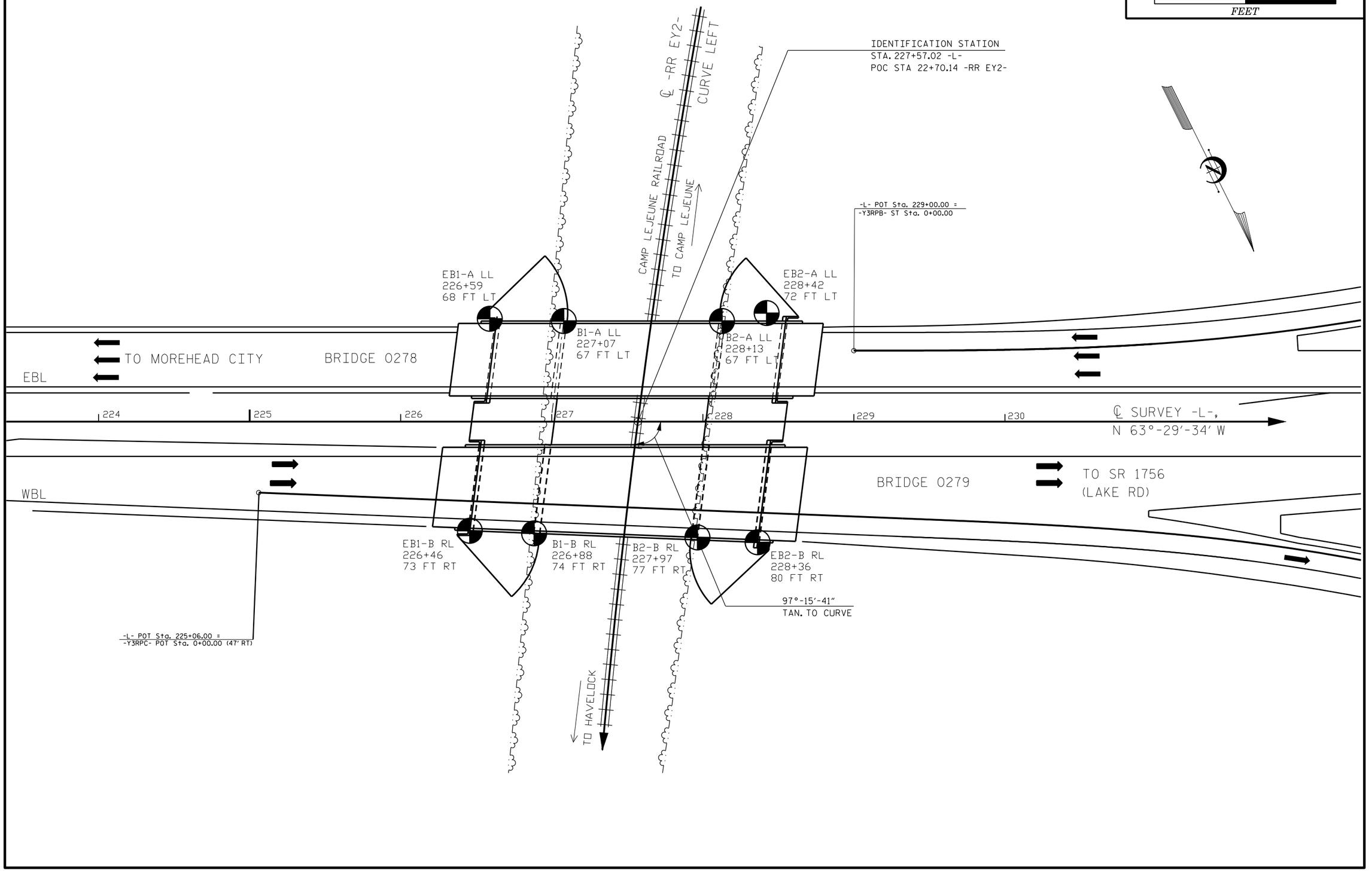
PROJECT REFERENCE NO.	SHEET NO.
R-1015	3

SITE PLAN

0 60 120

FEET

BENCH MARK: BM12 STA. 228+71.03 -L-, 242.76' LT., RR SPIKE IN TREE. EL. 28.81



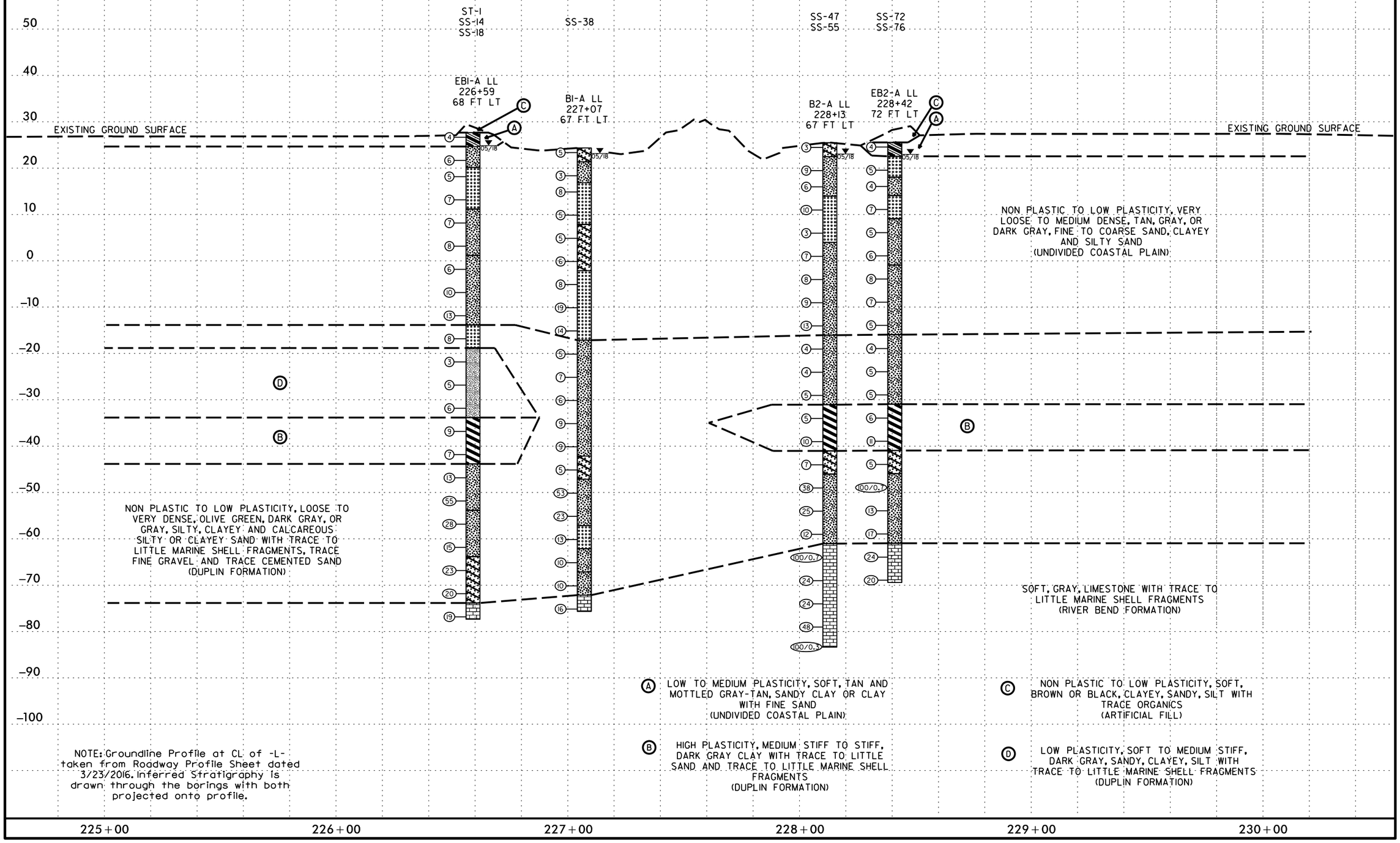
0	40	80

FEET

VE = 2.0

PROJECT REFERENCE NO.	SHEET NO.
R-1015	4

BRIDGE 278 SUBSURFACE PROFILE ALONG CENTERLINE -L-



NOTE: Groundline Profile at CL of -L- taken from Roadway Profile Sheet dated 3/23/2016. Inferred Stratigraphy is drawn through the borings with both projected onto profile.

(A) LOW TO MEDIUM PLASTICITY, SOFT, TAN AND MOTTLED GRAY-TAN, SANDY CLAY OR CLAY WITH FINE SAND (UNDIVIDED COASTAL PLAIN)

(B) HIGH PLASTICITY, MEDIUM STIFF TO STIFF, DARK GRAY CLAY WITH TRACE TO LITTLE SAND AND TRACE TO LITTLE MARINE SHELL FRAGMENTS (DUPLIN FORMATION)

(C) NON PLASTIC TO LOW PLASTICITY, SOFT, BROWN OR BLACK, CLAYEY, SANDY, SILT WITH TRACE ORGANICS (ARTIFICIAL FILL)

(D) LOW PLASTICITY, SOFT TO MEDIUM STIFF, DARK GRAY, SANDY, CLAYEY, SILT WITH TRACE TO LITTLE MARINE SHELL FRAGMENTS (DUPLIN FORMATION)

PROJECT REFERENCE NO.	SHEET NO.
R-1015	5

BRIDGE 279 SUBSURFACE PROFILE ALONG CENTERLINE -L-

0 40 80
FEET
VE = 2.0

SS-98
SS-100
SS-113
SS-121
SS-134
SS-141
SS-153
SS-163
ST-2
SS-165
ST-3

EB1-B RL
226+46
73 FT RT
B1-B RL
226+88
74 FT RT
B2-B RL
227+97
77 FT RT
EB2-B RL
228+36
80 FT RT

EXISTING GROUND SURFACE
EXISTING GROUND SURFACE

50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100

NON PLASTIC TO LOW PLASTICITY, VERY LOOSE TO MEDIUM DENSE, TAN, GRAY, TAN-GRAY, TAN-ORANGEISH TAN, OR DARK GRAY, FINE TO COARSE SAND, CLAYEY SAND, OR SILTY SAND
(UNDIVIDED COASTAL PLAIN)

SOFT, GRAY, LIMESTONE WITH TRACE MARINE SHELL FRAGMENTS
(RIVER BEND FORMATION)

NON PLASTIC TO LOW PLASTICITY, LOOSE TO VERY DENSE, GRAY, DARK GRAY, OR GRAY-TAN, CLAYEY, SILTY, AND CALCAREOUS SAND WITH TRACE TO LITTLE MARINE SHELL FRAGMENTS, TRACE FINE GRAVEL, AND TRACE CEMENTED SAND
(DUPLIN FORMATION)

NOTE: Groundline Profile at CL of -L- taken from Roadway Profile Sheet dated 3/23/2016. Inferred Stratigraphy is drawn through the borings with both projected onto profile.

Ⓐ LOW PLASTICITY, SOFT, TAN OR GRAY, SANDY CLAY WITH TRACE SILT OR TRACE ORGANIC MATTER
(UNDIVIDED COASTAL PLAIN)

Ⓑ LOW PLASTICITY, SOFT, BROWN OR BLACK, CLAYEY, SILT WITH FINE TO COARSE SAND AND TRACE ORGANICS
(ARTIFICIAL FILL)

Ⓒ NON PLASTIC TO HIGH PLASTICITY, MEDIUM STIFF TO STIFF, DARK GRAY, CLAY, WITH TRACE TO LITTLE SAND, SILT AND MARINE SHELL FRAGMENTS
(DUPLIN FORMATION)

Ⓓ NON PLASTIC TO LOW PLASTICITY, VERY LOOSE TO LOOSE, GRAY OR DARK GRAY, CLAYEY SAND WITH TRACE TO LITTLE SILT AND MARINE SHELL FRAGMENTS
(DUPLIN FORMATION)

225+00 226+00 227+00 228+00 229+00 230+00

8/23/99

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-1015	6

CROSS SECTION THROUGH END BENT 1

VE = 1
SKEW = 97° -15' -41"

ST-1
SS-14
SS-18

EBI-A LL
226+59
68 FT LT

SS-98
SS-100

EBI-B RL
226+46
73 FT RT

EXISTING GROUND SURFACE

05/18

NON PLASTIC TO LOW PLASTICITY, LOOSE TO MEDIUM DENSE, TAN, GRAY, OR DARK GRAY, FINE TO COARSE SAND, CLAYEY AND SILTY SAND (UNDIVIDED COASTAL PLAIN)

NON PLASTIC TO HIGH PLASTICITY, SOFT TO STIFF, DARK GRAY SANDY, CLAYEY SILT, SILTY CLAY AND SANDY CLAY WITH TRACE TO LITTLE MARINE SHELL FRAGMENTS (DUPLIN FORMATION)

NON PLASTIC TO LOW PLASTICITY, LOOSE TO VERY DENSE, OLIVE GREEN, DARK GRAY, OR GRAY, CLAYEY, SILTY AND CALCAREOUS SILTY OR CLAYEY SAND WITH TRACE TO LITTLE MARINE SHELL FRAGMENTS, TRACE FINE GRAVEL AND TRACE CEMENTED SAND (DUPLIN FORMATION)

SOFT, GRAY, LIMESTONE WITH TRACE TO LITTLE MARINE SHELL FRAGMENTS (RIVER BEND FORMATION)

A — LOW PLASTICITY, SOFT, TAN, SANDY CLAY WITH TRACE TO LITTLE SILT OR TRACE ORGANIC MATTER (UNDIVIDED COASTAL PLAIN)

B — NON PLASTIC TO LOW PLASTICITY, LOOSE, GRAY AND DARK GRAY, MEDIUM TO COARSE SAND AND CLAYEY SAND WITH TRACE TO LITTLE SILT AND MARINE SHELL FRAGMENTS (DUPLIN FORMATION)

- L -

226+51

NOTE: Groundline cross section taken from .tin file dated 5/15/2014. Inferred stratigraphy is drawn through the borings with both projected onto the cross section

8/23/99

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-1015	7

CROSS SECTION THROUGH BENT 1

VE = 1
SKEW = 97° -15' -41"

SS-38

BI-A LL
227+07
67 FT LT

SS-113
SS-121

BI-B RL
226+88
74 FT RT

EXISTING GROUND SURFACE

05/18

05/18

NON PLASTIC TO LOW PLASTICITY, VERY LOOSE TO MEDIUM DENSE, TAN, ORANGISH-TAN, GRAY, OR DARK GRAY, FINE TO COARSE SAND, CLAYEY AND SILTY SAND (UNDIVIDED COASTAL PLAIN)

NON PLASTIC TO LOW PLASTICITY, VERY LOOSE TO VERY DENSE, OLIVE GREEN, DARK GRAY, OR GRAY, SILTY, CLAYEY AND CALCAREOUS SILTY OR CLAYEY SAND WITH TRACE TO LITTLE MARINE SHELL FRAGMENTS, TRACE FINE GRAVEL AND TRACE CEMENTED SAND (DUPLIN FORMATION)

SOFT, GRAY, LIMESTONE WITH TRACE TO LITTLE MARINE SHELL FRAGMENTS (RIVER BEND FORMATION)

A — LOW PLASTICITY, SOFT, GRAY, SANDY CLAY WITH SILT (UNDIVIDED COASTAL PLAIN)

B — MEDIUM PLASTICITY, MEDIUM STIFF, DARK GRAY CLAY WITH TRACE TO LITTLE SAND (DUPLIN FORMATION)

- L -

226+97

NOTE: Groundline cross section taken from .tin file dated 5/15/2014. Inferred stratigraphy is drawn through the borings with both projected onto the cross section

8/23/99

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-1015	8

CROSS SECTION THROUGH BENT 2

VE = 1
SKEW = 97° -15' -41"

SS-47
SS-55

B2-A LL
228+13
67 FT LT

SS-134
SS-141

B2-B RL
227+97
77 FT RT

EXISTING GROUND SURFACE

05/18

NON PLASTIC TO LOW PLASTICITY SAND, VERY LOOSE TO MEDIUM DENSE, REDDISH TAN, TAN, GRAY, OR DARK GRAY, FINE TO COARSE SAND, CLAYEY SAND AND SILTY SAND
(UNDIVIDED COASTAL PLAIN)

NON PLASTIC TO LOW PLASTICITY, LOOSE, DARK GRAY, OR GRAY, CLAYEY SAND WITH TRACE TO LITTLE SILT AND MARINE SHELL FRAGMENTS
(DUPLIN FORMATION)

NON PLASTIC TO LOW PLASTICITY, LOOSE TO VERY DENSE, OLIVE GREEN, DARK GRAY, OR GRAY, SILTY, CLAYEY AND CALCAREOUS SILTY OR CLAYEY SAND WITH TRACE TO LITTLE MARINE SHELL FRAGMENTS, TRACE FINE GRAVEL AND TRACE CEMENTED SAND
(DUPLIN FORMATION)

SOFT, GRAY, LIMESTONE WITH TRACE TO LITTLE MARINE SHELL FRAGMENTS
(RIVER BEND FORMATION)

HIGH PLASTICITY, MEDIUM STIFF TO STIFF, DARK GRAY CLAY WITH TRACE TO LITTLE SAND, AND MARINE SHELL FRAGMENTS
(DUPLIN FORMATION)

NOTE: Groundline cross section taken from .tin file dated 5/15/2014. Inferred stratigraphy is drawn through the borings with both projected onto the cross section

228+01

8/23/99

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-1015	9

CROSS SECTION THROUGH END BENT 2

VE = 1
SKEW = 97° -15' -41"

SS-72
SS-76

EB2-A LL
228+42
72 FT LT

SS-153
SS-163
ST-2
SS-165
ST-3

EB2-B RL
228+36
80 FT RT

EXISTING GROUND SURFACE

05/18

NON PLASTIC TO LOW PLASTICITY, VERY LOOSE TO MEDIUM DENSE, TAN, GRAY, OR DARK GRAY, FINE TO COARSE SAND, CLAYEY SAND AND SILTY SAND (UNDIVIDED COASTAL PLAIN)

NON PLASTIC TO LOW PLASTICITY, LOOSE, DARK GRAY, CLAYEY SAND WITH TRACE TO LITTLE SILT AND MARINE SHELL FRAGMENTS (DUPLIN FORMATION)

NON PLASTIC TO LOW PLASTICITY, LOOSE TO VERY DENSE, OLIVE GREEN, DARK GRAY, OR GRAY, SILTY, CLAYEY AND CALCAREOUS SILTY OR CLAYEY SAND WITH TRACE TO LITTLE MARINE SHELL FRAGMENTS, TRACE FINE GRAVEL AND TRACE CEMENTED SAND (DUPLIN FORMATION)

SOFT, GRAY, LIMESTONE WITH TRACE TO LITTLE MARINE SHELL FRAGMENTS (RIVER BEND FORMATION)

A — NON PLASTIC TO LOW PLASTICITY, SOFT, BROWN OR BLACK, CLAYEY SILT WITH SAND AND TRACE ORGANICS (ARTIFICIAL FILL)

B — MEDIUM PLASTICITY, SOFT, MOTTLED GRAY-TAN, CLAY WITH FINE SAND (UNDIVIDED COASTAL PLAIN)

C — LOW TO HIGH PLASTICITY, MEDIUM STIFF TO STIFF, DARK GRAY CLAY WITH TRACE TO LITTLE SAND, SILT, AND MARINE SHELL FRAGMENTS (DUPLIN FORMATION)

- L -

228+45

NOTE: Groundline cross section taken from .tin file dated 5/15/2014. Inferred stratigraphy is drawn through the borings with both projected onto the cross section

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich	
SITE DESCRIPTION Site No. 4 - Bridge No. 278 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. EB1-A LL	**STATION** 226+59	**OFFSET** 68 ft LT	**ALIGNMENT** -L-	**0 HR.** 2.4
COLLAR ELEV. 27.4 ft	**TOTAL DEPTH** 105.0 ft	**NORTHING** 412,296	**EASTING** 2,620,585	**24 HR.** 2.8
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/18/18	**COMP. DATE** 05/22/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) — DEPTH (ft)
30										
	27.4	0.0	1	2	2	4		M		27.4 — 0.0 GROUND SURFACE
25										**UNDIVIDED COASTAL PLAIN** Low Plasticity, Soft, Tan, Sandy, CLAY with Trace to Little Silt
	22.4	5.0	2	2	4	6		W		24.4 — 3.0 **UNDIVIDED COASTAL PLAIN** Non Plastic, Loose, Gray and Tan, Silty, Fine to Coarse SAND with Trace Clay
20										19.9 — 7.5
	18.9	8.5	2	2	3	5		W		**UNDIVIDED COASTAL PLAIN** Non Plastic, Loose, Gray, Fine to Medium SAND with Trace Silt
15										
	13.9	13.5	3	3	4	7		W		10.9 — 16.5
10										**UNDIVIDED COASTAL PLAIN** Non Plastic, Loose, Gray or Tan, Silty, Fine to Medium SAND with Trace Clay
	8.9	18.5	3	3	4	7		W		
5										
	3.9	23.5	3	5	3	8		W		0.9 — 26.5
0										**UNDIVIDED COASTAL PLAIN** Non Plastic, Loose to Medium Dense, Dark Gray or Gray, Fine to Coarse SAND with Trace to Little Silt and Clay High Plasticity CLAY with Sand Lense at 28.5 to 28.8'
	-1.1	28.5	2	2	4	6		W		
-5										
	-6.1	33.5	4	4	6	10		W		
-10										
	-11.1	38.5	4	6	7	13		W		
-15										-14.1 — 41.5 **COASTAL PLAIN** Non Plastic, Loose, Dark Gray, Medium to Coarse SAND with Trace Silt and Marine Shell Fragments ("Duplin Formation")
	-16.1	43.5	4	4	4	8		W		
-20										-19.1 — 46.5 **COASTAL PLAIN** Low Plasticity, Soft to Medium Stiff, Dark Gray, Sandy, Clayey SILT with Trace to Little Marine Shell Fragments ("Duplin Formation")
	-21.1	48.5	1	1	2	3		W		
-25								35% W		
	-26.1	53.5	2	2	3	5		W		
-30										
	-31.1	58.5	2	3	3	6		W		
-35										-34.1 — 61.5 **COASTAL PLAIN** High Plasticity, Medium Stiff to Stiff, Dark Gray, Silty CLAY with Trace to Little Sand and Marine Shell Fragments ("Duplin Formation")
	-36.1	63.5	2	4	5	9	SS-14	61% W		
-40										
	-41.1	68.5	2	3	4	7		W		
-45										-44.1 — 71.5 **COASTAL PLAIN** Non Plastic, Medium Dense to Very Dense, Olive Green or Gray, Silty, Fine to Medium SAND with Trace to Little Marine Shell Fragments ("Duplin Formation")
	-46.1	73.5	3	6	7	13		W		
-50										

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich	
SITE DESCRIPTION Site No. 4 - Bridge No. 278 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. EB1-A LL	**STATION** 226+59	**OFFSET** 68 ft LT	**ALIGNMENT** -L-	**0 HR.** 2.4
COLLAR ELEV. 27.4 ft	**TOTAL DEPTH** 105.0 ft	**NORTHING** 412,296	**EASTING** 2,620,585	**24 HR.** 2.8
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/18/18	**COMP. DATE** 05/22/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
	-51.1	78.5	30	26	29	55		W		-54.1 — 81.5 **COASTAL PLAIN** Non Plastic, Medium Dense, Gray, Calcareous, Fine to Coarse SAND with Trace Clay, Little Silt, and Trace to Little Marine Shell Fragments, Trace Clay, and Trace Cemented Sand ("Duplin Formation")
-55										
	-56.1	83.5	14	10	18	28	SS-18	25% W		
-60										
	-61.1	88.5	9	7	8	15		W		-64.1 — 91.5 **COASTAL PLAIN** Low Plasticity, Medium Dense, Gray, Calcareous, Clayey, Fine to Medium SAND with Trace to Little Silt, Trace to Little Marine Shell Fragments, and Trace Cemented Sand Fragments ("Duplin Formation")
-65										
	-66.1	93.5	9	11	12	23		W		
-70										
	-71.1	98.5	11	9	11	20		W		-74.1 — 101.5 **COASTAL PLAIN SEDIMENTARY ROCK** Soft, Gray, LIMESTONE with Trace Marine Shell Fragments ("River Bend Formation")
-75										
	-76.1	103.5	9	11	8	19		W		-77.6 — 105.0 Boring Terminated at Elevation -77.6 ft in Soft, LIMESTONE with Trace Marine Shell Fragments ("River Bend Formation") Other Samples: ST-1 (50.0 - 52.0)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich	
SITE DESCRIPTION Site No. 4 - Bridge No. 278 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. B1-A LL	**STATION** 227+07	**OFFSET** 67 ft LT	**ALIGNMENT** -L-	**0 HR.** 0.8
COLLAR ELEV. 24.1 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 412,319	**EASTING** 2,620,542	**24 HR.** 1.2
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/16/18	**COMP. DATE** 05/17/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) — DEPTH (ft)
25	24.1	0.0	1	2	3	5		M		24.1 — 0.0 GROUND SURFACE
										21.1 — 3.0 **UNDIVIDED COASTAL PLAIN** Low Plasticity, Loose, Mottled Gray-Tan, Clayey, Fine to Medium SAND with Trace Silt
20	19.1	5.0	2	2	1	3		W		**UNDIVIDED COASTAL PLAIN** Non Plastic, Very Loose, Tan or Gray, Silty, Fine to Medium SAND with Trace Clay
	15.6	8.5								16.6 — 7.5
15			5	4	4	8		W		**UNDIVIDED COASTAL PLAIN** Non Plastic, Loose, Tan-Reddish Tan or Gray, Fine to Medium SAND with Trace Silt
10	10.6	13.5	3	2	3	5		W		7.6 — 16.5 **UNDIVIDED COASTAL PLAIN** Low Plasticity, Loose, Tan or Reddish Tan, Clayey, Silty, Fine to Coarse SAND
5	5.6	18.5	1	2	3	5		W		
0	0.6	23.5	2	3	3	6		W		-2.4 — 26.5 **UNDIVIDED COASTAL PLAIN** Non Plastic, Loose to Medium Dense, Dark Gray, Fine to Coarse SAND with Trace to Little Silt and Clay
-5	-4.4	28.5	3	4	4	8		W		
-10	-9.4	33.5	3	6	13	19		W		
-15	-14.4	38.5	7	7	7	14		W		
-20	-19.4	43.5	2	2	3	5		W		-17.4 — 41.5 **COASTAL PLAIN** Non Plastic to Low Plasticity, Loose, Dark Gray and Gray, Clayey, Fine to Coarse SAND with Trace to Little Silt and Trace to Little Marine Shell Fragments ("Duplin Formation")
-25	-24.4	48.5	3	3	4	7		W		
-30	-29.4	53.5	3	3	3	6		W		
-35	-34.4	58.5	3	4	5	9		W		
-40	-39.4	63.5	2	4	5	9		W		
-45	-44.4	68.5	2	2	3	5		W		-42.4 — 66.5 **COASTAL PLAIN** Low Plasticity, Loose, Dark Gray, Silty, Clayey, Fine to Coarse SAND with Trace to Little Marine Shell Fragments and Trace Cemented Sand ("Duplin Formation")
-50	-49.4	73.5	4	5	48	53	SS-38	15% W		-47.4 — 71.5 **COASTAL PLAIN** Non Plastic, Medium Dense to Very Dense, Gray, Silty, Fine to Coarse SAND with Trace Fine Gravel and Cemented Sand Fragments ("Duplin Formation")
-55	-54.4	78.5								

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich	
SITE DESCRIPTION Site No. 4 - Bridge No. 278 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. B1-A LL	**STATION** 227+07	**OFFSET** 67 ft LT	**ALIGNMENT** -L-	**0 HR.** 0.8
COLLAR ELEV. 24.1 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 412,319	**EASTING** 2,620,542	**24 HR.** 1.2
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/16/18	**COMP. DATE** 05/17/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55	-59.4	83.5	18	13	10	Match Line 23		W		-57.4 — 81.5 **COASTAL PLAIN** Non Plastic, Medium Dense, Gray, Fine to Medium SAND with Trace Silt ("Duplin Formation")
-60	-64.4	88.5	8	7	6	13		W		-62.4 — 86.5 **COASTAL PLAIN** Low Plasticity, Medium Dense, Dark Gray, Silty, Fine to Medium SAND with Trace Clay ("Duplin Formation")
-65	-69.4	93.5	5	4	6	10		W		-67.4 — 91.5 **COASTAL PLAIN** Non Plastic, Medium Dense, Olive Green or Dark Gray, Calcareous, Silty, Fine to Medium SAND with Trace to Little Marine Shell Fragments, Trace Clay, Trace Fine Gravel, and Trace Cemented Sand Fragments ("Duplin Formation")
-70	-74.4	98.5	9	4	6	10		W		-72.4 — 96.5
-75			7	8	8	16		W		-75.9 — 100.0 **COASTAL PLAIN SEDIMENTARY ROCK** Soft, Gray, LIMESTONE with Trace to Little Marine Shell Fragments ("River Bend Formation") Boring Terminated at Elevation -75.9 ft in Soft, LIMESTONE with Trace to Little Marine Shell Fragments ("River Bend Formation")

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich	
SITE DESCRIPTION Site No. 4 - Bridge No. 278 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. B2-A LL	**STATION** 228+13	**OFFSET** 67 ft LT	**ALIGNMENT** -L-	**0 HR.** 2.1
COLLAR ELEV. 25.2 ft	**TOTAL DEPTH** 108.8 ft	**NORTHING** 412,366	**EASTING** 2,620,448	**24 HR.** 2.4
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/21/18	**COMP. DATE** 05/22/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
30										
25	25.2	0.0	2	1	2	3		M		25.2 / 0.0 GROUND SURFACE
20	20.2	5.0	5	5	4	9		W		22.2 / 3.0 **UNDIVIDED COASTAL PLAIN** Low Plasticity, Very Loose, Mottled Gray and Reddish Tan, Clayey, Fine to Medium SAND with Trace Silt **UNDIVIDED COASTAL PLAIN** Low Plasticity, Loose, Gray, Silty, Fine to Medium SAND with Trace Clay
15	16.7	8.5	2	2	4	6		W		
10	11.7	13.5	4	5	5	10	SS-47	24% W		13.7 / 11.5 **UNDIVIDED COASTAL PLAIN** Non Plastic, Very Loose to Medium Dense, Tan or Gray, Fine to Coarse SAND with Trace Silt and Clay
5	6.7	18.5	1	1	2	3		W		
0	1.7	23.5	4	3	4	7		W		3.7 / 21.5 **UNDIVIDED COASTAL PLAIN** Non Plastic, Loose to Medium Dense, Dark Gray, Silty, Fine to Medium SAND with Trace to Little Clay
-5	-3.3	28.5	2	3	5	8		W		
-10	-8.3	33.5	5	5	4	9		W		
-15	-13.3	38.5	3	5	8	13		W		
-20	-18.3	43.5	2	2	2	4		W		-16.3 / 41.5 **COASTAL PLAIN** Non Plastic to Low Plasticity, Loose, Dark Gray and Gray, Clayey, Fine to Coarse SAND with Trace to Little Silt and Trace to Little Marine Shell Fragments ("Duplin Formation")
-25	-23.3	48.5	1	2	2	4		W		
-30	-28.3	53.5	2	2	3	5	SS-55	25% W		
-35	-33.3	58.5	2	3	2	5		W		-31.3 / 56.5 **COASTAL PLAIN** High Plasticity, Medium Stiff to Stiff, Dark Gray, CLAY with Trace to Little Sand and Trace to Little Marine Shell Fragments ("Duplin Formation")
-40	-38.3	63.5	4	5	5	10		W		
-45	-43.3	68.5	2	3	4	7		W		-41.3 / 66.5 **COASTAL PLAIN** Low Plasticity, Loose, Dark Gray, Clayey, Silty, Fine to Medium SAND with Little Marine Shell Fragments ("Duplin Formation")
-50	-48.3	73.5	3	8	30	38		W		-46.3 / 71.5

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich	
SITE DESCRIPTION Site No. 4 - Bridge No. 278 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. B2-A LL	**STATION** 228+13	**OFFSET** 67 ft LT	**ALIGNMENT** -L-	**0 HR.** 2.1
COLLAR ELEV. 25.2 ft	**TOTAL DEPTH** 108.8 ft	**NORTHING** 412,366	**EASTING** 2,620,448	**24 HR.** 2.4
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/21/18	**COMP. DATE** 05/22/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
-55	-53.3	78.5	10	12	13	25		W		**COASTAL PLAIN** Non Plastic, Medium Dense to Dense, Olive Green or Gray, Calcareous, Silty, Fine SAND with Trace to Little Marine Shell Fragments and Trace Cemented Sand Fragments ("Duplin Formation") *(continued)*
-60	-58.3	83.5	4	6	6	12		W		
-65	-63.3	88.5	22	12	100/0.2	100/0.7		W		-61.3 / 86.5 **COASTAL PLAIN SEDIMENTARY ROCK** Soft, Gray, LIMESTONE with Trace to Little Marine Shell Fragments ("River Bend Formation")
-70	-68.3	93.5	22	12	12	24		W		
-75	-73.3	98.5	42	11	13	24		W		
-80	-78.3	103.5	26	16	32	48		W		
	-83.3	108.5	100/0.3			100/0.3		W		-83.6 / 108.8 Boring Terminated at Elevation -83.6 ft in Soft, LIMESTONE with Trace to Little Marine Shell Fragments ("River Bend Formation")

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich	
SITE DESCRIPTION Site No. 4 - Bridge No. 278 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. EB2-A LL	**STATION** 228+42	**OFFSET** 72 ft LT	**ALIGNMENT** -L-	**0 HR.** 2.0
COLLAR ELEV. 25.3 ft	**TOTAL DEPTH** 95.0 ft	**NORTHING** 412,374	**EASTING** 2,620,419	**24 HR.** 2.6
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/21/18	**COMP. DATE** 05/22/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
30										
25	25.3	0.0	1	2	2	4		M		25.3 GROUND SURFACE 0.0 **UNDIVIDED COASTAL PLAIN** Medium Plasticity, Soft, Mottled Gray-Tan, CLAY, with Fine Sand
20	20.3	5.0	3	3	2	5		W		22.3 3.0 **UNDIVIDED COASTAL PLAIN** Non Plastic, , Loose, Tan to Gray, Fine to Medium SAND with Trace Silt
15	16.8	8.5	1	2	2	4		W		17.8 7.5 **UNDIVIDED COASTAL PLAIN** Low Plasticity, Very Loose, Gray-Tan, Silty, Fine to Medium SAND with Trace Clay
10	11.8	13.5	3	3	4	7		W		13.8 11.5 **UNDIVIDED COASTAL PLAIN** Non Plastic, Loose, Tan, Fine to Medium SAND with Trace Silt
5	6.8	18.5	1	2	3	5		W		8.8 16.5 **UNDIVIDED COASTAL PLAIN** Low Plasticity, Loose, Dark Gray, Silty, Fine to Medium SAND with Trace Clay
0	1.8	23.5	1	3	3	6		W		-1.2 26.5 **UNDIVIDED COASTAL PLAIN** Non Plastic to Low Plasticity, Loose, Dark Gray, Fine to Coarse SAND with Little Clay and Trace Silt
-5	-3.2	28.5	2	2	6	8	SS-72	29% W		
-10	-8.2	33.5	3	4	3	7		W		
-15	-13.2	38.5	3	2	3	5		W		-16.2 41.5 **COASTAL PLAIN** Non Plastic to Low Plasticity, Loose, Dark Gray, Clayey, Fine to Coarse SAND with Trace to Little Silt and Trace to Little Marine Shell Fragments ("Duplin Formation")
-20	-18.2	43.5	1	1	3	4		W		
-25	-23.2	48.5	2	2	3	5	SS-76	28% W		
-30	-28.2	53.5	2	2	3	5		W		-31.2 56.5 **COASTAL PLAIN** High Plasticity, Medium Stiff to Stiff, Dark Gray, CLAY with Trace to Little Sand and Trace to Little Marine Shell Fragments ("Duplin Formation")
-35	-33.2	58.5	3	3	3	6		W		
-40	-38.2	63.5	4	5	6	11		W		-41.2 66.5 **COASTAL PLAIN** Low Plasticity, Loose, Dark Gray, Clayey, Fine to Medium SAND with Little Silt and Trace to Little Marine Shell Fragments ("Duplin Formation")
-45	-43.2	68.5	1	2	3	5		W		-46.2 71.5
-50	-48.2	73.5	4	8	100/0.2	100/0.7		W		

NCDOT BORE DOUBLE EC18-161G_R-1015_SITE 4.GPJ NC_DOT.GDT 7/19/18

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich	
SITE DESCRIPTION Site No. 4 - Bridge No. 278 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. EB2-A LL	**STATION** 228+42	**OFFSET** 72 ft LT	**ALIGNMENT** -L-	**0 HR.** 2.0
COLLAR ELEV. 25.3 ft	**TOTAL DEPTH** 95.0 ft	**NORTHING** 412,374	**EASTING** 2,620,419	**24 HR.** 2.6
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/21/18	**COMP. DATE** 05/22/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
-55	-53.2	78.5	5	6	7	13		W		**COASTAL PLAIN** Non Plastic, Medium Dense to Very Dense, Olive Green or Gray, Calcareous, Silty, Fine SAND with Trace to Little Marine Shell Fragments, Trace Cemented Sand Fragments, and Trace Fine Gravel ("Duplin Formation") *(continued)*
-60	-58.2	83.5	8	7	10	17		W		
-65	-63.2	88.5	14	13	11	24		W		-61.2 86.5 **COASTAL PLAIN SEDIMENTARY ROCK** Soft, Gray, LIMESTONE with Trace Marine Shell Fragments ("River Bend Formation")
	-68.2	93.5	14	12	8	20		W		-69.7 95.0 Boring Terminated at Elevation -69.7 ft in Soft, LIMESTONE with Trace Marine Shell Fragments ("River Bend Formation")

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** M. English	
SITE DESCRIPTION Site No. 4 - Bridge No. 279 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. EB1-B RL	**STATION** 226+46	**OFFSET** 73 ft RT	**ALIGNMENT** -L-	**0 HR.** 4.4
COLLAR ELEV. 26.6 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 412,416	**EASTING** 2,620,659	**24 HR.** 2.4
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/17/18	**COMP. DATE** 05/18/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
30										
	26.6	0.0	2	2	2	4		M		26.6 GROUND SURFACE 0.0 **UNDIVIDED COASTAL PLAIN** Low Plasticity, Soft, Tan, Sandy, CLAY with Trace Organic Matter
25	21.6	5.0	2	3	5	8		W		23.6 3.0 **UNDIVIDED COASTAL PLAIN** Non Plastic, Loose to Medium Dense, Tan and Gray, Fine to Medium SAND with Trace Silt and Trace Clay
20	18.1	8.5	3	5	5	10		W		
15	13.1	13.5	1	2	3	5		W		15.1 11.5 **UNDIVIDED COASTAL PLAIN** Low Plasticity, Loose, Tan, Clayey, SAND with Trace Silt
10	8.1	18.5	3	3	3	6		W		10.1 16.5 **UNDIVIDED COASTAL PLAIN** Non Plastic, Loose, Tan, Fine to Medium SAND with Trace Silt
5	3.1	23.5	2	4	2	6		W		
0	-1.9	28.5	4	4	5	9		W		0.1 26.5 **UNDIVIDED COASTAL PLAIN** Non Plastic, Loose to Medium Dense, Gray, Fine to Medium SAND with Trace Silt and Trace Clay
-5	-6.9	33.5	3	5	6	11		W		
-10	-11.9	38.5	6	9	9	18		W		
-15	-16.9	43.5	6	8	8	16		W		
-20	-21.9	48.5	1	2	3	5		W		-19.9 46.5 **COASTAL PLAIN** Non Plastic to Low Plasticity, Loose, Gray, Clayey Fine to Coarse SAND with Trace to Little Silt and Trace to Little Marine Shell Fragments ("Duplin Formation")
-25	-26.9	53.5	1	2	3	5		W		
-30	-31.9	58.5	2	4	4	8	SS-98	28% W		-29.9 56.5 **COASTAL PLAIN** Non Plastic to Low Plasticity, Medium Stiff to Stiff, Gray, Sandy, Silty, CLAY with Trace to Little Marine Shell Fragments ("Duplin Formation")
-35	-36.9	63.5	3	5	5	10		W		
-40	-41.9	68.5	2	2	3	5	SS-100	25% W		-39.9 66.5 **COASTAL PLAIN** Low Plasticity, Loose, Gray, Clayey, Fine to Coarse SAND with Little Silt and Little Marine Shell Fragments ("Duplin Formation")
-45	-46.9	73.5	7	7	11	18		W		-44.9 71.5 **COASTAL PLAIN** Non Plastic, Medium Dense to Very Dense, Gray, Silty Fine to Medium SAND with Trace Fine Gravel ("Duplin Formation")
-50										

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** M. English	
SITE DESCRIPTION Site No. 4 - Bridge No. 279 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. EB1-B RL	**STATION** 226+46	**OFFSET** 73 ft RT	**ALIGNMENT** -L-	**0 HR.** 4.4
COLLAR ELEV. 26.6 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 412,416	**EASTING** 2,620,659	**24 HR.** 2.4
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/17/18	**COMP. DATE** 05/18/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
	-51.9	78.5	7	8	45	53		W		**COASTAL PLAIN** Non Plastic, Medium Dense to Very Dense, Gray, Silty Fine to Medium SAND with Trace Fine Gravel ("Duplin Formation") *(continued)*
-55	-56.9	83.5	44	22	18	40		W		-54.9 81.5 **COASTAL PLAIN** Non Plastic, Dense, Gray, Calcareous, Silty, Fine to Medium SAND with Trace to Little Marine Shell Fragments, Trace Cemented Sand Fragments, and Trace Fine Gravel ("Duplin Formation")
-60	-61.9	88.5	27	15	22	37		W		
-65	-66.9	93.5	4	16	10	26		W		-64.9 91.5 **COASTAL PLAIN SEDIMENTARY ROCK** Soft, Gray, LIMESTONE with Trace Marine Shell Fragments ("River Bend Formation")
-70	-71.9	98.5	8	8	11	19		W		-73.4 100.0 Boring Terminated at Elevation -73.4 ft in Soft, LIMESTONE with Trace Marine Shell Fragments ("River Bend Formation")

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich	
SITE DESCRIPTION Site No. 4 - Bridge No. 279 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. B1-B RL	**STATION** 226+88	**OFFSET** 74 ft RT	**ALIGNMENT** -L-	**0 HR.** 2.2
COLLAR ELEV. 24.0 ft	**TOTAL DEPTH** 110.0 ft	**NORTHING** 412,436	**EASTING** 2,620,622	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/16/18	**COMP. DATE** 05/17/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
25										
	24.0	0.0	2	2	2	4		M		24.0 / 0.0 GROUND SURFACE
20										**UNDIVIDED COASTAL PLAIN** Low Plasticity, Soft, Gray, Sandy, CLAY with Silt
	19.0	5.0	3	5	5	10		W		21.0 / 3.0
15	15.5	8.5	4	5	4	9		W		**UNDIVIDED COASTAL PLAIN** Non-Plastic, Loose to Medium Dense, Gray, Fine SAND with Silt
	10.5	13.5	3	3	3	6		W		
10										
	5.5	18.5	1	2	4	6		W		7.5 / 16.5 **UNDIVIDED COASTAL PLAIN** Low Plasticity, Loose, Tan-Gray, Silty, Clayey, Fine to Medium SAND
5										
	0.5	23.5	1	2	3	5		W		
0										
	-4.5	28.5	5	3	3	6	SS-113	25% W		-2.5 / 26.5 **UNDIVIDED COASTAL PLAIN** Non Plastic, Loose, Tan-Orangish Tan, Fine to Medium SAND with Trace Silt and Clay
-5										
	-9.5	33.5	4	4	6	10		W		-7.5 / 31.5 **UNDIVIDED COASTAL PLAIN** Non Plastic, Medium Dense, Dark Gray, Fine to Medium SAND with Trace Silt
-10										
	-14.5	38.5	5	8	10	18		W		
-15										
	-19.5	43.5	1	1	2	3		W		-17.5 / 41.5 **COASTAL PLAIN** Non Plastic to Low Plasticity, Very Loose to Loose, Dark Gray, Clayey, Fine to Coarse SAND with Trace to Little Silt and Trace to Little Marine Shell Fragments ("Duplin Formation")
-20										
	-24.5	48.5	2	2	2	4		W		
-25										
	-29.5	53.5	2	3	3	6		W		
-30										
	-34.5	58.5	4	3	4	7		W		-32.5 / 56.5 **COASTAL PLAIN** Medium Plasticity, Medium Stiff, Dark Gray, CLAY, with Trace to Little Sand ("Duplin Formation")
-35										
	-39.5	63.5	2	3	3	6		W		
-40										
	-44.5	68.5	5	11	15	26	SS-121	22% W		-42.5 / 66.5 **COASTAL PLAIN** Non Plastic, Medium Dense, Gray-Tan, Fine to Coarse SAND with Trace Silt, Trace Clay, and Little Marine Shell Fragments ("Duplin Formation")
-45										
	-49.5	73.5	4	4	6	10		W		-47.5 / 71.5 **COASTAL PLAIN** Non Plastic, Medium Dense, Gray-Tan, Silty, Fine to Coarse SAND with Trace to Little Marine Shell Fragments and Trace Clay ("Duplin Formation")
-50										
	-54.5	78.5								-52.5 / 76.5
-55										

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich	
SITE DESCRIPTION Site No. 4 - Bridge No. 279 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. B1-B RL	**STATION** 226+88	**OFFSET** 74 ft RT	**ALIGNMENT** -L-	**0 HR.** 2.2
COLLAR ELEV. 24.0 ft	**TOTAL DEPTH** 110.0 ft	**NORTHING** 412,436	**EASTING** 2,620,622	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/16/18	**COMP. DATE** 05/17/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55						Match Line				
	-59.5	83.5	17	11	14	25		W		**COASTAL PLAIN** Non Plastic, Medium Dense, Gray, Fine to Medium SAND with Trace Silt and Clay ("Duplin Formation") *(continued)*
-60										-57.5 / 81.5
	-64.5	88.5	5	5	12	17		W		**COASTAL PLAIN** Low Plasticity, Medium Dense to Dense, Dark Gray, Silty, Clayey, Fine to Coarse SAND with Little Marine Shell Fragments and Trace Cemented Sand ("Duplin Formation")
-65										
	-69.5	93.5	20	18	19	37		W		-67.5 / 91.5 **COASTAL PLAIN** Non Plastic, Medium Dense, Gray or Dark Gray, Silty, Fine to Medium SAND with Trace to Little Clay, Little Marine Shell Fragments, Trace Coarse Sand, and Trace Fine Gravel ("Duplin Formation")
-70										
	-74.5	98.5	10	8	18	26		W		
-75										
	-79.5	103.5	10	11	14	25		W		-77.5 / 101.5 **COASTAL PLAIN** Low Plasticity, Medium Dense, Dark Gray, Calcareous, Silty, Fine SAND with Trace to Little Clay, Little Marine Shell Fragments, Trace Fine Gravel, and Trace Cemented SAND ("Duplin Formation")
-80										
	-84.5	108.5	11	14	12	26		W		-82.5 / 106.5 **COASTAL PLAIN SEDIMENTARY ROCK** Soft, Gray, LIMESTONE with Trace Marine Shell Fragments ("River Bend Formation")
-85										
			17	23	24	47		W		-86.0 / 110.0 Boring Terminated at Elevation -86.0 ft in Soft, LIMESTONE with Trace Marine Shell Fragments ("River Bend Formation")

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich
SITE DESCRIPTION Site No. 4 - Bridge No. 279 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)			**GROUND WTR (ft)**
BORING NO. B2-B RL	**STATION** 227+97	**OFFSET** 77 ft RT	**ALIGNMENT** -L-	**0 HR.** 2.5
COLLAR ELEV. 24.4 ft	**TOTAL DEPTH** 108.6 ft	**NORTHING** 412,487	**EASTING** 2,620,527	**24 HR.** 1.6
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER T. Donahue	**START DATE** 05/22/18	**COMP. DATE** 05/23/18	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
25	24.4	0.0	1	2	1	3		M		24.4 / 0.0 GROUND SURFACE
										UNDIVIDED COASTAL PLAIN Low Plasticity, Very Loose, Mottled Gray-Tan, Clayey, Fine SAND with Silt
	21.4	3.0								21.4 / 3.0
20	19.4	5.0	2	4	4	8		W		**UNDIVIDED COASTAL PLAIN** Non Plastic, Loose, Gray, Silty, Fine to Coarse SAND
15	15.9	8.5	2	3	5	8		W		
	12.9	11.5								12.9 / 11.5 **UNDIVIDED COASTAL PLAIN** Non Plastic, Medium Dense, Gray, Fine to Medium SAND
10	10.9	13.5	3	4	6	10		W		
	7.9	16.5								7.9 / 16.5 **UNDIVIDED COASTAL PLAIN** Non Plastic, Loose to Medium Dense, Dark Gray, Fine to Coarse SAND with Trace Silt and Trace Clay
5	5.9	18.5	3	3	3	6	SS-134	24% W		
0	0.9	23.5	2	2	3	5		W		
-5	-4.1	28.5	2	3	5	8		W		
-10	-9.1	33.5	2	5	5	10		W		
-15	-14.1	38.5	5	6	8	14		W		
-20	-19.1	43.5	1	2	3	5		W		
-25	-24.1	48.5	1	2	2	4		W		
-30	-29.1	53.5	2	2	3	5	SS-141	29% W		
-35	-34.1	58.5	2	3	4	7		W		
-40	-39.1	63.5	4	4	5	9		W		
-45	-44.1	68.5	2	3	5	8		W		
-50	-49.1	73.5	5	7	7	14		W		
-55	-54.1	78.5	10	12	13					

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich
SITE DESCRIPTION Site No. 4 - Bridge No. 279 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)			**GROUND WTR (ft)**
BORING NO. B2-B RL	**STATION** 227+97	**OFFSET** 77 ft RT	**ALIGNMENT** -L-	**0 HR.** 2.5
COLLAR ELEV. 24.4 ft	**TOTAL DEPTH** 108.6 ft	**NORTHING** 412,487	**EASTING** 2,620,527	**24 HR.** 1.6
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER T. Donahue	**START DATE** 05/22/18	**COMP. DATE** 05/23/18	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-55	-59.1	83.5	7	6	9	Match Line		W		-55.4 / 79.8 **COASTAL PLAIN** Low Plasticity, Medium Dense to Very Dense, Gray and Tan, Calcareous, Silty, Fine to Medium SAND with Trace Clay, Trace Cemented Sand, and Marine Shell Fragments ("Duplin Formation")
-60	-64.1	88.5	12	22	40	62		W		
-65	-69.1	93.5	8	5	11	16		W		-67.1 / 91.5 **COASTAL PLAIN SEDIMENTARY ROCK** Soft, Gray, LIMESTONE with Trace Marine Shell Fragments ("River Bend Formation")
-70	-74.1	98.5	11	11	14	25		W		
-75	-79.1	103.5	22	10	36	46		W		
-80	-84.1	108.5	100/0.1			100/0.1		W		-84.2 / 108.6 Boring Terminated with Standard Penetration Test Refusal at Elevation -84.2 ft in Soft, LIMESTONE with Trace Marine Shell Fragments ("River Bend Formation")

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich	
SITE DESCRIPTION Site No. 4 - Bridge No. 279 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 228+36	**OFFSET** 80 ft RT	**ALIGNMENT** -L-	**0 HR.** 5.6
COLLAR ELEV. 27.1 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 412,508	**EASTING** 2,620,492	**24 HR.** 4.1
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/22/18	**COMP. DATE** 05/23/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
30										
	27.1	0.0	1	2	2	4				27.1 / 0.0 GROUND SURFACE
25							SS-153	23% M		**ARTIFICIAL FILL** Low Plasticity, Soft, Black, Clayey, SILT with Fine to Coarse Sand and Trace Organics
	24.1	3.0								24.1 / 3.0
	22.1	5.0	1	2	3	5		W		**UNDIVIDED COASTAL PLAIN** Low Plasticity, Loose, Gray, Clayey, SAND with Silt and Trace Wood Fragments
20										
	19.6	7.5								19.6 / 7.5
	18.6	8.5	2	4	5	9		W		**UNDIVIDED COASTAL PLAIN** Non Plastic, Loose to Medium Dense, Gray, Fine to Medium SAND with Trace Silt
15										
	13.6	13.5	5	6	9	15		W		
10										
	8.6	18.5	2	4	4	8		W		
5										
	3.6	23.5	5	8	7	15		W		
0										
	-1.4	28.5	3	2	5	7		W		
-5										
	-6.4	33.5	5	6	6	12		W		
-10										
	-11.4	38.5	4	4	7	11		W		
-15										
	-16.4	43.5	5	5	5	10		W		
-20										
	-21.4	48.5	2	3	3	6	SS-163	31% W		0.6 / 26.5 **UNDIVIDED COASTAL PLAIN** Non Plastic to Low Plasticity, Loose to Medium Dense, Gray, Silty, Fine to Coarse SAND with Trace Clay Low Plasticity, CLAY with Trace Sand Lense from 29.3 to 29.8 Feet
-25								34% W		
	-22.9	50.0								-22.9 / 50.0 (Duplin Formation)
	-26.4	53.5	2	3	2	5		W		**COASTAL PLAIN** Low Plasticiy, Medium Stiff, Dark Gray, Sandy CLAY with Trace Silt and Trace to Little Marine Shell Fragments ("Duplin Formation")
-30										
	-29.4	56.5								-29.4 / 56.5
	-31.4	58.5	4	4	2	6	SS-165	30% W		**COASTAL PLAIN** Low Plasticity, Loose, Dark Gray, Silty, Clayey, Fine to Medium SAND with Little Marine Shell Fragments ("Duplin Formation")
-35								57% W		
	-32.9	60.0								-32.9 / 60.0
	-36.4	63.5	3	3	3	6		W		**COASTAL PLAIN** High Plasticity, Medium Stiff, Dark Gray, Silty, CLAY with Trace Sand and Little Marine Shell Fragments ("Duplin Formation")
-40										
	-39.4	66.5								-39.4 / 66.5
	-41.4	68.5	2	3	3	6		W		**COASTAL PLAIN** Low Plasticity, Loose, Dark Gray, Clayey, Fine to Medium SAND with Little Silt and Little Marine Shell Fragments ("Duplin Formation")
-45										
	-44.4	71.5								-44.4 / 71.5
	-46.4	73.5	1	2	3	5		W		**COASTAL PLAIN** Non Plastic, Loose to Very Dense, Dark Gray, Silty, Fine to Medium SAND with Clay and Little Marine Shell Fragments ("Duplin Formation")
-50										

NCDOT BORE DOUBLE EC18-161G_R-1015_SITE 4.GPJ NC_DOT.GDT 7/19/18

WBS 34360.1.2	**TIP** R-1015	**COUNTY** CRAVEN	**GEOLOGIST** R. Bliefernich	
SITE DESCRIPTION Site No. 4 - Bridge No. 279 On -L- (US 70 Havelock Bypass) Over -RR EY2- (Camp Lejeune Railroad)				**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 228+36	**OFFSET** 80 ft RT	**ALIGNMENT** -L-	**0 HR.** 5.6
COLLAR ELEV. 27.1 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 412,508	**EASTING** 2,620,492	**24 HR.** 4.1
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 05/22/18	**COMP. DATE** 05/23/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
-50						Match Line				
	-51.4	78.5	30	100/0.4		100/0.4		W		-54.4 / 81.5 **COASTAL PLAIN** Non Plastic, Loose to Very Dense, Gray, Calcareous, Silty, Fine to Coarse SAND with Trace to Little Cemented Sand Fragments, Trace to Little Marine Shell Fragments, Trace Fine to Medium Gravel, and Trace Clay ("Duplin Formation")
-55	-56.4	83.5	15	12	4	16		W		
-60	-61.4	88.5	4	3	4	7		W		
-65	-66.4	93.5	53	14	50	64		W		
-70	-71.4	98.5	10	9	8	17		W		-69.4 / 96.5 **COASTAL PLAIN SEDIMENTARY ROCK** Soft, Gray, LIMESTONE with Trace Marine Shell Fragments ("River Bend Formation") -72.9 / 100.0 Boring Terminated at Elevation -72.9 ft in Soft, LIMESTONE with Trace Marine Shell Fragments ("River Bend Formation") Other Samples: ST-2 (50.0 - 52.0) ST-3 (60.0 - 62.0)

PROJECT REFERENCE NO.	SHEET NO.
R–1015	18

BRIDGE 0278

SOIL TEST RESULTS EB1–A LL

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
ST-1	68 FT LT	226+59	50.0 - 52.0	A-4(0)	29	3	3.8	51.5	16.1	28.7	99	97	57	35	==
SS-14	68 FT LT	226+59	63.5 - 65.0	A-7-5(69)	101	71	2.8	5.8	29.3	62.1	91	89	86	61	==
SS-18	68 FT LT	226+59	83.5 - 85.0	A-2-4(0)	NV	NP	13.4	69.0	11.7	6.0	91	90	18	25	==

SOIL TEST RESULTS B1–A LL

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-38	67 FT LT	227+07	73.5 - 75.0	A-2-4	NV	NP	--	--	--	--	--	--	13	15	--

SOIL TEST RESULTS B2–A LL

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-47	67 FT LT	228+13	13.5 - 15.0	A-3	NV	NP	8.6	88.5	0.9	2.0	100	99	3	24	--
SS-55	67 FT LT	228+13	53.5 - 55.0	A-2-4(0)	NV	NP	41.0	33.8	9.2	15.9	86	59	25	25	--

SOIL TEST RESULTS EB2–A LL

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-72	72 FT LT	228+42	28.5 - 30.0	A-2-4(0)	NV	NP	7.7	76.4	4.9	10.9	100	100	17	29	--
SS-76	72 FT LT	228+42	48.5 - 50.0	A-2-4(0)	NV	NP	9.1	66.6	10.3	14.0	95	89	34	28	--

DATE: 9-15-14

PROJECT REFERENCE NO.	SHEET NO.
R–1015	19

BRIDGE 0279

SOIL TEST RESULTS EB1–B RL

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-98	73 FT RT	226+46	58.5 - 60.0	A-6(1)	34	14	--	--	--	--	--	--	38	28	--
SS-100	73 FT RT	226+46	68.5 - 70.0	A-2-4(0)	26	9	27.5	44.3	10.1	18.1	86	77	32	25	--

SOIL TEST RESULTS B1–B RL

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-113	74 FT RT	226+88	28.5 - 30.0	A-3	NV	NP	4.4	86.6	2.0	7.0	100	100	10	25	--
SS-121	74 FT RT	226+88	68.5 - 70.0	A-2-4(0)	NV	NP	42.2	45.0	7.1	5.8	98	83	13	22	--

SOIL TEST RESULTS B2–B RL

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-134	77 FT RT	227+97	18.5 - 20.0	A-3	NV	NP	68.6	24.7	1.7	5.0	100	68	8	24	--
SS-141	77 FT RT	227+97	53.5 - 55.0	A-2-4(0)	29	8	25.9	42.1	11.9	20.1	69	57	27	29	--

SOIL TEST RESULTS EB2–B RL

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-153	80 FT RT	228+36	0.0 - 1.5	A-4(0)	NV	NP	11.3	55.9	15.3	17.6	100	98	36	23	3.9
SS-163	80 FT RT	228+36	48.5 - 50.0	A-2-7(0)	47	29	--	--	--	--	--	--	21	31	--
ST-2	80 FT RT	228+36	50.0 - 52.0	A-6(2)	39	16	3.6	67.5	8.5	20.3	99	98	39	34	--
SS-165	80 FT RT	228+36	58.5 - 60.0	A-2-4(0)	29	7	--	--	--	--	--	--	25	30	--
ST-3	80 FT RT	228+36	60.0 - 62.0	A-7-6(53)	75	48	1.6	7.5	25.8	65.1	99	98	95	57	--

DATE: 9-15-14

PROJECT REFERENCE NO.	SHEET NO.
R–1015	20

SITE PHOTOGRAPHS

Bridge 0278
LEFT BRIDGE

VIEW AT EB1-A LL ALONG -L-
FACING UP-STATIONING TOWARDS B1-A LL
AND -RR EY2-
(CAMP LEJEUNE RAILROAD)

VIEW AT EB2-A LL ALONG -L-
FACING DOWN-STATIONING TOWARDS B2-A LL
AND -RR EY2-
(CAMP LEJEUNE RAILROAD)

PROJECT REFERENCE NO.	SHEET NO.
R–1015	21

SITE PHOTOGRAPHS

Bridge 0279
RIGHT BRIDGE

VIEW AT EB1-B RL ALONG -L-
FACING UP-STATIONING TOWARDS B1-B RL
AND -RR EY2-
(CAMP LEJEUNE RAILROAD)

VIEW AT EB2-B RL ALONG -L-
FACING DOWN-STATIONING TOWARDS B2-B RL
AND -RR EY2-
(CAMP LEJEUNE RAILROAD)

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-1015	1	35

REFERENCE: R-1015

PROJECT: 34360

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *CRAVEN*

PROJECT DESCRIPTION *US 70 (Havelock Bypass) from North of Pine Grove to North of Carteret County Line*

SITE DESCRIPTION *MSE Retaining Walls 3 & 4: Site No. 9 – Dual Bridges on US 70 over 70 Business between SR 1747 and SR 1176 – Station 516+87.37 –L– / 69+02.79 –RP2AC–*

CONTENTS

APPENDICES

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. 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:
1. 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.
2. 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

P.M. WEAVER

C.R. PASTRANA

GET Solutions

INVESTIGATED BY *ESP Associates, INC.*

DRAWN BY *C.R. PASTRANA*

CHECKED BY *P.M. WEAVER*

SUBMITTED BY *ESP Associates, INC.*

DATE *August 2018*

ESP ASSOCIATES, INC.
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NORTH CAROLINA LICENSED SEAL 1500 GEOLOGIST PAUL M. WEAVER

DocuSigned by:
Paul M. Weaver 8/28/2018
01847D3739B240C... SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-1015	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

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-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
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 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (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

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	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	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

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

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.

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
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT / DPT / DMT / VST / PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] CME-45C
- [X] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [X] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16 " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

ROCK DESCRIPTION

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:

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 YEILD 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 SLI.)	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 (SLI.)	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. *IF TESTED, WOULD YIELD SPT REFUSAL*
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. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
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. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
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 PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
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

BEDDING

TERM	THICKNESS
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

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.

TERMS AND DEFINITIONS

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 (N 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.

BENCH MARK: BM-26: RR SPIKE IN TREE STA. 520+57.00 -L- 308' LEFT AND "r1015_ls_tin.tin" WAS USED TO DETERMINE GROUND ELEVATIONS AT BORINGS ELEVATION: 26.38 FEET

NOTES:

F.I.A.D. = FILLED IMMEDIATELY AFTER DRILLING

STATIONS AND OFFSETS FOR -WALL_3- AND -WALL_4- WERE MEASURED FROM "R-1015 MSE WALL_END BENT 1_Site 9.dgn" AND "R-1015 MSE WALL_END BENT 2_Site 9.dgn" FILES. NO GPK FILE WAS PROVIDED WITH WALL ALIGNMENTS. ALL BORINGS WERE REFERENCED TO -L- TO OBTAIN BORING ELEVATIONS. THE -L- STATION AND OFFSET EQUVIALENT FOR THE BORING LOCATIONS ARE PROVIDED ON THE BORING LOGS.

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-1015	3

SITE PLAN

0 40 80
FEET

SITE 9
BRIDGE SKEW = 126°41' 28"
MSE RETAINING WALLS 3 & 4

N

FLAGPOLE

RP2AC-

RWAL3-1

POINT "F"
STA. 13+83.68 -WALL_3-
STA. 516+64.81 -L-
OFFSET 138.63' LT.

RWAL3-2

BEGIN BRIDGE
-L- STA. 516+03.11

EBI-A LL

POINT "E"
STA. 13+16.68 -WALL_3-
STA. 516+64.81 -L-
OFFSET 71.62' LT.

BEGIN APPROACH SLAB
-L- STA. 515+79.33

515

EBI-B LL

POINT "D"
STA. 12+56.52 -WALL_3-
STA. 516+28.94 -L-
OFFSET 23.00' LT.

-L-

RWAL3-3

POINT "C"
STA. 11+99.98 -WALL_3-
STA. 515+96.06 -L-
OFFSET 23.00' RT.

EBI-B RL

POINT "B"
STA. 11+50.33 -WALL_3-
STA. 515+67.84 -L-
OFFSET 63.62' RT.

RWAL3-4

RWAL3-5

RWAL3-6

POINT "A"
BEGIN MSE WALL
STA. 10+00.00 -WALL_3-
STA. 514+84.43 -L-
OFFSET 186.81' RT.

POINT "A"
BEGIN MSE WALL
STA. 10+00.00 -WALL_4-
STA. 518+70.89 -L-
OFFSET 150.23' LT.

RWAL4-6

POINT "B"
STA. 11+03.00 -WALL_4-
STA. 518+02.32 -L-
OFFSET 71.63' LT.

RWAL4-5

EB2-A LL

POINT "C"
STA. 11+64.83 -WALL_4-
STA. 517+63.65 -L-
OFFSET 23.00' LT.

RWAL4-4

EB2-B LL

520

-L-

POINT "D"
STA. 12+22.87 -WALL_4-
STA. 517+28.25 -L-
OFFSET 23.00 RT.

RWAL4-3

POINT "E"
STA. 12+73.79 -WALL_4-
STA. 516+97.89 -L-
OFFSET 63.63' RT.

EB2-B RL

END APPROACH SLAB
-L- STA. 517+79.34

END BRIDGE
-L- STA. 517+55.61

RWAL4-2

POINT "F"
STA. 13+55.79 -WALL_4-
STA. 516+97.89 -L-
OFFSET 145.63' RT.

RWAL4-1

-L- POC STA. 516+87.37 =
-RP2AC- POT STA. 69+02.79

– BRIDGE SUPERSTRUCTURES NOT SHOWN FOR CLARITY.

REFERENCE "R1015_GEO_BRDG_Site9_Inventor Report" FOR BRIDGE DETAILS

0	40	80

FEET

VE = 2

PROJECT REFERENCE NO.	SHEET NO.
R-1015	4

SITE 9: END BENT 1
PROFILE ALONG
MSE RETAINING WALL 3

POINT "A"
STA. 10+00.00 -WALL_3-
STA. 514+84.43 -L-
OFFSET 186.81' RT.
BEGIN MSE WALL

BOTTOM OF WALL
EL. 29.69'

POINT "B"
STA. 11+50.33 -WALL_3-
STA. 515+67.84 -L-
OFFSET 63.62' RT.
GRADE ELEVATION
EL. 51.61'

POINT "C"
STA. 11+99.98 -WALL_3-
STA. 515+96.06 -L-
OFFSET 23.00' RT.
GRADE ELEVATION
EL. 49.75'

POINT "D"
STA. 12+56.52 -WALL_3-
STA. 516+28.94 -L-
OFFSET 23.00' LT.
GRADE ELEVATION
EL. 49.55'

POINT "E"
STA. 13+16.68 -WALL_3-
STA. 516+64.81 -L-
OFFSET 71.62' LT.
GRADE ELEVATION
EL. 47.23'

POINT "F"
STA. 13+83.68 -WALL_3-
STA. 516+64.81 -L-
OFFSET 138.63' LT.
END MSE WALL

BOTTOM OF WALL
EL. 32.13'

BOTTOM OF WALL
POINT "B"
BOTTOM OF WALL
EL. 30.37'
POINT "C"
BOTTOM OF WALL
EL. 30.77'
POINT "D"
BOTTOM OF WALL
EL. 31.22'
POINT "E"
BOTTOM OF WALL
EL. 31.70'

RWAL3-6 10+00 CL
RWAL3-5 10+47 CL
RWAL3-4 10+97 CL
EB1-B RL 11+47 7' LT
RWAL3-3 11+93 CL
EB1-B LL 12+38 6' LT
EB1-A LL 13+10 7' LT
RWAL3-2 13+34 CL
RWAL3-1 13+84 6' LT

SS-15 SS-14 SS-3 SS-4 SS-13 SS-2 SS-1 SS-12 SS-11

APPROXIMATE LINE OF EXISTING GRADE

Undivided Coastal Plain: Tan-Brown to Orange to Gray, Very Loose to Medium Dense, Silty SAND, Moist to Saturated

Coastal Plain: Greenish Gray to Tan-Brown and Thin Shell Fragments

to Gray with Clay Seams, Coastal Plain

Black, Very Loose to Medium Saturated (Duplin Formation)

Dense, Silty SAND with Sedimentary Rock: Gray and White,

Soft to Hard, LIMESTONE (Riverbend Formation)

BT FIAD 6/18

BT

(A) Alluvial: Very Soft, MUCK with Roots, Saturated
Note: Blow Counts Influenced by Roots

(B) Undivided Coastal Plain: Tan-Brown to Gray, Soft to Medium Stiff, Sandy CLAY, Saturated

(C) Coastal Plain: Green, Very Stiff, Sandy SILT with Shell Fragments, Saturated (Riverbend Formation)

- GROUNDLINE AND WALL PROFILE TAKEN FROM "R-1015 MSE WALL_END BENT 1_Site 9.dgn" FILE PROVIDED BY NCDOT DATED 5/21/2018.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE WALL PROFILE.
- ALL DIMENSIONS AND STATIONS ARE ALONG FRONT FACE OF WALL.

-WALL_3-

60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90

10+00 11+00 12+00 13+00 14+00

PROJECT REFERENCE NO.	SHEET NO.
R-1015	5

SITE 9: END BENT 2
PROFILE ALONG
MSE RETAINING WALL 4

0 40 80
FEET
VE = 2

POINT "A"
STA. 10+00.00 -WALL_4-
STA. 518+70.89 -L-
OFFSET 150.23' LT.
BEGIN MSE WALL

BOTTOM OF WALL
EL. 33.48'

POINT "B"
STA. 11+03.00 -WALL_4-
STA. 518+02.32 -L-
OFFSET 71.63' LT.
GRADE ELEVATION
EL. 46.04'

POINT "B"
BOTTOM OF WALL
EL. 32.67'

POINT "C"
STA. 11+64.83 -WALL_4-
STA. 517+63.65 -L-
OFFSET 23.00' LT.
GRADE ELEVATION
EL. 48.53'

POINT "C"
BOTTOM OF WALL
EL. 32.18'

POINT "D"
STA. 12+22.87 -WALL_4-
STA. 517+28.25 -L-
OFFSET 23.00 RT.
GRADE ELEVATION
EL. 48.85'

POINT "D"
BOTTOM OF WALL
EL. 31.71'

POINT "E"
STA. 12+73.79 -WALL_4-
STA. 516+97.89 -L-
OFFSET 63.63' RT.
GRADE ELEVATION
EL. 50.79'

POINT "E"
BOTTOM OF WALL
EL. 31.31'

BOTTOM OF WALL
EL. 30.78'

POINT "F"
STA. 13+55.79 -WALL_4-
STA. 516+97.89 -L-
OFFSET 145.63' RT.
END MSE WALL

RWALA-6 10+00 CL
RWALA-5 10+50 CL
RWALA-4 11+45 CL
RWALA-3 12+31 1' RT
RWALA-2 13+16' CL
RWALA-1 13+55 7' LT.
EB2-A LL 11+01 3' LT
EB2-B LL 11+71 10' LT
EB2-B RL 12+66 7' LT

APPROXIMATE LINE OF EXISTING GRADE

SS-21 SS-20 SS-9 SS-18 SS-19 SS-17 SS-10 SS-16

Undivided Coastal Plain: Tan-Brown to Gray, Medium Dense, Silty SAND, Moist

Loose to Saturated

Undivided Coastal Plain: Black to Tan-Brown to Gray, Very Loose to Medium Dense, Silty SAND with Clay Seams, Moist to Saturated

Coastal Plain: Green to Greenish Gray and Gray Thin Clay Seams, Saturated

with Black, Loose to Medium Dense, Silty SAND with Shell Fragments and (Duplin Formation)

Coastal Plain Sedimentary Rock: Green to Gray and White, Soft to Hard, LIMESTONE (Riverbend Formation)

Coastal Plain: Green, Very Stiff, Sandy SILT with Shell Fragments, Saturated (Riverbend Formation)

BT

Ⓑ Undivided Coastal Plain: Brown to Gray, Very Soft to Soft, Sandy CLAY and Silty CLAY, Wet to Saturated

Ⓓ Alluvial: Black and Brown, Very Soft, Sandy CLAY, Moderately Organic, Wet

Ⓔ Alluvial: Black, Loose, Silty SAND, Little Organics, Saturated

- GROUNDLINE AND WALL PROFILE TAKEN FROM "R-1015 MSE WALL_END BENT 2_Site 9.dgn" FILE PROVIDED BY NCDOT DATED 5/21/2018.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE WALL PROFILE.
- ALL DIMENSIONS AND STATIONS ARE ALONG FRONT FACE OF WALL.

-WALL_4-

60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90

10+00 11+00 12+00 13+00 14+00

SOILS LABORATORY TESTS RESULTS

WBS NO.: 34360.1.1

TIP NO.: R-1015

COUNTY: Craven

SITE DESCRIPTION: Site #9 - Dual Bridges on US 70 (Havelock Bypass) over US 70 Business - MSE Wall Abutments

BORING NO.	SAMPLE NO.	Boring Location			DEPTH INTERVAL (FT)	AASHTO	N	L.L	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
		Alignment	Station	Offset						CSE. SAND	F. SAND	SILT	CLAY	10	40	200		
EB1-A LL	SS-1	-WALL_3-	13+10	7' LT	53.0-54.5	A-2-4 (0)	9	NP	NP	29	50	6	15	80	67	18	30.8	-
EB1-B LL	SS-2	-WALL_4-	12+38	6' LT	13.0-14.5	A-3 (1)	4	NP	NP	27	66	2	5	100	98	8	-	-
EB1-B RL	SS-3	-WALL_3-	11+47	7' LT	3.2-4.7	A-2-4 (0)	8	NP	NP	36	50	2	12	100	79	15	-	-
EB1-B RL	SS-4	-WALL_3-	11+47	7' LT	48.2-49.7	A-2-4 (0)	0	NP	NP	68	21	3	8	99	64	11	26.1	0.5
EB2-A LL	SS-9	-WALL_4-	11+01	5' LT	48.5-50.0	A-2-4 (0)	9	NP	NP	12	67	7	14	100	93	27	31.0	-
EB2-B RL	SS-10	-WALL_4-	12+66	7' LT	18.5-20.0	A-2-4 (0)	6	NP	NP	7	79	5	9	100	97	17	31.1	-
RWAL3-1	SS-11	-WALL_3-	13+84	CL	3.5-5.0	A-2-4 (0)	8	NP	NP	13	65	11	11	100	98	23	14.2	-
RWAL3-2	SS-12	-WALL_3-	13+34	CL	3.0-4.5	A-2-4 (0)	7	NP	NP	11	72	10	7	100	98	18	13.1	-
RWAL3-3	SS-13	-WALL_3-	11+93	CL	14.2-15.7	A-3 (1)	14	NP	NP	29	68	0	3	100	89	5	21.8	-
RWAL3-4	SS-14	-WALL_3-	10+97	CL	13.0-14.5	A-2-4 (0)	4	24	10	18	48	22	12	99	92	35	29.8	-
RWAL3-6	SS-15	-WALL_3-	10+00	CL	3.1-4.6	A-2-4 (0)	7	NP	NP	7	70	2	21	100	99	24	19.4	-
RWAL4-2	SS-16	-WALL_4-	13+16	CL	3.1-4.6	A-2-4 (0)	7	NP	NP	9	69	3	19	100	98	23	16.8	-
RWAL4-3	SS-17	-WALL_4-	12+31	1' LT	1.0-2.5	A-2-4 (0)	5	24	8	6	66	16	12	100	99	29	20.4	-
RWAL4-4	SS-18	-WALL_4-	11+45	CL	1.0-2.5	A-2-4 (0)	4	NP	NP	7	71	8	14	100	99	24	25.7	3.9
RWAL4-4	SS-19	-WALL_4-	11+45	CL	28.0-29.5	A-3 (1)	26	NP	NP	62	32	2	4	100	65	8	17.9	-
RWAL4-5	SS-20	-WALL_4-	10+50	CL	8.5-10.0	A-7-6 (17)	1	41	21	2	17	61	20	100	99	84	68.6	-
RWAL4-6	SS-21	-WALL_4-	10+00	CL	3.0-4.5	A-2-4 (0)	6	NP	NP	8	74	2	16	100	98	19	21.6	-
-	ST-1	-L-	516+16	16'LT	4.0-6.0	A-6 (7)	N/A	31	18	6	39	20	35	100	98	57	34.6	-
-	ST-2	-L-	517+11	59' RT	11.0-13.0	A-2-4 (0)	N/A	NP	NP	6	84	1	9	100	98	11	23.6	-
-	ST-3	-L-	517+15	23' RT	9.8-11.8	A-7-6 (36)	N/A	65	44	2	20	27	51	100	99	79	64.2	-

Tony Dunsmore
Certification No. 121-01-1108
For all test samples but ST-3

Signed: Shawn F. Farrell

NCDOT Certification No. 129-04-0411
For test sample ST-3

PROJECT REFERENCE NO.	SHEET NO.
R–1015	7

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX A
CONSOLIDATION & TRIAXIAL TESTS RESULTS

REFERENCE: R–1015

PROJECT: 34360

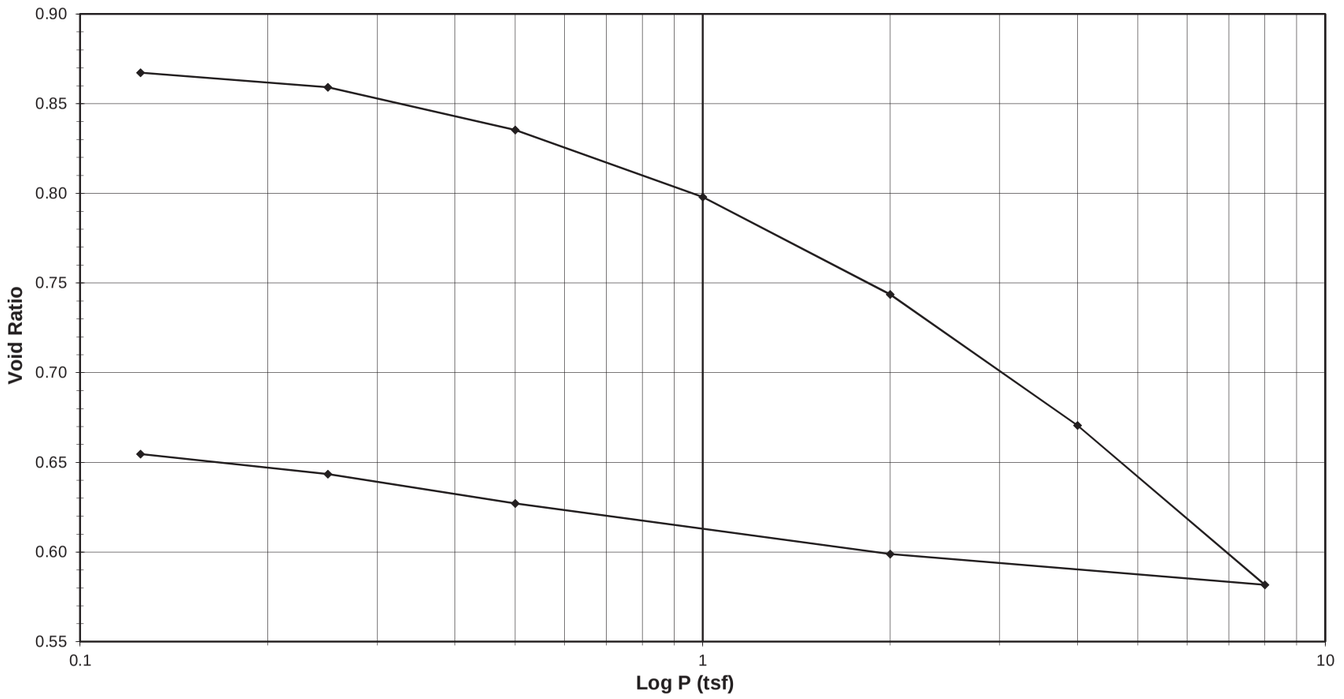
ESP
ESP ASSOCIATES, INC.
7011 ALBERT PICK RD
SUITE E
GREENSBORO, NC 27409
FIRM # C-0587
WWW.ESPASSOCIATES.COM

ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-04-0411 *Date* 4/10/18 *Approved By* MPS *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 6

Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-002 GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT

2200 Westinghouse Blvd., Suite 103 • Raleigh, NC 27604 • Phone (919) 876-0405 • Fax (919) 876-0460 • www.geotechnics.net

ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED
Consolidometer No. R409
1 Division = 0.0001 (in.)

Sample Properties	Initial	Final
Water Content		
Tare Number	SS-6	800
Wt. Tare & WS (g)	313.18	232.09
Wt. Tare & DS (g)	267.85	206.50
Wt. Water (g)	45.33	25.59
Wt. Tare (g)	100.77	103.09
Wt. DS (g)	167.08	103.41
Water Content (%)	27.13	24.75
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.0000	0.8822
Sample Volume (cc)	80.44	70.96
Wt. Wet Sample + Ring (g)	247.89	245.20
Wt. of Ring (g)	104.49	104.49
Wt. of Wet Sample (g)	143.40	140.71
Wet Density (pcf)	111.24	123.73
Wet Density (g/cc)	1.78	1.98
Water Content (%)	27.13	24.75
Wt. of Dry Sample (g)	112.80	112.80
Dry Density (pcf)	87.50	99.19
Dry Density (g/cc)	1.40	1.59
Void Ratio	0.8755	0.6546
Saturation (%)	81.50	99.42
Specific Gravity	2.63	*Measured*

Test Data Summary

Applied Pressure (tsf)	Final Dial Reading (div)	Machine Deflection (div)	Corrected Reading (div)	Height of Sample (mm)	Volume (cc)	Dry Density (g/cc)	Void Ratio
Seating	0	0	0	25.400	80.440	1.40226	**0.87555**
0.125	51.5	7.5	44.1	25.288	80.085	1.40846	**0.86728**
0.25	106.2	18.6	87.6	25.178	79.735	1.41465	**0.85912**
0.5	247.8	33.9	214.0	24.856	78.719	1.43292	**0.83541**
1	469.4	55.5	413.9	24.349	77.111	1.46280	**0.79793**
2	789.6	86.4	703.2	23.614	74.783	1.50832	**0.74366**
4	1218.3	125.8	1092.4	22.625	71.652	1.57423	**0.67066**
8	1734.8	168.6	1566.2	21.422	67.841	1.66267	**0.58179**
2	1584.7	109.7	1475.0	21.654	68.575	1.64487	**0.59891**
0.5	1391.9	67.4	1324.5	22.036	69.785	1.61634	**0.62713**
0.25	1297.5	60.3	1237.2	22.258	70.488	1.60024	**0.64351**
0.125	1238.4	60.3	1178.1	22.408	70.963	1.58951	**0.65459**

Tested By 129-04-0411 *Date* 4/10/18 *Input Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 6

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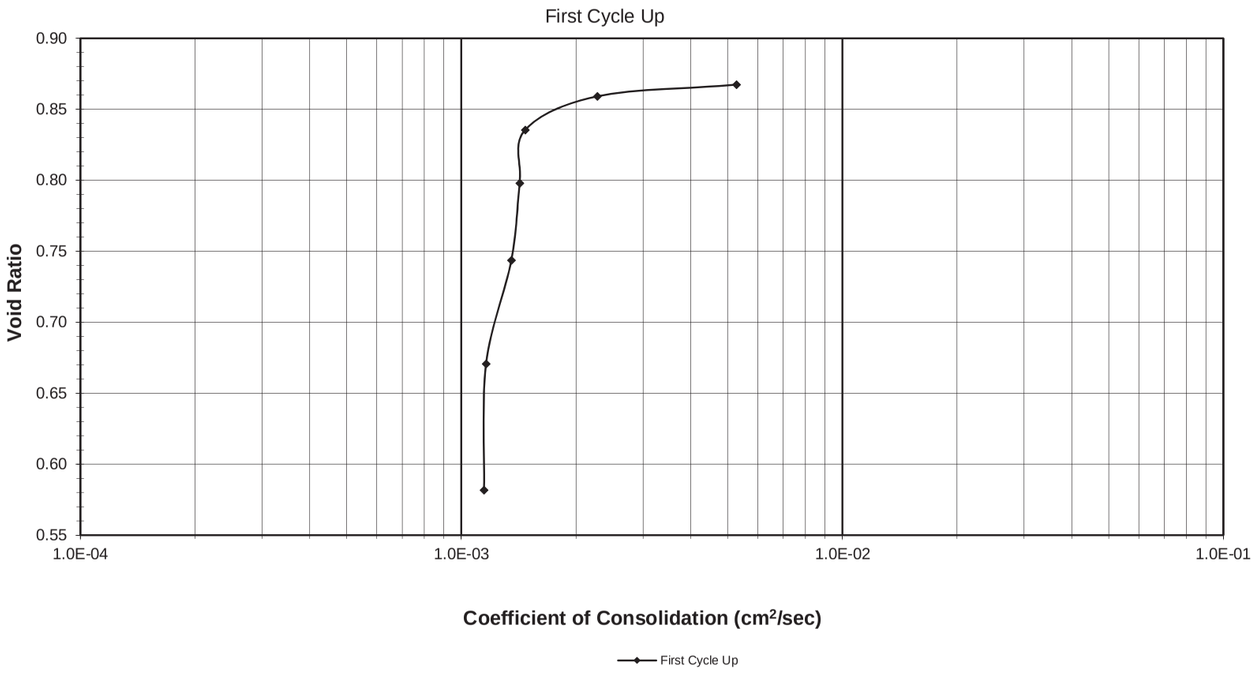
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-04-0411 *Date* 4/10/18 *Input Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 6 *Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-002 GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT*

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ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED
Consolidometer No. R409
1 Division = 0.0001 (in.)

Sample Properties	**Initial**	**Final**
Water Content		
Tare Number	SS-6	800
Wt. Tare & WS (g)	313.18	232.09
Wt. Tare & DS (g)	267.85	206.50
Wt. Water (g)	45.33	25.59
Wt. Tare (g)	100.77	103.09
Wt. DS (g)	167.08	103.41
Water Content (%)	27.13	24.75
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.000	0.882
Sample Volume (cc)	80.44	70.96
Wt. Wet Sample + Ring (g)	247.89	245.20
Wt. of Ring (g)	104.49	104.49
Wt. of Wet Sample (g)	143.40	140.71
Wet Density (pcf)	111.24	123.73
Wet Density (g/cc)	1.78	1.98
Water Content (%)	27.13	24.75
Wt. of Dry Sample (g)	112.80	112.80
Dry Density (pcf)	87.50	99.19
Dry Density (g/cc)	1.40	1.59
Void Ratio	0.8755	0.6546
Saturation (%)	81.50	99.42
Specific Gravity	*2.63*	*Measured*

C_v Test Data Summary

Load Increment	**Dial Reading @ t_{50}**	**Machine Deflection**	**Corrected Dial Reading @ t_{50}**	**Sample Height @ t_{50}**	**Time t_{50}**	**C_v**
(tsf)	(div)	(div)	(div)	(cm)	(min.)	**(cm²/sec)**
0.0 - 0.125	25.0	7.5	17.5	2.536	**1.00**	**0.00528**
0.125 - 0.25	75.4	18.6	56.8	2.526	**2.30**	**0.00228**
0.25 - 0.5	173.7	33.9	139.8	2.504	**3.50**	**0.00147**
0.5 - 1	358.5	55.5	303.0	2.463	**3.50**	**0.00142**
1 - 2	627.9	86.4	541.4	2.402	**3.50**	**0.00135**
2 - 4	995.3	125.8	869.4	2.319	**3.80**	**0.00116**
4 - 8	1462.1	168.6	1293.5	2.211	**3.50**	**0.00115**
8 - 2	NA	109.7	NA	NA	**NA**	**NA**
2 - 0.5	NA	67.4	NA	NA	**NA**	**NA**
0.5 - 0.25	NA	60.3	NA	NA	**NA**	**NA**
0.25 - 0.125	NA	60.3	NA	NA	**NA**	**NA**

Tested By 129-04-0411 *Date* 4/10/18 *Input Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 6 *Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-002 GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT*

SHEET 9

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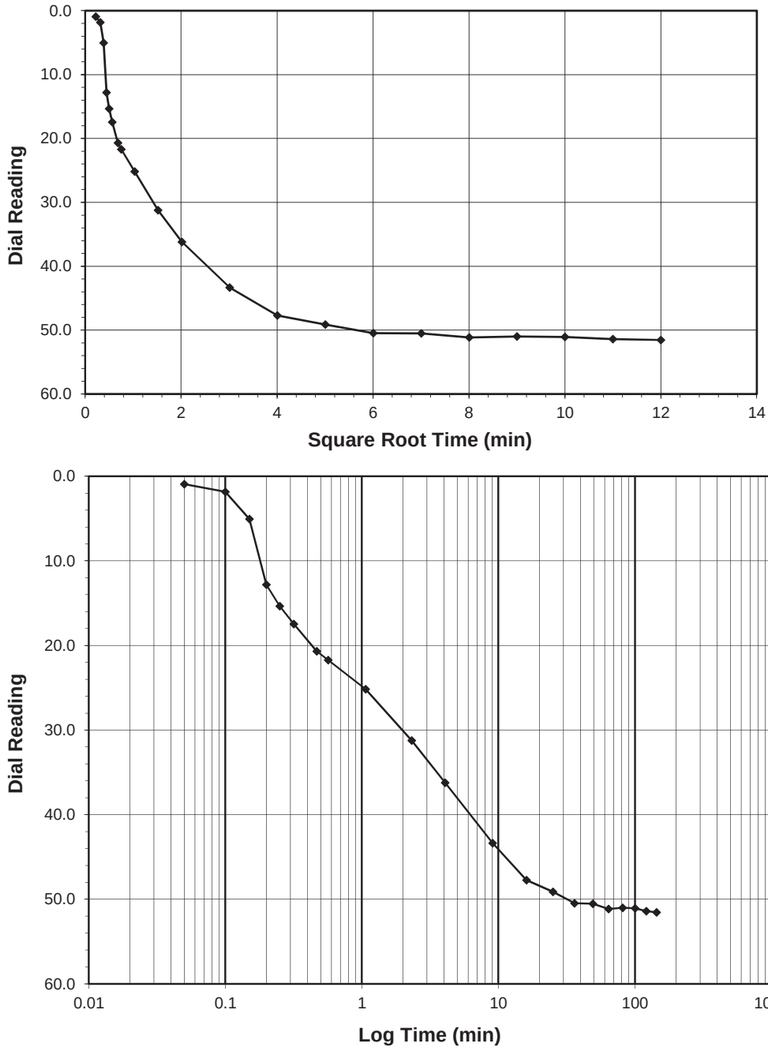
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.0-0.125**
Final Reading	**(div)**	**51.5**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/10/18
Start Time		17:10:38

Elapsed Time (min)	Dial Reading (div)
Initial	**0.0**
0.05	0.9
0.10	1.8
0.15	5.1
0.20	12.8
0.25	15.3
0.32	17.5
0.47	20.7
0.57	21.7
1.07	25.2
2.32	31.2
4.07	36.2
9.07	43.4
16.07	47.7
25.07	49.1
36.07	50.5
49.07	50.5
64.07	51.2
81.07	51.0
100.07	51.1
121.07	51.4
144.07	51.5

Tested By 129-04-0411 *Date* 4/10/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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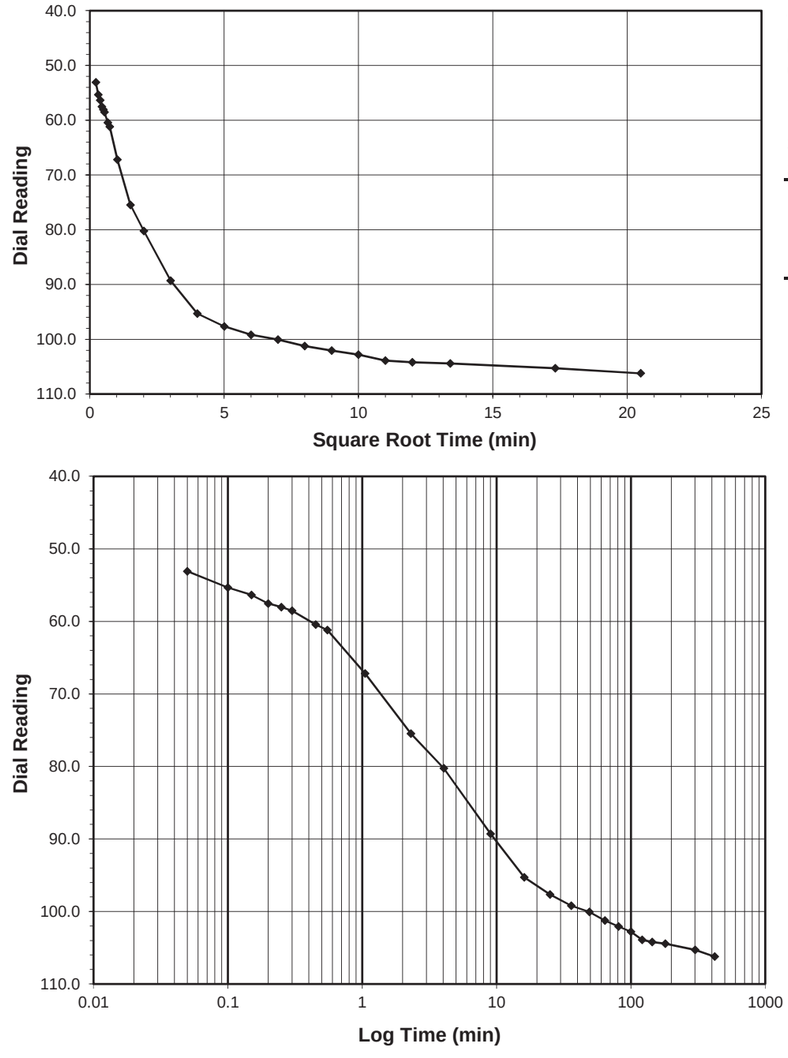
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.125-0.25**
Final Reading	**(div)**	**106.2**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/11/18
Start Time		0:11:01

Elapsed Time (min)	Dial Reading (div)
Initial	**51.5**
0.05	53.1
0.10	55.3
0.15	56.3
0.20	57.5
0.25	58.0
0.30	58.5
0.45	60.4
0.55	61.2
1.05	67.2
2.30	75.5
4.05	80.2
9.05	89.3
16.05	95.3
25.05	97.7
36.05	99.2
49.05	100.1
64.05	101.3
81.05	102.1
100.05	102.8
121.07	103.9
144.07	104.2
180.07	104.4
300.07	105.3
420.33	106.2

Tested By 129-04-0411 *Date* 4/11/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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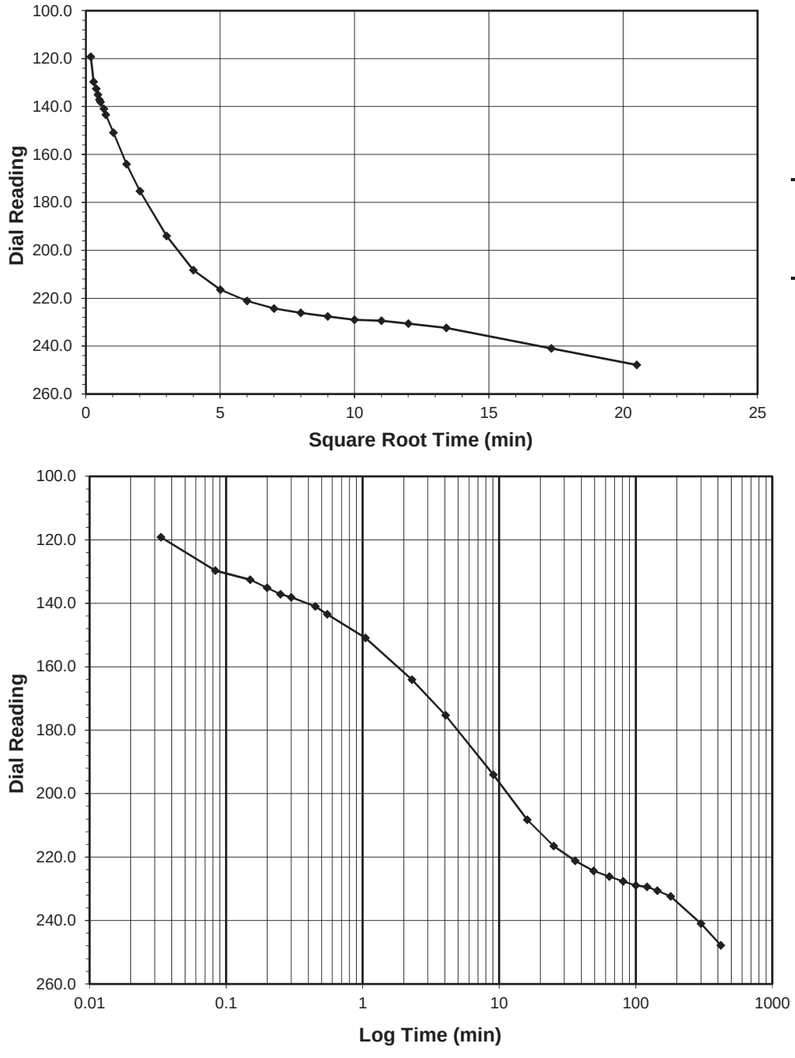
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.25-0.5**
Final Reading	**(div)**	**247.8**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/11/18
Start Time		7:11:21

Elapsed Time (min)	Dial Reading (div)
Initial	**106.2**
0.03	119.2
0.08	129.7
0.15	132.6
0.20	135.1
0.25	137.1
0.30	138.1
0.45	141.0
0.55	143.5
1.05	150.9
2.30	164.1
4.05	175.3
9.05	194.1
16.05	208.3
25.05	216.5
36.05	221.2
49.05	224.3
64.05	226.1
81.05	227.7
100.05	229.0
121.05	229.4
144.05	230.6
180.05	232.4
300.05	241.0
420.38	247.8

Tested By 129-04-0411 *Date* 4/11/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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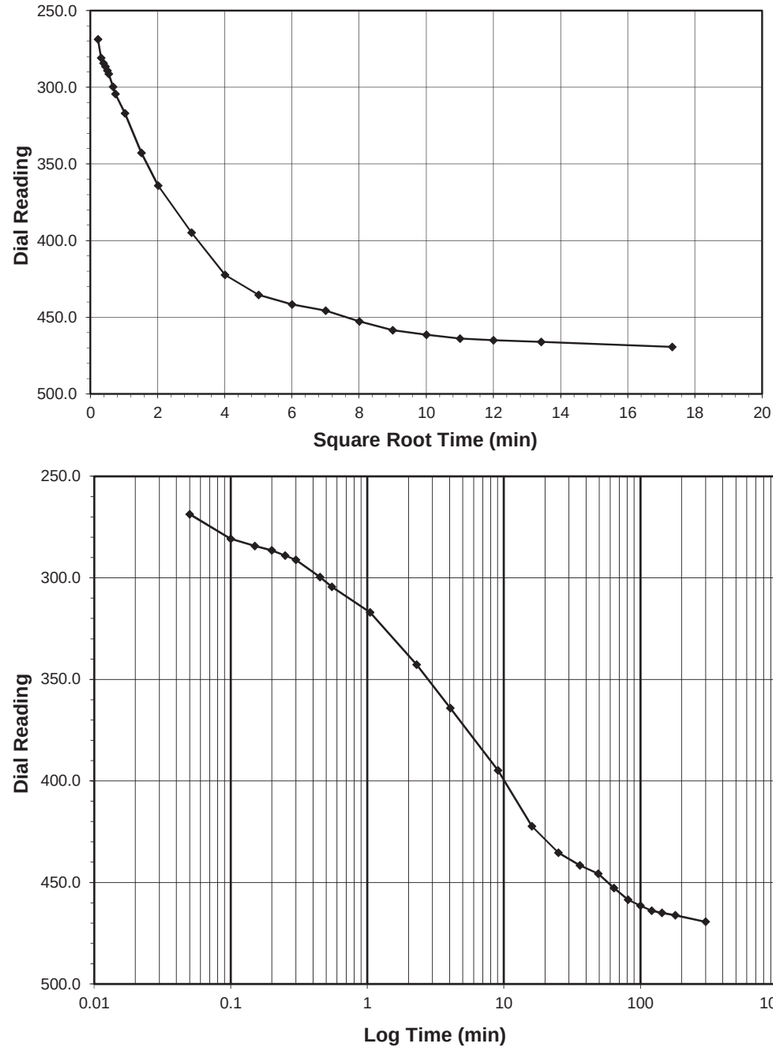
AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-1.0**
Final Reading	**(div)**	**469.4**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/11/18
Start Time		14:11:46

Elapsed Time (min)	Dial Reading (div)
Initial	**247.8**
0.05	268.6
0.10	280.8
0.15	284.3
0.20	286.4
0.25	289.0
0.30	291.2
0.45	299.6
0.55	304.4
1.05	317.0
2.30	342.7
4.05	364.2
9.05	394.8
16.05	422.3
25.05	435.3
36.05	441.5
49.05	445.7
64.07	452.7
81.07	458.5
100.07	461.5
121.07	463.9
144.07	465.0
180.07	466.1
300.07	469.4

Tested By 129-04-0411 *Date* 4/11/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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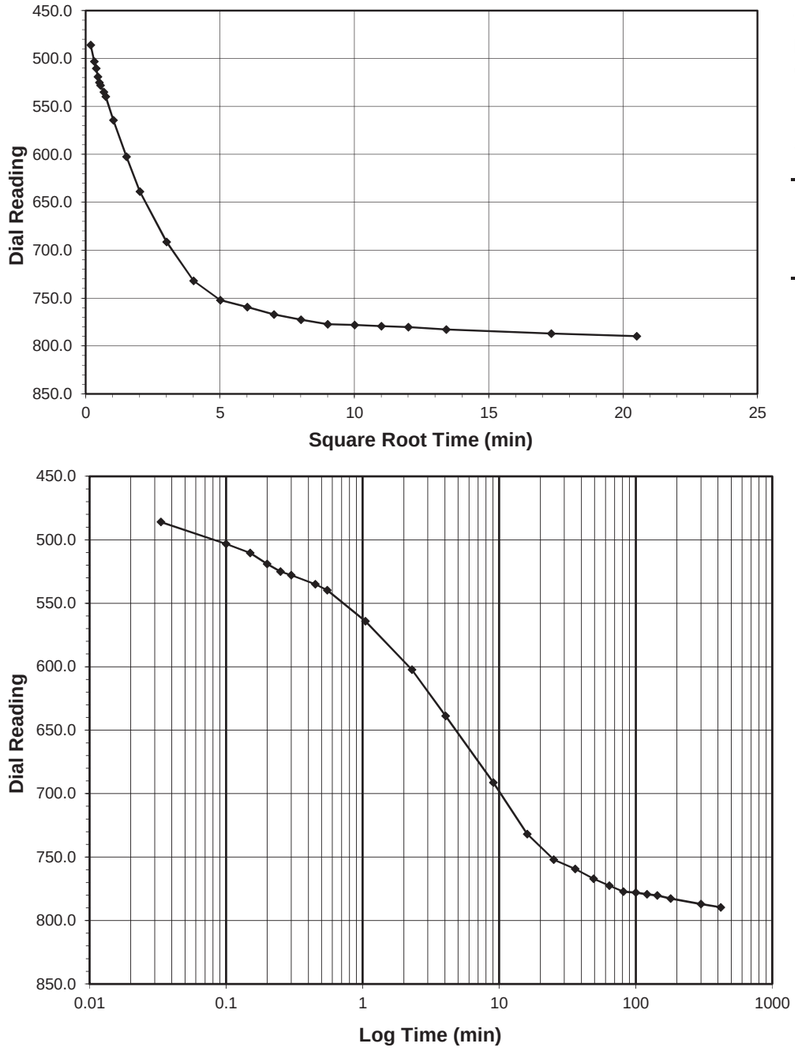
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-2.0**
Final Reading	**(div)**	**789.6**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/11/18
Start Time		21:12:10

Elapsed Time (min)	Dial Reading (div)
Initial	**469.4**
0.03	486.0
0.10	503.2
0.15	510.3
0.20	519.1
0.25	525.0
0.30	527.9
0.45	535.0
0.55	539.6
1.05	564.3
2.30	602.3
4.05	638.8
9.07	691.3
16.07	732.0
25.07	752.0
36.07	759.4
49.07	767.0
64.07	772.5
81.07	777.2
100.07	778.1
121.07	779.3
144.07	780.3
180.07	782.7
300.07	786.9
420.35	789.6

Tested By *129-04-0411* *Date* *4/11/18* *Checked By* *GEM* *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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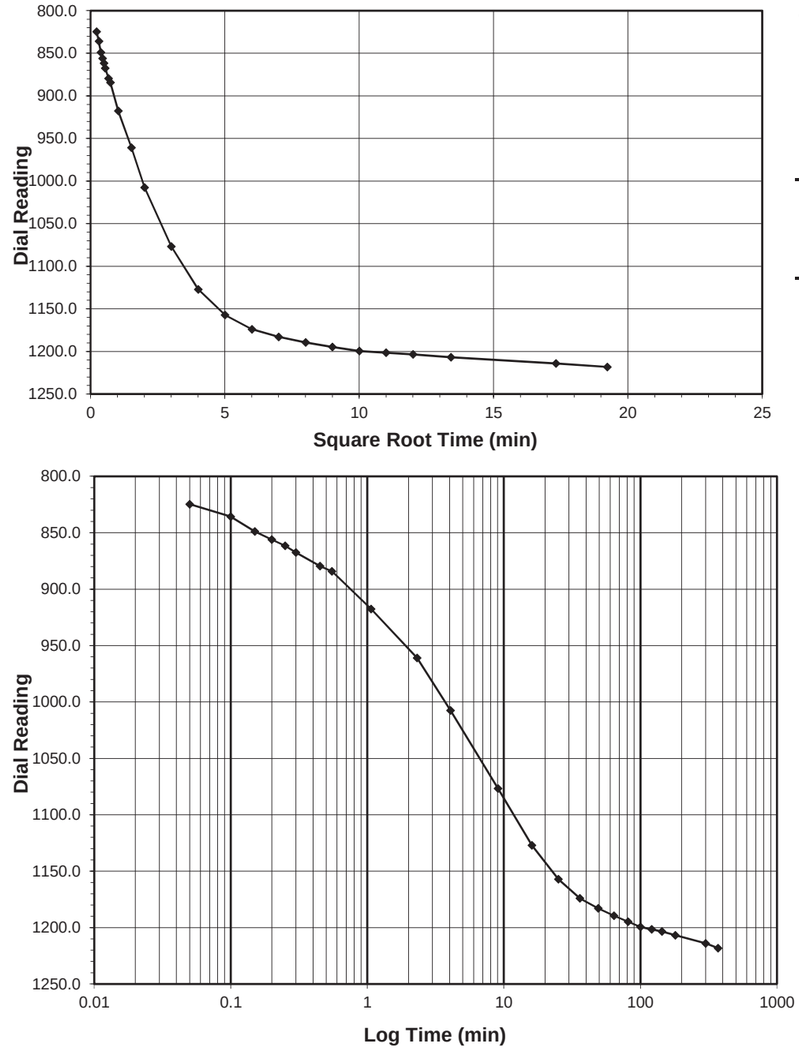
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-4.0**
Final Reading	**(div)**	**1218.3**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/12/18
Start Time		4:12:32

Elapsed Time (min)	Dial Reading (div)
Initial	**789.6**
0.05	824.7
0.10	835.9
0.15	849.0
0.20	856.1
0.25	861.6
0.30	867.5
0.45	879.6
0.55	884.3
1.07	917.7
2.32	960.9
4.07	1007.6
9.07	1076.8
16.07	1127.2
25.07	1157.1
36.07	1174.0
49.07	1183.0
64.07	1189.5
81.07	1194.8
100.07	1199.5
121.07	1201.6
144.07	1203.5
180.07	1206.8
300.07	1214.1
370.07	1218.3

Tested By *129-04-0411* *Date* *4/12/18* *Checked By* *GEM* *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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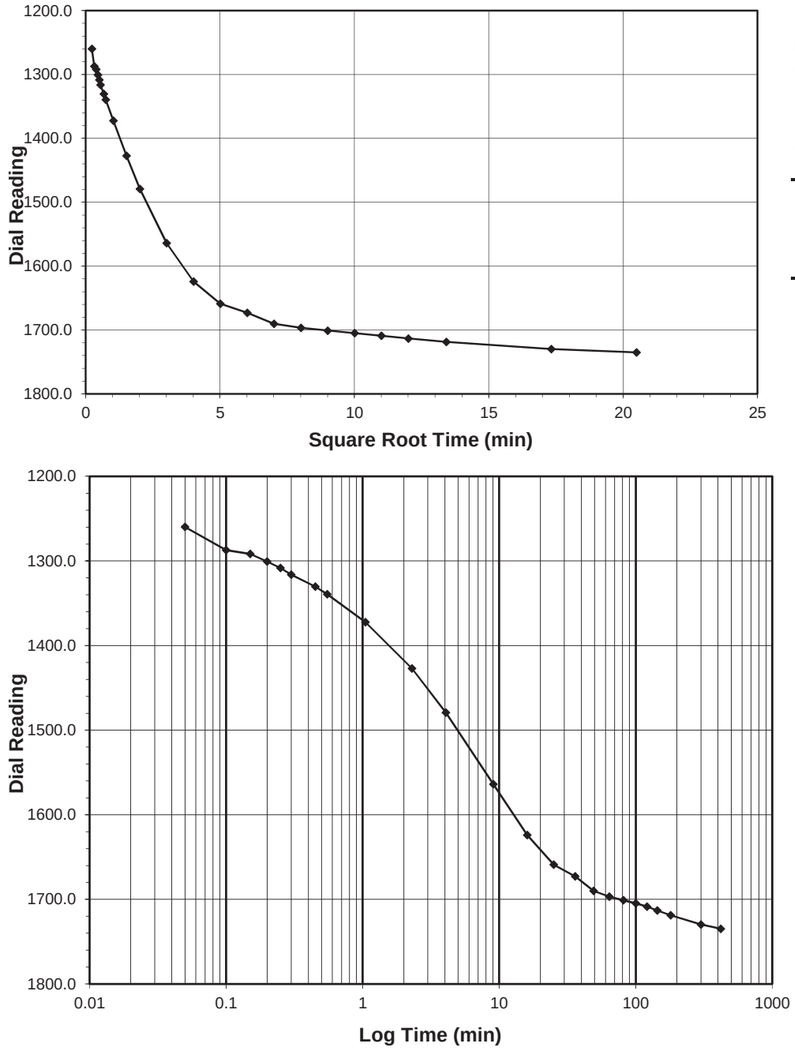
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**4.0-8.0**
Final Reading	**(div)**	**1734.8**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/12/18
Start Time		10:22:37

Elapsed Time (min)	Dial Reading (div)
Initial	**1218.3**
0.05	1259.8
0.10	1287.1
0.15	1291.8
0.20	1300.6
0.25	1308.3
0.30	1316.3
0.45	1330.3
0.55	1339.3
1.05	1372.4
2.30	1427.1
4.07	1479.2
9.07	1564.0
16.07	1624.1
25.07	1658.9
36.07	1672.8
49.07	1690.1
64.07	1696.7
81.07	1700.9
100.07	1704.6
121.07	1708.6
144.07	1713.2
180.07	1718.7
300.07	1729.9
420.22	1734.8

Tested By 129-04-0411 *Date* 4/12/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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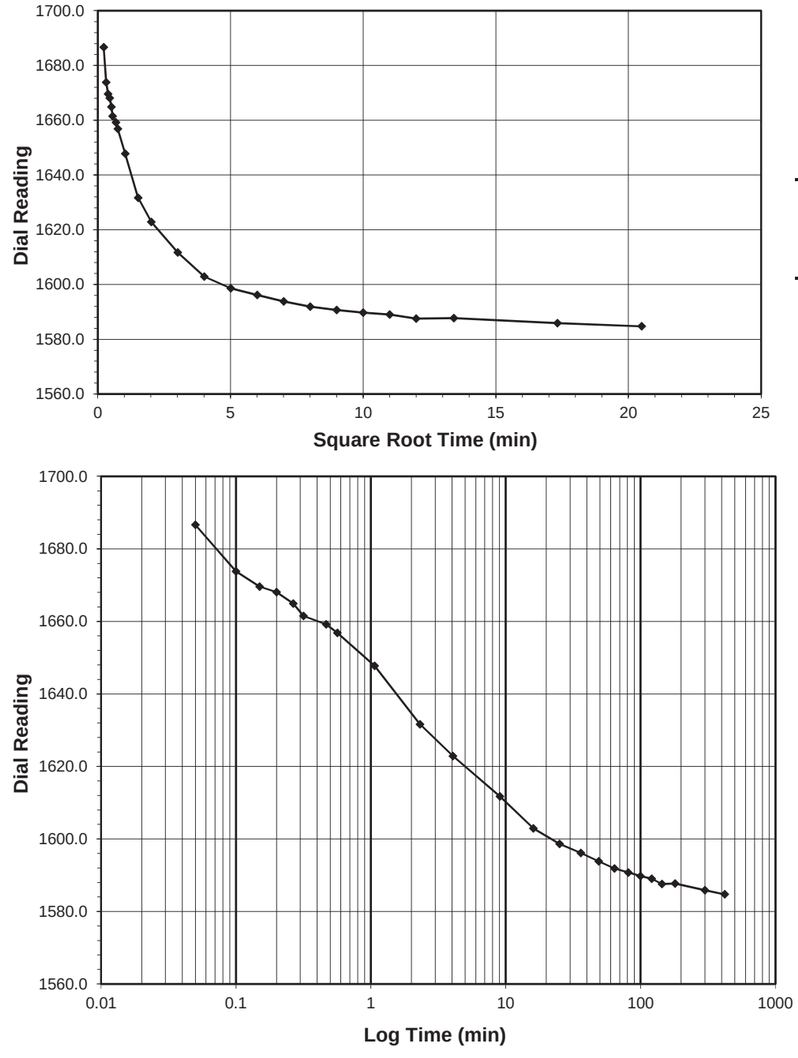
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**8.0-2.0**
Final Reading	**(div)**	**1584.7**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/12/18
Start Time		17:22:50

Elapsed Time (min)	Dial Reading (div)
Initial	**1734.8**
0.05	1686.6
0.10	1673.8
0.15	1669.6
0.20	1668.1
0.27	1664.9
0.32	1661.5
0.47	1659.2
0.57	1656.8
1.07	1647.8
2.32	1631.6
4.07	1622.9
9.07	1611.7
16.07	1602.9
25.07	1598.7
36.07	1596.2
49.07	1593.8
64.07	1591.9
81.07	1590.7
100.07	1589.7
121.07	1589.0
144.08	1587.6
180.08	1587.7
300.08	1585.9
420.20	1584.7

Tested By 129-04-0411 *Date* 4/12/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-002 GEOJAC-16TSF1 Cv.xlsm]STEP 8

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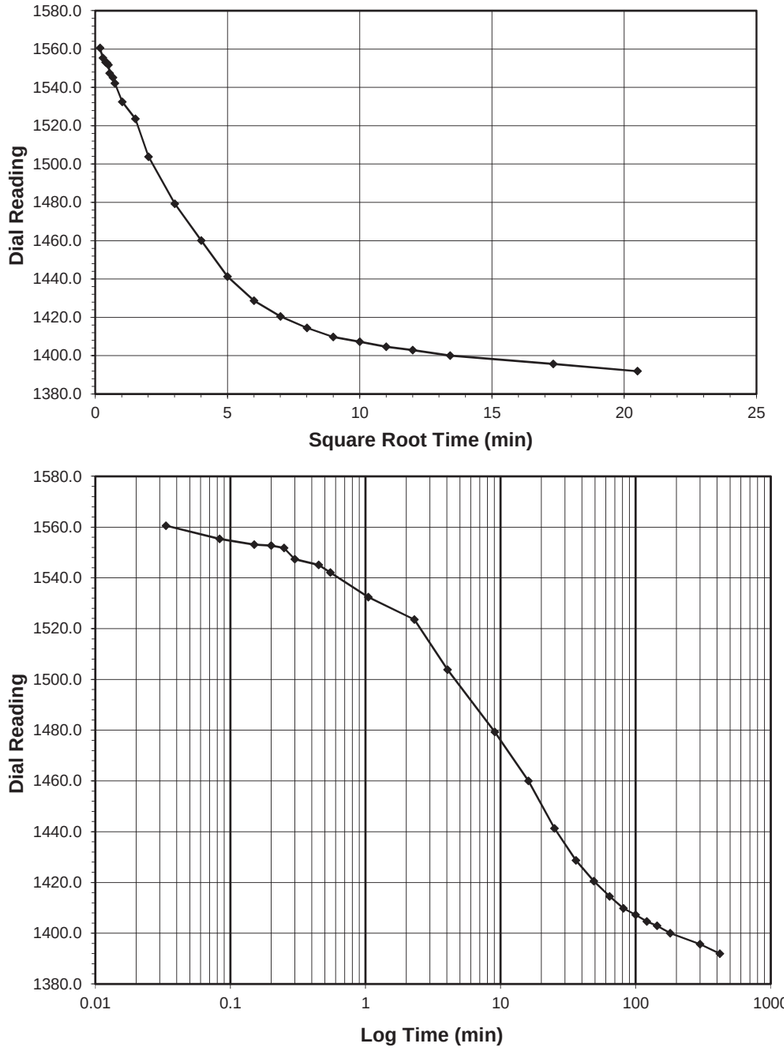
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-0.5**
Final Reading	**(div)**	**1391.9**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/13/18
Start Time		0:23:02

Elapsed Time (min)	Dial Reading (div)
Initial	**1584.7**
0.03	1560.5
0.08	1555.4
0.15	1553.1
0.20	1552.7
0.25	1551.8
0.30	1547.3
0.45	1545.1
0.55	1542.1
1.05	1532.5
2.30	1523.5
4.05	1503.8
9.05	1479.3
16.05	1460.0
25.05	1441.3
36.05	1428.7
49.05	1420.5
64.05	1414.5
81.05	1409.8
100.05	1407.3
121.05	1404.6
144.05	1402.9
180.05	1400.0
300.05	1395.7
420.33	1391.9

Tested By 129-04-0411 *Date* 4/13/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

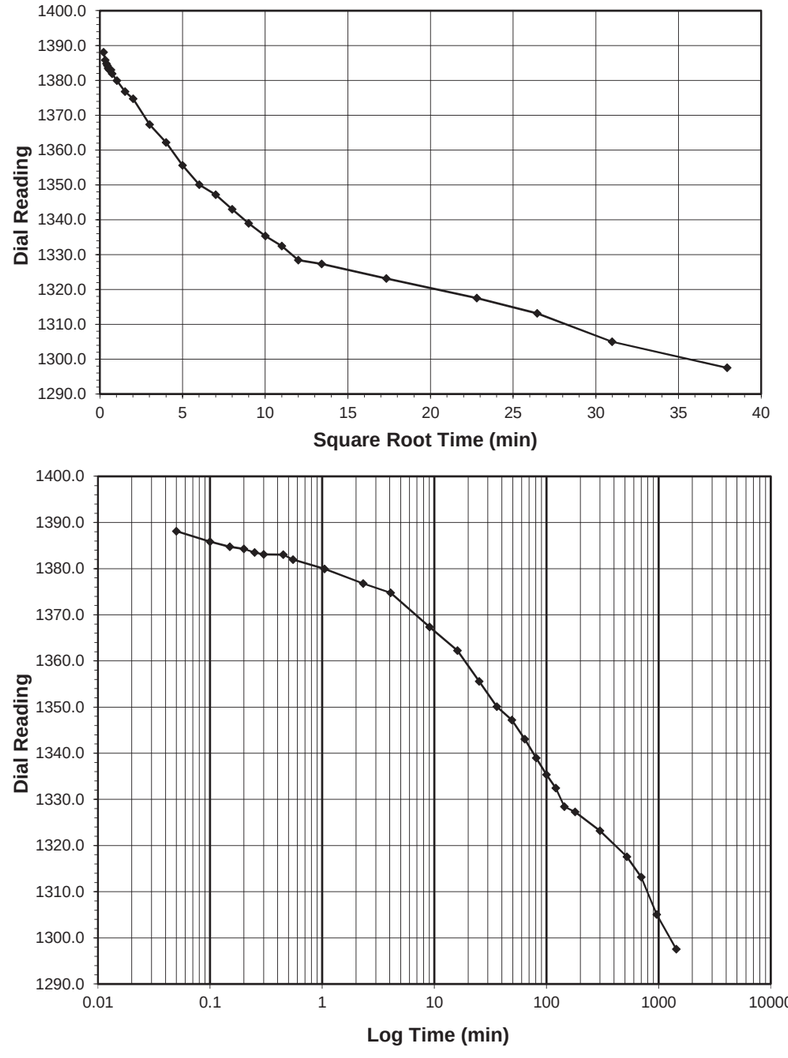
Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-002 GEOJAC-16TSF1 Cv.xlsm]STEP 9

ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-0.25**
Final Reading	**(div)**	**1297.5**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		4/13/18
Start Time		7:23:23

Elapsed Time (min)	Dial Reading (div)
Initial	**1391.9**
0.05	1388.1
0.10	1385.8
0.15	1384.8
0.20	1384.3
0.25	1383.5
0.30	1383.1
0.45	1383.0
0.55	1381.9
1.05	1379.9
2.32	1376.8
4.07	1374.7
9.07	1367.3
16.07	1362.2
25.07	1355.6
36.07	1350.1
49.07	1347.2
64.07	1343.0
81.07	1339.0
100.07	1335.3
121.07	1332.4
144.07	1328.4
180.07	1327.3
300.07	1323.2
520.07	1317.6
700.08	1313.2
960.08	1305.0
1440.02	1297.5

Tested By 129-04-0411 *Date* 4/13/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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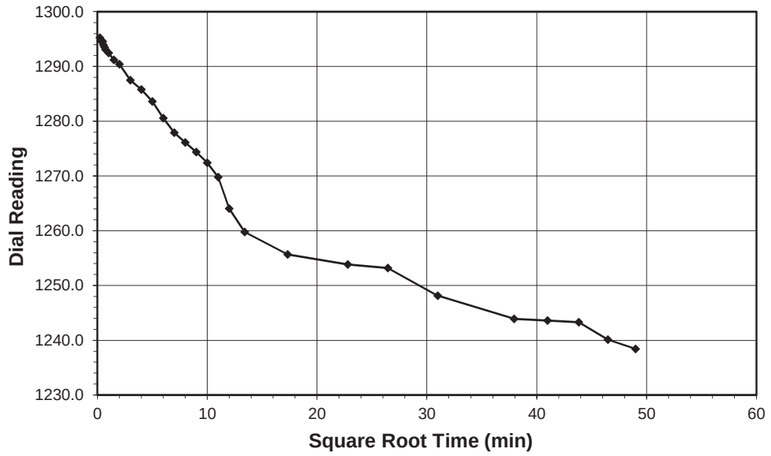
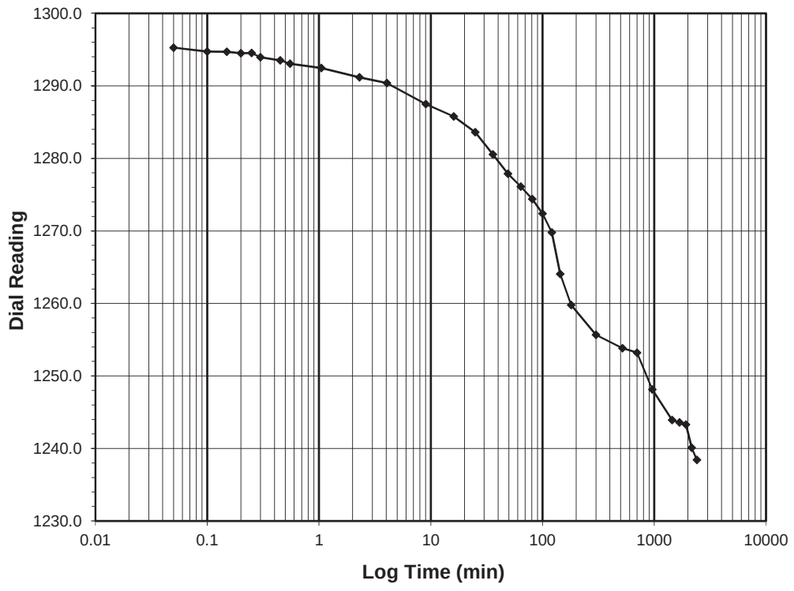
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 516+16, 16'LT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	4.0-6.0
Project No.	R-2018-095-001	Sample No.	ST-1
Lab ID	R-2018-095-001-002	Visual Description	LIGHT BROWN / GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load (tsf)	**0.25-0.125**
Final Reading (div)	**1238.4**
Consolidometer No.	**R409**
1 Division (in)	0.0001
Start Date	4/14/18
Start Time	7:23:25

Elapsed Time (min)	Dial Reading (div)
Initial	**1297.5**
0.05	1295.3
0.10	1294.7
0.15	1294.7
0.20	1294.5
0.25	1294.6
0.30	1294.0
0.45	1293.5
0.55	1293.1
1.05	1292.5
2.30	1291.2
4.05	1290.4
9.05	1287.5
16.05	1285.8
25.05	1283.6
36.05	1280.6
49.05	1277.9
64.05	1276.1
81.05	1274.4
100.05	1272.4
121.05	1269.8
144.05	1264.1
180.05	1259.8
300.05	1255.7
520.05	1253.8
700.05	1253.2
960.05	1248.1
1440.05	1243.9
1680.07	1243.6
1920.05	1243.3
2160.07	1240.1
2400.07	1238.4

Tested By 129-04-0411 *Date* 4/14/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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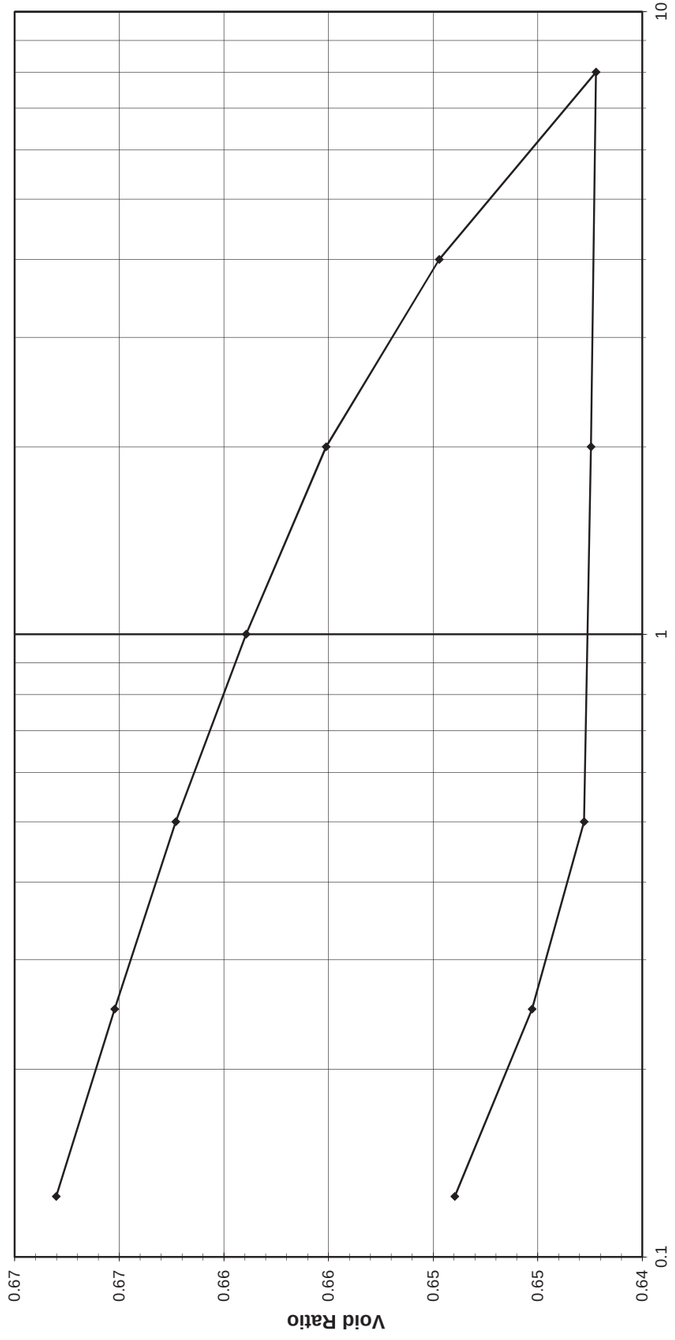
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-04-0411 *Date* 4/17/18 *Approved By* MPS *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 6

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ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED
Consolidometer No. R470
1 Division = 0.0001 (in.)

Sample Properties	Initial	Final
Water Content		
Tare Number	TB-08	815
Wt. Tare & WS (g)	485.43	287.95
Wt. Tare & DS (g)	418.64	259.52
Wt. Water (g)	66.79	28.43
Wt. Tare (g)	135.33	135.83
Wt. DS (g)	283.31	123.69
Water Content (%)	23.57	22.98
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.0000	0.9866
Sample Volume (cc)	80.44	79.36
Wt. Wet Sample + Ring (g)	371.31	370.56
Wt. of Ring (g)	214.30	214.30
Wt. of Wet Sample (g)	157.01	156.26
Wet Density (pcf)	121.80	122.87
Wet Density (g/cc)	1.95	1.97
Water Content (%)	23.57	22.98
Wt. of Dry Sample (g)	127.06	127.06
Dry Density (pcf)	98.56	99.90
Dry Density (g/cc)	1.58	1.60
Void Ratio	0.6714	0.6490
Saturation (%)	92.70	93.50
Specific Gravity	2.64	*Measured*

Test Data Summary

Applied Pressure (tsf)	Final Dial Reading (div)	Machine Deflection (div)	Corrected Reading (div)	Height of Sample (mm)	Volume (cc)	Dry Density (g/cc)	Void Ratio
Seating	0	0	0	25.400	80.440	1.57952	**0.67139**
0.125	24.4	4.2	20.2	25.349	80.278	1.58272	**0.66802**
0.25	49.9	13.1	36.9	25.306	80.143	1.58537	**0.66523**
0.5	81.7	27.4	54.3	25.262	80.003	1.58815	**0.66231**
1	125.6	51.0	74.5	25.211	79.840	1.59138	**0.65893**
2	184.5	87.1	97.4	25.153	79.656	1.59506	**0.65511**
4	254.4	124.7	129.7	25.071	79.396	1.60028	**0.64971**
8	337.6	163.1	174.5	24.957	79.036	1.60758	**0.64222**
2	276.1	103.0	173.1	24.960	79.047	1.60734	**0.64246**
0.5	227.0	55.9	171.1	24.965	79.063	1.60703	**0.64279**
0.25	204.7	48.4	156.3	25.003	79.183	1.60460	**0.64527**
0.125	182.6	48.4	134.2	25.059	79.361	1.60100	**0.64897**

Tested By 129-04-0411 *Date* 4/17/18 *Input Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 6

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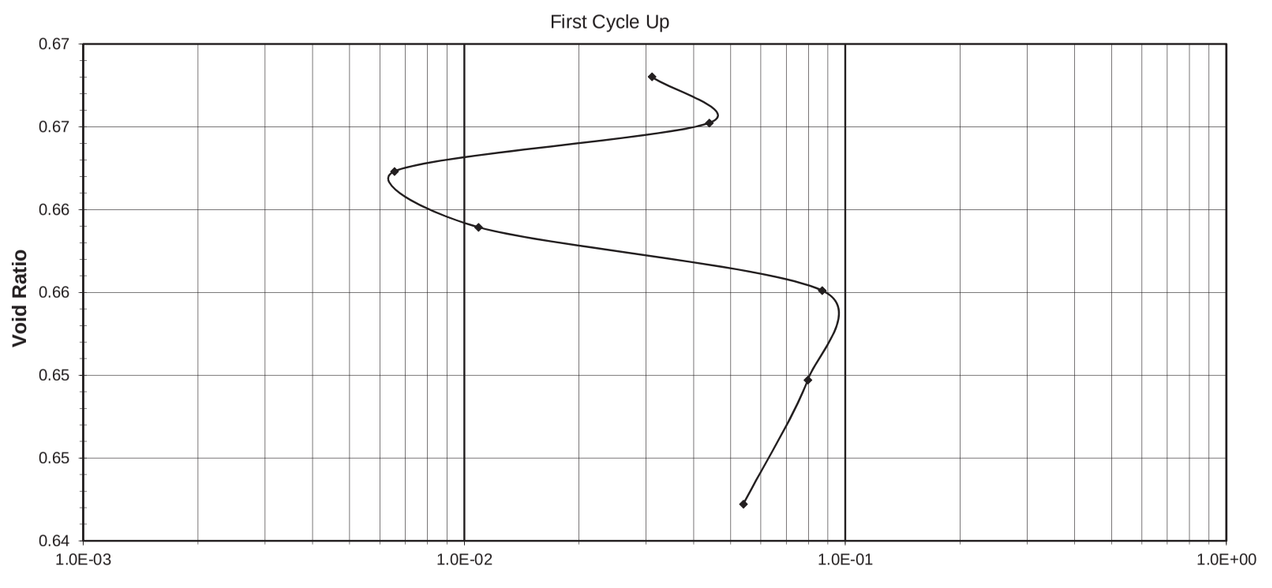
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-04-0411 *Date* 4/17/18 *Input Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 6

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ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Reference	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED
Consolidometer No. R470
1 Division = 0.0001 (in.)

Sample Properties	Initial	Final
Water Content		
Tare Number	TB-08	815
Wt. Tare & WS (g)	485.43	287.95
Wt. Tare & DS (g)	418.64	259.52
Wt. Water (g)	66.79	28.43
Wt. Tare (g)	135.33	135.83
Wt. DS (g)	283.31	123.69
Water Content (%)	23.57	22.98
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.000	0.987
Sample Volume (cc)	80.44	79.36
Wt. Wet Sample + Ring (g)	371.31	370.56
Wt. of Ring (g)	214.30	214.30
Wt. of Wet Sample (g)	157.01	156.26
Wet Density (pcf)	121.80	122.87
Wet Density (g/cc)	1.95	1.97
Water Content (%)	23.57	22.98
Wt. of Dry Sample (g)	127.06	127.06
Dry Density (pcf)	98.56	99.90
Dry Density (g/cc)	1.58	1.60
Void Ratio	0.6714	0.6490
Saturation (%)	92.70	93.50
Specific Gravity	*2.64*	*Measured*

C_v Test Data Summary

Load Increment (tsf)	Dial Reading @ t_{50} (div)	Machine Deflection (div)	Corrected Dial Reading @ t_{50} (div)	Sample Height @ t_{50} (cm)	Time t_{50} (min.)	C_v (cm^2/sec)
0.0 - 0.125	12.2	4.2	8.0	2.538	**0.17**	**0.03110**
0.125 - 0.25	38.7	13.1	25.6	2.534	**0.12**	**0.04391**
0.25 - 0.5	74.2	27.4	46.8	2.528	**0.80**	**0.00656**
0.5 - 1	117.3	51.0	66.2	2.523	**0.48**	**0.01089**
1 - 2	164.8	87.1	77.6	2.520	**0.06**	**0.08690**
2 - 4	235.6	124.7	110.9	2.512	**0.07**	**0.07968**
4 - 8	321.7	163.1	158.6	2.500	**0.10**	**0.05399**
8 - 2	NA	103.0	NA	NA	**NA**	**NA**
2 - 0.5	NA	55.9	NA	NA	**NA**	**NA**
0.5 - 0.25	NA	48.4	NA	NA	**NA**	**NA**
0.25 - 0.125	NA	48.4	NA	NA	**NA**	**NA**

Tested By 129-04-0411 *Date* 4/17/18 *Input Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 6

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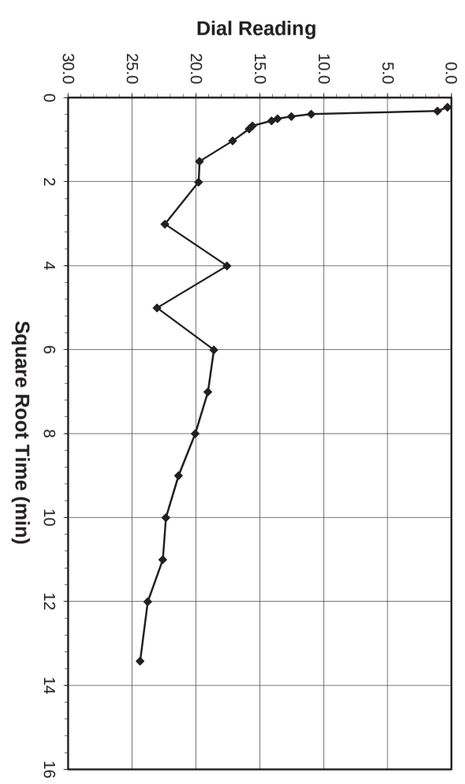
SHEET 17

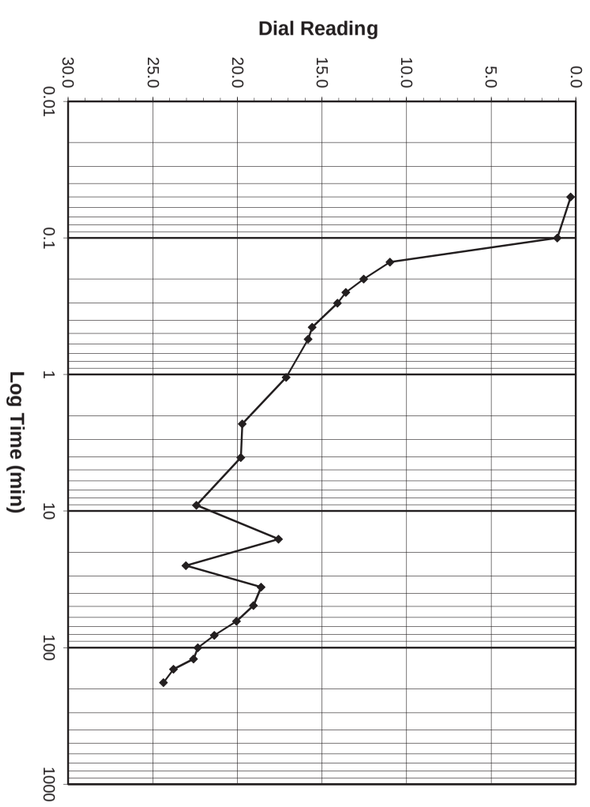
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load **0.0-0.125 (tsf)**
Final Reading **24.4 (div)**
Consolidometer No. **R470**
1 Division 0.0001 (in)

Start Date 4/17/18
Start Time 10:32:22

Elapsed Time (min)	Dial Reading (div)
Initial	**0.0**
0.05	0.3
0.10	1.1
0.15	11.0
0.20	12.5
0.25	13.6
0.30	14.1
0.45	15.6
0.55	15.8
1.05	17.1
2.30	19.7
4.05	19.8
9.05	22.4
16.05	17.6
25.05	23.0
36.05	18.6
49.07	19.0
64.07	20.0
81.07	21.4
100.07	22.3
121.07	22.6
144.07	23.8
180.07	24.4

Tested By 129-04-0411 *Date* 4/17/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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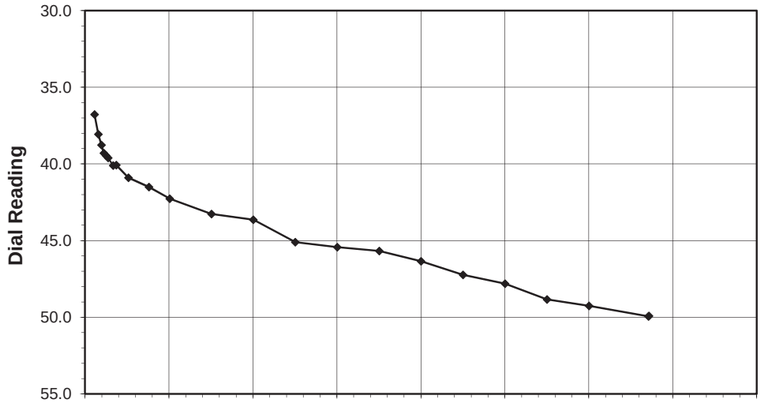
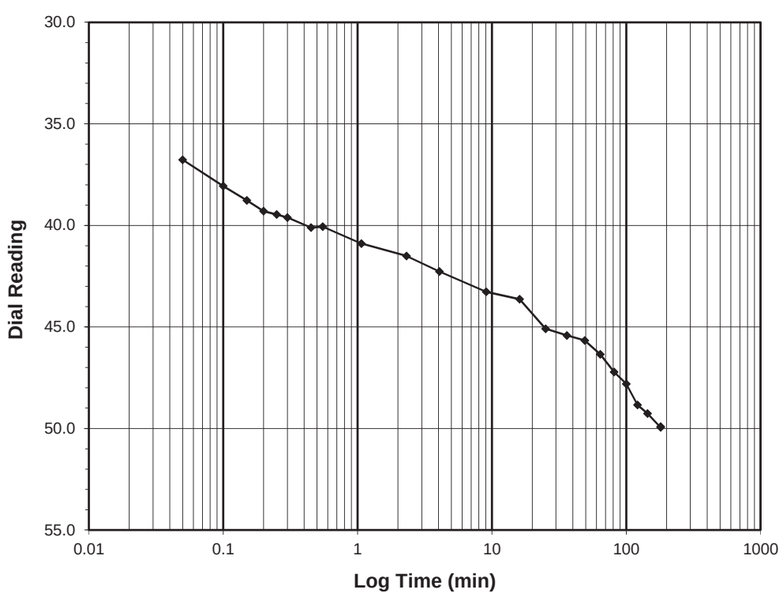
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**0.125-0.25**
Final Reading	**(div)**	**49.9**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/17/18
Start Time		13:32:46

Elapsed Time (min)	Dial Reading (div)
Initial	**24.4**
0.05	36.8
0.10	38.1
0.15	38.8
0.20	39.3
0.25	39.5
0.30	39.6
0.45	40.1
0.55	40.1
1.07	40.9
2.32	41.5
4.07	42.3
9.07	43.3
16.07	43.6
25.07	45.1
36.07	45.4
49.07	45.7
64.07	46.4
81.07	47.2
100.07	47.8
121.07	48.8
144.07	49.3
180.07	49.9
180.42	49.9

Tested By *129-04-0411* *Date* *4/17/18* *Checked By* *GEM* *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-011 GEOJAC-16TSF1 Cv.xlsm]STEP 2

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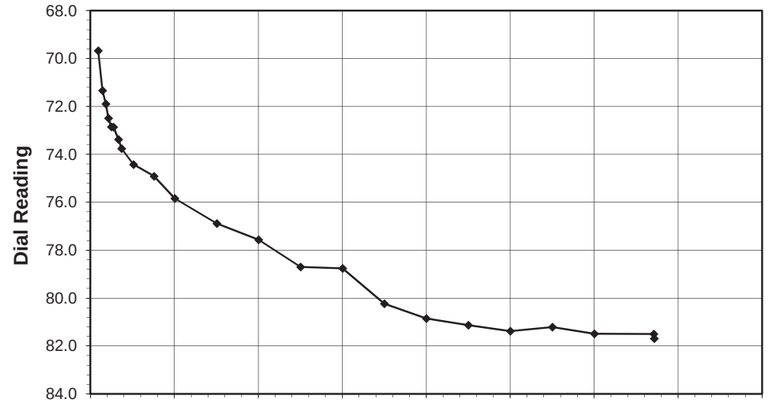
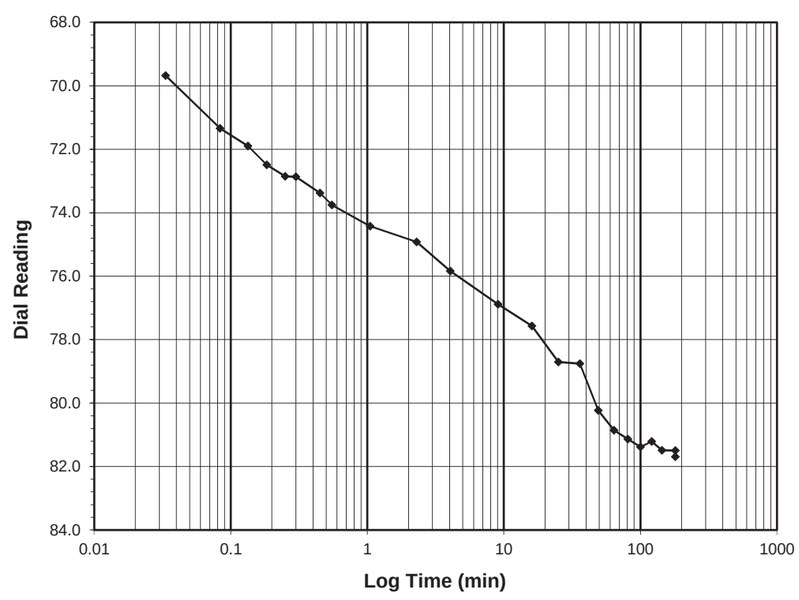
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**0.25-0.5**
Final Reading	**(div)**	**81.7**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/17/18
Start Time		16:33:11

Elapsed Time (min)	Dial Reading (div)
Initial	**49.9**
0.03	69.7
0.08	71.3
0.13	71.9
0.18	72.5
0.25	72.9
0.30	72.9
0.45	73.4
0.55	73.8
1.05	74.4
2.30	74.9
4.05	75.8
9.05	76.9
16.05	77.6
25.05	78.7
36.05	78.8
49.05	80.2
64.05	80.9
81.05	81.1
100.05	81.4
121.05	81.2
144.05	81.5
180.05	81.5
180.32	81.7

Tested By *129-04-0411* *Date* *4/17/18* *Checked By* *GEM* *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-011 GEOJAC-16TSF1 Cv.xlsm]STEP 3

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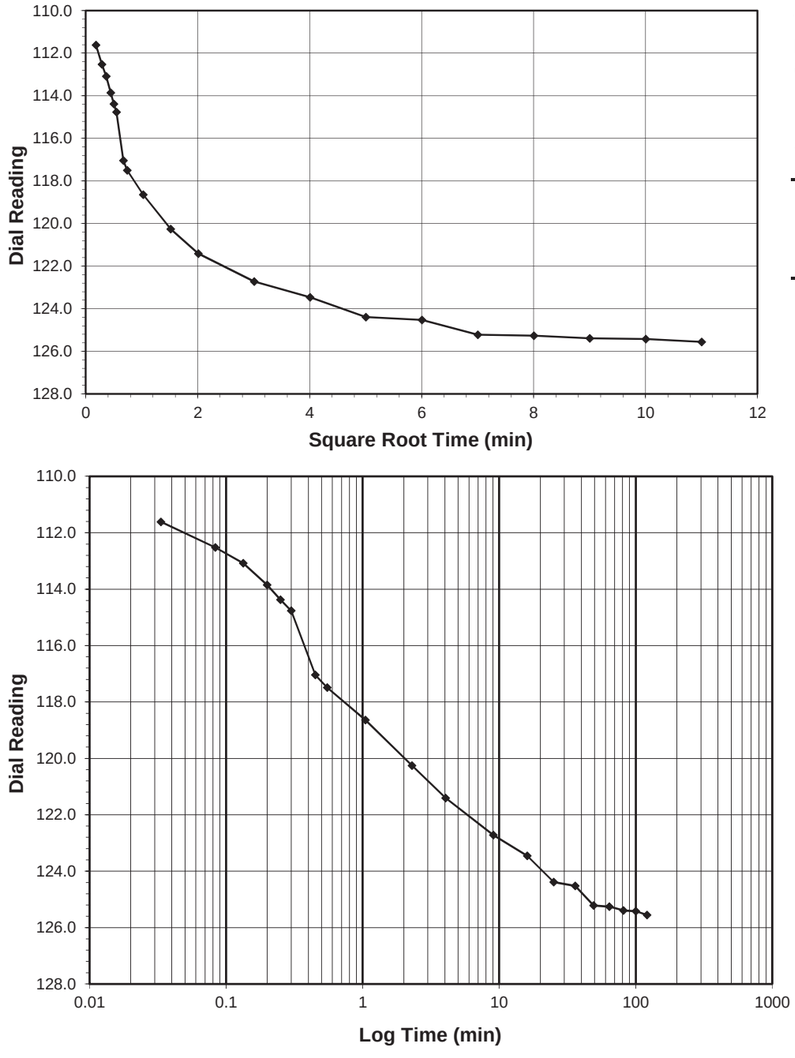
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-1.0**
Final Reading	**(div)**	**125.6**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/17/18
Start Time		19:33:31

Elapsed Time (min)	Dial Reading (div)
Initial	**81.7**
0.03	111.6
0.08	112.5
0.13	113.1
0.20	113.9
0.25	114.4
0.30	114.8
0.45	117.0
0.55	117.5
1.05	118.6
2.30	120.3
4.05	121.4
9.05	122.7
16.05	123.5
25.05	124.4
36.05	124.5
49.07	125.2
64.07	125.3
81.07	125.4
100.07	125.4
121.07	125.6

Tested By 129-04-0411 *Date* 4/17/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

Z:\2018 PROJECTS\ESP Associates\2018-095 ESP - R-1015 SITE 9\[2018-095-001-011 GEOJAC-16TSF1 Cv.xlsm]STEP 4

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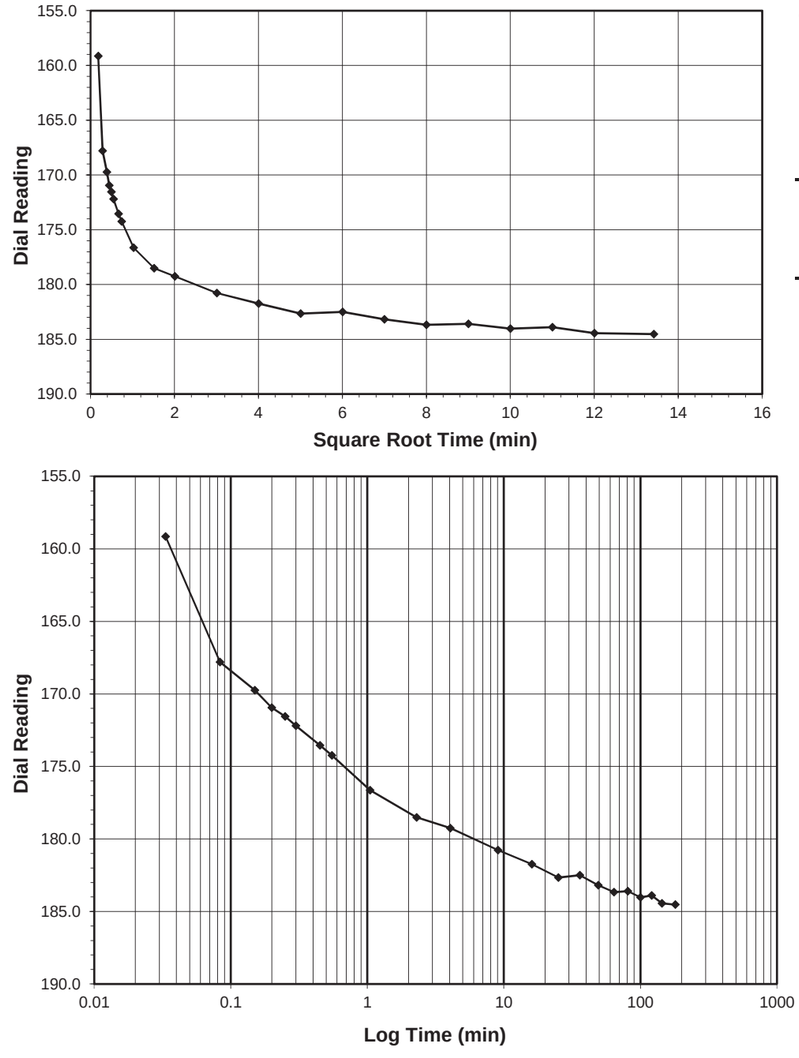
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-2.0**
Final Reading	**(div)**	**184.5**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/17/18
Start Time		22:33:55

Elapsed Time (min)	Dial Reading (div)
Initial	**125.6**
0.03	159.1
0.08	167.8
0.15	169.7
0.20	170.9
0.25	171.5
0.30	172.2
0.45	173.5
0.55	174.2
1.05	176.6
2.30	178.5
4.05	179.3
9.05	180.8
16.05	181.7
25.05	182.7
36.05	182.5
49.05	183.2
64.05	183.7
81.05	183.6
100.07	184.0
121.07	183.9
144.07	184.4
180.07	184.5

Tested By 129-04-0411 *Date* 4/17/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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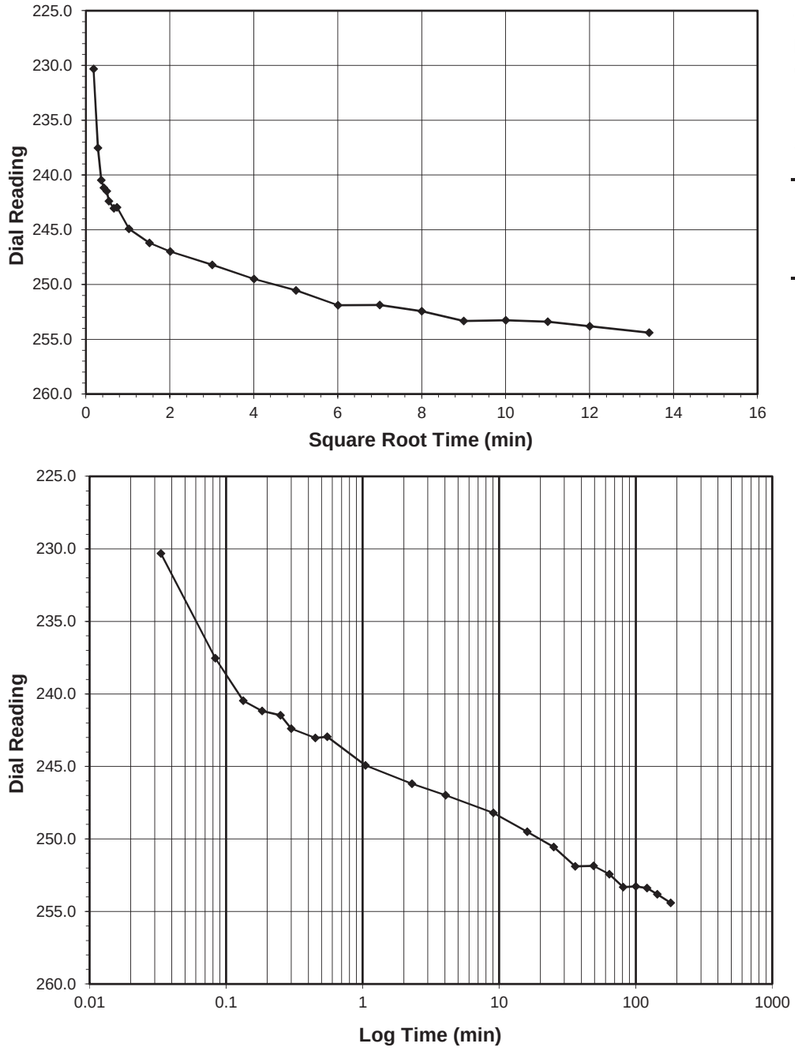
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-4.0**
Final Reading	**(div)**	**254.4**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/18/18
Start Time		1:34:20

Elapsed Time (min)	Dial Reading (div)
Initial	**184.5**
0.03	230.3
0.08	237.5
0.13	240.5
0.18	241.2
0.25	241.5
0.30	242.4
0.45	243.0
0.55	242.9
1.05	244.9
2.30	246.2
4.05	247.0
9.05	248.2
16.05	249.5
25.05	250.5
36.05	251.9
49.05	251.9
64.05	252.4
81.05	253.3
100.05	253.3
121.05	253.4
144.05	253.8
180.05	254.4

Tested By *129-04-0411* *Date* *4/18/18* *Checked By* *GEM* *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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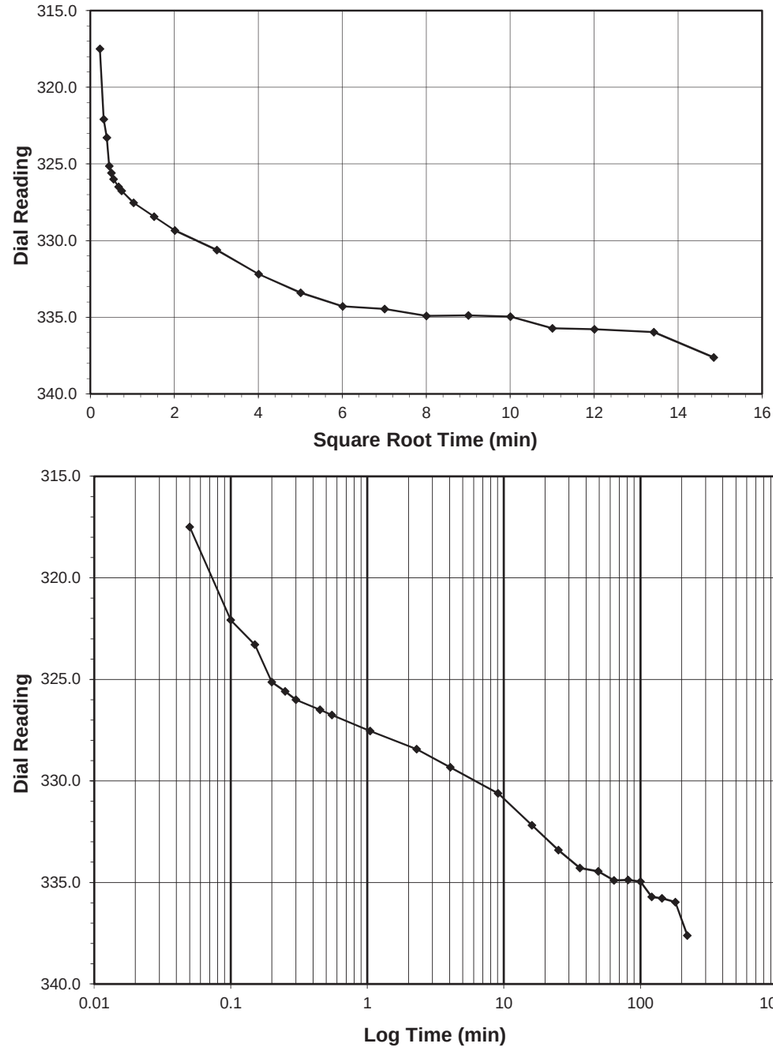
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**4.0-8.0**
Final Reading	**(div)**	**337.6**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/18/18
Start Time		4:34:44

Elapsed Time (min)	Dial Reading (div)
Initial	**254.4**
0.05	317.5
0.10	322.1
0.15	323.3
0.20	325.1
0.25	325.6
0.30	326.0
0.45	326.5
0.55	326.8
1.05	327.5
2.30	328.4
4.05	329.3
9.07	330.6
16.07	332.2
25.07	333.4
36.07	334.3
49.07	334.5
64.07	334.9
81.07	334.9
100.07	335.0
121.07	335.7
144.07	335.8
180.07	336.0
220.47	337.6

Tested By *129-04-0411* *Date* *4/18/18* *Checked By* *GEM* *Date* 5/15/18

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DCN: CT-24E Date: 5/3/12 Revision: 3

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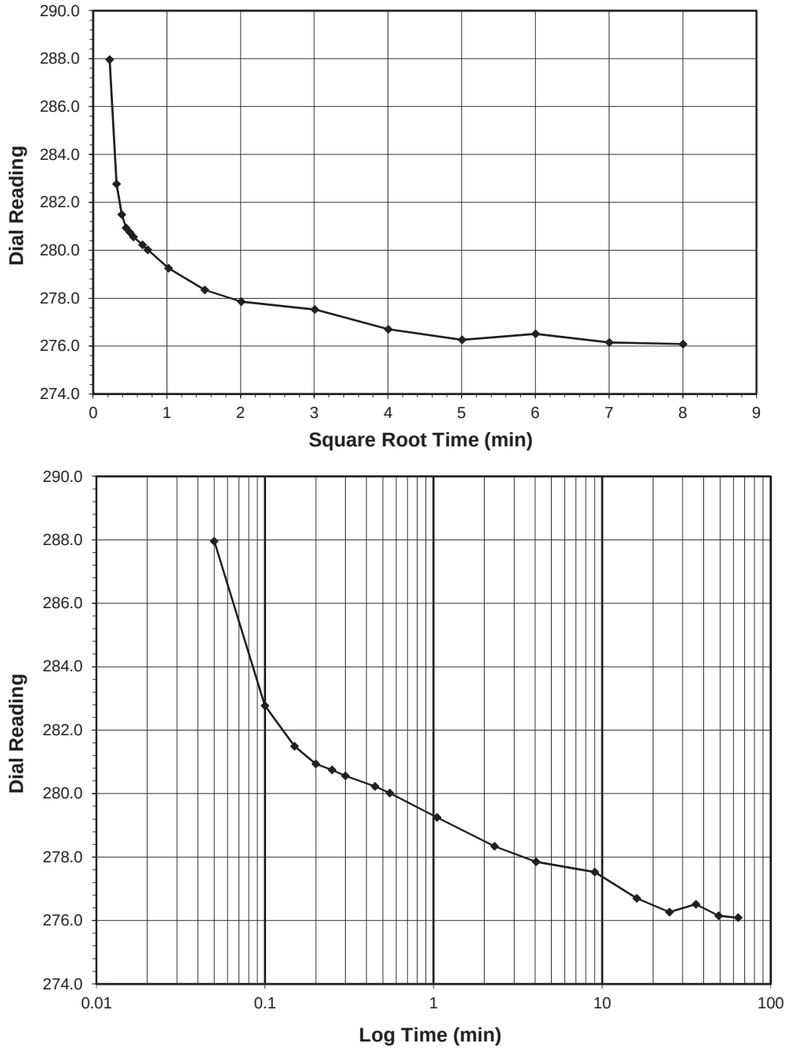
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**8.0-2.0**
Final Reading	**(div)**	**276.1**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/18/18
Start Time		8:15:13

Elapsed Time (min)	Dial Reading (div)
Initial	**337.6**
0.05	288.0
0.10	282.8
0.15	281.5
0.20	280.9
0.25	280.7
0.30	280.6
0.45	280.2
0.55	280.0
1.05	279.3
2.30	278.3
4.05	277.9
9.05	277.5
16.05	276.7
25.05	276.3
36.05	276.5
49.05	276.1
64.05	276.1

Tested By 129-04-0411 *Date* 4/18/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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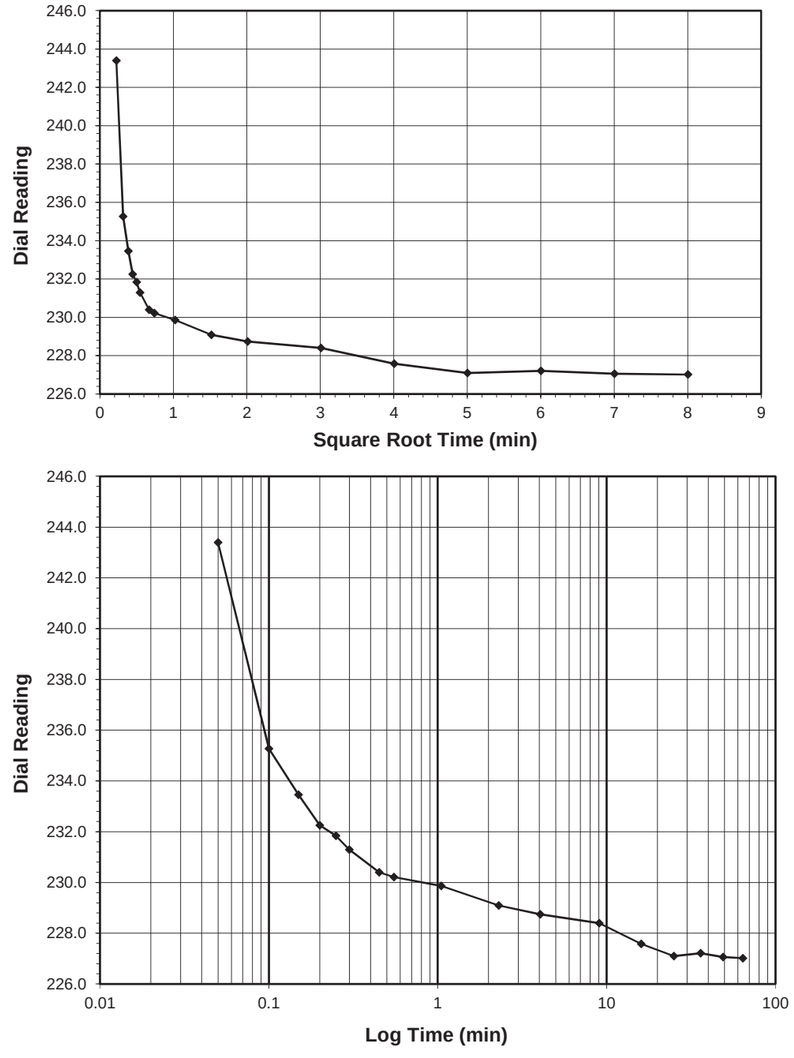
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-0.5**
Final Reading	**(div)**	**227.0**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/18/18
Start Time		11:15:34

Elapsed Time (min)	Dial Reading (div)
Initial	**276.1**
0.05	243.4
0.10	235.3
0.15	233.5
0.20	232.3
0.25	231.8
0.30	231.3
0.45	230.4
0.55	230.2
1.05	229.9
2.30	229.1
4.05	228.7
9.05	228.4
16.05	227.6
25.05	227.1
36.05	227.2
49.05	227.1
64.07	227.0

Tested By 129-04-0411 *Date* 4/18/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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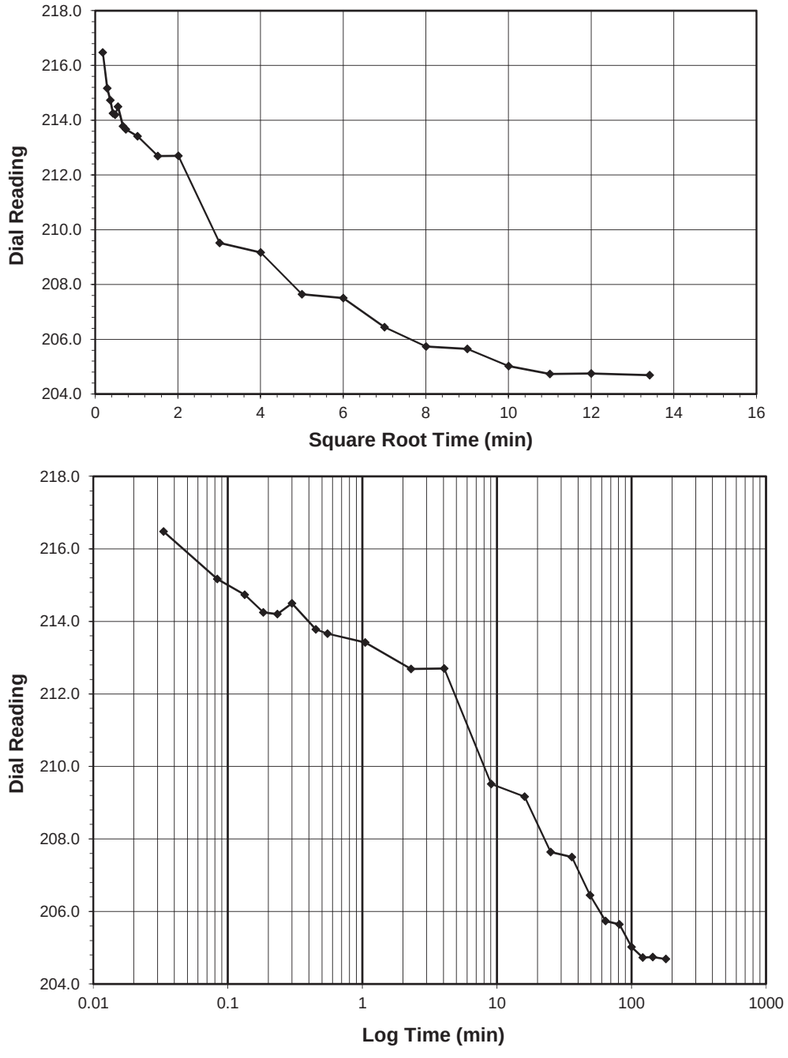
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-0.25**
Final Reading	**(div)**	**204.7**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/18/18
Start Time		14:15:59

Elapsed Time (min)	Dial Reading (div)
Initial	**227.0**
0.03	216.5
0.08	215.2
0.13	214.7
0.18	214.3
0.23	214.2
0.30	214.5
0.45	213.8
0.55	213.7
1.05	213.4
2.30	212.7
4.05	212.7
9.05	209.5
16.05	209.2
25.05	207.6
36.05	207.5
49.05	206.4
64.05	205.7
81.05	205.6
100.05	205.0
121.05	204.7
144.07	204.7
180.07	204.7

Tested By 129-04-0411 *Date* 4/18/18 *Checked By* GEM *Date* 5/15/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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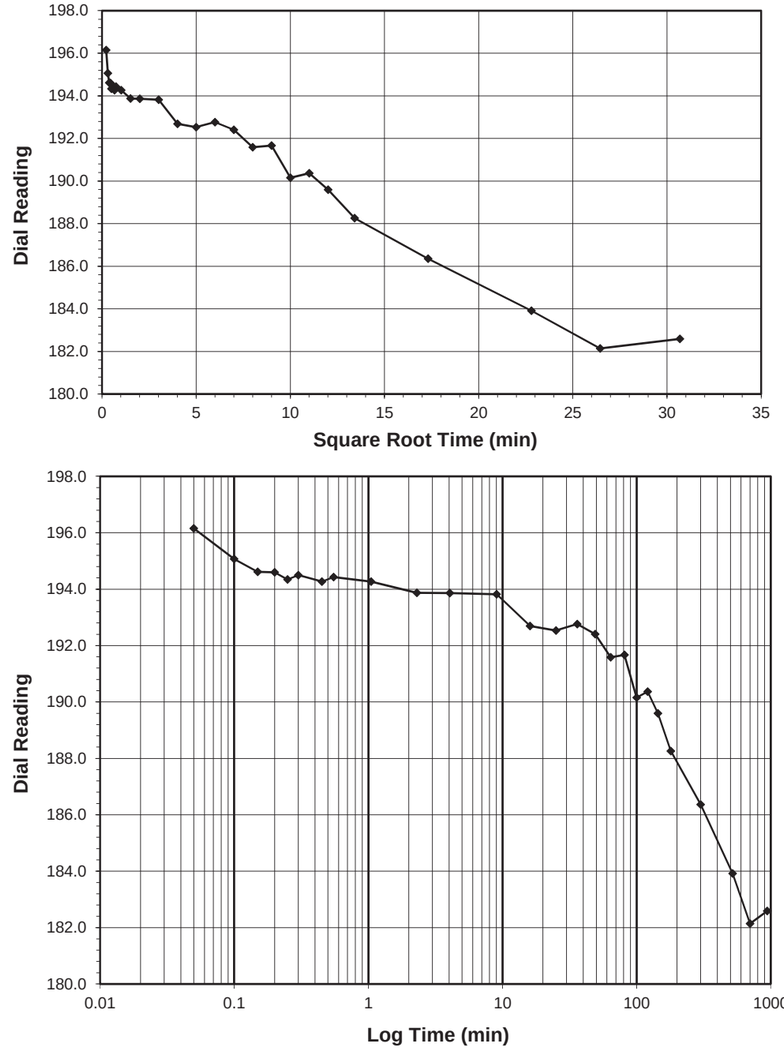
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Boring No.	-L- STA. 517+11, 59'RT
Client Project	R-1015 Site 9 - CS34.327.00	Depth (ft)	11.0-13.0
Project No.	R-2018-095-001	Sample No.	ST-2
Lab ID	R-2018-095-001-011	Visual Description	GRAY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.25-0.125**
Final Reading	**(div)**	**182.6**
Consolidometer No.		**R470**
1 Division	(in)	0.0001
Start Date		4/18/18
Start Time		17:16:22

Elapsed Time (min)	Dial Reading (div)
Initial	**204.7**
0.05	196.2
0.10	195.1
0.15	194.6
0.20	194.6
0.25	194.3
0.30	194.5
0.45	194.3
0.55	194.4
1.05	194.3
2.30	193.9
4.05	193.9
9.05	193.8
16.05	192.7
25.05	192.5
36.05	192.8
49.05	192.4
64.07	191.6
81.07	191.7
100.07	190.2
121.07	190.4
144.07	189.6
180.07	188.3
300.07	186.4
520.07	183.9
700.07	182.1
941.73	182.6

Tested By 129-04-0411 *Date* 4/18/18 *Checked By* GEM *Date* 5/15/18

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DCN: CT-24E Date: 5/3/12 Revision: 3

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SPECIFIC GRAVITY

AASHTO T-100-15

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Reference	R-2015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	**GRAY**
			(MInus No.4 sieve material, airdried)

Replicate Number	**1**	**2**
Pycnometer ID	R 280	R 347
Weight of Pycnometer + Soil + Water (gm)	718.53	711.58
Temperature, T (°Celsius)	28.1	27.8
Weight of Pycnometer + Water (gm)	685.04	668.72
Tare Number	280	347
Weight of Tare + Dry Soil (gm)	241.14	239.34
Weight of Tare (gm)	187.33	170.75
Weight of Dry Soil (gm)	53.81	68.59
Specific Gravity of Soil @ T	2.649	2.666
Specific Gravity of Water @ T	0.9962	0.9963
Conversion Factor for Temperature T	0.9980	0.9981
Specific Gravity @ 20° Celsius	2.654	2.671

Average Specific Gravity @ 20° Celsius	2.66

Tested By 129-04-0411 *Date* 7/3/18 *Checked By* GEM *Date* 7/3/18

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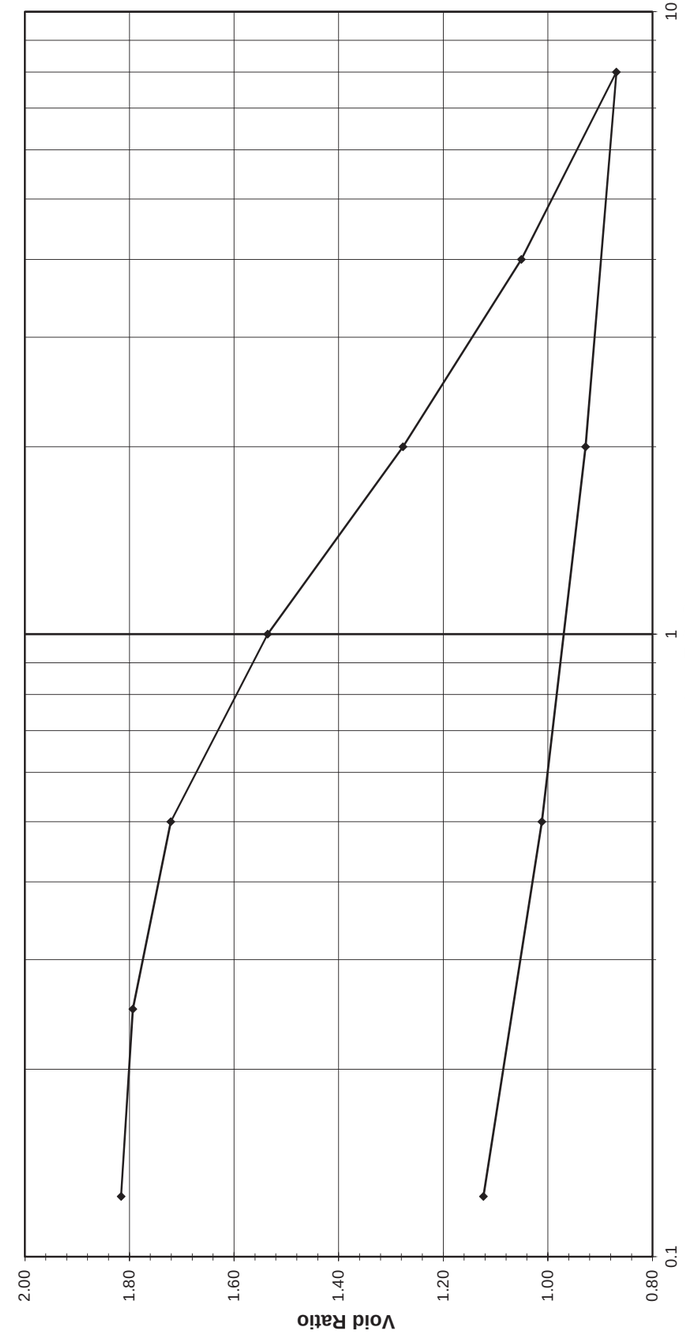
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Reference	R-1015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-04-0411 *Date* 6/26/18 *Approved By* MPS *Date* 7/6/18

Z:\2018 PROJECTS\ESP Associates\2018-181 ESP - R-1015 SITE 9 MSE WALL\[2018-181-001-001 DOT GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT

DCN: CT-24E Date: 5/3/12 Revision: 6

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ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Reference	R-1015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED
Consolidometer No. R487
1 Division = 0.0001 (in.)

Sample Properties	**Initial**	**Final**
Water Content		
Tare Number	912	826
Wt. Tare & WS (g)	335.79	237.23
Wt. Tare & DS (g)	244.03	205.02
Wt. Water (g)	91.76	32.21
Wt. Tare (g)	101.01	133.76
Wt. DS (g)	143.02	71.26
Water Content (%)	64.16	45.20
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.0000	1.0000
Sample Volume (cc)	80.44	80.44
Wt. Wet Sample + Ring (g)	337.93	323.70
Wt. of Ring (g)	214.69	214.69
Wt. of Wet Sample (g)	123.24	109.01
Wet Density (pcf)	95.60	84.56
Wet Density (g/cc)	1.53	1.36
Water Content (%)	64.16	45.20
Wt. of Dry Sample (g)	75.07	75.07
Dry Density (pcf)	58.24	58.24
Dry Density (g/cc)	0.93	0.93
Void Ratio	1.8501	1.8501
Saturation (%)	92.24	64.99
Specific Gravity	2.66	*Measured*

Test Data Summary

Applied Pressure (tsf)	Final Dial Reading (div)	Machine Deflection (div)	Corrected Reading (div)	Height of Sample (mm)	Volume (cc)	Dry Density (g/cc)	Void Ratio
Seating	0	0	0	25.400	80.440	0.93329	**1.85013**
0.125	123.7	3.6	120.1	25.095	79.474	0.94463	**1.81591**
0.25	207.3	9.0	198.3	24.896	78.844	0.95218	**1.79360**
0.5	474.4	21.0	453.4	24.248	76.793	0.97762	**1.72091**
1	1143.0	40.0	1103.0	22.598	71.567	1.04900	**1.53575**
2	2071.0	59.6	2011.4	20.291	64.260	1.16828	**1.27685**
4	2889.6	85.0	2804.6	18.276	57.880	1.29707	**1.05078**
8	3565.8	123.4	3442.5	16.656	52.749	1.42323	**0.86898**
2	3350.2	114.6	3235.6	17.182	54.413	1.37970	**0.92795**
0.5	3027.2	84.0	2943.2	17.924	56.765	1.32254	**1.01129**
0.125	2626.5	76.4	2550.1	18.923	59.927	1.25276	**1.12332**

Tested By 129-04-0411 *Date* 6/26/18 *Input Checked By* GEM *Date* 7/6/18

DCN: CT-24E Date: 5/3/12 Revision: 6

Z:\2018 PROJECTS\ESP Associates\2018-181 ESP - R-1015 SITE 9 MSE WALL\[2018-181-001-001 DOT GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT

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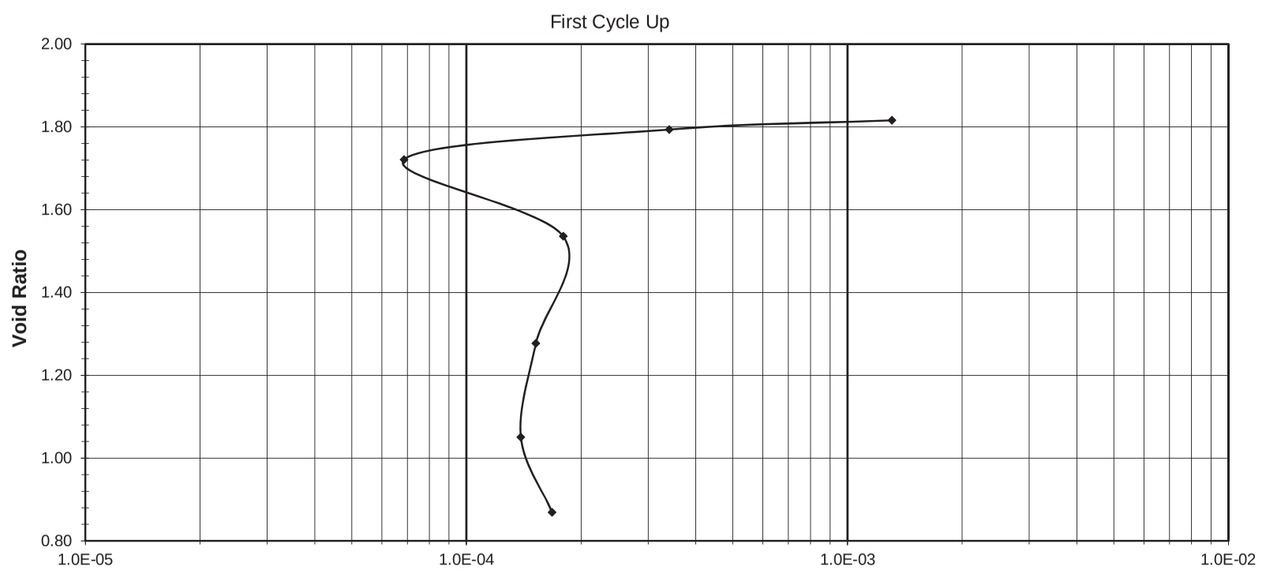
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Reference	R-1015 Site 9 MSE Wall CS34.368	Depth (ft) Sample	9.8-11.8
Project No.	R-2018-181-001	No. Visual	ST-3
Lab ID	R-2018-181-001-001	Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By 129-04-0411 *Date* 6/26/18 *Input Checked By* GEM *Date* 7/6/18

DCN: CT-24E Date: 5/3/12 Revision: 6

Z:\2018 PROJECTS\ESP Associates\2018-181 ESP - R-1015 SITE 9 MSE WALL\[2018-181-001-001 DOT GEOJAC-16TSF1 Cv.xlsm]FINAL PLOT

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ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Reference	R-1015 Site 9 MSE Wall CS34.368	Depth (ft) Sample	9.8-11.8
Project No.	R-2018-181-001	No. Visual	ST-3
Lab ID	R-2018-181-001-001	Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED
Consolidometer No. R487
1 Division = 0.0001 (in.)

Sample Properties	**Initial**	**Final**
Water Content		
Tare Number	912	826
Wt. Tare & WS (g)	335.79	237.23
Wt. Tare & DS (g)	244.03	205.02
Wt. Water (g)	91.76	32.21
Wt. Tare (g)	101.01	133.76
Wt. DS (g)	143.02	71.26
Water Content (%)	64.16	45.20
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.000	1.000
Sample Volume (cc)	80.44	80.44
Wt. Wet Sample + Ring (g)	337.93	323.70
Wt. of Ring (g)	214.69	214.69
Wt. of Wet Sample (g)	123.24	109.01
Wet Density (pcf)	95.60	84.56
Wet Density (g/cc)	1.53	1.36
Water Content (%)	64.16	45.20
Wt. of Dry Sample (g)	75.07	75.07
Dry Density (pcf)	58.24	58.24
Dry Density (g/cc)	0.93	0.93
Void Ratio	1.8501	1.8501
Saturation (%)	92.24	64.99
Specific Gravity	*2.66*	*Measured*

C_v Test Data Summary

Load Increment (tsf)	**Dial Reading @ t_{50}** (div)	**Machine Deflection** (div)	**Corrected Dial Reading @ t_{50}** (div)	**Sample Height @ t_{50}** (cm)	**Time t_{50}** (min.)	**C_v** (cm^2/sec)
0.0 - 0.125	60.3	3.6	56.7	2.526	**4.00**	**0.00131**
0.125 - 0.25	184.2	9.0	175.2	2.495	**15.00**	**0.00034**
0.25 - 0.5	360.8	21.0	339.8	2.454	**72.00**	**0.00007**
0.5 - 1	817.6	40.0	777.6	2.342	**25.10**	**0.00018**
1 - 2	1565.5	59.6	1505.9	2.157	**25.10**	**0.00015**
2 - 4	2486.4	85.0	2401.4	1.930	**22.00**	**0.00014**
4 - 8	3228.8	123.4	3105.4	1.751	**15.00**	**0.00017**
8 - 2	NA	114.6	NA	NA	**NA**	**NA**
2 - 0.5	NA	84.0	NA	NA	**NA**	**NA**
0.5 - 0.125	NA	76.4	NA	NA	**NA**	**NA**

Tested By *129-04-0411* *Date* *6/26/18* *Input Checked By* *GEM* *Date* *7/6/18*

DCN: CT-24E Date: 5/3/12 Revision: 6
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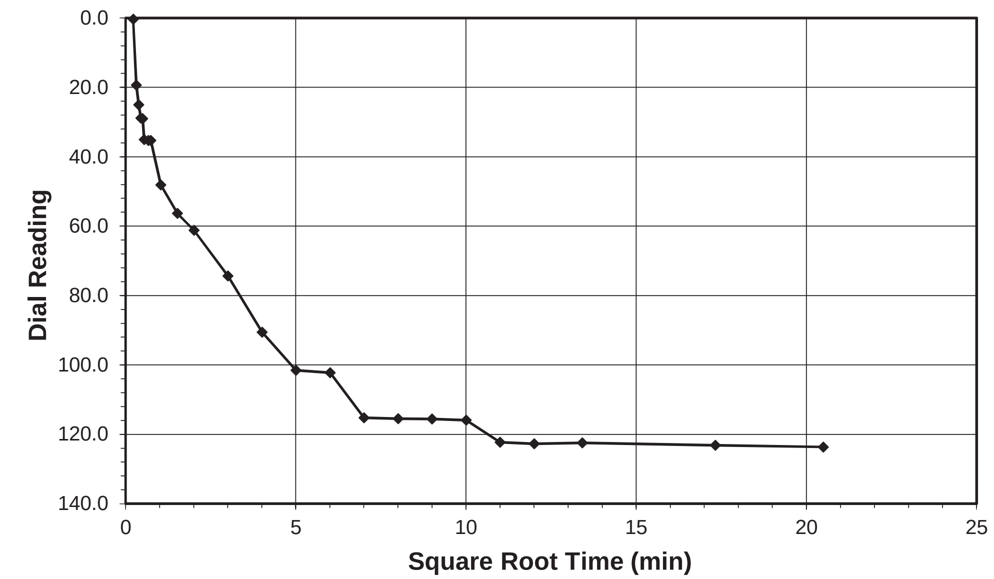
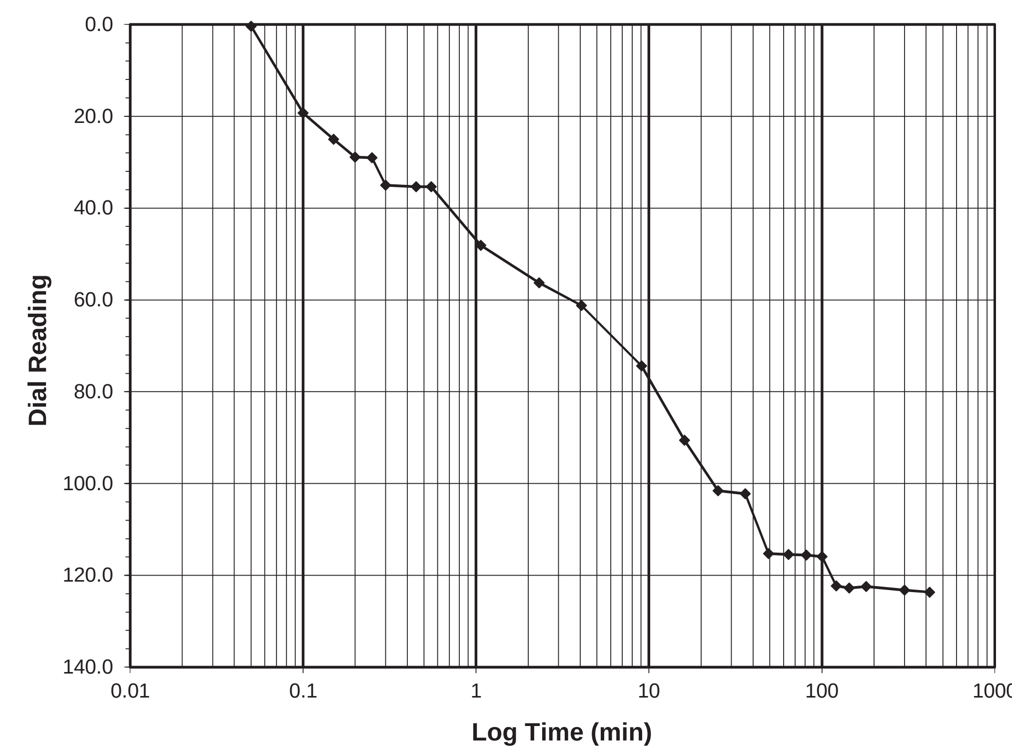
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Project	R-1015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**0.0-0.125**
Final Reading	**(div)**	**123.7**
Consolidometer No.		**R487**
1 Division	(in)	0.0001
Start Date		6/26/18
Start Time		17:27:35

Elapsed Time (min)	Dial Reading (div)
Initial	**0.0**
0.05	0.4
0.10	19.3
0.15	25.0
0.20	28.9
0.25	29.0
0.30	35.0
0.45	35.3
0.55	35.3
1.07	48.1
2.32	56.3
4.07	61.2
9.07	74.4
16.07	90.5
25.07	101.6
36.07	102.2
49.07	115.2
64.07	115.5
81.07	115.6
100.07	115.9
121.07	122.3
144.07	122.8
180.07	122.4
300.07	123.2
420.05	123.7

Tested By *129-04-0411* Date *6/26/18* *Checked By* *GEM* *Date* *7/6/18*

DCN: CT-24E Date: 5/3/12 Revision: 3
Z:\2018 PROJECTS\ESP Associates\2018-181 ESP - R-1015 SITE 9 MSE WALL\[2018-181-001-001 DOT GEOJAC-16TSF1 Cv.xlsm]STEP 1

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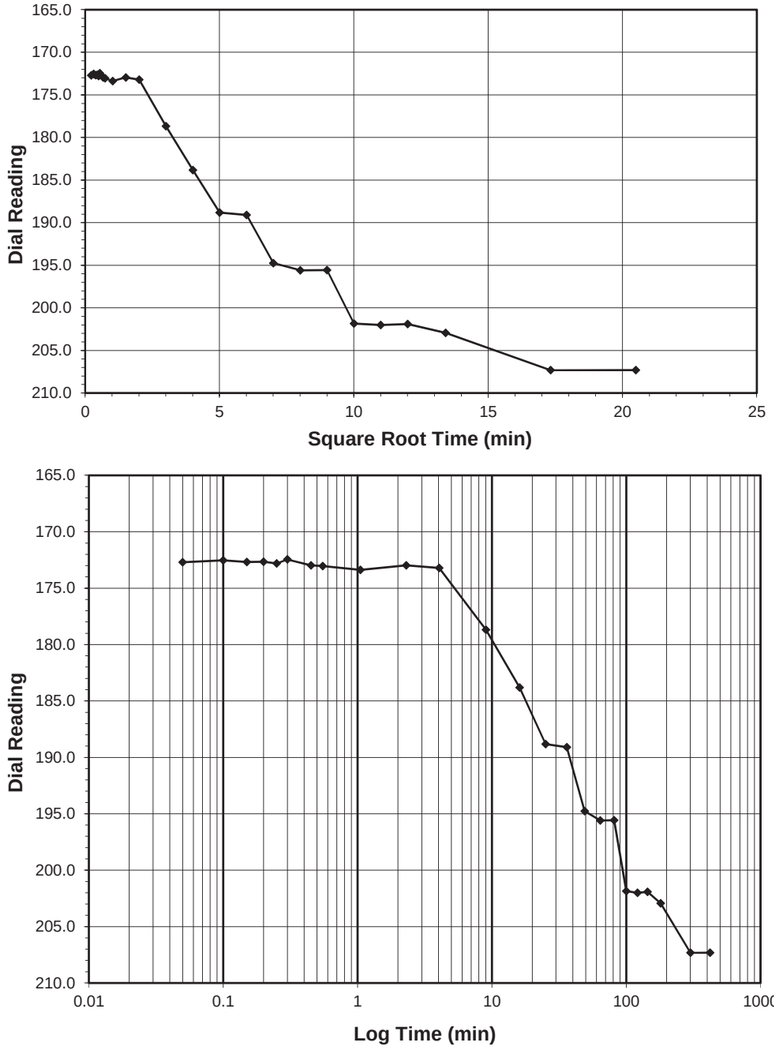
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Project	R-1015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.125-0.25**
Final Reading	**(div)**	**207.3**
Consolidometer No.		**R487**
1 Division	(in)	0.0001
Start Date		6/27/18
Start Time		0:27:38

Elapsed Time (min)	Dial Reading (div)
Initial	**123.7**
0.05	172.7
0.10	172.5
0.15	172.7
0.20	172.7
0.25	172.8
0.30	172.5
0.45	173.0
0.55	173.0
1.05	173.4
2.30	173.0
4.05	173.2
9.05	178.7
16.07	183.8
25.07	188.8
36.07	189.1
49.07	194.8
64.07	195.6
81.07	195.6
100.07	201.9
121.07	202.0
144.07	201.9
180.07	202.9
300.07	207.3
420.25	207.3

Tested By 129-04-0411 *Date* 6/27/18 *Checked By* GEM *Date* 7/6/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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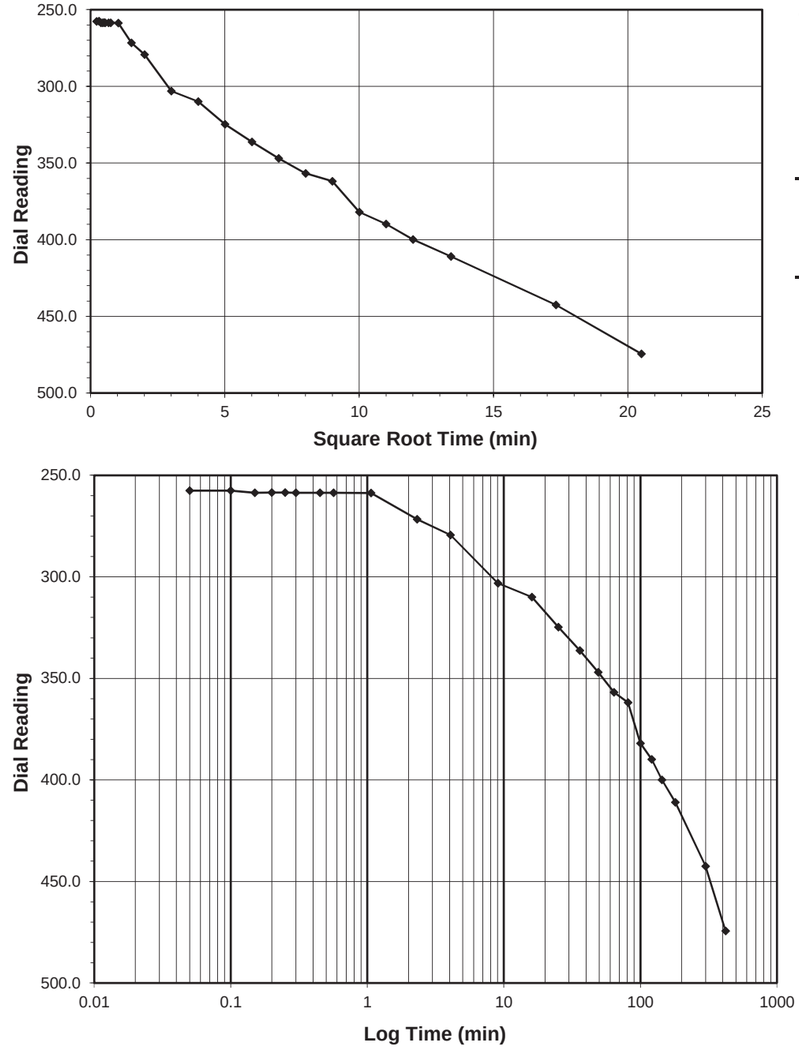
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location.	-L-STA.217+15,23'RT
Client Project	R-1015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.25-0.5**
Final Reading	**(div)**	**474.4**
Consolidometer No.		**R487**
1 Division	(in)	0.0001
Start Date		6/27/18
Start Time		7:27:53

Elapsed Time (min)	Dial Reading (div)
Initial	**207.3**
0.05	257.6
0.10	257.5
0.15	258.6
0.20	258.5
0.25	258.5
0.30	258.6
0.45	258.5
0.57	258.5
1.07	258.7
2.32	271.7
4.07	279.3
9.07	303.1
16.07	310.0
25.07	324.7
36.07	336.3
49.07	347.0
64.07	356.8
81.07	361.9
100.07	382.0
121.07	389.9
144.07	400.0
180.08	411.0
300.08	442.6
420.50	474.4

Tested By 129-04-0411 *Date* 6/27/18 *Checked By* GEM *Date* 7/6/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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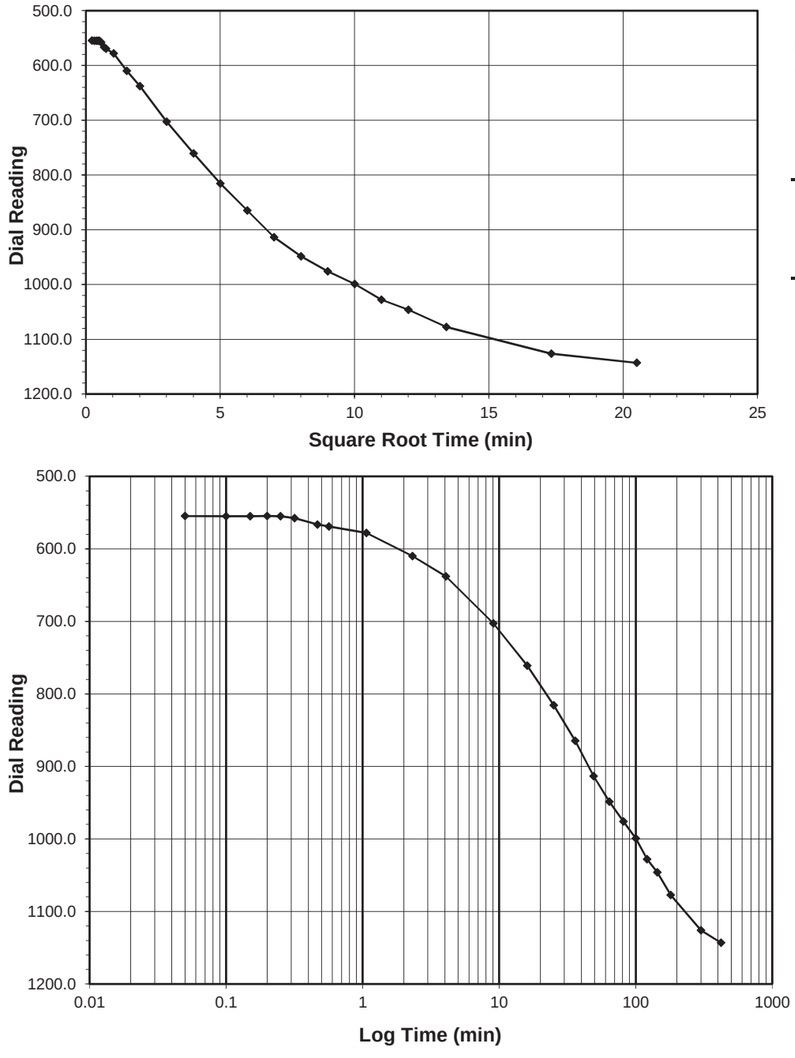
AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Project	R-1015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**0.5-1.0**
Final Reading	**(div)**	**1143.0**
Consolidometer No.		**R487**
1 Division	(in)	0.0001
Start Date		6/27/18
Start Time		14:28:23

Elapsed Time (min)	Dial Reading (div)
Initial	**474.4**
0.05	554.7
0.10	554.8
0.15	555.0
0.20	554.8
0.25	554.9
0.32	557.6
0.47	566.6
0.57	569.3
1.07	578.0
2.32	609.9
4.07	638.0
9.07	702.9
16.07	760.9
25.07	815.7
36.07	864.8
49.07	913.5
64.07	948.5
81.07	976.1
100.07	999.1
121.07	1027.9
144.07	1046.0
180.07	1077.3
300.08	1126.1
420.50	1143.0

Tested By 129-04-0411 *Date* 6/27/18 *Checked By* GEM *Date* 7/6/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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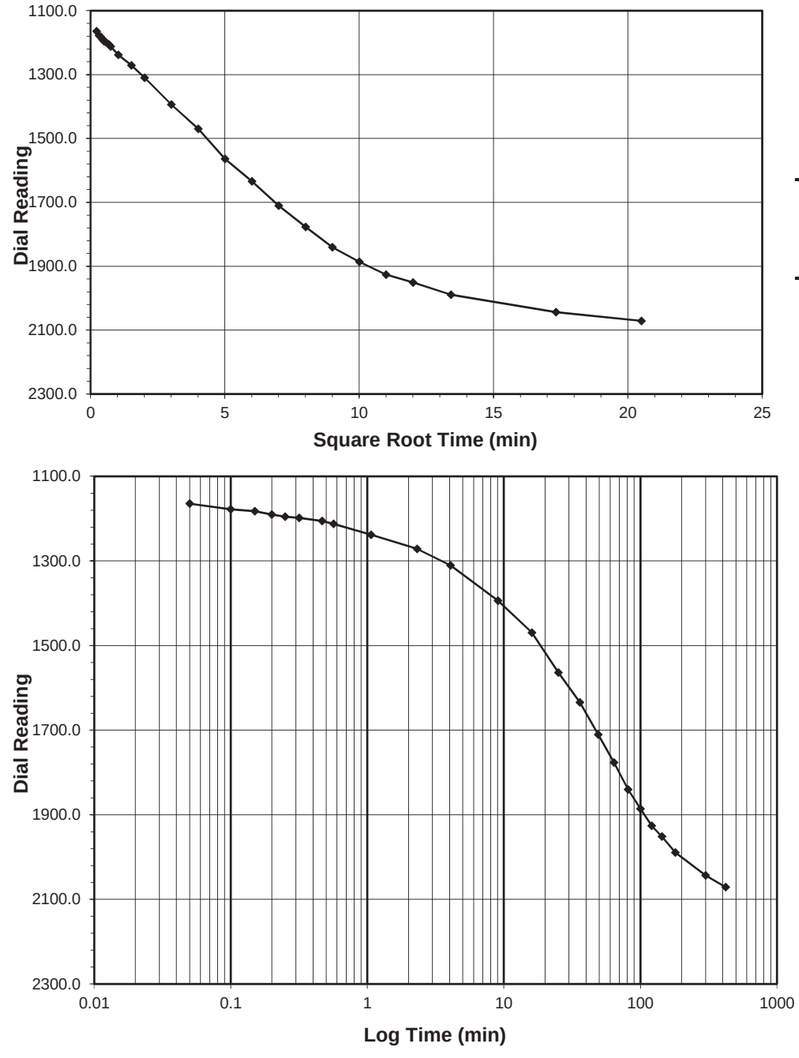
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Project	R-1015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**1.0-2.0**
Final Reading	**(div)**	**2071.0**
Consolidometer No.		**R487**
1 Division	(in)	0.0001
Start Date		6/27/18
Start Time		21:28:53

Elapsed Time (min)	Dial Reading (div)
Initial	**1143.0**
0.05	1164.5
0.10	1177.9
0.15	1182.6
0.20	1190.2
0.25	1195.3
0.32	1198.2
0.47	1205.6
0.57	1212.2
1.07	1238.0
2.32	1271.4
4.07	1310.2
9.07	1393.9
16.07	1469.5
25.07	1563.9
36.07	1634.3
49.07	1710.4
64.07	1776.7
81.07	1840.5
100.07	1885.8
121.07	1926.1
144.07	1951.3
180.08	1989.4
300.08	2043.6
420.47	2071.0

Tested By 129-04-0411 *Date* 6/27/18 *Checked By* GEM *Date* 7/6/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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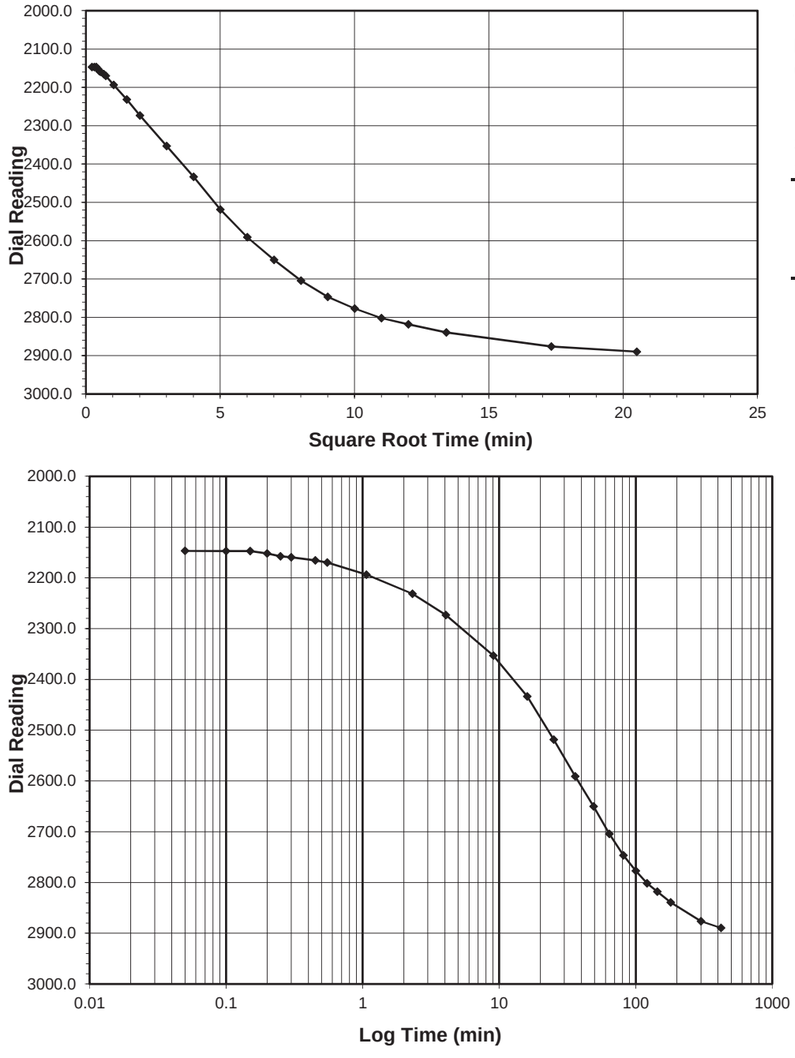
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Project	R-1015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-4.0**
Final Reading	**(div)**	**2889.6**
Consolidometer No.		**R487**
1 Division	(in)	0.0001
Start Date		6/28/18
Start Time		4:29:21

Elapsed Time (min)	Dial Reading (div)
Initial	**2071.0**
0.05	2146.9
0.10	2147.0
0.15	2147.1
0.20	2152.0
0.25	2157.7
0.30	2159.6
0.45	2165.7
0.55	2169.8
1.07	2193.9
2.32	2231.5
4.07	2273.1
9.07	2353.0
16.07	2433.4
25.07	2518.7
36.07	2590.8
49.07	2650.2
64.07	2704.3
81.08	2746.5
100.08	2777.2
121.08	2801.8
144.08	2817.9
180.08	2839.1
300.08	2876.3
420.48	2889.6

Tested By 129-04-0411 *Date* 6/28/18 *Checked By* GEM *Date* 7/6/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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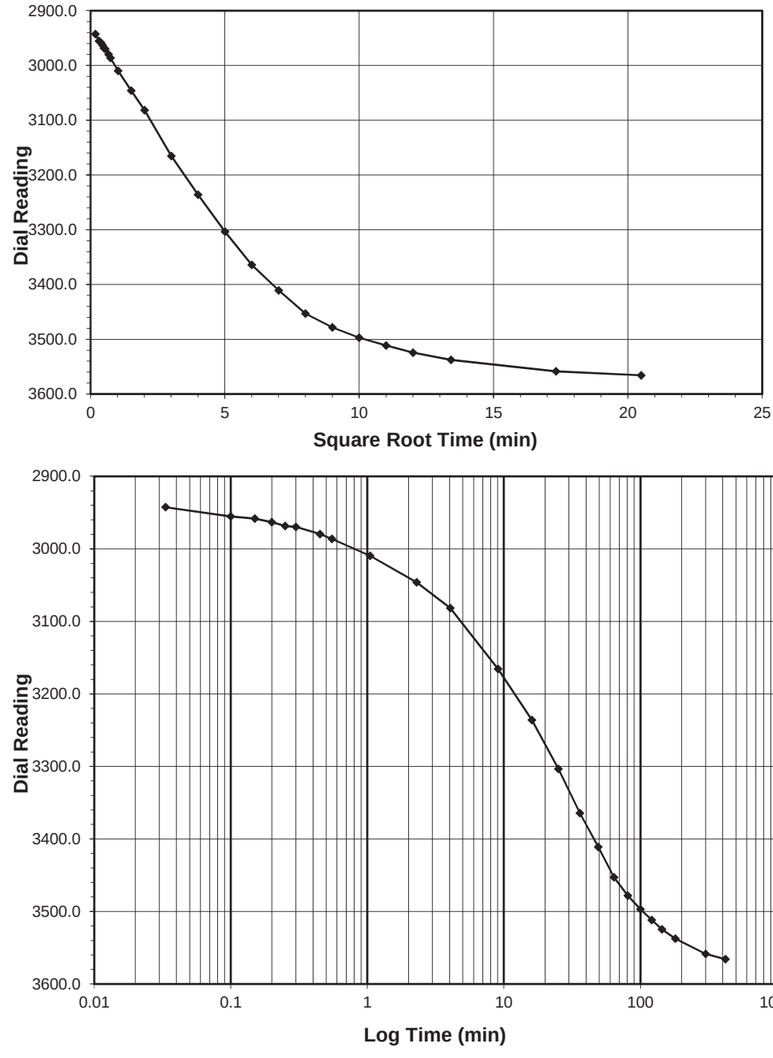
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Project	R-1015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**4.0-8.0**
Final Reading	**(div)**	**3565.8**
Consolidometer No.		**R487**
1 Division	(in)	0.0001
Start Date		6/28/18
Start Time		11:29:50

Elapsed Time (min)	Dial Reading (div)
Initial	**2889.6**
0.03	2942.6
0.10	2955.3
0.15	2958.2
0.20	2963.4
0.25	2968.4
0.30	2969.8
0.45	2979.7
0.55	2986.4
1.05	3009.7
2.30	3046.0
4.05	3081.7
9.05	3165.5
16.05	3235.9
25.05	3303.6
36.05	3364.4
49.05	3411.0
64.05	3452.9
81.05	3478.3
100.05	3496.9
121.05	3511.7
144.05	3524.5
180.05	3537.5
300.05	3558.4
420.05	3565.8

Tested By 129-04-0411 *Date* 6/28/18 *Checked By* GEM *Date* 7/6/18

DCN: CT-24E Date: 5/3/12 Revision: 3

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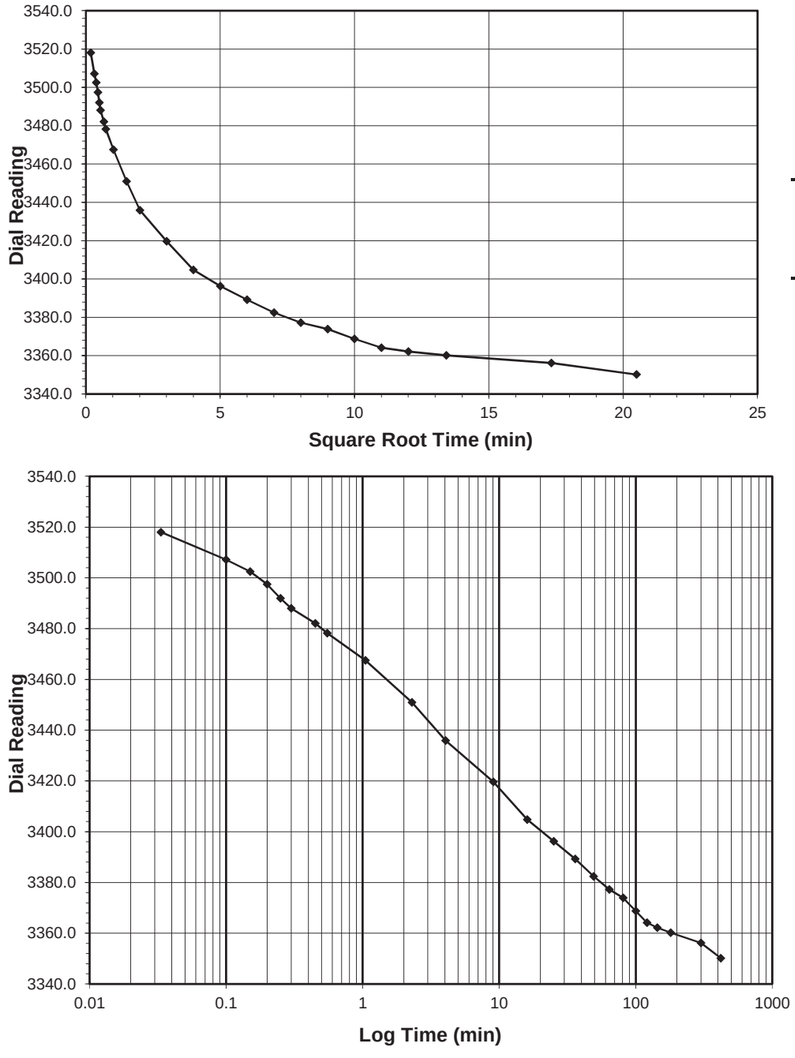
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Project	R-1015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**8.0-2.0**
Final Reading	**(div)**	**3350.2**
Consolidometer No.		**R487**
1 Division	(in)	0.0001
Start Date		6/28/18
Start Time		18:29:54

Elapsed Time (min)	Dial Reading (div)
Initial	**3565.8**
0.03	3518.0
0.10	3507.1
0.15	3502.5
0.20	3497.5
0.25	3492.0
0.30	3488.0
0.45	3482.0
0.55	3478.2
1.05	3467.5
2.30	3451.0
4.05	3435.9
9.05	3419.6
16.05	3404.8
25.05	3396.2
36.05	3389.2
49.05	3382.4
64.05	3377.2
81.05	3373.9
100.05	3368.8
121.05	3364.2
144.05	3362.2
180.07	3360.2
300.07	3356.1
420.08	3350.2

Tested By 129-04-0411 *Date* 6/28/18 *Checked By* GEM *Date* 7/6/18

DCN: CT-24E Date: 5/3/12 Revision: 3

Z:\2018 PROJECTS\ESP Associates\2018-181 ESP - R-1015 SITE 9 MSE WALL\[2018-181-001-001 DOT GEOJAC-16TSF1 Cv.xlsm]STEP 8

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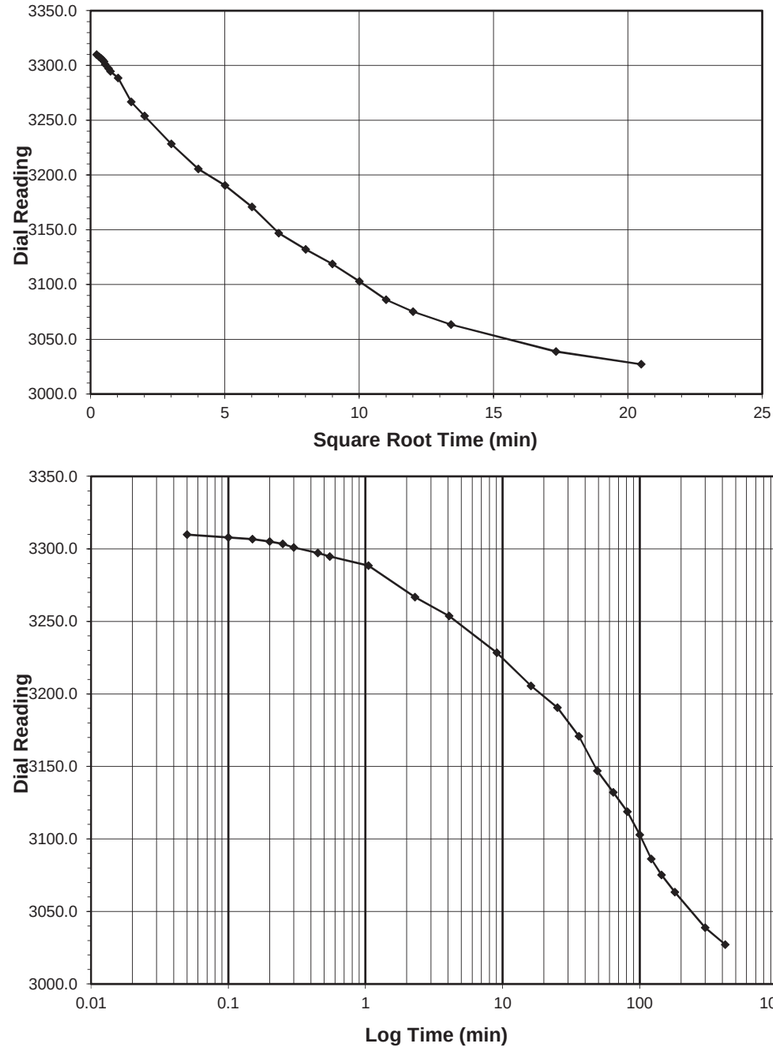
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Project	R-1015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Test Load	**(tsf)**	**2.0-0.5**
Final Reading	**(div)**	**3027.2**
Consolidometer No.		**R487**
1 Division	(in)	0.0001
Start Date		6/29/18
Start Time		1:30:00

Elapsed Time (min)	Dial Reading (div)
Initial	**3350.2**
0.05	3309.8
0.10	3307.9
0.15	3306.7
0.20	3305.0
0.25	3303.5
0.30	3300.9
0.45	3297.2
0.55	3294.7
1.05	3288.4
2.30	3266.7
4.07	3253.8
9.07	3228.3
16.07	3205.5
25.07	3190.5
36.07	3170.8
49.07	3147.0
64.07	3132.1
81.07	3118.8
100.07	3102.8
121.07	3086.2
144.07	3075.2
180.07	3063.4
300.07	3038.8
420.10	3027.2

Tested By 129-04-0411 *Date* 6/29/18 *Checked By* GEM *Date* 7/6/18

DCN: CT-24E Date: 5/3/12 Revision: 3

Z:\2018 PROJECTS\ESP Associates\2018-181 ESP - R-1015 SITE 9 MSE WALL\[2018-181-001-001 DOT GEOJAC-16TSF1 Cv.xlsm]STEP 9

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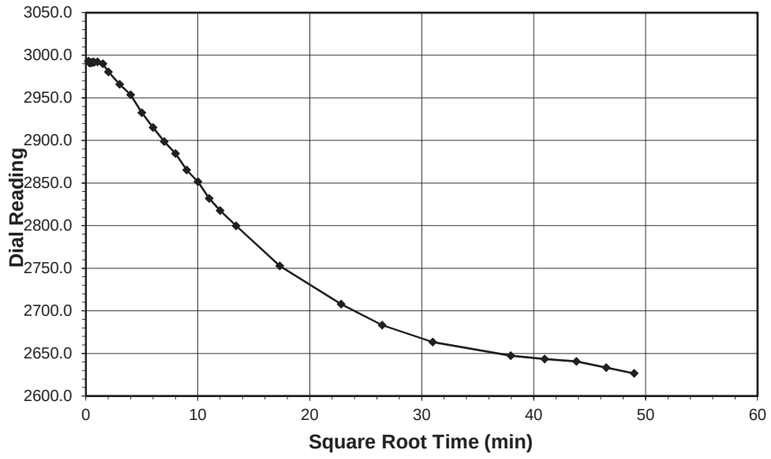
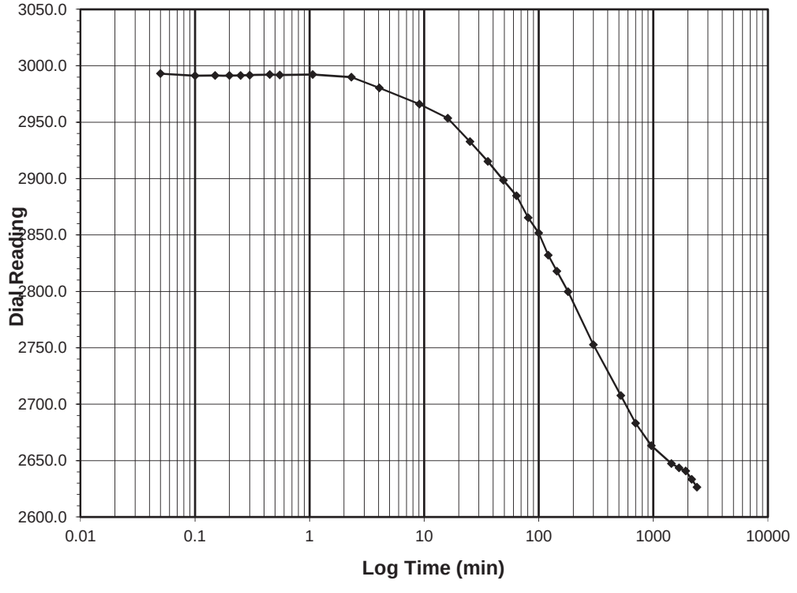
ONE DIMENSIONAL CONSOLIDATION

AASHTO T-216

Client	ESP Associates	Location	-L-STA.217+15,23'RT
Client Project	R-1015 Site 9 MSE Wall CS34.368	Depth (ft)	9.8-11.8
Project No.	R-2018-181-001	Sample No.	ST-3
Lab ID	R-2018-181-001-001	Visual Description	GRAY CLAY

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED





Test Load	**(tsf)**	**0.5-0.125**
Final Reading	**(div)**	**2626.5**
Consolidometer No.		**R487**
1 Division	(in)	0.0001
Start Date		6/29/18
Start Time		8:30:06

Elapsed Time (min)	Dial Reading (div)
Initial	**3027.2**
0.05	2993.0
0.10	2991.3
0.15	2991.4
0.20	2991.4
0.25	2991.4
0.30	2991.5
0.45	2992.2
0.55	2991.7
1.07	2992.3
2.32	2989.9
4.07	2980.5
9.07	2965.9
16.07	2953.5
25.07	2932.7
36.07	2915.3
49.07	2898.6
64.07	2884.7
81.07	2865.3
100.07	2851.7
121.07	2832.1
144.07	2817.8
180.07	2799.7
300.07	2752.8
520.08	2707.8
700.08	2683.2
960.08	2663.3
1440.08	2647.4
1680.08	2643.5
1920.08	2640.8
2160.08	2633.4
2400.08	2626.5

Tested By 129-04-0411 *Date* 6/29/18 *Checked By* GEM *Date* 7/6/18

DCN: CT-24E Date: 5/3/12 Revision: 3

Z:\2018 PROJECTS\ESP Associates\2018-181 ESP - R-1015 SITE 9 MSE WALL\[2018-181-001-001 DOT GEOJAC-16TSF1 Cv.xlsm]STEP 10

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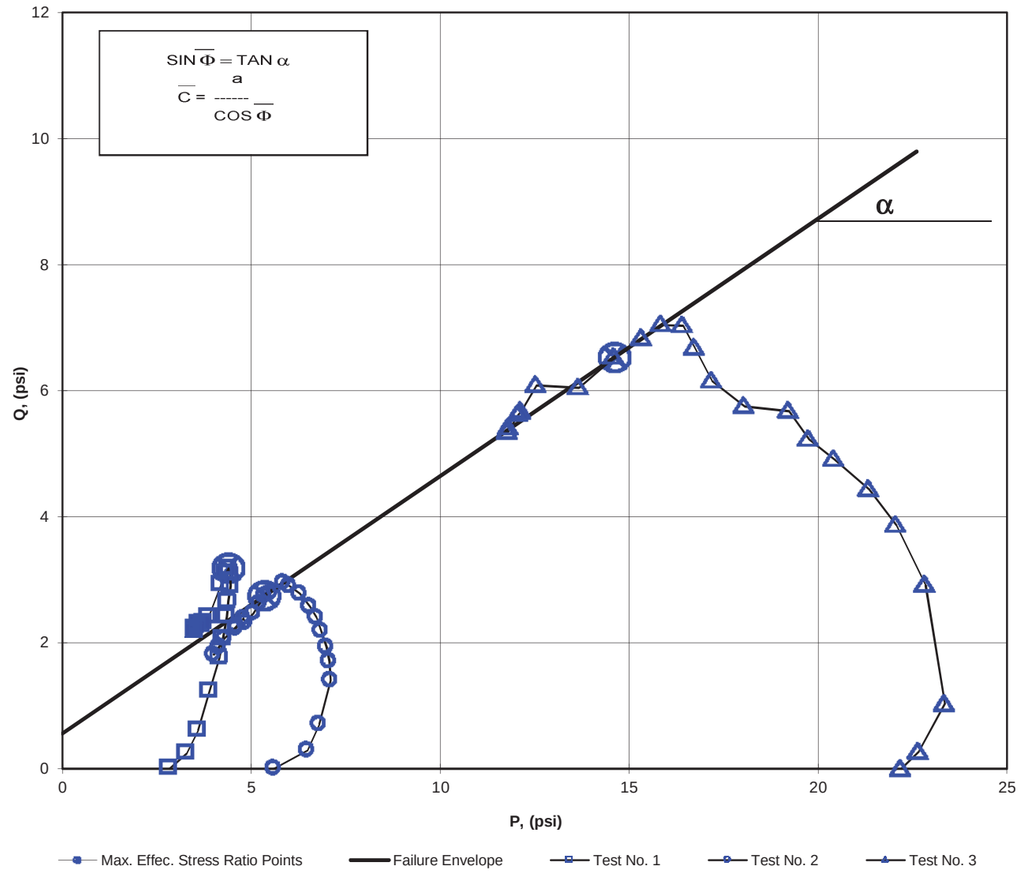
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

AASHTO T-297

Client:	ESP Associates	Location:	-L-STA 217+15, 23' RT
Client Reference:	R-1015 Site 9 MSE Wall CS34.368	Depth (ft):	9.8-11.8
Project No.:	R-2018-181-001	Sample No.:	ST-3
Lab ID:	R-2018-181-001-001		

Consolidated Undrained Triaxial Test with Pore Pressure



a	=	**0.56**	$\overline{C}$	=	**0.61**
α	=	**22.2**	$\overline{\Phi}$	=	**24.10**

Tested By: 129-04-0411 Date: 7/2/18 Approved By: MPS Date: 7/16/18

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

Sigmatriax.xls

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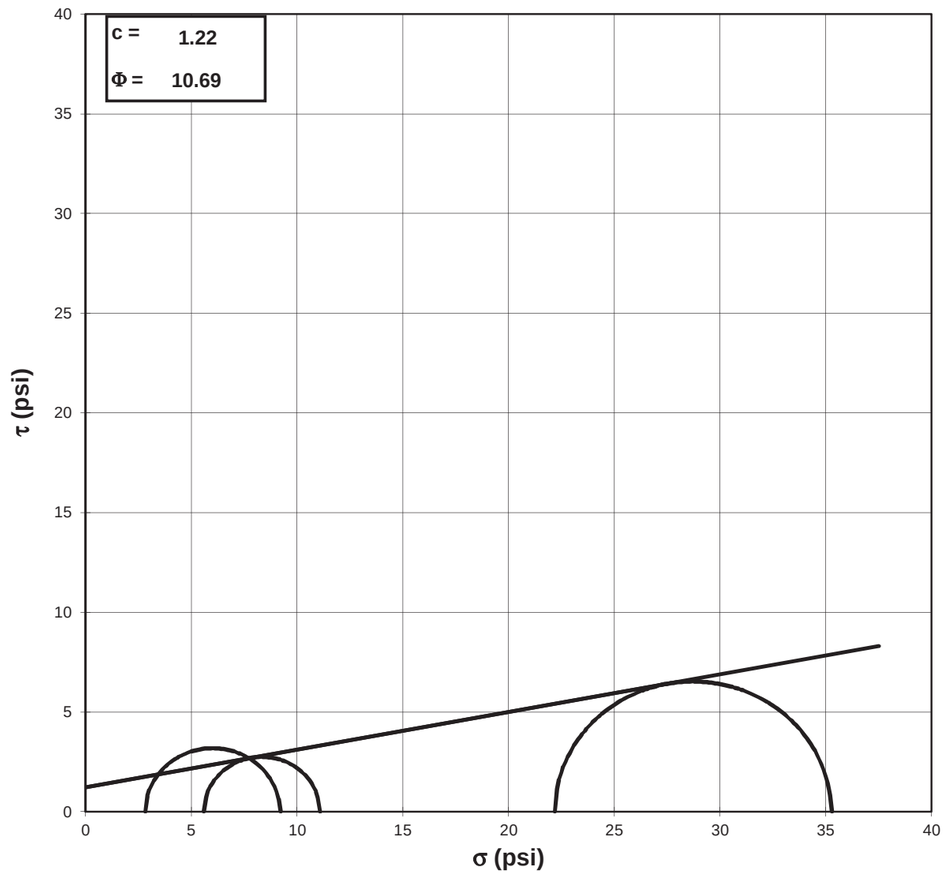
MOHR TOTAL STRENGTH ENVELOPE

AASHTO T-297

Client:	ESP Associates	Location:	-L-STA 217+15, 23' RT
Client Reference:	R-1015 Site 9 MSE Wall CS34.368	Depth (ft):	9.8-11.8
Project No.:	R-2018-181-001	Sample No.:	ST-3
Lab ID:	R-2018-181-001-001		
Visual Description:	TAN CLAYEY SAND (UNDISTURBED)		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: 129-04-0411 *Date:* 7/2/18 *Approved By:* MPS *Date:* 7/16/18

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

AASHTO T-297

Client:	ESP Associates	Location:	-L-STA 217+15, 23' RT
Client Reference:	R-1015 Site 9 MSE Wall CS34.368	Depth (ft):	9.8-11.8
Project No.:	R-2018-181-001	Sample No.:	ST-3
Lab ID:	R-2018-181-001-001		
Visual Description:	TAN CLAYEY SAND (UNDISTURBED)		

Stage No.	1
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	42.8
Back Pressure (psi)	40.0
Eff. Conf. Pressure (psi)	2.8
Pore Pressure Response (%)	100

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	4.40
Q	=	3.18

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	6.097	Diameter 1:	2.838
Length 2:	6.097	Diameter 2:	2.869
Length 3:	6.071	Diameter 3:	2.852
Length 4:	6.087	Diameter 4:	2.874
Avg. Length:	6.088	*Avg. Diam.:*	2.858

VOLUME CHANGE

Initial Burette Reading (ml)	24.0
Final Burette Reading (ml)	20.1
Final Change (ml)	3.9
Initial Dial Reading (mil)	55
Dial Reading After Saturation (mil)	99
Dial Reading After Consolidation (mil)	115

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
10.7	0.000	40.0
13.8	0.001	39.8
18.3	0.003	39.8
26.2	0.009	40.2
32.9	0.015	40.4
36.8	0.021	40.6
41.2	0.030	40.9
44.4	0.039	41.1
47.5	0.052	41.3
50.4	0.073	41.5
51.5	0.105	41.6
50.8	0.141	41.6
48.7	0.177	41.6
42.2	0.220	41.4
41.1	0.251	41.4
40.9	0.293	41.4
41.1	0.351	41.5
43.8	0.754	41.5
43.5	0.768	41.5
43.8	0.782	41.5
44.0	0.796	41.5
42.8	0.818	41.5
43.5	0.872	41.5
43.0	0.924	41.5

Tested By: 129-04-0411 Date: 7/2/18 Input Checked By: GEM Date: 7/16/18

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
AASHTO T-297

Client:	ESP Associates	Location:	-L-STA 217+15, 23' RT
Client Reference:	R-1015 Site 9 MSE Wall CS34.368	Depth (ft):	9.8-11.8
Project No.:	R-2018-181-001	Sample No.:	ST-3
Lab ID:	R-2018-181-001-001		

Visual Description: TAN CLAYEY SAND (UNDISTURBED)

Effective Confining Pressure (psi)	2.8	*Stage No.*	1
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	6.09
Initial Sample Diameter (in)	2.86
Initial Sample Area (in^2)	6.42
Initial Sample Volume (in^3)	39.06

VOLUME CHANGE

Volume After Consolidation (in^3)	37.98
Length After Consolidation (in)	6.03
Area After Consolidation (in^2)	6.300

Strain (%)	Deviation Stress	ΔU	$\overline{\sigma}_1$	$\overline{\sigma}_3$	Effective Principle Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	0.48	-0.21	3.53	3.0	1.159	-0.43	3.28	0.24
0.05	1.21	-0.16	4.20	3.0	1.403	-0.13	3.59	0.60
0.15	2.46	0.17	5.13	2.7	1.922	0.07	3.90	1.23
0.25	3.51	0.43	5.92	2.4	2.459	0.12	4.16	1.76
0.35	4.13	0.64	6.32	2.2	2.887	0.16	4.26	2.07
0.51	4.81	0.89	6.75	1.9	3.481	0.19	4.35	2.41
0.65	5.31	1.10	7.05	1.7	4.057	0.21	4.39	2.66
0.86	5.80	1.28	7.35	1.6	4.737	0.22	4.45	2.90
1.22	6.22	1.51	7.54	1.3	5.688	0.24	4.44	3.11
1.74	6.36	1.61	7.59	1.2	6.199	0.25	4.40	3.18
2.33	6.21	1.61	7.43	1.2	6.094	0.26	4.32	3.11
2.94	5.85	1.55	7.13	1.3	5.578	0.27	4.20	2.92
3.66	4.82	1.38	6.28	1.5	4.309	0.29	3.87	2.41
4.17	4.63	1.40	6.06	1.4	4.237	0.30	3.75	2.32
4.86	4.56	1.42	5.97	1.4	4.226	0.31	3.69	2.28
5.83	4.55	1.45	5.93	1.4	4.299	0.32	3.65	2.27
12.51	4.60	1.50	5.93	1.3	4.450	0.33	3.63	2.30
12.75	4.55	1.50	5.87	1.3	4.420	0.33	3.60	2.27
12.97	4.57	1.50	5.91	1.3	4.425	0.33	3.62	2.29
13.20	4.58	1.50	5.91	1.3	4.449	0.33	3.62	2.29
13.57	4.40	1.52	5.71	1.3	4.364	0.35	3.51	2.20
14.47	4.45	1.52	5.76	1.3	4.400	0.34	3.54	2.23
15.33	4.34	1.49	5.68	1.3	4.235	0.34	3.51	2.17

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
AASHTO T-297

Client:	ESP Associates	Location:	-L-STA 217+15, 23' RT
Client Reference:	R-1015 Site 9 MSE Wall CS34.368	Depth (ft):	9.8-11.8
Project No.:	R-2018-181-001	Sample No.:	ST-3
Lab ID:	R-2018-181-001-001		

Visual Description: TAN CLAYEY SAND (UNDISTURBED)

Stage No.	1
Test No.	2

PRESSURES (psi)

Cell Pressure (psi)	45.6
Back Pressure (psi)	40.0
Eff. Conf. Pressure (psi)	5.6
Pore Pressure Response (%)	100

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	5.35
Q	=	2.75

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	6.265	Diameter 1:	2.869
Length 2:	6.235	Diameter 2:	2.865
Length 3:	6.234	Diameter 3:	2.860
Length 4:	6.200	Diameter 4:	2.848
Avg. Length:	6.234	*Avg. Diam.:*	2.861

VOLUME CHANGE

Initial Burette Reading (ml)	48.0
Final Burette Reading (ml)	25.6
Final Change (ml)	22.4
Initial Dial Reading (mil)	8
Dial Reading After Saturation (mil)	31
Dial Reading After Consolidation (mil)	77

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
19.2	0.000	40.0
22.8	0.001	39.4
28.0	0.003	39.5
36.7	0.008	39.9
40.4	0.015	40.2
43.3	0.022	40.5
46.6	0.032	40.9
49.2	0.042	41.3
51.5	0.056	41.6
54.2	0.081	42.1
55.9	0.117	42.5
56.9	0.161	42.7
55.0	0.202	42.9
54.8	0.252	43.0
53.5	0.288	43.0
51.7	0.339	43.0
50.1	0.424	43.1
51.6	0.519	43.2
49.8	0.590	43.2
50.9	0.684	43.2
48.5	0.757	43.4
46.8	0.826	43.4
47.5	0.912	43.4
45.7	0.932	43.4

Tested By: 129-04-0411 Date: 7/2/18 Input Checked By: GEM Date: 7/16/18

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
AASHTO T-297

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geotechnical & geosynthetic testing

Client:	ESP Associates	Location:	-L-STA 217+15, 23' RT
Client Reference:	R-1015 Site 9 MSE Wall CS34.368	Depth (ft):	9.8-11.8
Project No.:	R-2018-181-001	Sample No.:	ST-3
Lab ID:	R-2018-181-001-001		

Visual Description: TAN CLAYEY SAND (UNDISTURBED)

Effective Confining Pressure (psi)	5.6	*Stage No.*	1
		Test No	2

INITIAL DIMENSIONS

Initial Sample Length (in)	6.23
Initial Sample Diameter (in)	2.86
Initial Sample Area (in^2)	6.43
Initial Sample Volume (in^3)	40.06

VOLUME CHANGE

Volume After Consolidation (in^3)	38.25
Length After Consolidation (in)	6.16
Area After Consolidation (in^2)	6.205

Strain (%)	Deviation Stress	Δ U	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principle Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	0.57	-0.60	6.77	6.2	1.092	-1.05	6.48	0.29
0.05	1.40	-0.50	7.50	6.1	1.230	-0.35	6.80	0.70
0.12	2.80	-0.10	8.50	5.7	1.492	-0.04	7.10	1.40
0.24	3.41	0.23	8.78	5.4	1.635	0.07	7.07	1.70
0.35	3.87	0.54	8.92	5.1	1.765	0.14	6.99	1.93
0.52	4.38	0.94	9.04	4.7	1.941	0.21	6.85	2.19
0.68	4.80	1.27	9.12	4.3	2.108	0.27	6.73	2.40
0.91	5.16	1.63	9.13	4.0	2.298	0.32	6.55	2.58
1.32	5.56	2.09	9.07	3.5	2.586	0.38	6.29	2.78
1.90	5.80	2.50	8.90	3.1	2.871	0.43	6.00	2.90
2.61	5.91	2.70	8.80	2.9	3.039	0.46	5.85	2.95
3.28	5.58	2.89	8.28	2.7	3.060	0.52	5.50	2.79
4.08	5.49	2.99	8.10	2.6	3.105	0.54	5.35	2.75
4.68	5.26	3.00	7.86	2.6	3.028	0.57	5.23	2.63
5.49	4.94	3.01	7.53	2.6	2.911	0.61	5.06	2.47
6.87	4.64	3.07	7.17	2.5	2.836	0.66	4.85	2.32
8.41	4.78	3.20	7.18	2.4	2.991	0.67	4.79	2.39
9.58	4.45	3.24	6.81	2.4	2.887	0.73	4.58	2.23
11.10	4.53	3.24	6.89	2.4	2.926	0.72	4.62	2.27
12.28	4.14	3.38	6.36	2.2	2.868	0.82	4.29	2.07
13.40	3.84	3.38	6.06	2.2	2.732	0.88	4.14	1.92
14.80	3.87	3.39	6.09	2.2	2.753	0.87	4.15	1.94
15.12	3.61	3.40	5.81	2.2	2.647	0.94	4.00	1.81

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
AASHTO T-297

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Client:	ESP Associates	Location:	-L-STA 217+15, 23' RT
Client Reference:	R-1015 Site 9 MSE Wall CS34.368	Depth (ft):	9.8-11.8
Project No.:	R-2018-181-001	Sample No.:	ST-3
Lab ID:	R-2018-181-001-001		

Visual Description: TAN CLAYEY SAND (UNDISTURBED)

Stage No.	1
Test No.	3

PRESSURES (psi)

Cell Pressure (psi)	62.2
Back Pressure (psi)	40.0
Eff. Conf. Pressure (psi)	22.2
Pore Pressure Response (%)	99

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	14.61
Q	=	6.53

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	6.114	Diameter 1:	2.853
Length 2:	6.192	Diameter 2:	2.857
Length 3:	6.167	Diameter 3:	2.883
Length 4:	6.134	Diameter 4:	2.844
Avg. Length:	6.152	*Avg. Diam.:*	2.859

VOLUME CHANGE

Initial Burette Reading (ml)	72.0
Final Burette Reading (ml)	14.5
Final Change (ml)	57.5
Initial Dial Reading (mil)	31
Dial Reading After Saturation (mil)	88
Dial Reading After Consolidation (mil)	429

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
16.3	0.000	40.0
19.6	0.001	39.8
28.8	0.002	39.9
51.7	0.008	42.3
63.3	0.014	44.0
70.2	0.019	45.3
76.2	0.028	46.7
80.1	0.036	47.7
85.7	0.049	48.6
86.9	0.070	49.9
92.3	0.100	51.1
99.2	0.138	52.1
104.3	0.175	52.8
105.1	0.218	53.4
102.9	0.249	53.7
99.7	0.293	54.1
94.4	0.352	54.6
101.2	0.756	55.7
95.7	0.769	55.7
95.8	0.783	55.7
95.5	0.797	55.8
92.0	0.823	55.8
93.7	0.878	55.8

Tested By: 129-04-0411 Date: 7/2/18 Input Checked By: GEM Date: 7/16/18

DCN: CT-S28 DATE: 4/12/13 REVISION: 3
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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
AASHTO T-297

Client:	ESP Associates	Location:	-L-STA 217+15, 23' RT
Client Reference:	R-1015 Site 9 MSE Wall CS34.368	Depth (ft):	9.8-11.8
Project No.:	R-2018-181-001	Sample No.:	ST-3
Lab ID:	R-2018-181-001-001		

Visual Description: TAN CLAYEY SAND (UNDISTURBED)

Effective Confining Pressure (psi)	22.2	*Stage No.*	1
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in)	6.15
Initial Sample Diameter (in)	2.86
Initial Sample Area (in^2)	6.42
Initial Sample Volume (in^3)	39.50

VOLUME CHANGE

Volume After Consolidation (in^3)	34.89
Length After Consolidation (in)	5.75
Area After Consolidation (in^2)	6.064

Strain (%)	Deviation Stress	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principle Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	0.54	-0.20	22.94	22.4	1.024	-0.37	22.67	0.27
0.04	2.06	-0.13	24.39	22.3	1.092	-0.07	23.36	1.03
0.14	5.83	2.26	25.76	19.9	1.292	0.39	22.85	2.91
0.24	7.73	3.99	25.94	18.2	1.425	0.52	22.08	3.87
0.33	8.85	5.28	25.78	16.9	1.523	0.60	21.35	4.43
0.49	9.82	6.68	25.35	15.5	1.633	0.69	20.43	4.91
0.63	10.46	7.67	24.99	14.5	1.720	0.74	19.76	5.23
0.84	11.34	8.63	24.91	13.6	1.836	0.77	19.24	5.67
1.21	11.50	9.89	23.81	12.3	1.934	0.87	18.06	5.75
1.74	12.30	11.15	23.36	11.1	2.113	0.92	17.20	6.15
2.40	13.34	12.13	23.41	10.1	2.325	0.92	16.74	6.67
3.05	14.06	12.81	23.46	9.4	2.497	0.92	16.42	7.03
3.80	14.08	13.38	22.90	8.8	2.597	0.96	15.86	7.04
4.32	13.65	13.68	22.17	8.5	2.603	1.01	15.34	6.83
5.09	13.05	14.12	21.13	8.1	2.614	1.09	14.61	6.53
6.11	12.09	14.57	19.72	7.6	2.584	1.22	13.67	6.04
13.13	12.16	15.73	18.63	6.5	2.880	1.31	12.55	6.08
13.37	11.34	15.73	17.81	6.5	2.753	1.40	12.14	5.67
13.60	11.32	15.72	17.80	6.5	2.748	1.40	12.14	5.66
13.85	11.24	15.76	17.69	6.4	2.745	1.42	12.06	5.62
14.30	10.69	15.76	17.13	6.4	2.659	1.49	11.79	5.34
15.26	10.81	15.79	17.22	6.4	2.687	1.48	11.82	5.41

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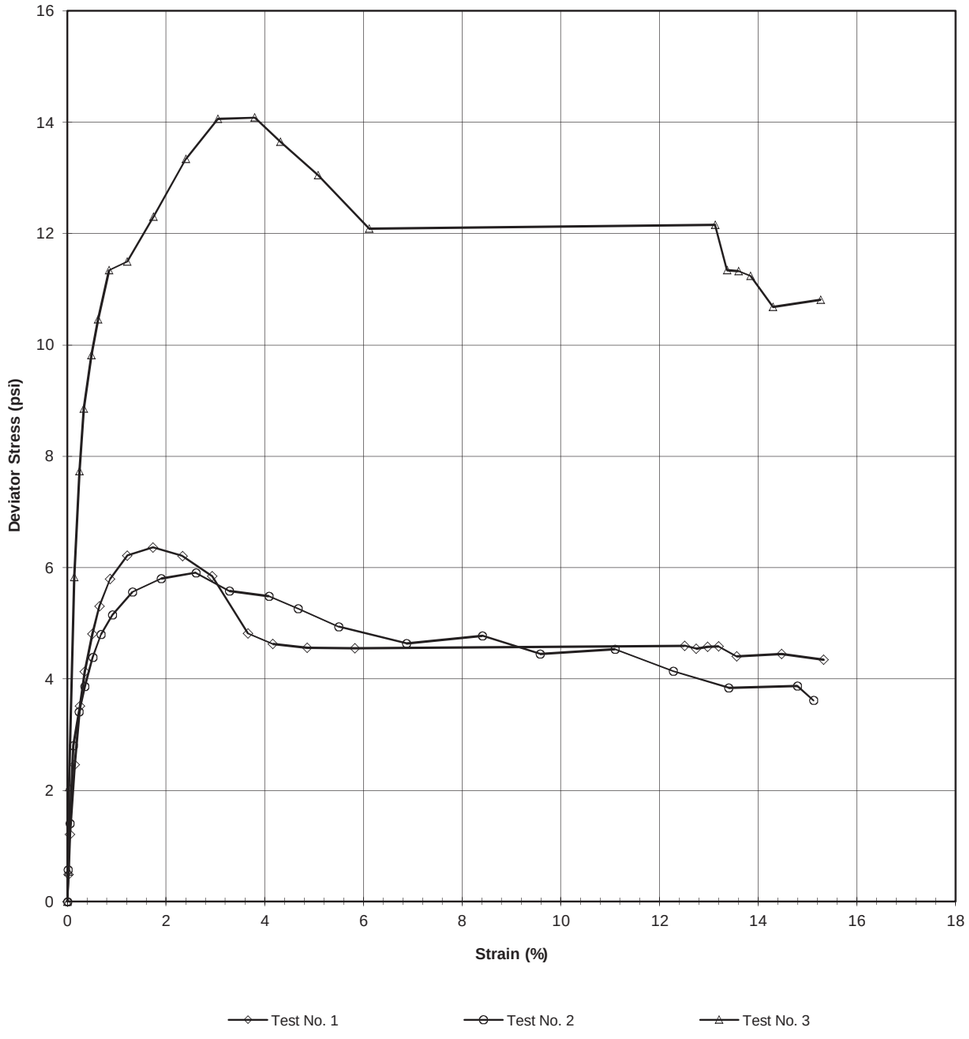
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
AASHTO T-297

Client:	ESP Associates	Location:	-L-STA 217+15, 23' RT
Client Reference:	R-1015 Site 9 MSE Wall CS34.368	Depth (ft):	9.8-11.8
Project No.:	R-2018-181-001	Sample No.:	ST-3
Lab ID:	R-2018-181-001-001		
Visual Description:	TAN CLAYEY SAND (UNDISTURBED)		



Tested By: 129-04-0411 Date: 7/2/18 Approved By: MPS Date: 7/16/18

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
AASHTO T-297

Client:	ESP Associates		
Client Reference:	R-1015 Site 9 MSE Wall CS34.368		
Project No.:	R-2018-181-001		
Lab ID:	R-2018-181-001-001	Specific Gravity (Measured)	2.66

Visual Description: TAN CLAYEY SAND (UNDISTURBED)

SAMPLE CONDITION SUMMARY

Location:	-L-STA 217+15, 23' RT	-L-STA 217+15, 23' RT	-L-STA 217+15, 23' RT
Depth (ft):	9.8-11.8	9.8-11.8	9.8-11.8
Sample No.:	ST-3	ST-3	ST-3
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.0006	0.0006	0.0006
Back Pressure (psi)	40.0	40.0	40.0
Consolidation Time (days)	2	2	2
Moisture Content (%) (INITIAL)	64.2	64.2	64.2
Total Unit Weight (pcf)	99.7	99.3	100.8
Dry Unit Weight (pcf)	60.7	60.5	61.4
Moisture Content (%) (FINAL)	67.1	63.1	52.4
Initial State Void Ratio,e	1.735	1.745	1.705
Void Ratio at Shear, e	1.659	1.621	1.390

Tested By: 129-04-0411 Date: 7/2/18 Input Checked By: GEM Date: 7/16/18

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
AASHTO T-297

Client:	ESP Associates	Location:	-L-STA 217+15, 23
Client Reference:	R-1015 Site 9 MSE Wall CS34.368	Depth (ft):	9.8-11.8
Project No.:	R-2018-181-001	Sample No.:	ST-3
Lab ID:	R-2018-181-001-001		

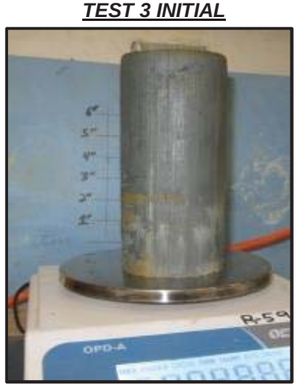
TEST 1 INITIAL

TEST 1 FINAL

TEST 2 INITIAL

TEST 2 FINAL

TEST 3 INITIAL



TEST 3 FINAL

Tested By *129-04-0411* *Date* *7/2/18* *Approved By* MPS *Date* 7/16/18

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