STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	14

REFERENCE: R-3300B

PROJECT: 40237

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *PENDER*

PROJECT DESCRIPTION *HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD*

SITE DESCRIPTION *BRIDGE NO. 257 ON -Y30- (NC 210) OVER -L1- (HAMPSTEAD BYPASS) BETWEEN US 17 BUS. AND SR 1002 (ISLAND CREEK RD.)*

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.

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

MID-ATLANTIC

GOODNIGHT, D.J.

LANE, R.W.

INVESTIGATED BY *LANE, R.W.*

DRAWN BY *CROCKETT, S.C.*

CHECKED BY *HAMM, J.R.*

SUBMITTED BY *FALCON ENG.*

DATE *DECEMBER 2019*

NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C CROCKETT

DocuSigned by:
Stephen C Crockett 12/20/2019
C5CA5FED48E0435...
SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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 EXCAVATION
- 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-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] DIEDRICH D-25
- [ ] _____

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 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: BL-95, -Y30- STA. 39+12, 15' LT
N: 231572 E: 2377851
ELEVATION: 42.28 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	3

0 30 60
FEET

NC GRID
NAD 83/NSRS 2007

38+00
39+00
606+00
607+00
40+00
41+00
42+00

WALTON RD
SR 1002
-L-
-L17-

BENT #1
STATION 39+82.39 (Y30)
STATION 605+44.35 (LI)

S13_B1-A
S13_EB1-A
S13_EB2-A
S13_EB1-B
S13_B1-B
S13_EB2-B

EIP
EIP

605+00
TO SR 1002
(ISLAND CREEK RD.)

BL95 -Y30-
BRIDGE NO. 257

END BENT #2
STATION 40+90.55 (Y30)

ISFD
36" WD
DK
72" CHL
24" BLK WA
TO US 17 BUS.

18" RCP
19' BST
RIP RAP
24" RCP
24" RCP
22' BST

END BENT #1
STATION 38+74.22 (Y30)
WD POSTS
TC
TC
TC

604+00

POND
NONMIT

BRIDGE SKEW: 111°35'21"

DATE: 9-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	4

BRIDGE NO. 257 ON -Y30- OVER -LI- BETWEEN US 17 BUS. AND NC 210/SR 1002

0 50 100
FEET
VE = 5

SS-34
SS-74
ST-16
SS-85
SS-75
SS-76
SI3_EBI-A
38+94
33' LT

SS-32
SI3_BI-A
39+72
32' LT

SS-80
SS-87
SS-81
SS-35
SS-82
SI3_EB2-A
41+12
37' LT

05/18

SPT REF.

BT

SPT REF.

-Y30-

(A) **UNDIVIDED COASTAL PLAIN:** GRAY, TAN, AND BLACK, MOIST TO SAT., V. LOOSE TO MEDIUM DENSE, SAND (A-3)

(B) **COASTAL PLAIN:** GRAY AND BLUE-GRAY, SAT., V. LOOSE TO LOOSE, SILTY AND CLAYEY SAND (A-2-4, A-2-7) (CASTLE HAYNE FORMATION)

(C) **COASTAL PLAIN:** GRAY AND BLUE-GRAY, SAT., V. SOFT TO SOFT, SANDY SILT AND SANDY AND SILTY CLAY (A-4, A-6, A-7) WITH TRACE ORGANICS

(D) **COASTAL PLAIN:** WHITE AND GRAY, SAT., MED. DENSE TO V. DENSE, SAND (A-3) WITH TRACE TO LITTLE LIMESTONE FRAGS.

(E) **COASTAL PLAIN SEDIMENTARY ROCK:** WHITE, HARD, SANDY LIMESTONE

NOTES:

GROUNDLINE PROFILE TAKEN FROM FILES PROVIDED BY STANTEC DATED JUNE, 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

BRIDGE SKEW: 111°35'21"

50 40 30 20 10 0 -10 -20 -30

38+00 39+00 40+00 41+00 42+00 43+00 44+00

PROJ. REFERENCE NO.	SHEET NO.
R-3300B	5

0 2.5 5

0 10 20
FEET

Ⓐ **UNDIVIDED COASTAL PLAIN:** GRAY AND TAN, WET TO SAT., V. LOOSE TO MED. DENSE, SAND (A-3)
Ⓑ **COASTAL PLAIN:** GRAY, SAT., V. LOOSE, SILTY SAND (A-2-4) (CASTLE HAYNE FORMATION)
Ⓒ **COASTAL PLAIN:** GRAY AND BLUE-GRAY, SAT., V. SOFT TO MED. STIFF, SANDY SILT AND SANDY AND SILTY CLAY (A-4, A-6, A-7-6) WITH TRACE ORGANICS
Ⓓ **COASTAL PLAIN:** WHITE AND GRAY, SAT., MED. DENSE TO V. DENSE, SAND (A-3) WITH TRACE LIMESTONE FRAGS.
Ⓔ **COASTAL PLAIN SEDIMENTARY ROCK:** GRAY AND WHITE, HARD, SANDY LIMESTONE

ROADWAY EMBANKMENT: GRAY, MOIST, SILTY F. SAND (A-2-4)

SS-34
SS-74
ST-16
SS-85
SS-75
SS-76

SI3_EBI-A
38+94
33' LT

05/18

7
1
3
0
2
3
4
WOH
1
36
52
41
100/0.8
18
36
100/0.9
60/0.0
BT

SS-86
SS-77
ST-10
SS-78
SS-79

SI3_EBI-B
38+67
36' RT

04/18

10
13
WOH
WOH
WOH
WOH
6
WOH
100/0.6
38
22
100/0.9
100/0.9
BT

ST-10

END BENT #1
38+50.29

-Y30-

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED MARCH 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRIDGE SKEW: 111°35'21"

8/23/9

$DATE$

PROJ. REFERENCE NO.	SHEET NO.
R-3300B	6

0 2.5 5

0 10 20
FEET

SS-32
SI3_BI-A
39+72
32' LT

SS-33
SI3_BI-B
39+63
36' RT

ROADWAY EMBANKMENT: *GRAY, MOIST, SILTY F. SAND (A-2-4)*

SS-32		SS-33	
6		9	
11	05/18	11	04/18
4		4	
WOH		WOH	
WOH		3	
WOH		WOH	
WOH		5	
WOH		WOH	
WOH		WOH	
60		28	
35		19	
42		48	
100/0.9		49	
28		28	
36		26	
100/0.8		100/0.6	
100/0.2	BT	100/0.3	
		100/0.9	
		18	
		100/0.9	BT

NOTES:
GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED MARCH 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRIDGE SKEW: 111°35'21"

BENT #1
39+82.39
-Y30-

Ⓐ ***UNDIVIDED COASTAL PLAIN:*** *BLACK, TAN, AND GRAY, WET TO SAT., LOOSE TO MED. DENSE, SAND (A-3)*
Ⓑ ***COASTAL PLAIN:*** *GRAY, SAT., V. LOOSE, CLAYEY SAND (A-2-7) (CASTLE HAYNE FORMATION)*
Ⓒ ***COASTAL PLAIN:*** *GRAY AND BLUE-GRAY, SAT., V. SOFT TO MED. STIFF, SANDY SILT AND SANDY AND SILTY CLAY (A-4, A-6, A-7-6)*
Ⓓ ***COASTAL PLAIN:*** *GRAY AND WHITE, SAT., MED. DENSE TO V. DENSE, SAND (A-3) WITH TRACE LIMESTONE FRAGS.*
Ⓔ ***COASTAL PLAIN SEDIMENTARY ROCK:*** *WHITE, HARD, SANDY LIMESTONE*

$DATE$

PROJ. REFERENCE NO.	SHEET NO.
R-3300B	7

0 2.5 5

Ⓐ **UNDIVIDED COASTAL PLAIN:** GRAY, TAN, AND BLACK, MOIST TO SAT., LOOSE TO MED. DENSE, SAND (A-3) AND SAND (A-3) WITH LITTLE ORGANICS
Ⓑ **UNDIVIDED COASTAL PLAIN:** BLACK, SAT., V. SOFT, SANDY SILT (A-4)
Ⓒ **COASTAL PLAIN:** GRAY AND BLUE-GRAY, SAT., V. SOFT, SANDY SILT AND SANDY AND SILTY CLAY (A-4, A-6, A-7-6) (CASTLE HAYNE FORMATION)
Ⓓ **COASTAL PLAIN:** BLUE-GRAY, SAT., LOOSE, SILTY SAND (A-2-4)
Ⓔ **COASTAL PLAIN:** WHITE AND GRAY, SAT., MED. DENSE TO V. DENSE, SAND (A-3) WITH TRACE LIMESTONE FRAGS.
Ⓕ **COASTAL PLAIN SEDIMENTARY ROCK:** WHITE, HARD, SANDY LIMESTONE

ROADWAY EMBANKMENT: GRAY, MOIST, SILTY F. SAND (A-2-4)

SS-80
SS-87
SS-81
SS-35
SS-82

SI3_EB2-A
41+12
37' LT

SS-83
SS-88
SS-84
SS-36
SS-89

SI3_EB2-B
40+67
37' RT

0 10 20
FEET

NOTES:
GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED MARCH 2018.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.
BRIDGE SKEW: 111°35'21"

END BENT #2
40 + 90.55

-Y30-

BT

BT

8/23/9

$DATE$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 257 ON -Y30- (NC 210) OVER -L1- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S13_EB1-A	**STATION** 38+94	**OFFSET** 33 ft LT	**ALIGNMENT** -Y30-	**0 HR.** 8.4
COLLAR ELEV. 41.8 ft	**TOTAL DEPTH** 73.0 ft	**NORTHING** 231,595	**EASTING** 2,377,840	**24 HR.** 3.6
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 05/08/18	**COMP. DATE** 05/09/18	**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)
45											
										41.8	0.0
										GROUND SURFACE	
40	40.8	1.0	2	4	3	7		W		**UNDIVIDED COASTAL PLAIN** GRAY AND TAN, SAND (A-3)	
	38.8	3.0	WOH	WOH	1	1					
	36.8	5.0	1	2	1	3		Sat.			
35	33.8	8.0	1	0	0	0	SS-34	68%		34.8	7.0
										COASTAL PLAIN GRAY, SILTY SAND (A-2-4) (CASTLE HAYNE FORMATION)	
30	28.8	13.0	WOH	WOH	2	2	SS-74	37%		30.8	11.0
										BLUE-GRAY, SILTY CLAY (A-7-6) W/ SAND AND TRACE ORGANICS	
25	23.8	18.0	1	1	2	3	SS-85	31%			
20	18.8	23.0	1	2	2	4	SS-75	30%		20.8	21.0
										BLUE-GRAY, SANDY SILT (A-4) WITH TRACE ORGANICS	
15	13.8	28.0	WOH	WOH	WOH	0		Sat.		15.8	26.0
										BLUE-GRAY AND GRAY, SANDY CLAY (A-6)	
10	8.8	33.0	WOH	WOH	1	1	SS-76	33%			
5	3.8	38.0	19	17	19	36		Sat.		5.8	36.0
										WHITE, SAND (A-3) W/ TRACE LIMESTONE FRAGMENTS	
0	-1.2	43.0	12	9	43	52		Sat.			
-5	-6.2	48.0	23	16	25	41		Sat.			
-10	-11.2	53.0	23	36	64/0.3	100/0.8				-10.2	52.0
										COASTAL PLAIN SEDIMENTARY ROCK WHITE, HARD, SANDY LIMESTONE	
-15	-16.2	58.0	10	8	10	18		Sat.		-14.2	56.0
										COASTAL PLAIN WHITE, SAND (A-3) W/ TRACE LIMESTONE FRAGMENTS	
-20	-21.2	63.0	12	13	23	36		Sat.			
-25	-26.2	68.0	66	34/0.4		100/0.9				-24.2	66.0
										COASTAL PLAIN SEDIMENTARY ROCK WHITE, HARD, SANDY LIMESTONE	
-30	-31.2	73.0	60/0.0			60/0.0				-31.2	73.0
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation -31.2 ft IN CP: SANDY	

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/5/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 257 ON -Y30- (NC 210) OVER -L1- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S13_EB1-A	**STATION** 38+94	**OFFSET** 33 ft LT	**ALIGNMENT** -Y30-	**0 HR.** 8.4
COLLAR ELEV. 41.8 ft	**TOTAL DEPTH** 73.0 ft	**NORTHING** 231,595	**EASTING** 2,377,840	**24 HR.** 3.6
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 05/08/18	**COMP. DATE** 05/09/18	**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						Match Line				LIMESTONE	
										ST-16 pushed in offset boring at Sta. -Y30- 38+91, 33' LT	
										Other Samples: ST-16 (13.0 - 15.0)	

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/5/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 257 ON -Y30- (NC 210) OVER -L1- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S13_EB1-B	**STATION** 38+67	**OFFSET** 36 ft RT	**ALIGNMENT** -Y30-	**0 HR.** 8.3
COLLAR ELEV. 41.0 ft	**TOTAL DEPTH** 53.7 ft	**NORTHING** 231,539	**EASTING** 2,377,792	**24 HR.** 1.3
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 85% 09/06/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 04/25/18	**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)
45											
40	40.0	1.0	2	4	6	10 13				41.0 GROUND SURFACE	0.0
	38.2	2.8	7	7	6					**UNDIVIDED COASTAL PLAIN** GRAY, SAND (A-3)	
	36.2	4.8	WOH	WOH	WOH	0		Sat.		37.0	4.0
35	33.2	7.8	WOH	WOH	WOH	0	SS-86	32%		**COASTAL PLAIN** GRAY, SANDY CLAY (A-6) (CASTLE HAYNE FORMATION)	
							SS-77	33%			
30	28.2	12.8	WOH	WOH	WOH	0		42% Sat.		30.0 GRAY AND BLUE-GRAY, SILTY CLAY (A-7-6)	11.0
25	23.2	17.8	WOH	WOH	WOH	0	SS-78	49%		25.0 GRAY AND BLUE-GRAY, SANDY CLAY (A-6) WITH TRACE ORGANICS	16.0
20	18.2	22.8	1	3	3	6		Sat.			
15	13.2	27.8	WOH	WOH	WOH	0	SS-79	38%			
10	8.2	32.8	4	80	20/0.1	100/0.6				7.7 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY AND WHITE, HARD, SANDY LIMESTONE	33.3
5	3.2	37.8	19	20	18	38		Sat.		6.0 **COASTAL PLAIN** WHITE AND GRAY, SAND (A-3) W/ LITTLE LIMESTONE FRAGMENTS	35.0
0	-1.8	42.8	10	10	12	22		Sat.		-4.0 **COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE	45.0
-5	-6.8	47.8	42	58/0.4		100/0.9					
-10	-11.8	52.8	48	52/0.4		100/0.9				-12.7 Boring Terminated at Elevation -12.7 ft IN CP: SANDY LIMESTONE	53.7

ST-10 pushed in offset boring at Sta. -Y30- 38+70, 36' RT

Other Samples:
ST-10 (12.0 - 14.0)

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/5/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 257 ON -Y30- (NC 210) OVER -L1- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S13_B1-A	**STATION** 39+72	**OFFSET** 32 ft LT	**ALIGNMENT** -Y30-	**0 HR.** 10.5
COLLAR ELEV. 42.2 ft	**TOTAL DEPTH** 73.5 ft	**NORTHING** 231,568	**EASTING** 2,377,913	**24 HR.** 4.2
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 05/09/18	**COMP. DATE** 05/10/18	**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)
45											
40	41.2	1.0	3	3	3	6		W		42.2 GROUND SURFACE	0.0
	38.9	3.3	3	5	6	11				**UNDIVIDED COASTAL PLAIN** BLACK, TAN, AND GRAY, SAND (A-3)	
	36.9	5.3	3	3	1	4		Sat.		34.2	8.0
35	33.9	8.3	WOH	WOH	WOH	0		Sat.		**COASTAL PLAIN** GRAY, CLAYEY SAND (A-2-7) (CASTLE HAYNE FORMATION)	
30	28.9	13.3	WOH	WOH	WOH	0		Sat.		30.2 GRAY, SANDY SILTY CLAY (A-7)	12.0
25	23.9	18.3	WOH	WOH	WOH	0		Sat.		22.2 BLUE-GRAY, SANDY SILT (A-4)	20.0
20	18.9	23.3	WOH	WOH	WOH	0	SS-32	27%			
15	13.9	28.3	WOH	WOH	WOH	0		Sat.		15.2 GRAY AND BLUE-GRAY, SANDY CLAY (A-6)	27.0
10	8.9	33.3	WOH	WOH	WOH	0		Sat.		6.2 WHITE, SAND (A-3) W/ TRACE LIMESTONE FRAGMENTS	36.0
5	3.9	38.3	10	36	24	60		Sat.			
0	-1.1	43.3	8	9	26	35		Sat.		-9.8 **COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE	52.0
-5	-6.1	48.3	27	22	20	42		Sat.		-13.8 **COASTAL PLAIN** GRAY AND WHITE, SAND (A-3)	56.0
-10	-11.1	53.3	73	27/0.4		100/0.9					
-15	-16.1	58.3	5	15	13	28		Sat.			
-20	-21.1	63.3	18	14	22	36		Sat.			
-25	-26.1	68.3	18	82/0.3		100/0.8				-26.1 **COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE	68.3
-30	-31.1	73.3	100/0.2			100/0.2				-31.3 Boring Terminated at Elevation -31.3 ft IN CP: SANDY LIMESTONE	73.5

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/5/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 257 ON -Y30- (NC 210) OVER -L1- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S13_B1-B	**STATION** 39+63	**OFFSET** 36 ft RT	**ALIGNMENT** -Y30-	**0 HR.** 11.2
COLLAR ELEV. 42.1 ft	**TOTAL DEPTH** 88.7 ft	**NORTHING** 231,507	**EASTING** 2,377,882	**24 HR.** 3.6
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 04/26/18	**COMP. DATE** 04/27/18	**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)
45											
										42.1 GROUND SURFACE	0.0
40	41.1	1.0	2	5	4	9				**UNDIVIDED COASTAL PLAIN** BLACK, GRAY, AND TAN, SAND (A-3)	
	39.3	2.8	4	5	6	11					
	37.3	4.8	3	2	2	4		Sat.			
35	34.3	7.8	WOH	WOH	WOH	0				35.1	7.0
								Sat.		**COASTAL PLAIN** GRAY, SANDY SILTY CLAY (A-7-6) (CASTLE HAYNE FORMATION)	
30	29.3	12.8	WOH	WOH	3	3	SS-33	31%			
25	24.3	17.8	WOH	WOH	WOH	0		Sat.			
20	19.3	22.8	WOH	2	3	5		Sat.			
15	14.3	27.8	WOH	WOH	WOH	0		Sat.			
10	9.3	32.8	WOH	WOH	WOH	0		Sat.			
5	4.3	37.8	15	15	13	28		Sat.		5.1 WHITE, SAND (A-3) W/ TRACE LIMESTONE FRAGMENTS	37.0
0	-0.7	42.8	15	11	8	19		Sat.			
-5	-5.7	47.8	23	25	23	48		Sat.			
-10	-10.7	52.8	28	25	24	49		Sat.			
-15	-15.7	57.8	18	15	13	28		Sat.			
-20	-20.7	62.8	11	14	12	26		Sat.			
-25	-25.7	67.8	7	83	17/0.1	100/0.6		Sat.		-26.2 **COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE	68.3
-30	-30.7	72.8	100/0.3			100/0.3					
-35											

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/5/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 257 ON -Y30- (NC 210) OVER -L1- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S13_B1-B	**STATION** 39+63	**OFFSET** 36 ft RT	**ALIGNMENT** -Y30-	**0 HR.** 11.2
COLLAR ELEV. 42.1 ft	**TOTAL DEPTH** 88.7 ft	**NORTHING** 231,507	**EASTING** 2,377,882	**24 HR.** 3.6
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 04/26/18	**COMP. DATE** 04/27/18	**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						Match Line					
	-35.7	77.8	8	92/0.4		100/0.9				**COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE *(continued)*	
-40	-40.7	82.8	7	9	9	18		Sat.		-39.9	82.0
										COASTAL PLAIN WHITE, SAND (A-3)	
-45	-45.7	87.8	26	74/0.4		100/0.9				-43.9	86.0
										COASTAL PLAIN SEDIMENTARY ROCK WHITE, HARD, SANDY LIMESTONE	
										-46.6	88.7
										Boring Terminated at Elevation -46.6 ft IN CP: SANDY LIMESTONE	

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/5/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 257 ON -Y30- (NC 210) OVER -L1- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S13_EB2-A	**STATION** 41+12	**OFFSET** 37 ft LT	**ALIGNMENT** -Y30-	**0 HR.** 8.7
COLLAR ELEV. 43.6 ft	**TOTAL DEPTH** 73.1 ft	**NORTHING** 231,527	**EASTING** 2,378,047	**24 HR.** 4.7
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 05/07/18	**COMP. DATE** 05/08/18	**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)
45										43.6 GROUND SURFACE	0.0
	42.6	1.0	1	2	2	4		M		**UNDIVIDED COASTAL PLAIN** GRAY AND TAN, SAND (A-3)	
40	40.6	3.0	2	3	4	7					
	38.6	5.0	4	6	5	11		Sat.			
35	35.6	8.0	WOH	WOH	WOH	0	SS-80	33%		36.6 **COASTAL PLAIN** GRAY, SANDY SILT (A-4) (CASTLE HAYNE FORMATION)	7.0
										32.6 BLUE-GRAY, SILTY CLAY (A-7-6)	11.0
30	30.6	13.0	WOH	WOH	1	1	SS-87	30%			
										27.6 BLUE-GRAY, SILTY SAND (A-2-4)	16.0
25	25.6	18.0	1	2	3	5	SS-81	33%			
20	20.6	23.0	2	3	2	5	SS-35	30%			
										17.6 GRAY, SANDY CLAY (A-6)	26.0
15	15.6	28.0	WOH	WOH	WOH	0		Sat.			
10	10.6	33.0	WOH	WOH	WOH	0	SS-82	33%			
										7.6 WHITE, SAND (A-3) W/ LITTLE LIMESTONE FRAGMENTS	36.0
5	5.6	38.0	33	16	41	57		Sat.			
0	0.6	43.0	10	15	22	37		Sat.			
-5	-4.4	48.0	16	60	26	86		Sat.			
-10	-9.4	53.0	16	49	51/0.4	100/0.9				-9.9 **COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE	53.5
										-12.4 **COASTAL PLAIN** WHITE AND GRAY, SAND (A-3) W/ TRACE TO LITTLE LIMESTONE FRAGMENTS	56.0
-15	-14.4	58.0	24	26	12	38		Sat.			
-20	-19.4	63.0	8	7	9	16		Sat.			
-25	-24.4	68.0	7	7	7	14		Sat.			
	-29.4	73.0	60/0.1			60/0.1				-29.4 **COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE	73.0
										-29.5 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation -29.5 ft IN CP: SANDY	73.1

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/5/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 257 ON -Y30- (NC 210) OVER -L1- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S13_EB2-A	**STATION** 41+12	**OFFSET** 37 ft LT	**ALIGNMENT** -Y30-	**0 HR.** 8.7
COLLAR ELEV. 43.6 ft	**TOTAL DEPTH** 73.1 ft	**NORTHING** 231,527	**EASTING** 2,378,047	**24 HR.** 4.7
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 05/07/18	**COMP. DATE** 05/08/18	**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						Match Line				LIMESTONE	

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/5/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 257 ON -Y30- (NC 210) OVER -L1- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S13_EB2-B	**STATION** 40+67	**OFFSET** 37 ft RT	**ALIGNMENT** -Y30-	**0 HR.** 7.3
COLLAR ELEV. 41.6 ft	**TOTAL DEPTH** 68.6 ft	**NORTHING** 231,472	**EASTING** 2,377,980	**24 HR.** 4.5
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 04/27/18	**COMP. DATE** 05/07/18	**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)
45										
	41.6	0.0								GROUND SURFACE
40	40.6	1.0	2	4	3	7		M		**UNDIVIDED COASTAL PLAIN** TAN AND BLACK, SAND (A-3) WITH LITTLE ORGANICS
	38.7	2.9	WOH	2	1	3				
	37.1	4.5								BLACK, SANDY SILT (A-4)
	36.7	4.9	WOH	WOH	WOH	0		Sat.		
35	34.6	7.0								**COASTAL PLAIN** GRAY, SAND (A-3) (CASTLE HAYNE FORMATION)
	33.7	7.9	4	6	8	14		Sat.		
30	30.6	11.0								GRAY, SANDY SILT (A-4)
	28.7	12.9	WOH	WOH	WOH	0	SS-83	26%		
25	25.6	16.0								GRAY AND BLUE-GRAY, SILTY CLAY (A-7-6)
	23.7	17.9	WOH	WOH	WOH	0	SS-88	42%		
20	20.6	21.0								BLUE-GRAY, SANDY CLAY (A-6)
	18.7	22.9	WOH	WOH	WOH	0	SS-84	40%		
15	13.7	27.9	WOH	WOH	2	2		Sat.		
10	10.6	31.0								GRAY, SANDY SILT (A-4)
	8.7	32.9	WOH	WOH	WOH	0	SS-36	38%		
5	5.6	36.0								GRAY, SANDY CLAY (A-6)
	3.7	37.9	WOH	WOH	WOH	0	SS-89	27%		
0	0.6	41.0								WHITE, SAND (A-3) W/ TRACE LIMESTONE FRAGMENTS
	-1.3	42.9	4	8	73	81		Sat.		
-5	-6.8	48.4								**COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE
	-6.3	47.9	25	34	66/0.2	100/0.7				
-10	-9.4	51.0								**COASTAL PLAIN** WHITE, SAND (A-3) W/ LITTLE LIMESTONE FRAGMENTS
	-11.4	53.0	58	34	23	57		Sat.		
-15	-16.4	58.0	10	15	16	31		Sat.		
-20	-21.4	63.0	10	13	23	36		Sat.		
-25	-26.7	68.3	100/0.3			100/0.3				
	-27.0	68.6								**COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE
										Boring Terminated at Elevation -27.0 ft IN CP: SANDY LIMESTONE

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/5/19

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–86	36 FT RT	38+67	4.8'–6.3'	A–6	29	11	0	54	21	25	100	100	71	32	–
SS–77	36 FT RT	38+67	7.8'–9.3'	A–6	39	27	20	25	14	41	100	94	58	33	–
ST–10	36 FT RT	38+70	12.0'–14.0'	A–7–6	70	55	1	12	44	43	100	100	87	42	–
SS–78	36 FT RT	38+67	17.8'–19.3'	A–6	34	17	17	45	19	19	100	89	43	49	–
SS–79	36 FT RT	38+67	27.8'–29.3'	A–6	31	16	13	39	31	17	100	90	61	38	–
ST–16	33 FT LT	38+91	13.0'–15.0'	A–6	38	26	15	36	17	31	100	96	49	36	–
SS–34	33 FT LT	38+94	8.0'–9.5'	A–2–4	NP	NP	58	25	7	10	81	68	15	68	–
SS–74	33 FT LT	38+94	13.0'–14.5'	A–7–6	46	30	7	11	42	40	100	96	84	37	–
SS–85	33 FT LT	38+94	18.0'–19.5'	A–7–6	84	68	31	36	13	20	100	86	38	31	–
SS–75	33 FT LT	38+94	23.0'–24.5'	A–4	27	6	2	68	19	11	100	99	48	30	–
SS–76	33 FT LT	38+94	33.0'–34.5'	A–6	31	14	31	41	14	14	98	83	36	33	–
SS–33	36 FT RT	39+63	12.8'–14.3'	A–7–6	42	13	7	27	35	31	100	99	69	31	–
SS–32	32 FT LT	39+72	23.3'–24.8'	A–4	24	4	5	66	4	25	100	98	38	27	–
SS–83	37 FT RT	40+67	12.9'–14.4'	A–4	24	9	22	39	15	24	100	94	56	26	–
SS–88	37 FT RT	40+67	17.9'–19.4'	A–7–6	48	37	15	26	13	46	100	98	60	42	–
SS–84	37 FT RT	40+67	22.9'–24.4'	A–6	29	15	20	49	17	14	100	90	36	40	–
SS–36	37 FT RT	40+67	32.9'–34.4'	A–4	21	3	2	26	42	30	100	99	81	38	–
SS–89	37 FT RT	40+67	37.9'–39.4'	A–6	30	17	36	34	11	19	99	87	36	27	–
SS–80	37 FT LT	41+12	8.0'–9.5'	A–4	27	10	1	52	22	25	100	100	76	33	–
SS–87	37 FT LT	41+12	13.0'–14.5'	A–7–6	108	93	8	23	15	64	100	98	72	30	–
SS–81	37 FT LT	41+12	18.0'–19.5'	A–2–4	23	NP	20	61	6	13	100	92	20	33	–
SS–35	37 FT LT	41+12	23.0'–24.5'	A–2–4	27	8	8	65	1	26	99	96	32	30	–
SS–82	37 FT LT	41+12	33.0'–34.5'	A–6	26	12	26	42	17	15	100	90	40	33	–

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	14

-Y30-, LOOKING DOWNSTATION FROM STATION 41+50

LOOKING AT BRIDGE NO. 257 BENT 1 FROM RIGHT OF -Y30- CENTERLINE

DATE: 9-15-14

REFERENCE: R-3300B

PROJECT: 40237

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	11

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *PENDER*

PROJECT DESCRIPTION *HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD*

SITE DESCRIPTION *BRIDGES NO. 258 & 259 ON -L1- (HAMPSTEAD BYPASS) OVER -Y38- (HOLIDAY DR.) BETWEEN US 17 BUS. AND NC 210 /SR 1002 (ISLAND CREEK RD.)*

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.

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

MID-ATLANTIC

CROCKETT, S.C.

LANE, R.W.

INVESTIGATED BY *LANE, R.W.*

DRAWN BY *CROCKETT, S.C.*

CHECKED BY *HAMM, J.R.*

SUBMITTED BY *FALCON ENG.*

DATE *DECEMBER 2019*

NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C CROCKETT

DocuSigned by:
Stephen C Crockett 12/19/2019
C5CA5FED4B5D4B5... SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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 EXCAVATION
- 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-550X
- [ ] 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 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-25 - RR SPIKE SET IN POWER POLE ON HOLIDAY DR. BY 4 STA. 19+44, 27' RT, N: 232087 E: 2382638
ELEVATION: 34.91 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	3

0 30 60
FEET

N
NC GRID
NAD 83/NSRS 2007

657+00
658+00
659+00
660+00
-Y38-
-L1-
21+00
22+00
23+00

END BENT #1
STATION 658+23.63 (L1)

END BENT #2
STATION 659+19.30 (L1)

S14_EB1-A LL
S14_EB2-A LL
BRIDGE NO.258

88°47'29"
89°49'53"
88°46'51"
89°48'43"

S15_EB1-B RL
S15_EB2-B RL
BRIDGE NO.259

END BENT #1
STATION 658+22.66 (L1)

END BENT #2
STATION 659+17.50 (L1)

JS MIT
50' DRAINAGE EASEMENT
MB 28 PG 136
TO NC 210/SR 1002
(ISLAND CREEK DR.)
BRICK YARD BRANCH
TO US 17 BUS.
ISFD
WOODS
48" CHL
WD
9' GR
G
CONC
EXISTING R/W
EXISTING R/W
F
E

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	4

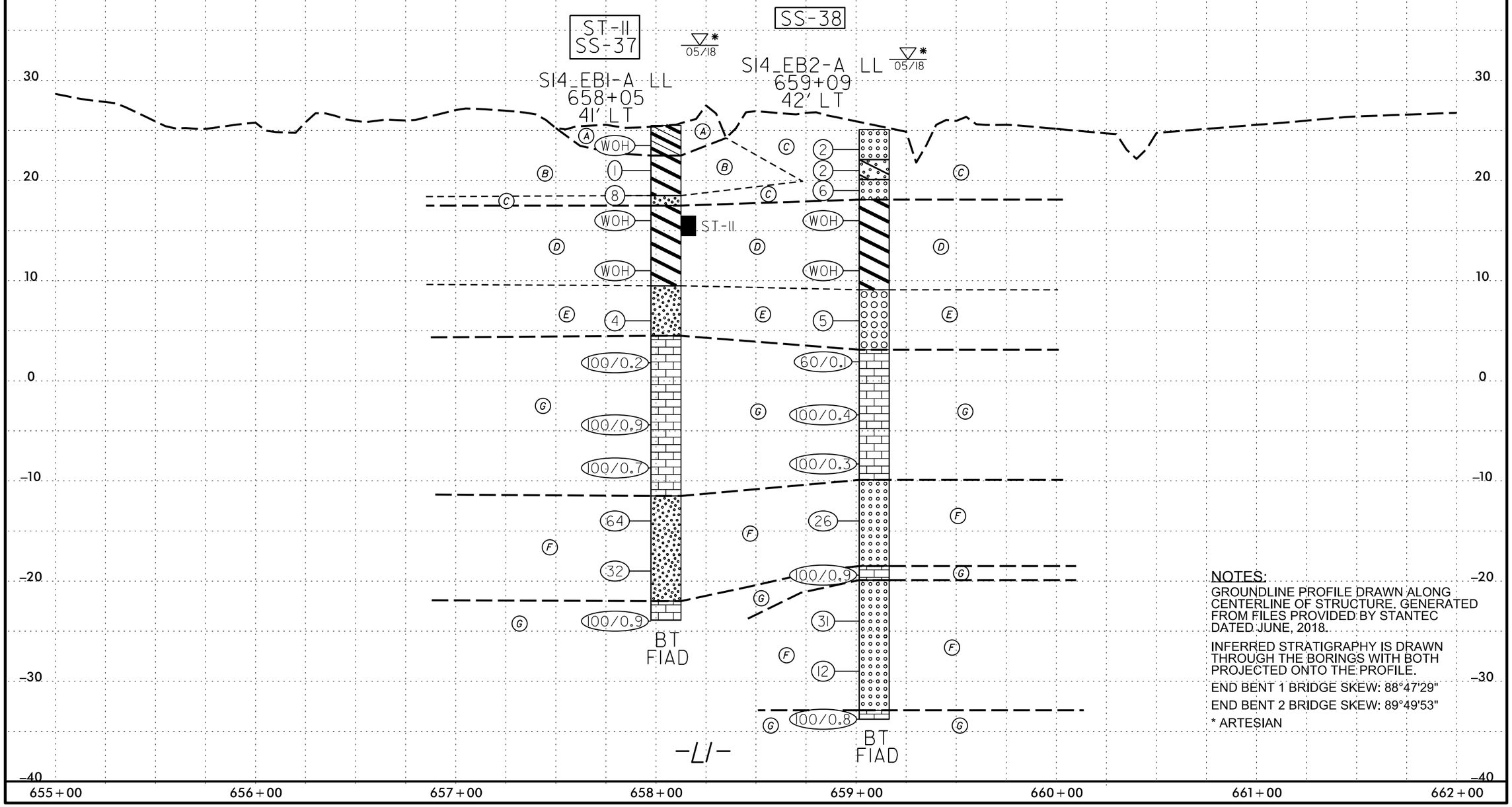
BRIDGE NO. 258 ON –LI– (HAMPSTEAD BYPASS) OVER –Y38– (HOLIDAY DR.)

0 50 100
FEET
VE = 5

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		
ST-11	41 FT LT	658+08	9.0'-11.0'	A-7-6	45	27	2	11	50	37	100	1	87	43	-
SS-37	41 FT LT	658+05	18.5'-20.0'	A-2-4	NP	NP	57	21	9	13	78	56	19	30	-
SS-38	42 FT LT	659+09	18.1'-19.6'	A-1-b	NP	NP	74	12	3	11	75	40	11	28	-

(A) **ALLUVIAL:** GRAY AND BLACK, WET, V. SOFT, SANDY CLAY (A-6) WITH TRACE ORGANICS
(B) **UNDIVIDED COASTAL PLAIN:** GRAY, WET, V. SOFT, SANDY SILTY CLAY (A-7)
(C) **UNDIVIDED COASTAL PLAIN:** BLACK AND GRAY, WET TO SAT., V. LOOSE TO LOOSE, SILTY AND CLAYEY SAND AND SAND (A-2-4, A-2-7, A-3) WITH TRACE ORAGNICS
(D) **COASTAL PLAIN:** GRAY, WET TO SAT., V. SOFT, SILTY CLAY (A-7-6) WITH LITTLE SAND (CASTLE HAYNE FORMATION)
(E) **COASTAL PLAIN:** GRAY, WET TO SAT., LOOSE, CSE. SAND AND SILTY SAND (A-1-b, A-2-4) WITH SHELL AND LIMESTONE FRAGS.
(F) **COASTAL PLAIN:** WHITE AND GRAY, WET TO SAT., MED. DENSE TO V. DENSE, SILTY SAND AND SAND (A-2-4, A-3) WITH LIMESTONE FRAGS.
(G) **COASTAL PLAIN SEDIMENTARY ROCK:** WHITE AND GRAY, HARD, SANDY LIMESTONE



NOTES:
GROUNDLINE PROFILE DRAWN ALONG CENTERLINE OF STRUCTURE. GENERATED FROM FILES PROVIDED BY STANTEC DATED JUNE, 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

END BENT 1 BRIDGE SKEW: 88°47'29"

END BENT 2 BRIDGE SKEW: 89°49'53"

* ARTESIAN

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	5

BRIDGE NO. 259 ON -LI- (HAMPSTEAD BYPASS) OVER -Y38- (HOLIDAY DR.)

0 50 100
FEET
VE = 5

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-39	44 FT RT	658+24	8.0'-9.5'	A-4	NP	NP	2	28	54	16	100	98	81	43	-
ST-12	44 FT RT	658+27	13.0'-15.0'	A-7-6	45	27	1	12	53	34	100	100	87	40	-
SS-61	44 FT RT	658+24	18.0'-19.5'	A-6	30	14	48	19	11	22	97	72	35	37	-
SS-62	36 FT RT	658+92	3.0'-4.5'	A-2-4	23	8	22	47	4	27	100	92	33	28	-
SS-63	36 FT RT	658+92	8.0'-9.5'	A-6	37	19	4	12	49	35	100	97	92	43	-

(A) **UNDIVIDED COASTAL PLAIN:** GRAY, TAN, AND BLACK, MOIST TO SAT., V. LOOSE TO LOOSE, SILTY SAND AND SAND (A-2-4, A-3) WITH TRACE ORGANICS

(B) **UNDIVIDED COASTAL PLAIN:** GRAY, SAT., V. SOFT TO SOFT, SANDY SILT AND SANDY SILTY CLAY (A-4, A-7) WITH TRACE ORGANICS

(C) **COASTAL PLAIN:** GRAY, SAT., V. SOFT TO SOFT, SANDY AND SILTY CLAY (A-6, A-7-6) WITH LITTLE SAND (CASTLE HAYNE FORMATION)

(D) **COASTAL PLAIN:** GRAY AND WHITE, SAT., LOOSE TO V. DENSE, SILTY SAND AND SAND (A-1-b, A-2-4, A-3) WITH LIMESTONE FRAGS.

(E) **COASTAL PLAIN SEDIMENTARY ROCK:** GRAY AND WHITE, HARD, SANDY LIMESTONE

SS-39
ST-12
SS-61

SS-62
SS-63

SI5_EB1-B RL
658+24
44' RT
▽* 05/18

SI5_EB2-B RL
658+92
36' RT
▽* 05/18

ST-12

SPT REF.

BT FIAD

-L/-

NOTES:

GROUNDLINE PROFILE DRAWN ALONG CENTERLINE OF STRUCTURE. GENERATED FROM FILES PROVIDED BY STANTEC DATED JUNE, 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

END BENT 1 BRIDGE SKEW: 88°46'51"

END BENT 2 BRIDGE SKEW: 89°48'43"

* ARTESIAN

50 40 30 20 10 0 -10 -20 -30 -40

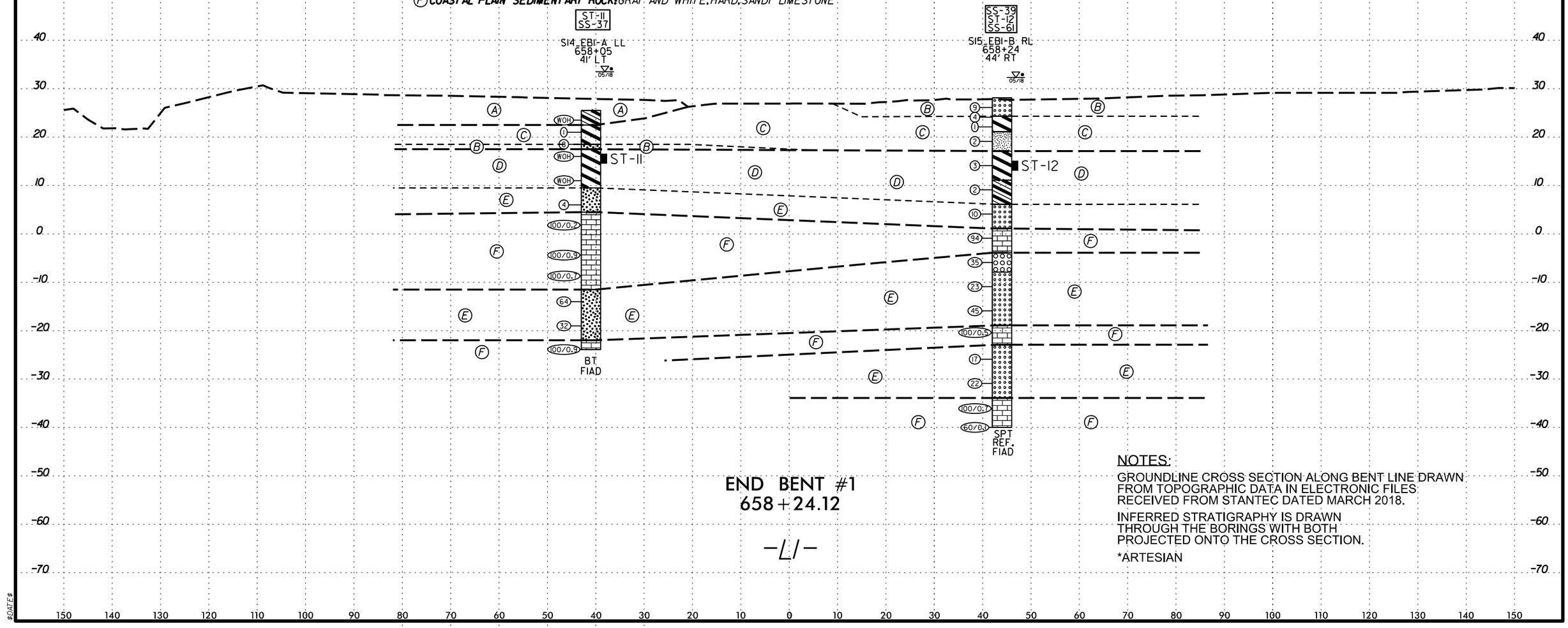
655+00 656+00 657+00 658+00 659+00 660+00 661+00 662+00

0 20 40
FEET

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
ST-11	41 FT LT	658+08	9.0'-11.0'	A-7-6	45	27	2	11	50	37	100	100	90	43	-
SS-37	41 FT LT	658+05	18.5'-20.0'	A-2-4	NP	NP	57	21	9	13	78	56	19	30	-
SS-39	44 FT RT	658+24	8.0'-9.5'	A-4	NP	NP	2	28	54	16	100	98	81	43	-
ST-12	44 FT RT	658+27	13.0'-15.0'	A-7-6	45	27	1	12	53	34	100	100	97	40	-
SS-61	44 FT RT	658+24	18.0'-19.5'	A-6	30	14	48	19	11	22	97	72	35	37	-

(A) **ALLUVIAL:** GRAY AND BLACK, WET, V. SOFT, SANDY CLAY (A-6) WITH TRACE ORGANICS
(B) **UNDIVIDED COASTAL PLAIN:** GRAY AND TAN, MOIST TO SAT., LOOSE, SILTY SAND AND SAND (A-2-4, A-3)
(C) **UNDIVIDED COASTAL PLAIN:** GRAY, WET TO SAT., V. SOFT TO SOFT, SANDY SILT AND SANDY SILTY CLAY (A-4, A-7) WITH TRACE ORGANICS
(D) **COASTAL PLAIN:** GRAY, WET TO SAT., V. SOFT TO SOFT, SANDY AND SILTY CLAY (A-6, A-7) (CASTLE HAYNE FORMATION)
(E) **COASTAL PLAIN:** GRAY AND WHITE, WET TO SAT., LOOSE TO V. DENSE, SILTY SAND AND SAND (A-1-b, A-2-4, A-3) WITH LIMESTONE FRAGS.
(F) **COASTAL PLAIN SEDIMENTARY ROCK:** GRAY AND WHITE, HARD, SANDY LIMESTONE



END BENT #1
658+24.12

-L/-

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED MARCH 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

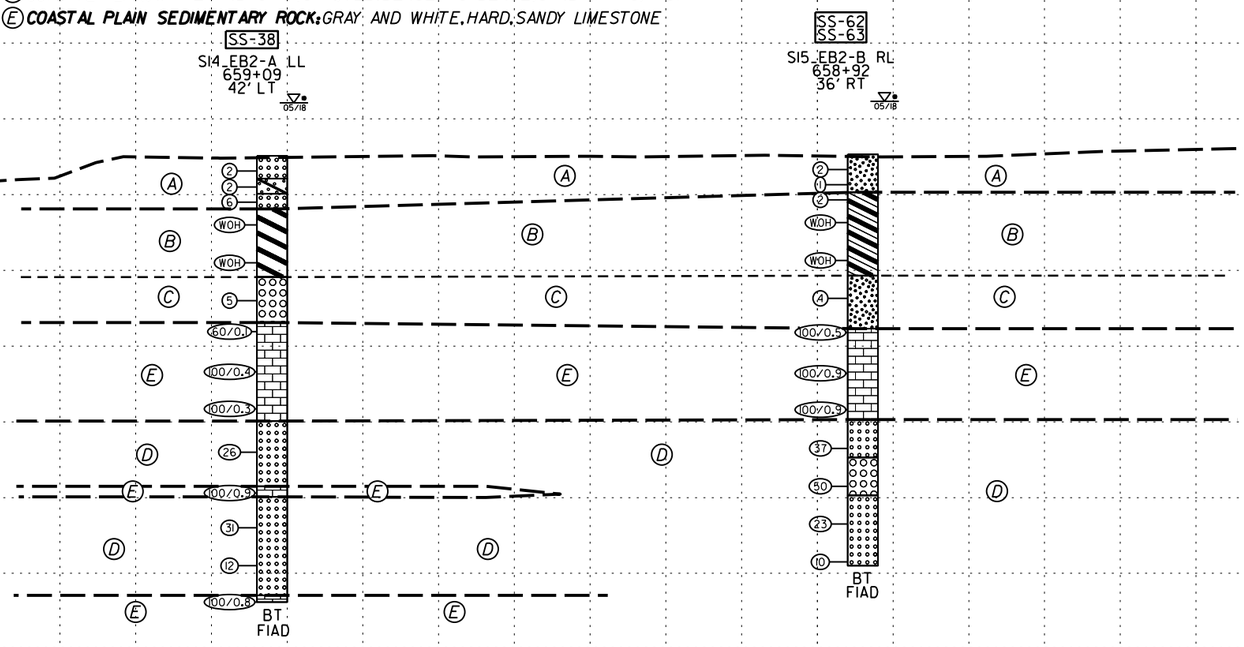
*ARTESIAN

0 20 40
FEET

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-62	36 FT RT	658+92	3.0'-4.5'	A-2-4	23	8	22	47	4	27	100	92	33	28	-
SS-63	36 FT RT	658+92	8.0'-9.5'	A-6	37	19	4	12	49	35	100	97	92	43	-
SS-38	42 FT LT	659+09	18.1'-19.6'	A-1-b	NP	NP	74	12	3	11	75	40	11	28	-

(A) **UNDIVIDED COASTAL PLAIN:** BLACK AND GRAY, SAT., V. LOOSE TO LOOSE, SILTY AND CLAYEY SAND AND SAND (A-2-4, A-2-7, A-3) WITH TRACE ORGANICS
(B) **COASTAL PLAIN:** GRAY, SAT., V. SOFT, SANDY AND SILTY CLAY (A-6, A-7) (CASTLE HAYNE FORMATION)
(C) **COASTAL PLAIN:** GRAY, SAT., LOOSE, CSE. SAND AND SILTY SAND (A-1-b, A-2-4) WITH TRACE LIMESTONE FRAGS.
(D) **COASTAL PLAIN:** WHITE AND GRAY, SAT., MED. DENSE TO DENSE, SAND (A-1-b, A-3)
(E) **COASTAL PLAIN SEDIMENTARY ROCK:** GRAY AND WHITE, HARD, SANDY LIMESTONE



END BENT #2
659+19.37

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED MARCH 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

*ARTESIAN

$DATE$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Crockett, S.C.	
SITE DESCRIPTION BRIDGE NO. 258 ON -L1- (HAMPSTEAD BYPASS) OVER -Y38- (HOLIDAY DR.)				**GROUND WTR (ft)**
BORING NO. S14_EB1-A LL	**STATION** 658+05	**OFFSET** 41 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 25.5 ft	**TOTAL DEPTH** 49.4 ft	**NORTHING** 232,907	**EASTING** 2,382,603	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 05/21/18	**COMP. DATE** 05/21/18	**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))
	25.5	0.0								GROUND SURFACE
	24.5	1.0	WOH	WOH	WOH	0		W		**ALLUVIAL** GRAY AND BLACK, SANDY CLAY (A-6) W/ TRACE ORGANICS
	22.5	3.0								**UNDIVIDED COASTAL PLAIN** GRAY, SANDY SILTY CLAY (A-7)
	22.0	3.5	WOH	WOH	1	1		W		
	19.5	6.0	1	2	6	8		W		
	18.5	7.0								GRAY, SILTY SAND (A-2-4)
	17.5	8.0								**COASTAL PLAIN** GRAY, SILTY CLAY (A-7-6) W/ SAND (CASTLE HAYNE FORMATION)
	17.0	8.5	WOH	WOH	WOH	0		W		
	12.0	13.5	WOH	WOH	WOH	0		43%		
	9.5	16.0								GRAY, SILTY SAND (A-2-4) W/ SHELL FRAGMENTS
	7.0	18.5	2	2	2	4	SS-37	W		
	4.5	21.0						30%		**COASTAL PLAIN SEDIMENTARY ROCK** GRAY, HARD, SANDY LIMESTONE
	2.0	23.5	100/0.2			100/0.2				
	-3.0	28.5	17	26	74/0.4	100/0.9				
	-8.0	33.5	45	55/0.2		100/0.7				
	-11.5	37.0								**COASTAL PLAIN** GRAY, SILTY SAND (A-2-4) W/ LIMESTONE FRAGMENTS
	-13.0	38.5	22	31	33	64		W		
	-18.0	43.5	8	18	14	32		W		
	-22.0	47.5								**COASTAL PLAIN SEDIMENTARY ROCK** GRAY, HARD, SANDY LIMESTONE
	-23.0	48.5	13	87/0.4		100/0.9				
	-23.9	49.4								Boring Terminated at Elevation -23.9 ft IN CPSR: SANDY LIMESTONE

ST-11 pushed at 9.0'-11.0' in offset boring located at -L1- Sta. 658+08, 41' LT.

ARTESIAN CONDITIONS ENCOUNTERED. 8' HEAD.

Other Samples:
ST-11 (9.0 - 11.0)

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/9/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 258 ON -L1- (HAMPSTEAD BYPASS) OVER -Y38- (HOLIDAY DR.)				**GROUND WTR (ft)**
BORING NO. S14_EB2-A LL	**STATION** 659+09	**OFFSET** 42 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 25.1 ft	**TOTAL DEPTH** 58.9 ft	**NORTHING** 232,907	**EASTING** 2,382,706	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 05/14/18	**COMP. DATE** 05/15/18	**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))
	25.1	0.0								GROUND SURFACE
	24.1	1.0	1	1	1	2		Sat.		**UNDIVIDED COASTAL PLAIN** BLACK, SAND (A-3)
	22.1	3.0								BLACK, CLAYEY SAND (A-2-7) W/ TRACE ORGANICS
	22.0	3.1	WOH	WOH	2	2		Sat.		
	20.1	5.0								GRAY, SAND (A-3)
	20.0	5.1	2	3	3	6		Sat.		
	18.1	7.0								**COASTAL PLAIN** GRAY, SILTY CLAY (A-7-6) (CASTLE HAYNE FORMATION)
	17.0	8.1	WOH	WOH	WOH	0		Sat.		
	13.1	12.0	WOH	WOH	WOH	0		Sat.		
	9.1	16.0								GRAY, COARSE SAND (A-1-b) W/ TRACE LIMESTONE FRAGMENTS
	7.0	18.1	3	2	3	5	SS-38	28%		
	3.1	22.0								**COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE
	2.0	23.1	60/0.1			60/0.1				
	-3.0	28.1	100/0.4			100/0.4				
	-8.0	33.1	100/0.3			100/0.3				
	-9.9	35.0								**COASTAL PLAIN** WHITE, SAND (A-3)
	-13.0	38.1	14	12	14	26		Sat.		
	-18.0	43.1	10	15	85/0.4	100/0.9				
	-18.5	43.6								
	-19.9	45.0								**COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE
	-23.0	48.1	30	15	16	31		Sat.		**COASTAL PLAIN** WHITE, SAND (A-3)
	-28.0	53.1	12	9	3	12		Sat.		
	-32.9	58.0								**COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE
	-33.0	58.1	55	45/0.3		100/0.8				
	-33.8	58.9								Boring Terminated at Elevation -33.8 ft IN CPSR: SANDY LIMESTONE

ARTESIAN CONDITIONS ENCOUNTERED. 7' HEAD.

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/9/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 259 ON -L1- (HAMPSTEAD BYPASS) OVER -Y38- (HOLIDAY DR.)				**GROUND WTR (ft)**
BORING NO. S15_EB1-B RL	**STATION** 658+24	**OFFSET** 44 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 28.1 ft	**TOTAL DEPTH** 68.1 ft	**NORTHING** 232,822	**EASTING** 2,382,620	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 05/15/18	**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											
	27.1	1.0	4	4	5	9		M		28.1 GROUND SURFACE	0.0
25	25.1	3.0	WOH	2	2	4		Sat.		**UNDIVIDED COASTAL PLAIN** GRAY AND TAN, SAND (A-3)	
	23.1	5.0	WOH	WOH	1	1		Sat.		24.3 GRAY, SANDY SILTY CLAY (A-7) W/ TRACE ORGANICS	3.8
20	20.1	8.0								21.1 GRAY, SANDY SILT (A-4)	7.0
			1	1	1	2	SS-39	43%			
15	15.1	13.0								17.1 **COASTAL PLAIN** GRAY, SILTY CLAY (A-7-6) W/ SAND (CASTLE HAYNE FORMATION)	11.0
			WOH	1	2	3		Sat. 40%			
10	10.1	18.0								11.1 GRAY, SANDY CLAY (A-6)	17.0
			1	1	1	2	SS-61	37%			
5	5.1	23.0								6.1 GRAY, SAND (A-3)	22.0
			4	6	4	10		Sat.			
0	0.1	28.0								1.1 **COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE	27.0
			20	43	51	94		Sat.			
-5	-4.9	33.0								-3.9 WHITE, COARSE SAND (A-1-b)	32.0
			21	17	18	35		Sat.			
-10	-9.9	38.0								-7.9 GRAY AND WHITE, SAND (A-3) W/ LITTLE LIMESTONE FRAGMENTS	36.0
			34	13	10	23		Sat.			
-15	-14.9	43.0									
			16	22	23	45		Sat.			
-20	-19.9	48.0	100/0.5			100/0.5				-18.9 **COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE	47.0
										-22.9 **COASTAL PLAIN** GRAY AND WHITE, SAND (A-3) W/ TRACE LIMESTONE FRAGMENTS	51.0
-25	-24.9	53.0									
			18	9	8	17		Sat.			
-30	-29.9	58.0									
			10	10	12	22		Sat.			
-35	-34.9	63.0								-33.9 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY, HARD, SANDY LIMESTONE	62.0
			30	57	43/0.2	100/0.7					
-40	-39.9	68.0	60/0.1			60/0.1				-40.0 Boring Terminated at Elevation -40.0 ft IN CPSR: SANDY LIMESTONE ST-12 pushed at 13.0'-15.0' in offset boring located at -L1- Sta. 658+27, 44' RT. ARTESIAN CONDITIONS ENCOUNTERED. 4.2' HEAD.	68.1

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/9/19

GEOTECHNICAL BORING REPORT
BORE LOG

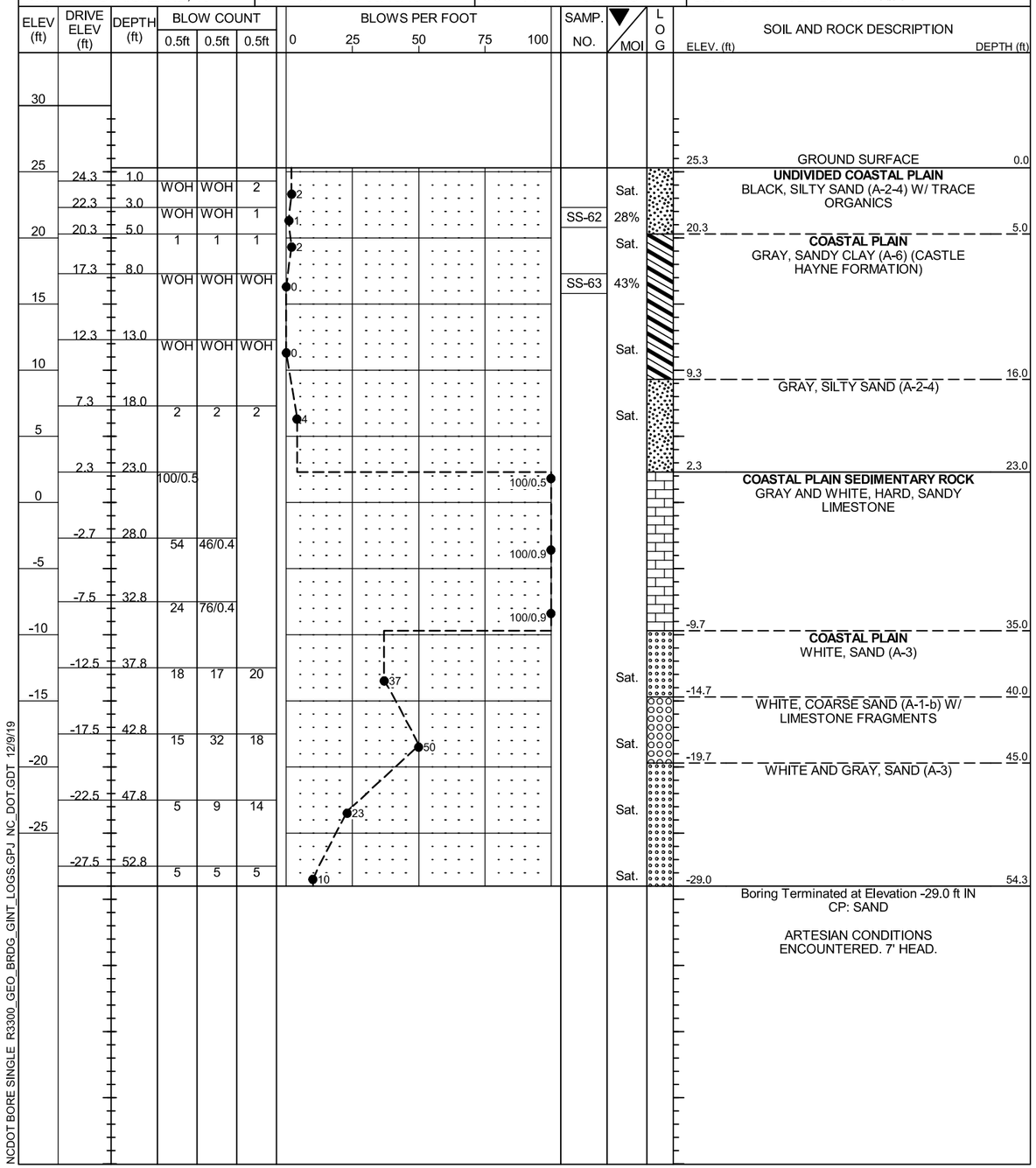
WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 259 ON -L1- (HAMPSTEAD BYPASS) OVER -Y38- (HOLIDAY DR.)				**GROUND WTR (ft)**
BORING NO. S15_EB1-B RL	**STATION** 658+24	**OFFSET** 44 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 28.1 ft	**TOTAL DEPTH** 68.1 ft	**NORTHING** 232,822	**EASTING** 2,382,620	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 05/15/18	**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)
-50						Match Line				Other Samples: ST-12 (13.0 - 15.0)	

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 12/9/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 259 ON -L1- (HAMPSTEAD BYPASS) OVER -Y38- (HOLIDAY DR.)				**GROUND WTR (ft)**
BORING NO. S15_EB2-B RL	**STATION** 658+92	**OFFSET** 36 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 25.3 ft	**TOTAL DEPTH** 54.3 ft	**NORTHING** 232,829	**EASTING** 2,382,689	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID3964 CME-45C 83% 09/05/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER STRICKLAND, TJ	**START DATE** 05/10/18	**COMP. DATE** 05/11/18	**SURFACE WATER DEPTH** N/A	



PROJECT REFERENCE NO.	SHEET NO.
R-3300B	11

-Y38-, LOOKING DOWNSTATION FROM STATION 23+00

LOOKING AT SI5_EB2-B RL FROM RIGHT OF -LI- CENTERLINE

DATE: 9-15-14

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	10

REFERENCE: R-3300B

PROJECT: 40237

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *PENDER*

PROJECT DESCRIPTION *HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD*

SITE DESCRIPTION *STRUCTURE #16 – BRIDGE ON -Y31- (HOOVER RD) OVER -L- (HAMPSTEAD BYPASS) AT -Y31- STA. 30+17.11*

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.

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

MID-ATLANTIC

CROCKETT, S.C.

INVESTIGATED BY *CROCKETT, S.C.*

DRAWN BY *CROCKETT, S.C.*

CHECKED BY *HAMM, J.R.*

SUBMITTED BY *FALCON ENG.*

DATE *DECEMBER 2019*

NORTH CAROLINA PROFESSIONAL SEAL 39779 ENGINEER JEREMY R HAMM

DocuSigned by:
Jeremy R Hamm 12/19/2019
462202304BBC46A...
SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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 EXCAVATION
- 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-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-45B
- [ ] _____

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 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: BY53, -BY5- STA. 27+65.67, N: 235623.2 E: 2389187.0

ELEVATION: 47.43 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	3

0 30 60
FEET

NC GRID
NAD 83 NA 2011

20' DRAINAGE EASEMENT
DB 4134 PG 336

END BENT #1
STATION 29+13.36 (Y31)

BENT #1
STATION 30+17.11(Y31)

END BENT #2
STATION 31+33.86 (Y31)

732+00
731+00
730+00
28+00
29+00
30+00
31+00
32+00

-Y31-

BY53

TO GODFREY CREEK RD

TO US-17 BUS.
SR 1569 HOOVER RD

STRUCTURE #16

77°09'31"
76°06'09"
74°54'52"

S16_EB1-B
S16_B1-B
S16_EB2-B

EXISTING R/W

WOODS

WOODS

DATE: 9-15-14

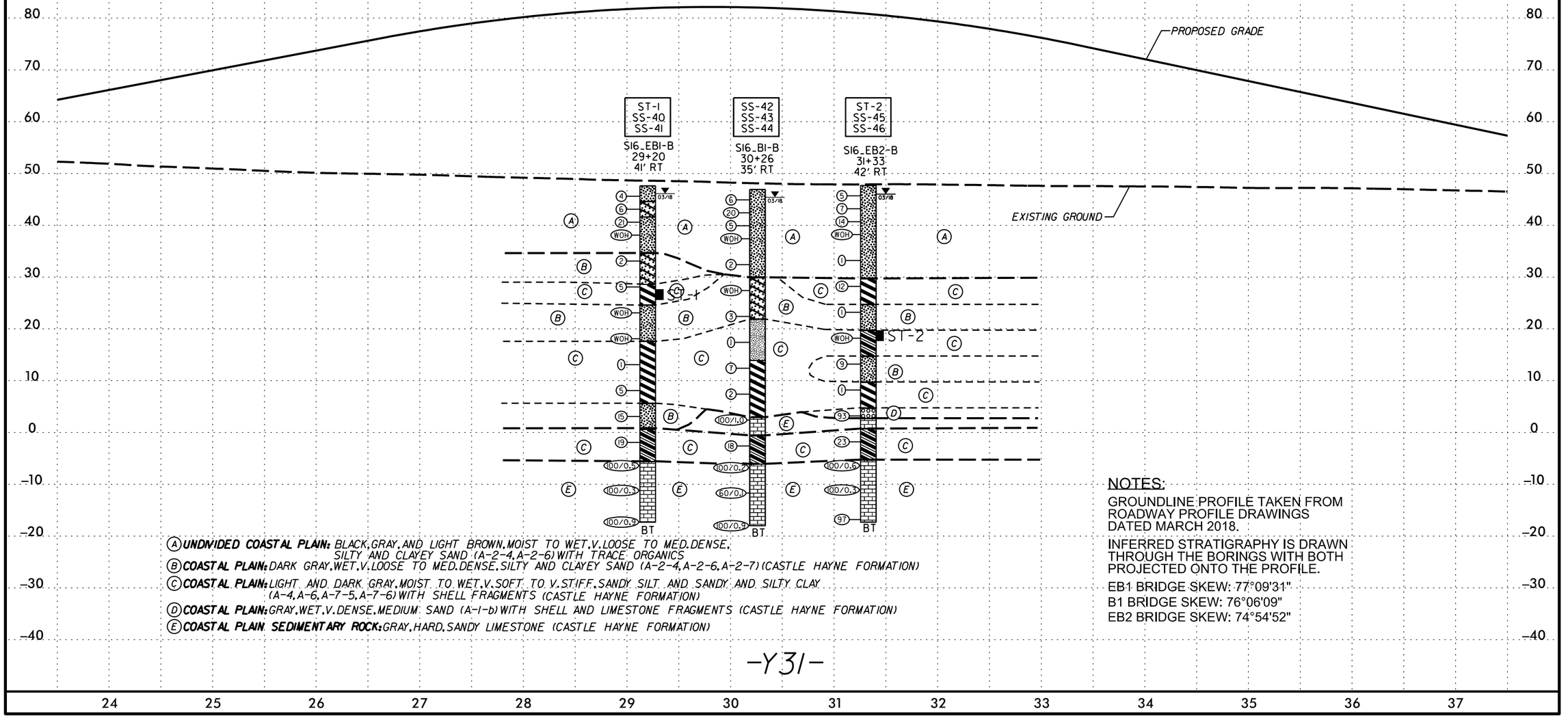
PROJECT REFERENCE NO.	SHEET NO.
R-3300B	4

STRUCTURE #16, BRIDGE ON –Y31– (HOOVER RD) OVER –L– (HAMPSTEAD BYPASS)

0 100 200
FEET
VE = 5

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
ST-1	38 FT RT	29+20	20.0'–22.0'	A-7-5	66	33	1	3	28	67	100	99	96	91	–
SS-40	41 FT RT	29+20	23.5'–25.0'	A-2-4	23	0	20	69	2	9	100	93	13	31	–
SS-41	41 FT RT	29+20	33.5'–35.0'	A-7-6	43	23	8	26	32	34	100	94	77	62	–
SS-42	35 FT RT	30+26	18.5'–20.0'	A-2-7	48	15	63	14	7	16	85	39	21	37	–
SS-43	35 FT RT	30+26	28.5'–30.0'	A-4	22	3	31	42	12	15	98	78	37	36	–
SS-44	35 FT RT	30+26	38.5'–40.0'	A-7-6	45	25	7	14	36	43	100	94	81	64	–
ST-2	39 FT RT	31+33	28.0'–30.0'	A-4	27	7	0	46	39	15	98	98	53	38	–
SS-45	42 FT RT	31+33	28.5'–30.0'	A-6	39	14	8	53	25	14	100	95	57	38	–
SS-46	42 FT RT	31+33	38.5'–40.0'	A-7-6	43	23	13	18	40	29	100	89	76	61	–



Ⓐ **UNDIVIDED COASTAL PLAIN:** BLACK, GRAY, AND LIGHT BROWN, MOIST TO WET, V. LOOSE TO MED. DENSE, SILTY AND CLAYEY SAND (A-2-4, A-2-6) WITH TRACE ORGANICS

Ⓑ **COASTAL PLAIN:** DARK GRAY, WET, V. LOOSE TO MED. DENSE, SILTY AND CLAYEY SAND (A-2-4, A-2-6, A-2-7) (CASTLE HAYNE FORMATION)

Ⓒ **COASTAL PLAIN:** LIGHT AND DARK GRAY, MOIST TO WET, V. SOFT TO V. STIFF, SANDY SILT AND SANDY AND SILTY CLAY (A-4, A-6, A-7-5, A-7-6) WITH SHELL FRAGMENTS (CASTLE HAYNE FORMATION)

Ⓓ **COASTAL PLAIN:** GRAY, WET, V. DENSE, MEDIUM SAND (A-1-b) WITH SHELL AND LIMESTONE FRAGMENTS (CASTLE HAYNE FORMATION)

Ⓔ **COASTAL PLAIN SEDIMENTARY ROCK:** GRAY, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)

NOTES:

GROUNDLINE PROFILE TAKEN FROM ROADWAY PROFILE DRAWINGS DATED MARCH 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

EB1 BRIDGE SKEW: 77°09'31"

B1 BRIDGE SKEW: 76°06'09"

EB2 BRIDGE SKEW: 74°54'52"

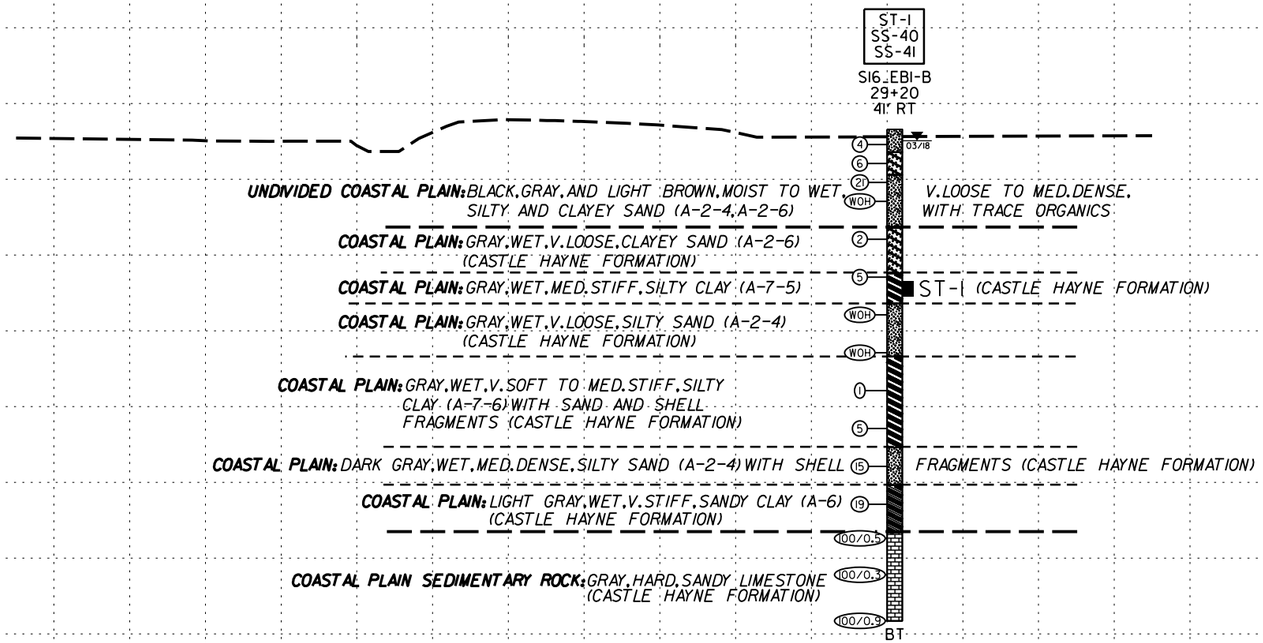
–Y31–

0 5 10

0 20 40
FEET

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		
ST-1	38 FT RT	29+20	20.0'-22.0'	A-7-5	66	33	1	3	28	67	100	99	96	91	-
SS-40	41 FT RT	29+20	23.5'-25.0'	A-2-4	23	0	20	69	2	9	100	93	13	31	-
SS-41	41 FT RT	29+20	33.5'-35.0'	A-7-6	43	23	8	26	32	34	100	94	77	62	-



END BENT #1
29+14.22

-Y31-

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED MARCH 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRIDGE SKEW: 77°09'31" AT END BENT #1

8/23/9

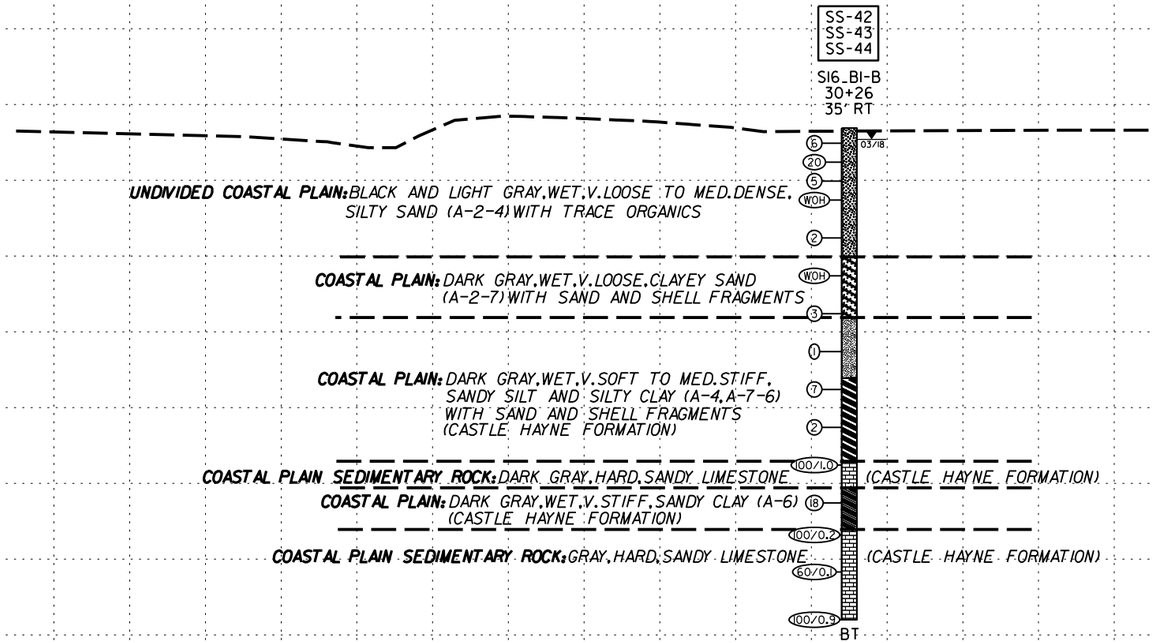
$DATE$

0 5 10

0 20 40
FEET

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-42	35 FT RT	30+26	18.5'-20.0'	A-2-7	48	15	63	14	7	16	85	39	21	37	-
SS-43	35 FT RT	30+26	28.5'-30.0'	A-4	22	3	31	42	12	15	98	78	37	36	-
SS-44	35 FT RT	30+26	38.5'-40.0'	A-7-6	45	25	7	14	36	43	100	94	81	64	-



BENT #1
30+17.11

-Y31-

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED MARCH 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRIDGE SKEW: 76°06'09" AT BENT #1

8/23/9

$DATE$

0 5 10

0 20 40
FEET

SOIL TEST RESULTS

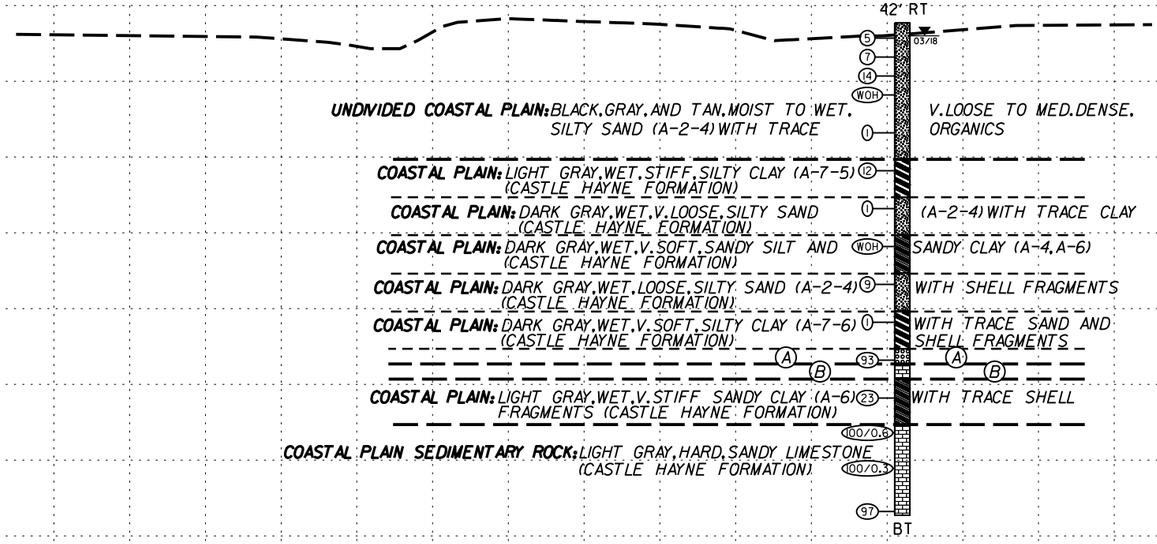
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
ST-2	39 FT RT	31+33	28.0'-30.0'	A-4	27	7	0	46	39	15	98	98	53	38	–
SS-45	42 FT RT	31+33	28.5'-30.0'	A-6	39	14	8	53	25	14	100	95	57	38	–
SS-46	42 FT RT	31+33	38.5'-40.0'	A-7-6	43	23	13	18	40	29	100	89	76	61	–

Ⓐ **COASTAL PLAIN:** GRAY, WET, V. DENSE, MEDIUM SAND (A-1-b) WITH SHELL AND LIMESTONE FRAGMENTS (CASTLE HAYNE FORMATION)

Ⓑ **COASTAL PLAIN SEDIMENTARY ROCK:** GRAY, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)

SS-42
SS-43
SS-44

SI6_EB2-B
31+33
42' RT



END BENT #2
31+33.00

-Y31-

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED MARCH 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRIDGE SKEW: 74°54'52" AT END BENT #2

8/23/9

$DATE$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE #16 - BRIDGE ON -Y31- (HOOVER RD) OVER -L- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S16_EB1-B	**STATION** 29+20	**OFFSET** 41 ft RT	**ALIGNMENT** -Y31-	**0 HR.** 2.2
COLLAR ELEV. 47.6 ft	**TOTAL DEPTH** 64.9 ft	**NORTHING** 235,803	**EASTING** 2,389,148	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 09/06/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER MEIGS, R.	**START DATE** 03/06/18	**COMP. DATE** 03/06/18	**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)
										47.6	0.0
										GROUND SURFACE	
										UNDIVIDED COASTAL PLAIN	
										BLACK, SILTY SAND (A-2-4) WITH TRACE ORGANICS	
	46.6	1.0	2	2	2	4				44.6	3.0
	44.1	3.5	2	3	3	6		W		GRAY, CLAYEY SAND (A-2-6)	
	41.6	6.0	7	10	11	21		W		41.6	6.0
	39.1	8.5	WOH	WOH	WOH	0		W		LIGHT BROWN, SILTY SAND (A-2-4) WITH TRACE CLAY	
										34.6	13.0
	34.1	13.5	1	1	1	2		W		**COASTAL PLAIN**	
										GRAY, CLAYEY SAND (A-2-6) (CASTLE HAYNE FORMATION)	
	29.1	18.5	1	3	2	5		W		28.6	19.0
										GRAY, SILTY CLAY (A-7-5)	
	24.1	23.5	WOH	WOH	WOH	0	SS-40	31%		24.6	23.0
										GRAY, SILTY SAND (A-2-4)	
	19.1	28.5	WOH	WOH	WOH	0		W		17.6	30.0
										DARK GRAY, SILTY CLAY (A-7-6) WITH SAND AND SHELL FRAGMENTS	
	14.1	33.5	WOH	WOH	1	1	SS-41	62%		5.6	42.0
	9.1	38.5	WOH	2	3	5		W		DARK GRAY, SILTY SAND (A-2-4) WITH SHELL FRAGMENTS	
	4.1	43.5	14	8	7	15		W		0.6	47.0
	-0.9	48.5	5	9	10	19		W		LIGHT GRAY, SANDY CLAY (A-6)	
	-5.9	53.5	100/0.5			100/0.5				-5.6	53.2
	-10.9	58.5	100/0.3			100/0.3				**COASTAL PLAIN SEDIMENTARY ROCK** GRAY, SANDY LIMESTONE	
	-15.9	63.5	14	36	64/0.4	100/0.9				-17.3	64.9
										Boring Terminated at Elevation -17.3 ft IN CP: SANDY LIMESTONE	
										ST-1 pushed at 20.0'-22.0" in offset boring located at -Y31- Sta. 29+20, 38' RT.	

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE #16 - BRIDGE ON -Y31- (HOOVER RD) OVER -L- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S16_B1-B	**STATION** 30+26	**OFFSET** 35 ft RT	**ALIGNMENT** -Y31-	**0 HR.** 2.5
COLLAR ELEV. 46.9 ft	**TOTAL DEPTH** 64.9 ft	**NORTHING** 235,697	**EASTING** 2,389,145	**24 HR.** 1.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 09/06/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER MEIGS, R.	**START DATE** 03/06/18	**COMP. DATE** 03/06/18	**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
										46.9 GROUND SURFACE 0.0
										UNDIVIDED COASTAL PLAIN
										BLACK AND LIGHT GRAY, SILTY SAND (A-2-4) WITH TRACE ORGANICS
	45.9	1.0	1	3	3	6				
	43.4	3.5	5	8	12	20		W		
	40.9	6.0	8	4	1	5		W		
	38.4	8.5	WOH	WOH	WOH	0		W		
	33.4	13.5	WOH	1	1	2		W		
	28.4	18.5	WOH	WOH	WOH	0	SS-42	37%		29.9 17.0
										COASTAL PLAIN
										DARK GRAY, CLAYEY SAND (A-2-7) WITH SAND AND SHELL FRAGMENTS (CASTLE HAYNE FORMATION)
	23.4	23.5	WOH	WOH	3	3		W		21.9 25.0
										DARK GRAY, SANDY SILT (A-4) WITH SAND AND SHELL FRAGMENTS
	18.4	28.5	WOH	WOH	1	1	SS-43	36%		
	13.4	33.5	4	4	3	7		W		13.9 33.0
	8.4	38.5	1	1	1	2	SS-44	64%		DARK GRAY, SILTY CLAY (A-7-6) WITH SAND AND SHELL FRAGMENTS
	3.4	43.5	7	11	89/0.5	100/1.0				2.9 44.0
	-1.6	48.5	6	7	11	18		W		**COASTAL PLAIN SEDIMENTARY ROCK** DARK GRAY, SANDY LIMESTONE
	-6.6	53.5	100/0.2			100/0.2				-0.6 47.5
	-11.6	58.5	60/0.1			60/0.1				**COASTAL PLAIN** LIGHT GRAY, SANDY CLAY (A-6)
	-16.6	63.5	42	29	71/0.4	100/0.9				-6.1 53.0
										COASTAL PLAIN SEDIMENTARY ROCK GRAY, SANDY LIMESTONE
										-18.0 64.9
										Boring Terminated at Elevation -18.0 ft IN CP: SANDY LIMESTONE

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION STRUCTURE #16 - BRIDGE ON -Y31- (HOOVER RD) OVER -L- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S16_EB2-B	**STATION** 31+33	**OFFSET** 42 ft RT	**ALIGNMENT** -Y31-	**0 HR.** 4.4
COLLAR ELEV. 47.7 ft	**TOTAL DEPTH** 65.0 ft	**NORTHING** 235,592	**EASTING** 2,389,127	**24 HR.** 1.7
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 09/06/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER MEIGS, R.	**START DATE** 03/05/18	**COMP. DATE** 03/05/18	**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)
50											
										47.7 GROUND SURFACE	0.0
	46.7	1.0	2	3	2	5				**UNDIVIDED COASTAL PLAIN** BLACK, GRAY, AND TAN, SILTY SAND (A-2-4) WITH TRACE ORGANICS	
45	44.2	3.5	3	3	4	7		W			
	41.7	6.0	3	6	8	14		W			
40	39.2	8.5	WOH	WOH	WOH	0		W			
35	34.2	13.5	1	1	0	1		W			
30	29.2	18.5	4	5	7	12		W		29.7 **COASTAL PLAIN** LIGHT GRAY, SILTY CLAY (A-7-5) WITH SAND (CASTLE HAYNE FORMATION)	18.0
25	24.2	23.5	1	1	0	1		W		24.7 DARK GRAY, SILTY SAND (A-2-4) WITH TRACE CLAY	23.0
20	19.2	28.5	WOH	WOH	WOH	0	SS-45	38%		19.7 DARK GRAY, SANDY CLAY (A-6)	28.0
15	14.2	33.5	WOH	4	5	9		W		14.7 DARK GRAY, SILTY SAND (A-2-4) WITH SHELL FRAGMENTS	33.0
10	9.2	38.5	WOH	WOH	1	1	SS-46	61%		9.7 DARK GRAY, SILTY CLAY (A-7-6) WITH TRACE SAND AND SHELL FRAGMENTS	38.0
5	4.2	43.5	4	14	79	93		W		4.7 GRAY, MEDIUM SAND (A-1-b) WITH SHELL AND LIMESTONE FRAGMENTS	43.0
0	-0.8	48.5	14	11	12	23		W		2.7 **COASTAL PLAIN SEDIMENTARY ROCK** 0.7 GRAY, SANDY LIMESTONE **COASTAL PLAIN** LIGHT GRAY, SANDY CLAY (A-6) WITH TRACE SHELL FRAGMENTS	45.0 47.0
-5	-5.8	53.5	53	47/0.1		100/0.6				-5.3 **COASTAL PLAIN SEDIMENTARY ROCK** LIGHT GRAY, SANDY LIMESTONE	53.0
-10	-10.8	58.5	100/0.3			100/0.3					
-15	-15.8	63.5	16	42	55	97				-17.3	65.0

Boring Terminated at Elevation -17.3 ft IN CP: SANDY LIMESTONE

ST-2 pushed at 28.0'-30.0' in offset boring located at -Y31- Sta. 31+33, 39' RT. Sample classified as a dark gray, sandy silt (A-4).

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	10

-Y31-, LOOKING UPSTATION FROM STATION 29+00

-Y31-, LOOKING UPSTATION FROM LEFT OF CENTERLINE

DATE: 9-15-14

REFERENCE: R-3300B

PROJECT: 40237

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	16

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *PENDER*

PROJECT DESCRIPTION *HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD*

SITE DESCRIPTION *BRIDGE NO. 262 ON -Y32- OVER -LI_NORTHERN- (HAMPSTEAD BYPASS) BETWEEN SR 1565 (COUNTRY CLUB DR.) AND SR 1675 (LONG LEAF DR.)*

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.

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

MID-ATLANTIC

CROCKETT, S.C.

LANE, R.W.

INVESTIGATED BY *LANE, R.W.*

DRAWN BY *CROCKETT, S.C.*

CHECKED BY *HAMM, J.R.*

SUBMITTED BY *FALCON ENG.*

DATE *APRIL 2020*

NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C CROCKETT

DocuSigned by:
Stephen C Crockett 4/17/2020
C5CA5FED48E0435...
SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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 EXCAVATION
- 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-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-45B
- [ ] _____

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 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-R3300-29, -Y32- STA. 15+86, 176' LT
N: 238208 E: 2399827
ELEVATION: 44.38 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	3

0 30 60
FEET

NAD 83/NSRS 2007
NC GRID

24+00
25+00
852+00
26+00
27+00
-LI_NORTHERN-

BENT #1
STATION 25+28.04 -Y32-
STATION 852+98.21 -LI_NORTHERN-

END BENT #1
STATION 24+45.87 -Y32-

END BENT #2
STATION 26+25.20 -Y32-

MSE1-LT
MSE2-LT
S18_EB1-A
S18_B1-A
S18_EB2-A
853+00
-Y32-
TO SR 1565
88°19'10"
83°05'19"
BRIDGE NO.262
76°54'10"
TO SR 1675
S18_B1-B
S18_EB1-B
S18_EB2-B
MSE1-RT
854+00
MSE2-RT

0 50 100
FEET
VE = 5

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	4

BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- BETWEEN SR 1565 AND SR 1563.

SOIL TEST RESULTS

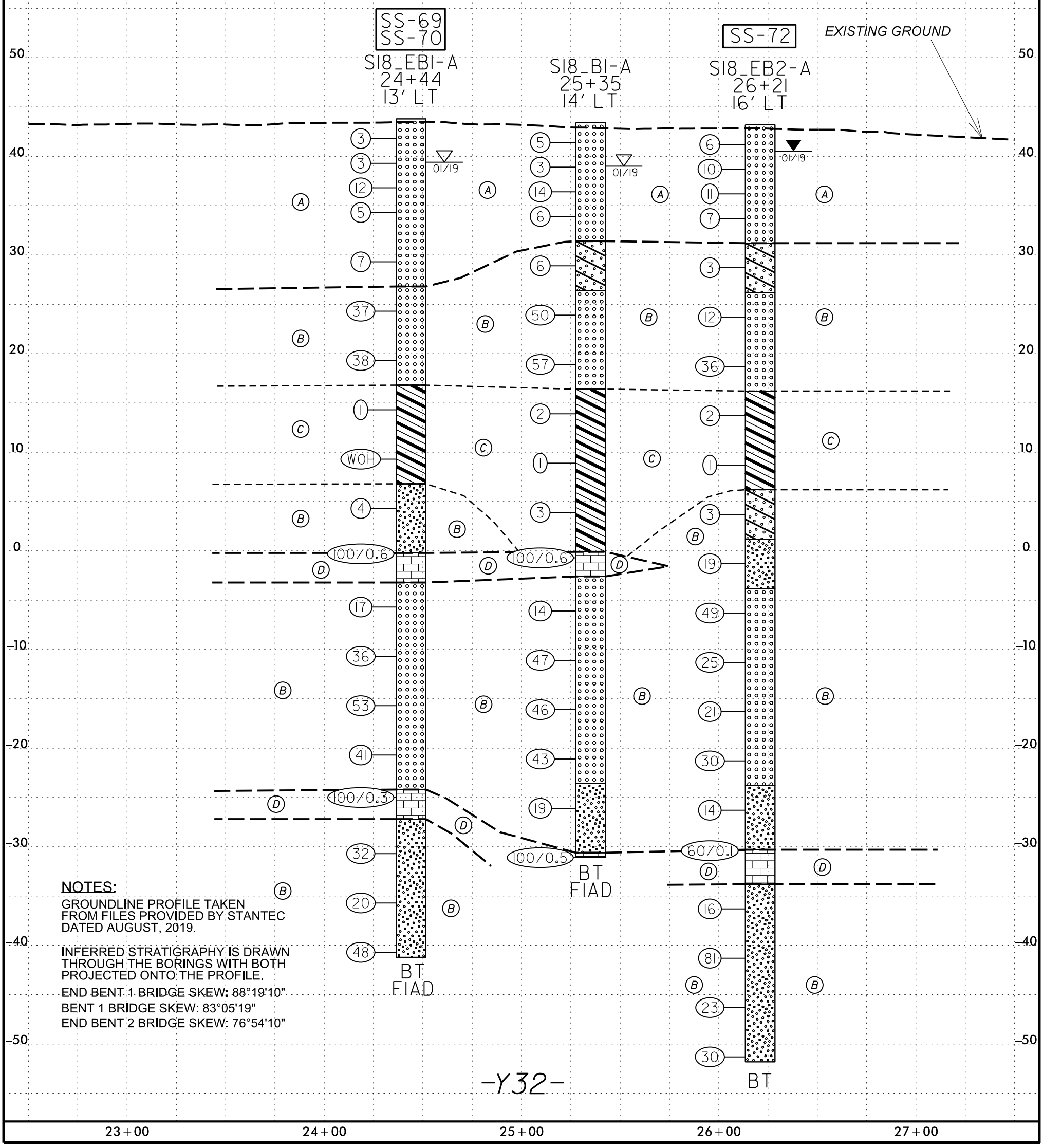
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-69	13 FT LT	24+44	28.5'-30.0'	A-6	31	17	1	30	33	36	100	100	79	37	-
SS-70	13 FT LT	24+44	38.5'-40.0'	A-2-4	27	4	38	38	10	14	100	81	31	36	-
SS-72	16 FT LT	26+21	28.5'-30.0'	A-6	34	19	1	25	38	36	100	100	89	36	-

(A) **UNDIVIDED COASTAL PLAIN:** TAN, GRAY, BLACK AND BROWN, MOIST TO SAT., V.LOOSE TO MED.DENSE, SAND (A-3)

(B) **COASTAL PLAIN:** GRAY, TAN, WHITE, AND GREEN-GRAY, SAT., V.LOOSE TO V.DENSE, SILTY AND CLAYEY SAND AND SAND (A-2-4, A-2-6, A-2-7, A-3) (CASTLE HAYNE FORMATION)

(C) **COASTAL PLAIN:** GRAY, SAT., V.SOFT TO SOFT, SANDY CLAY (A-6)

(D) **COASTAL PLAIN SEDIMENTARY ROCK:** GRAY, WHITE, AND GREEN-GRAY, V.HARD, SANDY LIMESTONE



NOTES:

GROUNDLINE PROFILE TAKEN FROM FILES PROVIDED BY STANTEC DATED AUGUST, 2019.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

END BENT 1 BRIDGE SKEW: 88°19'10"

BENT 1 BRIDGE SKEW: 83°05'19"

END BENT 2 BRIDGE SKEW: 76°54'10"

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
ST-14	53 FT RT	24+39	30.5'-32.5'	A-6	34	17	0	48	22	30	100	100	52	39	-
SS-71	53 FT RT	24+42	38.5'-40.0'	A-2-4	27	NP	35	39	11	15	100	83	33	36	-
SS-69	13 FT LT	24+44	28.5'-30.0'	A-6	31	17	1	30	33	36	100	100	79	37	-
SS-70	13 FT LT	24+44	38.5'-40.0'	A-2-4	27	4	38	38	10	14	100	81	31	36	-

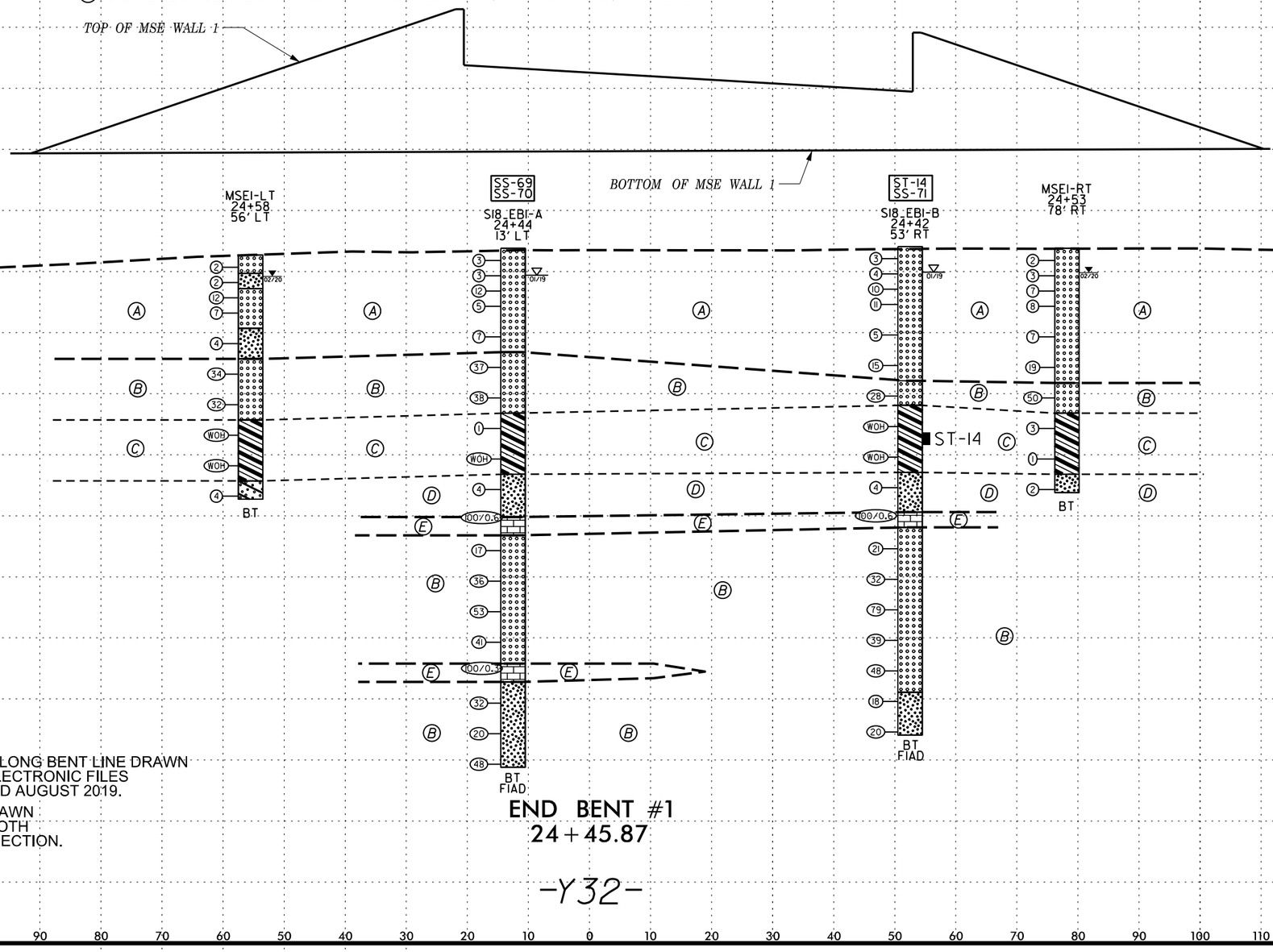
(A) **UNDIVIDED COASTAL PLAIN:** TAN AND BROWN, MOIST TO SAT., V.LOOSE TO MED.DENSE, SILTY SAND AND SAND (A-2-4, A-3) WITH TRACE ORGANICS

(B) **COASTAL PLAIN:** GRAY AND WHITE, SAT., MED.DENSE TO V.DENSE, SILTY AND CLAYEY SAND AND SAND (A-2-4, A-2-6, A-3) WITH TRACE TO SOME SHELLS AND LIMESTONE FRAGS. (CASTLE HAYNE FORMATION)

(C) **COASTAL PLAIN:** GRAY, SAT., V.SOFT TO SOFT, SANDY CLAY (A-6)

(D) **COASTAL PLAIN:** GRAY AND GREEN-GRAY, SAT., V.LOOSE TO LOOSE, SILTY SAND (A-2-4)

(E) **COASTAL PLAIN SEDIMENTARY ROCK:** GRAY AND GREEN-GRAY, HARD TO V.HARD, SANDY LIMESTONE



NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED AUGUST 2019.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRDIGE SKEW: 88°19'10"

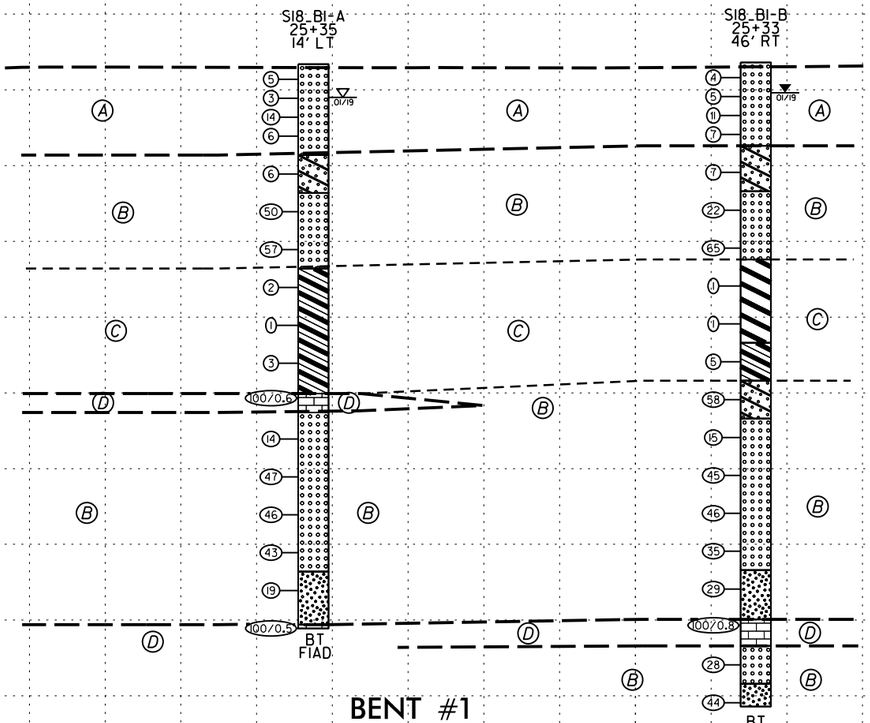
-Y32-

PROJ. REFERENCE NO.	SHEET NO.
R-3300B	6

0 5 10

0 20 40
FEET

Ⓐ **UNDIVIDED COASTAL PLAIN:** TAN, BLACK, BROWN, AND GRAY, DRY TO SAT., V. LOOSE TO MED. DENSE, SAND (A-3)
Ⓑ **COASTAL PLAIN:** GRAY, WHITE, AND GREEN-GRAY, SAT., LOOSE TO V. DENSE, SILTY AND CLAYEY SAND AND SAND (A-2-4, A-2-6, A-2-7, A-3) (CASTLE HAYNE FORMATION)
Ⓒ **COASTAL PLAIN:** GRAY, SAT., V. SOFT TO MED. STIFF, SANDY AND SILTY CLAY (A-6, A-7) WITH THIN SAND LAYERS
Ⓓ **COASTAL PLAIN SEDIMENTARY ROCK:** GRAY AND WHITE, HARD TO V. HARD, SANDY LIMESTONE



BENT #1
25+28.04

-Y32-

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED AUGUST 2019.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRDIGE SKEW: 83°05'19"

8/23/9

$DATE$

8/23/9

0 5 10

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-72	16 FT LT	26+21	28.5'-30.0'	A-6	34	19	1	25	38	36	100	100	89	36	-
SS-73	59 FT RT	26+39	33.5'-35.0'	A-6	33	17	1	38	25	36	100	100	71	42	-

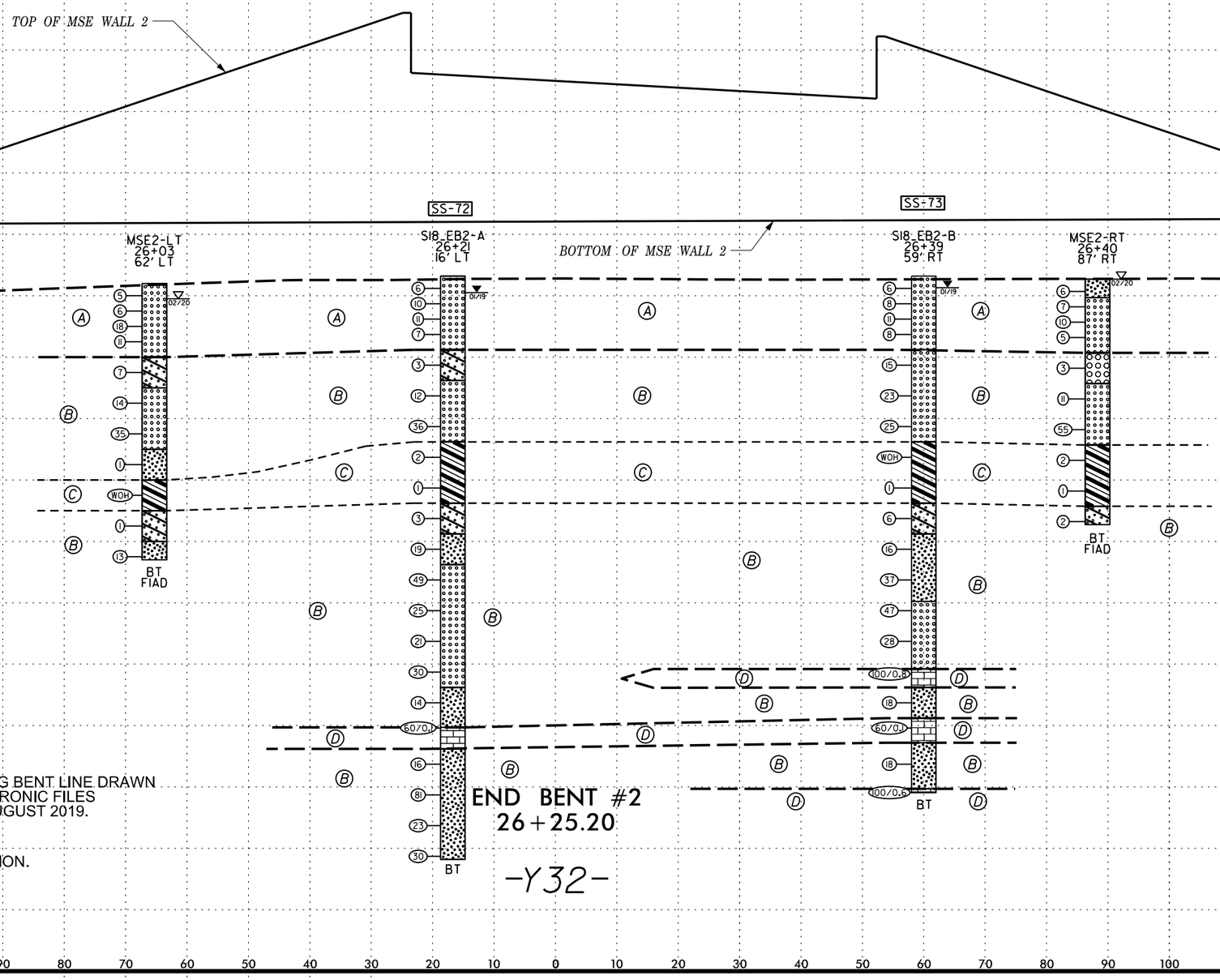
0 20 40
FEET

Ⓐ **UNDIVIDED COASTAL PLAIN:** TAN, BROWN, AND GRAY, MOIST TO SAT., V.LOOSE TO MED.DENSE, SILTY F.SAND AND SAND (A-2-4, A-3) WITH TRACE ORGANICS

Ⓑ **COASTAL PLAIN:** GRAY WHITE, TAN, AND GREEN-GRAY, SAT., V.LOOSE TO DENSE, SILTY AND CLAYEY SAND AND SAND (A-1-a, A-2-4, A-2-6, A-2-7, A-3) WITH TRACE TO LITTLE LIMESTONE AND SHELL FRAGS. AND INTERMITTENT THIN LENSES OF CLAY (CASTLE HAYNE FORMATION)

Ⓒ **COASTAL PLAIN:** GRAY, SAT., V.SOFT TO SOFT, SANDY CLAY (A-6)

Ⓓ **COASTAL PLAIN SEDIMENTARY ROCK:** GRAY AND WHITE, HARD TO V.HARD, SANDY LIMESTONE



NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED AUGUST 2019.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRDIGE SKEW: 76°54'10"

$DATE$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S18_EB1-A	**STATION** 24+44	**OFFSET** 13 ft LT	**ALIGNMENT** -Y32-	**0 HR.** 4.4
COLLAR ELEV. 43.8 ft	**TOTAL DEPTH** 85.0 ft	**NORTHING** 238,948	**EASTING** 2,400,128	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGANS, M.	**START DATE** 01/24/19	**COMP. DATE** 01/25/19	**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)
45											
										43.8 GROUND SURFACE	0.0
	42.8	1.0	2	2	1	3		M		**UNDIVIDED COASTAL PLAIN** TAN AND BROWN, SAND (A-3)	
40	40.3	3.5	2	2	1	3					
	37.8	6.0	2	5	7	12		Sat.			
35	35.3	8.5	4	3	2	5		Sat.			
30	30.3	13.5	2	3	4	7		Sat.			
										26.8	17.0
25	25.3	18.5	12	17	20	37		Sat.		**COASTAL PLAIN** GRAY, SAND (A-3) (CASTLE HAYNE FORMATION)	
20	20.3	23.5	15	22	16	38		Sat.			
										16.8	27.0
15	15.3	28.5	WOH	WOH	1	1	SS-69	37%		GRAY, SANDY CLAY (A-6)	
10	10.3	33.5	WOH	WOH	WOH	0		Sat.			
										6.8	37.0
5	5.3	38.5	1	2	2	4	SS-70	36%		GREENISH-GRAY, SILTY SAND (A-2-4)	
										-0.2	44.0
0	0.3	43.5	26	74/0.1		100/0.6				**COASTAL PLAIN SEDIMENTARY ROCK** GRAY, HARD, SANDY LIMESTONE	
										-3.2	47.0
-5	-4.7	48.5	10	8	9	17		Sat.		**COASTAL PLAIN** GRAY, SAND (A-3) W/ TRACE LIMESTONE FRAGMENTS	
-10	-9.7	53.5	19	15	21	36		Sat.			
-15	-14.7	58.5	16	25	28	53		Sat.			
-20	-19.7	63.5	15	16	25	41		Sat.			
										-24.2	68.0
-25	-24.7	68.5	100/0.3			100/0.3				**COASTAL PLAIN SEDIMENTARY ROCK** GREEN-GRAY, HARD, SANDY LIMESTONE	
										-27.2	71.0
-30	-29.7	73.5	8	10	22	32		Sat.		**COASTAL PLAIN** WHITE, SILTY SAND (A-2-4) W/ SOME LIMESTONE FRAGMENTS	
-35	-34.7	78.5									

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S18_EB1-A	**STATION** 24+44	**OFFSET** 13 ft LT	**ALIGNMENT** -Y32-	**0 HR.** 4.4
COLLAR ELEV. 43.8 ft	**TOTAL DEPTH** 85.0 ft	**NORTHING** 238,948	**EASTING** 2,400,128	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGANS, M.	**START DATE** 01/24/19	**COMP. DATE** 01/25/19	**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						Match Line					
			12	10	10	20		Sat.		**COASTAL PLAIN** WHITE, SILTY SAND (A-2-4) W/ SOME LIMESTONE FRAGMENTS *(continued)*	
-40	-39.7	83.5	12	18	30	48		Sat.		-41.2	85.0
										Boring Terminated at Elevation -41.2 ft IN CP: SILTY SAND	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S18_EB1-B	**STATION** 24+42	**OFFSET** 53 ft RT	**ALIGNMENT** -Y32-	**0 HR.** 4.2
COLLAR ELEV. 44.1 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 238,931	**EASTING** 2,400,191	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGANS, M.	**START DATE** 01/25/19	**COMP. DATE** 01/25/19	**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)
45										44.1 GROUND SURFACE	0.0
	43.1	1.0	2	2	1	3		M		**UNDIVIDED COASTAL PLAIN** TAN, SAND (A-3)	
40	40.6	3.5	2	2	2	4					
	38.1	6.0	3	4	6	10		Sat.			
35	35.6	8.5	4	4	7	11		Sat.			
	30.6	13.5	1	2	3	5		Sat.			
25	25.6	18.5	9	7	8	15		Sat.		22.1 **COASTAL PLAIN** WHITE, SAND (A-3) (CASTLE HAYNE FORMATION)	22.0
20	20.6	23.5	15	17	11	28		Sat.		18.1 GRAY, SANDY CLAY (A-6)	26.0
15	15.6	28.5	WOH	WOH	WOH	0		Sat.			
10	10.6	33.5	WOH	WOH	WOH	0		39% Sat.			
5	5.6	38.5	WOH	2	2	4	SS-71	36%		7.1 GRAY, SILTY SAND (A-2-4)	37.0
0	0.6	43.5	100/0.6			100/0.6				0.6 **COASTAL PLAIN SEDIMENTARY ROCK** GREEN-GRAY, HARD, SANDY LIMESTONE	43.5
-5	-4.4	48.5	10	9	12	21		Sat.		-1.9 **COASTAL PLAIN** GRAY, SAND (A-3) W/ LITTLE LIMESTONE FRAGMENTS	46.0
-10	-9.4	53.5	16	14	18	32		Sat.			
-15	-14.4	58.5	28	35	44	79		Sat.			
-20	-19.4	63.5	9	16	23	39		Sat.			
-25	-24.4	68.5	30	26	22	48		Sat.			
-30	-29.4	73.5	7	7	11	18		Sat.		-28.9 WHITE, SILTY SAND (A-2-4) W/ LITTLE LIMESTONE FRAGMENTS	73.0
-35	-34.4	78.5									

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 4/16/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S18_EB1-B	**STATION** 24+42	**OFFSET** 53 ft RT	**ALIGNMENT** -Y32-	**0 HR.** 4.2
COLLAR ELEV. 44.1 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 238,931	**EASTING** 2,400,191	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGANS, M.	**START DATE** 01/25/19	**COMP. DATE** 01/25/19	**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			31	11	9	Match Line 20		Sat.		-35.9 Boring Terminated at Elevation -35.9 ft IN CP: SILTY SAND ST-14 pushed in offset boring located at -Y32- Sta. 24+39, 53' RT Other Samples: ST-14 (30.5 - 32.5)	80.0

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 4/16/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S18_B1-A	**STATION** 25+35	**OFFSET** 14 ft LT	**ALIGNMENT** -Y32-	**0 HR.** 4.4
COLLAR ELEV. 43.4 ft	**TOTAL DEPTH** 74.5 ft	**NORTHING** 239,037	**EASTING** 2,400,153	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 09/06/2017		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER WIGGANS, M.	**START DATE** 01/22/19	**COMP. DATE** 01/22/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
45											
	42.4	1.0	2	3	2		D		GROUND SURFACE **UNDIVIDED COASTAL PLAIN** TAN BLACK AND BROWN, SAND (A-3)	43.4	0.0
40	39.9	3.5	2	2	1		Sat.				
	37.4	6.0	3	7	7		Sat.				
35	34.9	8.5	4	3	3		Sat.			31.4	12.0
30	29.9	13.5	2	2	4		Sat.		**COASTAL PLAIN** GRAY, CLAYEY SAND (A-2-7) (CASTLE HAYNE FORMATION)	26.4	17.0
25	24.9	18.5	14	22	28		Sat.		GRAY, SAND (A-3)		
20	19.9	23.5	15	26	31		Sat.			16.4	27.0
15	14.9	28.5	1	1	1		Sat.		GRAY, SANDY CLAY (A-6) W/ THIN SAND LAYERS		
10	9.9	33.5	WOH	WOH	1		Sat.				
5	4.9	38.5	WOH	WOH	3		Sat.				
0	-0.1	43.5	40	60/0.1					**COASTAL PLAIN SEDIMENTARY ROCK** GRAY AND WHITE, HARD, SANDY LIMESTONE	-0.1	43.5
-5	-5.2	48.5	7	7	7		Sat.		**COASTAL PLAIN** GRAY, SAND (A-3) W/ TRACE SHELL FRAGMENTS	-2.7	46.0
-10	-10.2	53.5	13	22	25		Sat.				
-15	-15.2	58.5	15	19	27		Sat.				
-20	-20.2	63.5	12	20	23		Sat.				
-25	-25.2	68.5	14	10	9		Sat.		GRAY AND WHITE, SILTY SAND (A-2-4) W/ TRACE LIMESTONE FRAGMENTS	-23.7	67.0
-30	-30.2	73.5	15	81	19/0.0				**COASTAL PLAIN SEDIMENTARY ROCK** GRAY, HARD, SANDY LIMESTONE Boring Terminated at Elevation -31.2 ft IN CPSR: SANDY LIMESTONE	-30.7 -31.2	74.0 74.5

BLOWS PER FOOT: 0 25 50 75 100

NCDOT BORE DOUBLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 4/16/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S18_B1-B	**STATION** 25+33	**OFFSET** 46 ft RT	**ALIGNMENT** -Y32-	**0 HR.** 5.0
COLLAR ELEV. 43.6 ft	**TOTAL DEPTH** 85.0 ft	**NORTHING** 239,016	**EASTING** 2,400,208	**24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 09/06/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGANS, M.	**START DATE** 01/21/19	**COMP. DATE** 01/21/19	**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)
45											
										43.6	0.0
	42.6	1.0								GROUND SURFACE **UNDIVIDED COASTAL PLAIN** TAN AND GRAY, SAND (A-3)	
			3	2	2	4		D			
40	40.1	3.5	5	2	3	5					
	37.6	6.0	4	5	6	11		Sat.			
35	35.1	8.5	4	4	3	7		Sat.			
										32.6	11.0
	30.1	13.5								**COASTAL PLAIN** GRAY, CLAYEY SAND (A-2-7) (CASTLE HAYNE FORMATION)	
30			2	3	4	7		Sat.			
										26.6	17.0
25	25.1	18.5								GRAY AND WHITE, SAND (A-3)	
			4	9	13	22		Sat.			
20	20.1	23.5									
			17	30	35	65		Sat.			
										17.6	26.0
15	15.1	28.5								GRAY, SILTY CLAY (A-7)	
			WOH	WOH	1	1		Sat.			
10	10.1	33.5	WOH	WOH	1	1		Sat.			
										6.6	37.0
5	5.1	38.5								GRAY, SANDY CLAY (A-6)	
			1	2	3	5		Sat.			
0	0.1	43.5								1.6	42.0
			6	12	46	58		Sat.		GRAY, CLAYEY SAND (A-2-6) W/ LITTLE SHELL FRAGMENTS	
-5	-4.9	48.5								-3.4	47.0
			8	8	7	15		Sat.		GRAY, SAND (A-3) W/ TRACE SHELL FRAGMENTS	
-10	-9.9	53.5									
			13	21	24	45		Sat.			
-15	-14.9	58.5									
			14	18	28	46		Sat.			
-20	-19.9	63.5									
			12	17	18	35		Sat.			
-25	-24.9	68.5								-23.4	67.0
			28	18	11	29		Sat.		GREEN-GRAY AND WHITE, SILTY FINE TO COARSE SAND (A-2-4) W/ LITTLE LIMESTONE FRAGMENTS	
-30	-29.9	73.5								-29.9	73.5
			28	72/0.3		100/0.8				**COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE	
										-33.4	77.0
-35	-34.9	78.5									

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 4/16/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S18_B1-B	**STATION** 25+33	**OFFSET** 46 ft RT	**ALIGNMENT** -Y32-	**0 HR.** 5.0
COLLAR ELEV. 43.6 ft	**TOTAL DEPTH** 85.0 ft	**NORTHING** 239,016	**EASTING** 2,400,208	**24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 78% 09/06/2017		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGANS, M.	**START DATE** 01/21/19	**COMP. DATE** 01/21/19	**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						Match Line					
			20	16	12	28		Sat.		**COASTAL PLAIN** WHITE, SAND (A-3) W/ LITTLE LIMESTONE FRAGMENTS *(continued)*	
-40	-39.9	83.5								-38.4	82.0
			10	17	27	44		Sat.		WHITE, SILTY SAND (A-2-4) W/ TRACE LIMESTONE FRAGMENTS	
										-41.4	85.0
										Boring Terminated at Elevation -41.4 ft IN CP: SILTY SAND	

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 4/16/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S18_EB2-A	**STATION** 26+21	**OFFSET** 16 ft LT	**ALIGNMENT** -Y32-	**0 HR.** 4.5
COLLAR ELEV. 43.2 ft	**TOTAL DEPTH** 95.0 ft	**NORTHING** 239,119	**EASTING** 2,400,182	**24 HR.** 2.7
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGANS, M.	**START DATE** 01/23/19	**COMP. DATE** 01/23/19	**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)
45										43.2 GROUND SURFACE	0.0
	42.2	1.0	3	3	3	6		Sat.		**UNDIVIDED COASTAL PLAIN** TAN AND GRAY, SAND (A-3)	
40	39.7	3.5	3	5	5	10		Sat.			
	37.2	6.0	4	5	6	11		Sat.			
35	34.7	8.5	3	3	4	7				31.2	12.0
30	29.7	13.5	1	1	2	3		Sat.		**COASTAL PLAIN** GRAY, CLAYEY SAND (A-2-6) (CASTLE HAYNE FORMATION)	
	24.7	18.5								26.2 TAN AND GRAY, SAND (A-3)	17.0
25			5	5	7	12		Sat.			
20	19.7	23.5	11	16	20	36		Sat.			
15	14.7	28.5	WOH	WOH	2	2	SS-72	36%		16.2 GRAY, SANDY CLAY (A-6)	27.0
10	9.7	33.5	WOH	WOH	1	1		Sat.			
	4.7	38.5	WOH	1	2	3				6.2	37.0
5								Sat.		GREEN-GRAY, CLAYEY SAND (A-2-6)	
0	-0.3	43.5	6	10	9	19				1.2	42.0
-5	-5.3	48.5	5	25	24	49		Sat.		GREEN-GRAY, SILTY SAND (A-2-4) W/ LITTLE SHELL FRAGMENTS	
-10	-10.3	53.5	9	10	15	25		Sat.		-3.8 GRAY, SAND (A-3)	47.0
-15	-15.3	58.5	8	7	14	21		Sat.			
-20	-20.3	63.5	12	14	16	30		Sat.			
-25	-25.3	68.5	6	6	8	14		Sat.		-23.8 WHITE, SILTY SAND (A-2-4)	67.0
-30	-30.3	73.5	60/0.1			60/0.1				-30.3 **COASTAL PLAIN SEDIMENTARY ROCK** WHITE AND GRAY, HARD, SANDY LIMESTONE	73.5
-35										-33.8	77.0

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S18_EB2-A	**STATION** 26+21	**OFFSET** 16 ft LT	**ALIGNMENT** -Y32-	**0 HR.** 4.5
COLLAR ELEV. 43.2 ft	**TOTAL DEPTH** 95.0 ft	**NORTHING** 239,119	**EASTING** 2,400,182	**24 HR.** 2.7
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGANS, M.	**START DATE** 01/23/19	**COMP. DATE** 01/23/19	**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	-35.3	78.5	7	8	8	Match Line		Sat.		**COASTAL PLAIN** WHITE, SILTY SAND (A-2-4) *(continued)*	
-40	-40.3	83.5	45	40	41	16 81		Sat.			
-45	-45.3	88.5	11	11	12	23		Sat.			
-50	-50.3	93.5	13	14	16	30		Sat.		-51.8 Boring Terminated at Elevation -51.8 ft IN CP: SILTY SAND	95.0

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 4/16/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S18_EB2-B	**STATION** 26+39	**OFFSET** 59 ft RT	**ALIGNMENT** -Y32-	**0 HR.** 2.8
COLLAR ELEV. 43.2 ft	**TOTAL DEPTH** 84.1 ft	**NORTHING** 239,103	**EASTING** 2,400,257	**24 HR.** 1.9
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGANS, M.	**START DATE** 01/23/19	**COMP. DATE** 01/24/19	**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)
45										43.2 GROUND SURFACE	0.0
	42.2	1.0	3	3	3	6		Sat.		**UNDIVIDED COASTAL PLAIN** TAN AND BROWN, SAND (A-3)	
40	39.7	3.5	3	4	4	8		Sat.			
	37.2	6.0	3	5	6	11		Sat.			
35	34.7	8.5	3	5	3	8		Sat.		31.2 **COASTAL PLAIN** TAN AND GRAY, SAND (A-3) (CASTLE HAYNE FORMATION)	12.0
30	29.7	13.5	2	7	8	15		Sat.			
25	24.7	18.5	6	9	14	23		Sat.			
20	19.7	23.5	13	13	12	25		Sat.			
15	14.7	28.5	WOH	WOH	WOH	0		Sat.		16.2 GRAY, SANDY CLAY (A-6)	27.0
10	9.7	33.5	WOH	WOH	1	1	SS-73	42%		6.2 GREEN-GRAY, CLAYEY SAND (A-2-7) W/ TRACE LIMESTONE FRAGMENTS	37.0
5	4.7	38.5	WOH	2	4	6		Sat.		1.2 GREEN-GRAY, SILTY SAND (A-2-4) W/ SOME SHELL FRAGMENTS	42.0
0	-0.3	43.5	10	9	7	16		Sat.			
-5	-5.3	48.5	20	17	20	37		Sat.			
-10	-10.3	53.5	10	19	28	47		Sat.		-9.8 GRAY, SAND (A-3)	53.0
-15	-15.3	58.5	9	12	16	28		Sat.			
-20	-20.3	63.5	16	15	85/0.3	100/0.8				-20.8 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY, HARD, SANDY LIMESTONE	64.0
-25	-25.3	68.5	8	9	9	18		Sat.		-23.8 **COASTAL PLAIN** WHITE, SILTY SAND (A-2-4)	67.0
-30	-30.3	73.5	60/0.1			60/0.1				-28.8 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY, HARD, SANDY LIMESTONE	72.0
-35										-32.8 **COASTAL PLAIN** WHITE, SILTY SAND (A-2-4)	76.0

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 4/16/20

SHEET 13

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. S18_EB2-B	**STATION** 26+39	**OFFSET** 59 ft RT	**ALIGNMENT** -Y32-	**0 HR.** 2.8
COLLAR ELEV. 43.2 ft	**TOTAL DEPTH** 84.1 ft	**NORTHING** 239,103	**EASTING** 2,400,257	**24 HR.** 1.9
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGANS, M.	**START DATE** 01/23/19	**COMP. DATE** 01/24/19	**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						Match Line					
	-35.3	78.5	8	8	10	18		Sat.		**COASTAL PLAIN** WHITE, SILTY SAND (A-2-4) *(continued)*	
-40	-40.3	83.5	69	31/0.1		100/0.6				-40.3 -40.9 **COASTAL PLAIN SEDIMENTARY ROCK** GRAY, HARD, SANDY LIMESTONE Boring Terminated at Elevation -40.9 ft IN CPSR: SANDY LIMESTONE	83.5 84.1

NCDOT BORE SINGLE R3300_GEO_BRDG_GINT_LOGS.GPJ NC_DOT.GDT 4/16/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. MSE1-LT	**STATION** 24+58	**OFFSET** 56 ft LT	**ALIGNMENT** -Y32-	**0 HR.** 4.2
COLLAR ELEV. 42.7 ft	**TOTAL DEPTH** 40.0 ft	**NORTHING** 238,972	**EASTING** 2,400,089	**24 HR.** 3.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/06/20	**COMP. DATE** 02/06/20	**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)
45											
	41.7	1.0	1	1	1	2				42.7 GROUND SURFACE	0.0
40	39.2	3.5	2	1	1	2		Sat.		**UNDIVIDED COASTAL PLAIN** TAN, F. SAND (A-3)	
	36.7	6.0	4	6	6	12		Sat.		39.7	3.0
35	34.2	8.5	2	3	4	7		Sat.		TAN AND BROWN, SILTY F. SAND (A-2-4) WITH TRACE ORGANICS 37.2	5.5
										TAN, F. SAND (A-3)	
30	29.2	13.5	2	2	2	4		Sat.		30.7	12.0
										TAN AND GRAY, CLAYEY SILTY F. SAND (A-2-4)	
25	24.2	18.5	12	15	19	34		Sat.		25.7	17.0
										COASTAL PLAIN TAN, F. SAND (A-3) (CASTLE HAYNE FORMATION)	
20	19.2	23.5	13	16	16	32		Sat.			
15	14.2	28.5	WOH	WOH	WOH	0		Sat.		15.7 GRAY, SILTY F. SANDY CLAY (A-6)	27.0
10	9.2	33.5	WOH	WOH	WOH	0		Sat.		5.7	37.0
5	4.2	38.5	WOH	1	3	4		Sat.		GRAY, CLAYEY CSE. TO F. SAND (A-2-6) WITH TRACE SHELLS AND LIMESTONE FRAGS. 2.7	40.0
										Boring Terminated at Elevation 2.7 ft IN CP: CLAYEY SAND	

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. MSE1-RT	**STATION** 24+53	**OFFSET** 78 ft RT	**ALIGNMENT** -Y32-	**0 HR.** 5.0
COLLAR ELEV. 43.8 ft	**TOTAL DEPTH** 40.0 ft	**NORTHING** 238,935	**EASTING** 2,400,218	**24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/06/20	**COMP. DATE** 02/06/20	**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										
	42.8	1.0	1	1	1	2		M		43.8 GROUND SURFACE 0.0
40	40.3	3.5	2	1	2	3		Sat.		**UNDIVIDED COASTAL PLAIN** TAN, F. SAND (A-3)
	37.8	6.0	1	3	4	7		Sat.		
35	35.3	8.5	3	4	4	8		Sat.		
30	30.3	13.5	2	2	5	7		Sat.		
25	25.3	18.5	5	7	12	19		Sat.		21.8 **COASTAL PLAIN** TAN, F. SAND (A-3) (CASTLE HAYNE FORMATION) 22.0
20	20.3	23.5	12	19	31	50		Sat.		16.8 GRAY, SILTY F. SANDY CLAY (A-6) 27.0
15	15.3	28.5	1	1	2	3		W		
10	10.3	33.5	WOH	WOH	1	1		W		6.8 GRAY, CLAYEY SILTY SAND (A-2-5) 37.0
5	5.3	38.5	1	1	1	2		Sat.		3.8 Boring Terminated at Elevation 3.8 ft IN CP: SILTY SAND 40.0

GEOTECHNICAL BORING REPORT
BORE LOG

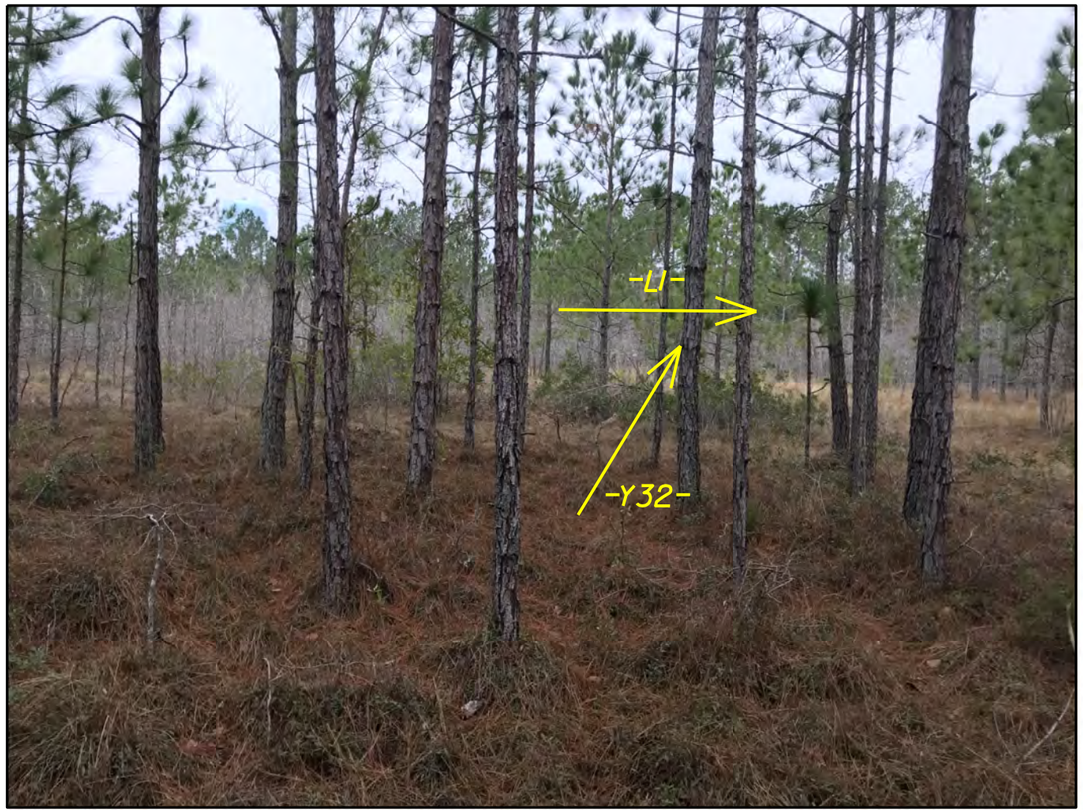
WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. MSE2-LT	**STATION** 26+03	**OFFSET** 62 ft LT	**ALIGNMENT** -Y32-	**0 HR.** 2.5
COLLAR ELEV. 42.0 ft	**TOTAL DEPTH** 45.0 ft	**NORTHING** 239,120	**EASTING** 2,400,133	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/07/20	**COMP. DATE** 02/07/20	**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)
										42.0 GROUND SURFACE	0.0
	41.0	1.0	1	2	3	5				**UNDIVIDED COASTAL PLAIN** TAN AND BROWN, SLIGHTLY SILTY F. SAND (A-3) WITH TRACE ORGANICS	
	38.5	3.5	1	1	5	6		W			
	36.0	6.0	5	8	10	18		Sat.			
	33.5	8.5	3	5	6	11		Sat.			
	28.5	13.5	2	3	4	7				30.0 **COASTAL PLAIN** GRAY-TAN, CLAYEY SAND (A-2-6) (CASTLE HAYNE FORMATION)	12.0
	23.5	18.5	3	8	6	14		Sat.		25.0 GRAY, SLIGHTLY SILTY F. SAND (A-3) WITH INTERMITTENT THIN LENSES OF CLAY	17.0
	18.5	23.5	10	10	25	35		Sat.			
	13.5	28.5	1	1	0	1		Sat.		15.0 TAN-GRAY, CLAYEY SILTY F. SAND (A-2-4)	27.0
	8.5	33.5	WOH	WOH	WOH	0		Sat.		10.0 GRAY, SILTY F. SANDY CLAY (A-6)	32.0
	3.5	38.5	WOH	WOH	1	1		Sat.		5.0 GRAY, CLAYEY SAND (A-2-6)	37.0
	-1.5	43.5	4	7	6	13		Sat.		0.0 GRAY, CLAYEY SILTY F. TO CSE. SAND (A-2-5) WITH TRACE SHELLS AND LIMESTONE FRAGS.	42.0
										-3.0 Boring Terminated at Elevation -3.0 ft IN CP: SILTY SAND	45.0

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION BRIDGE NO. 262 ON -Y32- OVER -L1_NORTHERN- (HAMPSTEAD BYPASS)				**GROUND WTR (ft)**
BORING NO. MSE2-RT	**STATION** 26+40	**OFFSET** 87 ft RT	**ALIGNMENT** -Y32-	**0 HR.** 0.0
COLLAR ELEV. 42.7 ft	**TOTAL DEPTH** 40.0 ft	**NORTHING** 239,092	**EASTING** 2,400,284	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/07/20	**COMP. DATE** 02/07/20	**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
										42.7 GROUND SURFACE 0.0
	41.7	1.0	2	3	3	6		M		**UNDIVIDED COASTAL PLAIN** TAN, SILTY F. SAND (A-2-4)
	39.2	3.5	2	3	4	7		W		39.7 TAN, F. SAND (A-3) 3.0
	36.7	6.0	2	4	6	10		Sat.		
	34.2	8.5	2	3	2	5		Sat.		
	29.2	13.5	1	2	1	3				30.7 **COASTAL PLAIN** TAN, F. TO CSE. SAND (A-1-a) (CASTLE HAYNE FORMATION) 12.0
	24.2	18.5	4	3	8	11		Sat.		25.7 TAN, F. SAND (A-3) 17.0
	19.2	23.5	12	23	32	55		Sat.		
	14.2	28.5	1	1	1	2		Sat.		15.7 GRAY, SILTY F. SANDY CLAY (A-6) 27.0
	9.2	33.5	WOH	WOH	1	1		W		
	4.2	38.5	WOH	WOH	2	2		Sat.		5.7 GRAY, CLAYEY SAND (A-2-6) WITH TRACE SHELL FRAGS. 37.0
								Sat.		2.7 Boring Terminated at Elevation 2.7 ft IN CP: CLAYEY SAND 40.0

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	16



-Y32-, LOOKING UPSTATION FROM -Y32- STATION 24+00

LOOKING AT BRIDGE NO. 262 BENT 1 FROM RIGHT OF -Y32- CENTERLINE

DATE: 9-15-14

REFERENCE: R-3300B

PROJECT: 40237

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	23

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY PENDER

PROJECT DESCRIPTION HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD

SITE DESCRIPTION CULVERT ON -Y30RPD- (HAMPSTEAD BYPASS RAMP) STATION 19+49 OVER WINDING BRANCH

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.

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

CATLIN

INVESTIGATED BY CATLIN

DRAWN BY CROCKETT, S.C.

CHECKED BY HAMM, J. R.

SUBMITTED BY FALCON

DATE APRIL 2020

NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C CROCKETT

DocuSigned by:
Stephen C Crockett 4/9/2020
C5CA5FED48E0435...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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] CME-45B
- [ ] _____

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 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: ELEVATIONS TAKEN FROM R3300B_LS_TNL_190919.TIN
DATED 09/19

ELEVATION: FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	3

0 50 100
FEET

NAD 83/NSRS 2007 NC GRID

16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00

Y30RPD_1949-LT

BEGIN CULVERT
-Y30RPD- Sta.19+42.15

Winding Branch

TO SR 1644

-Y30RPD-

TO NC 210

1@12'x7'
RCBC

END CULVERT
-Y30RPD- Sta.19+55.04

Y30RPD_1949-RT

WOODS

614+00 613+00

JS MIT

-L1-

CONC

25FD

G

CULVERT SKEW: 112°

DATE: 9-15-14

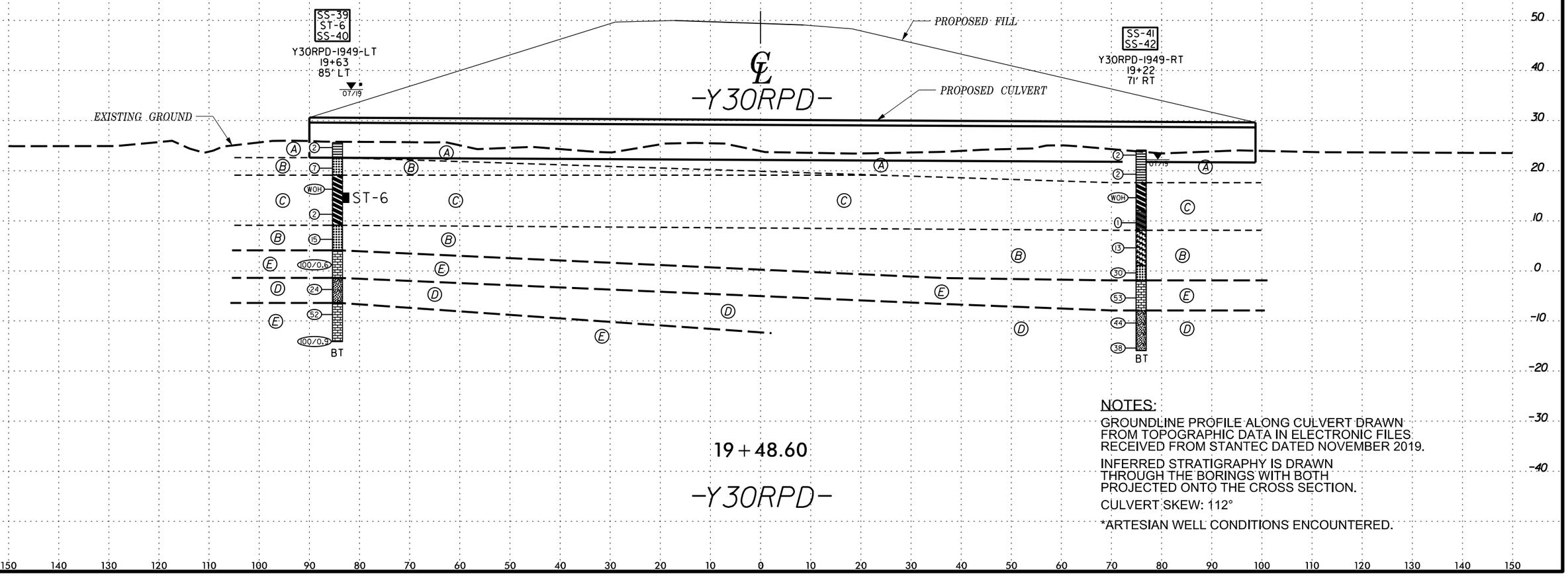
8/23/9

0 20 40
FEET
VE = 1

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-41	71 FT RT	19+22	8.5'-10.0'	A-7-6	59	40	1	17	44	38	100	99	91	49	-
SS-42	71 FT RT	19+22	13.5'-15.0'	A-6	39	22	13	45	14	28	98	94	49	33	-
SS-39	85 FT LT	19+63	8.3'-9.8'	A-7-6	61	43	5	46	26	23	99	96	59	38	-
ST-6	85 FT LT	19+63	10.0'-12.0'	A-7-6	27	12	62	13	4	21	90	60	24	43	-
SS-40	85 FT LT	19+63	13.3'-14.8'	A-7-6	42	26	15	48	13	24	100	94	45	39	-

(A) **UNDIVIDED COASTAL PLAIN:** DARK GRAY, MOIST TO SATURATED, SOFT, SILT (A-4) WITH LITTLE ORGANICS AND TRACE WOOD AND ROOT FRAGMENTS (NO RECOVERY)
(B) **UNDIVIDED COASTAL PLAIN:** GRAY, WET TO SATURATED, LOOSE TO MED. DENSE, CLAYEY SAND AND FINE TO COARSE SAND (A-2-6, A-3) WITH SHELL FRAGMENTS
(C) **UNDIVIDED COASTAL PLAIN:** GRAY, WET TO SAT., V. SOFT TO SOFT, SANDY AND SILTY CLAY (A-6, A-7-6) WITH TRACE SHELL FRAGMENTS
(D) **COASTAL PLAIN:** LIGHT GRAY, SATURATED, MED. DENSE TO DENSE, SILTY SAND (A-2-4) WITH LIMESTONE FRAGMENTS (CASTLE HAYNE FORMATION)
(E) **COASTAL PLAIN SEDIMENTARY ROCK:** LIGHT GRAY, SOFT TO HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)



19+48.60
-Y30RPD-

NOTES:
GROUNDLINE PROFILE ALONG CULVERT DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED NOVEMBER 2019.
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.
CULVERT SKEW: 112°
*ARTESIAN WELL CONDITIONS ENCOUNTERED.

$DATE$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** FUTRAL, C.	
SITE DESCRIPTION CULVERT ON -Y30RPD- (HAMPSTEAD BYPASS RAMP) STATION 19+49 OVER WINDING BRANCH				**GROUND WTR (ft)**
BORING NO. Y30RPD-1949-LT	**STATION** 19+63	**OFFSET** 85 ft LT	**ALIGNMENT** -Y30RPD-	**0 HR.** N/A
COLLAR ELEV. 25.6 ft	**TOTAL DEPTH** 39.7 ft	**NORTHING** 231,768	**EASTING** 2,378,642	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 94% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 07/03/19	**COMP. DATE** 07/03/19	**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)
	25.6	0.0								GROUND SURFACE	25.6	0.0
			WOH	1	1	2		M		**UNDIVIDED COASTAL PLAIN** DARK GRAY, SILT (A-4) W/ LITTLE ORGANICS AND ROOTS (NO RECOVERY)		
	21.5	4.1	1	4	3	7		W		GRAY, FINE SAND (A-3)	22.6	3.0
	17.3	8.3	WOH	WOH	WOH	0	SS-39	38%		GRAY, SILTY CLAY (A-7-6) W/ SHELL FRAGMENTS, HIGHLY PLASTIC	19.1	6.5
								43%				
	12.3	13.3	WOH	1	1	2	SS-40	39%				
	7.3	18.3	6	7	8	15		Sat.		GRAY, FINE SAND (A-3)	9.1	16.5
	2.3	23.3	2	41	59/0.1	100/0.6		Sat.		**COASTAL PLAIN SEDIMENTARY ROCK** LIGHT GRAY, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)	4.1	21.5
	-2.7	28.3	13	12	12	24		Sat.		**COASTAL PLAIN** LIGHT GRAY, SILTY SAND (A-2-4) W/ LIMESTONE FRAGMENTS	-1.4	27.0
	-7.7	33.3	7	24	28	52		Sat.		**COASTAL PLAIN SEDIMENTARY ROCK** LIGHT GRAY, SOFT TO HARD, SANDY LIMESTONE	-6.4	32.0
	-12.7	38.3	52	55	45/0.4	100/0.9		Sat.		Boring Terminated at Elevation -14.1 ft IN CPSR: SANDY LIMESTONE	-14.1	39.7

ARTESIAN WELL, HEAD ELEVATION 36.2'

Other Samples:
ST-6 (10.0 - 12.0)

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** FUTRAL, C.	
SITE DESCRIPTION CULVERT ON -Y30RPD- (HAMPSTEAD BYPASS RAMP) STATION 19+49 OVER WINDING BRANCH				**GROUND WTR (ft)**
BORING NO. Y30RPD-1949-RT	**STATION** 19+22	**OFFSET** 71 ft RT	**ALIGNMENT** -Y30RPD-	**0 HR.** 2.6
COLLAR ELEV. 24.1 ft	**TOTAL DEPTH** 40.0 ft	**NORTHING** 231,858	**EASTING** 2,378,508	**24 HR.** 1.9
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 94% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 07/02/19	**COMP. DATE** 07/02/19	**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)
	24.1	0.0	1	1	1	2				GROUND SURFACE	24.1	0.0
	20.3	3.8	2	1	1	2		Sat.		**UNDIVIDED COASTAL PLAIN** DARK GRAY, SILT (A-4) W/ LITTLE ORGANICS AND TRACE WOOD FRAGMENTS (NO RECOVERY)		
	15.6	8.5	WOH	WOH	WOH	0	SS-41	49%		GRAY, SILTY CLAY (A-7-6) W/ TRACE SHELL FRAGMENTS, HIGHLY PLASTIC	17.6	6.5
	10.6	13.5	WOH	WOH	1	1	SS-42	33%		GRAY, SANDY CLAY (A-6) W/ TRACE SHELL FRAGMENTS	12.1	12.0
	5.6	18.5	3	6	7	13		Sat.		GRAY, CLAYEY FINE SAND (A-2-6) W/ SHELL FRAGMENTS	8.1	16.0
	0.6	23.5	2	13	17	30		Sat.		GRAY, FINE TO COARSE SAND (A-3) W/ SHELL FRAGMENTS	1.1	23.0
	-4.4	28.5	32	33	20	53		Sat.		**COASTAL PLAIN SEDIMENTARY ROCK** LIGHT GRAY, SOFT, SANDY LIMESTONE (CASTLE HAYNE FORMATION)	-1.9	26.0
	-9.4	33.5	9	15	29	44		Sat.		**COASTAL PLAIN** LIGHT GRAY, SILTY SAND (A-2-4) W/ LIMESTONE FRAGMENTS	-7.9	32.0
	-14.4	38.5	36	18	20	38		Sat.		Boring Terminated at Elevation -15.9 ft IN CP: SILTY SAND	-15.9	40.0

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	23

REFERENCE: R-3300B

PROJECT: 40237

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY PENDER

PROJECT DESCRIPTION HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD

SITE DESCRIPTION CULVERT ON -Y30RPD- (HAMPSTEAD BYPASS RAMP) STATION 19+49 OVER WINDING BRANCH

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.

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

CATLIN

INVESTIGATED BY CATLIN

DRAWN BY CROCKETT, S.C.

CHECKED BY HAMM, J. R.

SUBMITTED BY FALCON

DATE APRIL 2020

NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C CROCKETT

DocuSigned by:
Stephen C Crockett 4/9/2020
C5CA5FED48E0435...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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] CME-45B
- [ ] _____

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 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: ELEVATIONS TAKEN FROM R3300B_LS_TNL_190919.TIN
DATED 09/19

ELEVATION: FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	3

0 50 100
FEET

WOODS
R= 340.15'
INV=21.76'
INV=22.20'
8" SOIL ROAD
10' SOIL
R= 280.15'
JS MIT
609+00
610+00
611+00
613+00
614+00
615+00
L1-61213-LT
WINDING BRANCH
TO NC 210
TO SR 1002
-L/-
1@12'x7' RCBC
BEGIN CULVERT
-L/- Sta.612+07.22
END CULVERT
-L/- Sta.612+19.97
L1-61213-RT
NAD 83/96 GRID N
CULVERT SKEW: 104°
-Y30RPD-
8:1
CAT-1
16' SOIL
17+00
16+00

DATE: 9-15-14

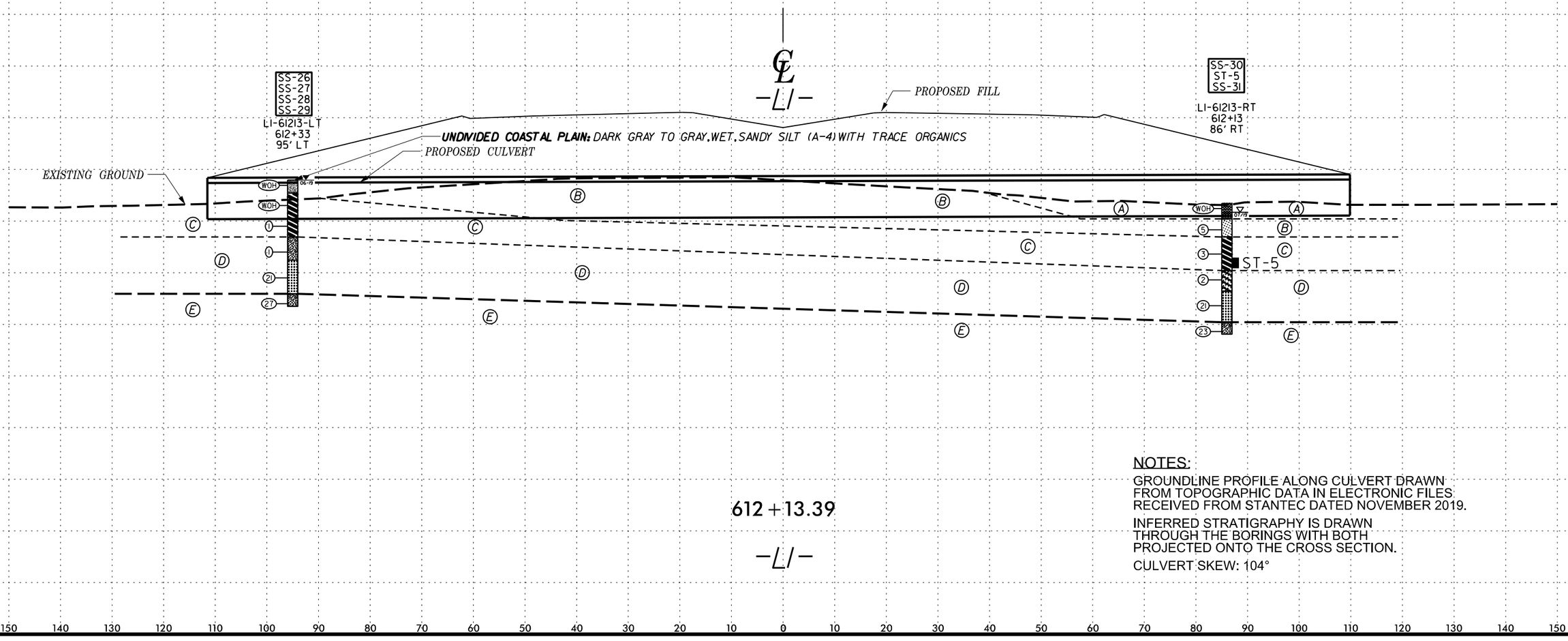
0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	R-3300B	4

0 20 40
FEET
VE = 1

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-30	86 FT RT	612+13	8.8'-10.3'	A-7-6	53	34	3	16	47	34	100	98	91	38	-
ST-5	86 FT RT	612+13	10.5'-12.5'	A-6	34	16	9	48	18	24	98	94	49	35	-
SS-31	86 FT RT	612+13	13.8'-15.3'	A-2-4	23	4	39	37	9	15	99	88	29	30	-
SS-26	95 FT LT	612+33	0.0'-1.5'	A-4	28	6	13	56	17	14	100	96	39	38	4
SS-27	95 FT LT	612+33	3.9'-5.4'	A-7-6	87	69	6	27	27	40	100	98	71	62	-
SS-28	95 FT LT	612+33	7.9'-9.4'	A-7-6	76	54	18	24	44	14	100	88	66	61	-
SS-29	95 FT LT	612+33	12.9'-14.4'	A-2-4	28	7	39	38	7	16	100	86	30	37	-

Ⓐ **UNDIVIDED COASTAL PLAIN:** DARK GRAY, WET, V. SOFT, HIGHLY ORGANIC MUCK WITH ROOTS
Ⓑ **UNDIVIDED COASTAL PLAIN:** DARK GRAY AND BROWN, SAT., LOOSE, FINE SAND (A-3) WITH LITTLE ORGANICS
Ⓒ **UNDIVIDED COASTAL PLAIN:** GRAY, SAT., V. SOFT TO SOFT, SILTY CLAY (A-7-6), HIGHLY PLASTIC, WITH TRACE SHELL FRAGS.
Ⓓ **UNDIVIDED COASTAL PLAIN:** GRAY, SAT., V. LOOSE TO MED. DENSE, SILTY AND CLAYEY SAND AND FINE TO COARSE SAND (A-2-4, A-2-6, A-3) WITH SHELL FRAGS.
Ⓔ **COASTAL PLAIN:** LIGHT GRAY, SAT., MED. DENSE, SILTY SAND (A-2-4) WITH TRACE SHELL FRAGS. AND LIMESTONE FRAGS.



NOTES:

GROUNDLINE PROFILE ALONG CULVERT DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED NOVEMBER 2019.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

CULVERT SKEW: 104°

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** FUTRAL, C.	
SITE DESCRIPTION CULVERT ON -L1- (HAMPSTEAD BYPASS) STATION 612+13 OVER WINDING BRANCH				**GROUND WTR (ft)**
BORING NO. L1-61213-LT	**STATION** 612+33	**OFFSET** 95 ft LT	**ALIGNMENT** -L1-	**0 HR.** 0.0
COLLAR ELEV. 27.9 ft	**TOTAL DEPTH** 24.4 ft	**NORTHING** 232,117	**EASTING** 2,378,290	**24 HR.** 0.0
DRILL RIG/HAMMER EFF./DATE CAT1303 CME-550 77% 01/27/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 06/19/19	**COMP. DATE** 06/19/19	**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											
	27.9	0.0	WOH	WOH	WOH	0	SS-26	38%		27.9 GROUND SURFACE	0.0
25										**UNDIVIDED COASTAL PLAIN** DARK GRAY TO GRAY, SANDY SILT (A-4) W/ TRACE ORGANICS	
	24.0	3.9	WOH	WOH	WOH	0	SS-27	62%		25.4 GRAY, SILTY CLAY (A-7-6), HIGHLY PLASTIC	2.5
20	20.0	7.9	WOH	WOH	1	1	SS-28	61%			
15	15.0	12.9	WOH	WOH	1	1	SS-29	37%		16.9 GRAY, SILTY SAND (A-2-4)	11.0
10	10.0	17.9	9	10	11	21		Sat.		12.4 GRAY, FINE TO COARSE SAND (A-3)	15.5
5	5.0	22.9	9	12	15	27		Sat.		5.9 **COASTAL PLAIN** LIGHT GRAY, SILTY SAND (A-2-4) W/ LIMESTONE FRAGMENTS AND TRACE SHELL FRAGMENTS (CASTLE HAYNE FORMATION)	22.0
										3.5 Boring Terminated at Elevation 3.5 ft IN CP: SILTY SAND	24.4

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** FUTRAL, C.	
SITE DESCRIPTION CULVERT ON -L1- (HAMPSTEAD BYPASS) STATION 612+13 OVER WINDING BRANCH				**GROUND WTR (ft)**
BORING NO. L1-61213-RT	**STATION** 612+13	**OFFSET** 86 ft RT	**ALIGNMENT** -L1-	**0 HR.** 1.7
COLLAR ELEV. 23.4 ft	**TOTAL DEPTH** 25.3 ft	**NORTHING** 231,984	**EASTING** 2,378,415	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 94% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 07/02/19	**COMP. DATE** 07/02/19	**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
25										
	23.4	0.0	WOH	WOH	WOH	0				23.4 GROUND SURFACE 0.0
20	19.3	4.1	2	2	3	5		Sat.		**UNDIVIDED COASTAL PLAIN** DARK GRAY AND BLACK, MUCK, W/ ROOTS 20.4 3.0
15	14.6	8.8	WOH	1	2	3	SS-30	38%		DARK GRAY AND BROWN, FINE SAND (A-3) W/ LITTLE ORGANICS 16.9 6.5
10	9.6	13.8	1	1	1	2	SS-31	35% 30%		GRAY, SILTY CLAY (A-7-6) W/ TRACE SHELL FRAGMENTS HIGHLY PLASTIC 10.4 13.0
5	4.6	18.8	8	10	11	21		Sat.		GRAY, CLAYEY SAND (A-2-6) W/ SHELL FRAGMENTS 6.4 17.0
0	-0.4	23.8	12	11	12	23		Sat.		GRAY, FINE SAND (A-3) W/ TRACE SHELL FRAGMENTS 0.4 23.0 **COASTAL PLAIN** LIGHT GRAY, SILTY SAND (A-2-4) W/ LIMESTONE FRAGMENTS (CASTLE HAYNE FORMATION) -1.9 25.3 Boring Terminated at Elevation -1.9 ft IN CP: SILTY SAND

Other Samples:
ST-5 (10.5 - 12.5)

REFERENCE: R-3300B

PROJECT: 40237

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	19

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *PENDER*

PROJECT DESCRIPTION *HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD*

SITE DESCRIPTION *CULVERT ON -Y30RPA- (HAMPSTEAD BYPASS RAMP) STATION 16+22 OVER WINDING BRANCH*

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.

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

CATLIN

INVESTIGATED BY *CATLIN*

DRAWN BY *CROCKETT, S.C.*

CHECKED BY *HAMM, J. R.*

SUBMITTED BY *FALCON*

DATE *APRIL 2020*

NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C CROCKETT

DocuSigned by:
Stephen C Crockett 4/9/2020
C5CA5FED48E0435...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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] CME-45B
- [ ] _____

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 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: ELEVATIONS TAKEN FROM R3300B_LS_TNL_190919.TIN
DATED 09/19

ELEVATION: FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	3

0 50 100
FEET

Y30RPA_1622-LT

Y30RPA_1622-RT

END CULVERT
-Y30RPA- Sta.16+30.21

BEGIN CULVERT
-Y30RPA- Sta.16+13.01

1@12'x7'
RCBC

TO SR 1644

TO NC 210

-Y30RPA-

-SR6-

BM22

MARSH

WOODS

WINDING BRANCH
MB 29 PG 102

JS MIT

INV=22.20'

INV=21.76'

14+00

15+00

16+00

17+00

18+00

19+00

20+00

24+00

25+00

26+00

27+00

28+00

29+00

30+00

NAD 83/NSRS 2007
NC GRID

CULVERT SKEW: 44°15'14" -Y30RPA-, 58&&D15'13" -SR6-

DATE: 9-15-14

8/23/9

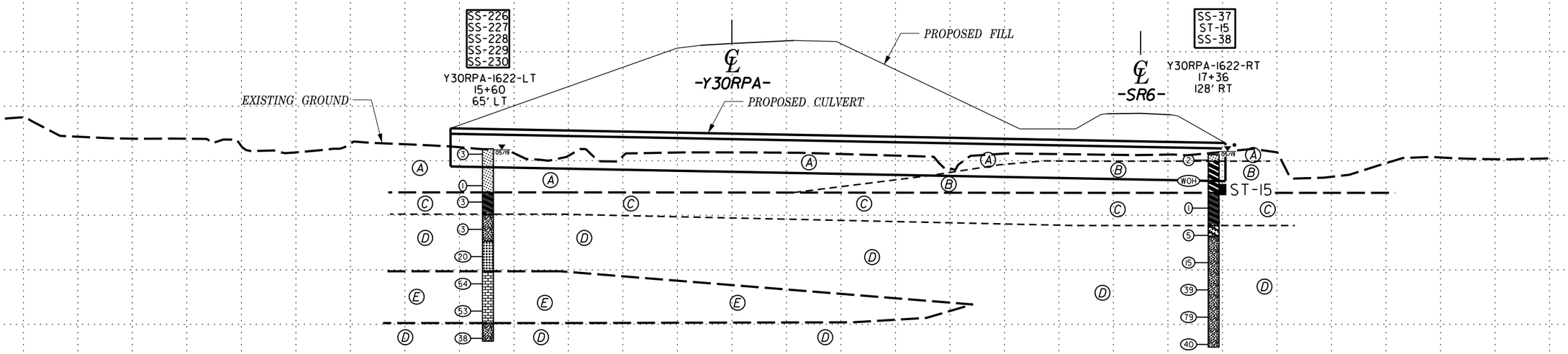
0 40 80
FEET

VE = 2

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-226	65 FT LT	15+60	0.0'-1.5'	A-2-4	NP	NP	4	81	15	0	100	98	27	–	5
SS-227	65 FT LT	15+60	5.8'-7.3'	A-2-4	NP	NP	12	63	15	10	99	96	31	–	5
SS-228	65 FT LT	15+60	8.8'-10.3'	A-6	30	12	11	34	31	24	100	94	63	–	–
SS-229	65 FT LT	15+60	13.8'-15.3'	A-2-4	23	5	52	27	12	10	94	71	24	–	–
SS-230	65 FT LT	15+60	18.8'-20.3'	A-3	NP	NP	74	19	3	4	95	51	7	–	–
SS-37	128 FT RT	17+36	3.8'-5.3'	A-7-6	59	44	1	21	41	37	100	100	87	52	–
ST-15	128 FT RT	17+36	5.4'-7.7'	A-7-6^	42	28	-^	-^	-^	-^	-^	-^	-^	49	2
SS-38	128 FT RT	17+36	8.8'-10.3'	A-6	36	19	28	37	16	19	100	90	41	36	–

Ⓐ **UNDIVIDED COASTAL PLAIN:** GRAY, MOIST TO WET, V. LOOSE, SILTY FINE SAND (A-2-4) WITH LITTLE ORGANICS
Ⓑ **UNDIVIDED COASTAL PLAIN:** GRAY, WET, V. SOFT, HIGHLY PLASTIC, SILTY CLAY (A-7-6) WITH TRACE ORGANICS
Ⓒ **COASTAL PLAIN:** BLUE-GRAY, WET, V. SOFT TO SOFT, SLI. TO MOD. PLASTIC, SILTY SANDY CLAY (A-6) WITH SHELL FRAGMENTS (CASTLE HAYNE FORMATION)
Ⓓ **COASTAL PLAIN:** BLUE-GRAY, GRAY, AND WHITE, V. LOOSE TO DENSE, SILTY AND CLAYEY SAND AND SAND (A-2-4, A-2-6, A-3) WITH SHELL AND LIMESTONE FRAGMENTS
Ⓔ **COASTAL PLAIN SEDIMENTARY ROCK:** WHITE, SOFT, SANDY LIMESTONE



16 + 21.63

-Y30RPA-

NOTES:

GROUNDLINE PROFILE ALONG CULVERT DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED NOVEMBER 2019.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

CULVERT SKEW: 44°15'14" -Y30RPA, 58°,15'13" -SR6-

* ARTESIAN WELL CONDITIONS ENCOUNTERED

^ GRAIN SIZE TESTING NOT PERFORMED. VISUALLY CLASSIFIED.

$DATE$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** HOLLAND, J.	
SITE DESCRIPTION CULVERT ON -Y30RPA- (HAMPSTEAD BYPASS RAMP) STATION 16+22 OVER WINDING BRANCH				**GROUND WTR (ft)**
BORING NO. Y30RPA-1622-LT	**STATION** 15+60	**OFFSET** 65 ft LT	**ALIGNMENT** -Y30RPA-	**0 HR.** 0.8
COLLAR ELEV. 22.2 ft	**TOTAL DEPTH** 35.3 ft	**NORTHING** 232,281	**EASTING** 2,378,061	**24 HR.** 0.2
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 94% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 05/28/19	**COMP. DATE** 05/30/19	**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										
	22.2	0.0								22.2 0.0 GROUND SURFACE
20			WOH	1	2	3	SS-226			**UNDIVIDED COASTAL PLAIN** GRAY, SILTY FINE SAND (A-2-4) W/ TRACE ROOTS AND LITTLE ORGANICS
	16.4	5.8								
15			WOH	WOH	1	1	SS-227	W		
	13.4	8.8								14.2 8.0
			WOH	1	2	3	SS-228	W		**COASTAL PLAIN** BLUE GRAY, SILTY SANDY CLAY (A-6) W/ SHELL FRAGMENTS, SLIGHTLY PLASTIC (CASTLE HAYNE FORMATION)
10										10.2 12.0 BLUE GRAY, SILTY SAND (A-2-4) W/ SHELL FRAGMENTS
	8.4	13.8								
			1	1	2	3	SS-229	W		
5										5.2 17.0 BLUE GRAY, SAND (A-3) W/ SHELL FRAGMENTS
	3.4	18.8								
			7	10	10	20	SS-230	Sat.		
0										
	-1.6	23.8								-0.3 22.5 **COASTAL PLAIN SEDIMENTARY ROCK** WHITE, SOFT, SANDY LIMESTONE
			30	30	24	54		Sat.		
-5										
	-6.6	28.8								
			18	40	13	53		Sat.		
-10										-9.8 32.0 **COASTAL PLAIN** WHITE, SILTY SAND (A-2-4) W/ LIMESTONE FRAGMENTS
	-11.6	33.8								-13.1 35.3 Boring Terminated at Elevation -13.1 ft IN CP: SILTY SAND
			6	13	25	38		Sat.		

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** HOLLAND, J.	
SITE DESCRIPTION CULVERT ON -Y30RPA- (HAMPSTEAD BYPASS RAMP) STATION 16+22 OVER WINDING BRANCH				**GROUND WTR (ft)**
BORING NO. Y30RPA-1622-RT	**STATION** 17+36	**OFFSET** 128 ft RT	**ALIGNMENT** -Y30RPA-	**0 HR.** N/A
COLLAR ELEV. 21.1 ft	**TOTAL DEPTH** 35.3 ft	**NORTHING** 232,434	**EASTING** 2,377,843	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 94% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 05/29/19	**COMP. DATE** 05/31/19	**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
25										
	21.1	0.0								21.1 0.0 GROUND SURFACE
20			1	1	1	2		M		19.9 1.2 **UNDIVIDED COASTAL PLAIN** GRAY, SILTY FINE SAND (A-2-4) W/ LITTLE ORGANICS
	17.3	3.8								GRAY, SILTY CLAY (A-7-6), HIGHLY PLASTIC WITH TRACE ORGANICS
15			WOH	WOH	WOH	0	SS-37	52%		
	12.3	8.8						49%		13.1 8.0 **COASTAL PLAIN** BLUE GRAY, SANDY CLAY (A-6) W/ SHELL FRAGMENTS, MOD. PLASTIC (CASTLE HAYNE FORMATION)
			1	WOH	1	1	SS-38	36%		
10										8.1 13.0 GRAY, CLAYEY SAND (A-2-6) W/ LIMESTONE FRAGMENTS
	7.3	13.8								6.1 15.0 GRAY AND WHITE, SILTY SAND (A-2-4) W/ SHELL AND LIMESTONE FRAGMENTS
			2	3	2	5		Sat.		
5										
	2.3	18.8								
			5	7	8	15		Sat.		
0										
	-2.7	23.8								
			6	11	28	39		Sat.		
-5										
	-7.7	28.8								
			9	26	53	79		Sat.		
-10										
	-12.7	33.8								-14.2 35.3 Boring Terminated at Elevation -14.2 ft IN CP: SILTY SAND
			6	22	18	40		Sat.		ARTESIAN WELL, HEAD ELEVATION = 21.7'

Other Samples:
ST-15 (5.4 - 7.7)

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	18

REFERENCE: R-3300B

PROJECT: 40237

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY PENDER

PROJECT DESCRIPTION HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD

SITE DESCRIPTION CULVERT NO. 263 ON -Y38- (HOLIDAY DRIVE) STATION 19+80 OVER HARRISONS CREEK

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.

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

CATLIN

FUTRAL, C.

INVESTIGATED BY CATLIN

DRAWN BY CROCKETT, S.C.

CHECKED BY HAMM, J. R.

SUBMITTED BY FALCON

DATE FEBRUARY 2020

Stephen C Crockett 2/6/2020

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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] CME-45B
- [ ] _____

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 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.

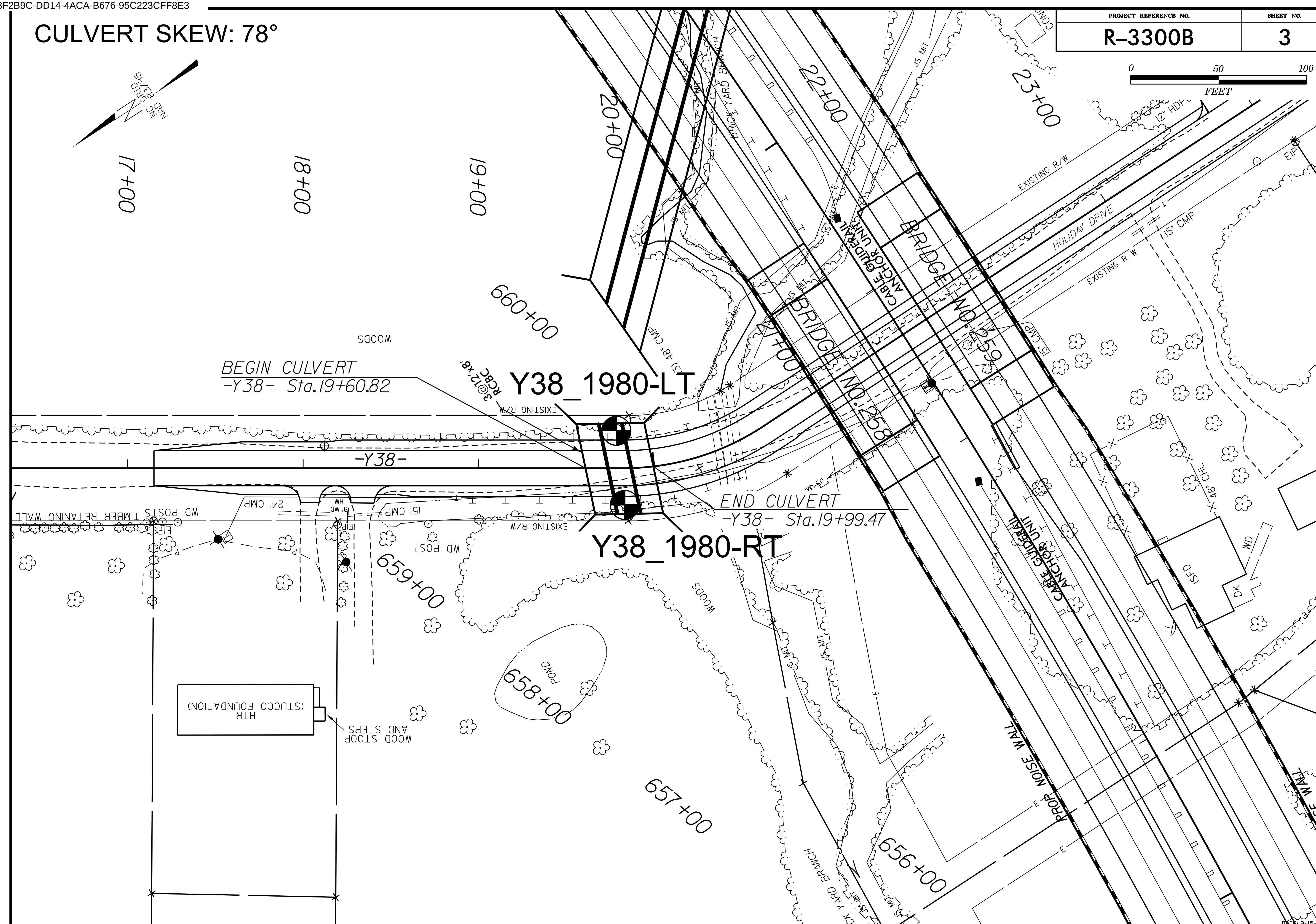
BENCH MARK: ELEVATIONS TAKEN FROM R3300B_LS_TNL_190919.TIN
DATED 09/19

ELEVATION: FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

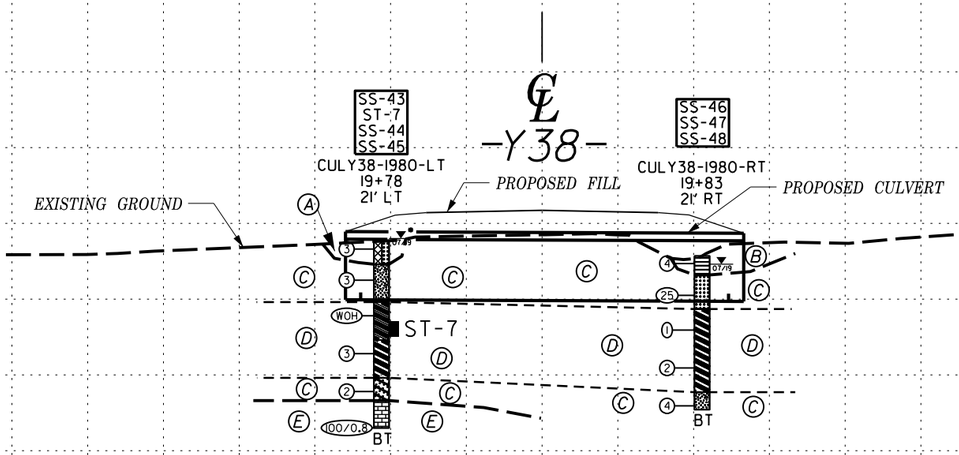


0 20 40
FEET
VE = 1

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-43	21 FT LT	19+78	4.1'-5.6'	A-2-4	NP	NP	14	65	8	13	100	97	24	21	-
ST-7	21 FT LT	19+78	10.5'-12.7'	A-6	38	20	4	24	43	29	99	97	72	46	-
SS-44	21 FT LT	19+78	13.8'-15.3'	A-7-6	44	23	4	18	45	33	100	98	89	41	-
SS-45	21 FT LT	19+78	18.8'-20.3'	A-2-6	27	12	62	13	4	21	90	60	24	31	-
SS-46	21 FT RT	19+83	8.8'-10.3'	A-7-6	46	27	2	19	47	32	100	99	91	43	-
SS-47	21 FT RT	19+83	13.8'-15.3'	A-7-6	53	37	9	26	31	34	99	93	73	40	-
SS-48	21 FT RT	19+83	18.8'-20.3'	A-2-4	25	9	62	15	10	13	84	53	22	30	-

(A) **ARTIFICIAL FILL:** GRAY AND TAN, DRY, V.LOOSE, FINE SAND (A-3)
(B) **UNDIVIDED COASTAL PLAIN:** DARK GRAY AND BLACK, MOIST, MED. STIFF, SILT (A-4) WITH LITTLE ORGANICS
(C) **UNDIVIDED COASTAL PLAIN:** GRAY, WET TO SAT., V.LOOSE TO MED. DENSE, SILTY AND CLAYEY SAND AND FINE SAND (A-2-4, A-2-6, A-3) WITH SHELL FRAGMENTS
(D) **UNDIVIDED COASTAL PLAIN:** GRAY, WET TO SAT., V. SOFT TO SOFT, MOD. TO HIGHLY PLASTIC, SANDY AND SILTY CLAY (A-6, A-7-6) WITH SHELL FRAGMENTS
(E) **COASTAL PLAIN SEDIMENTARY ROCK:** LIGHT GRAY, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION)



19+80.23

-Y38-

NOTES:

GROUNDLINE PROFILE ALONG CULVERT DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED NOVEMBER 2019.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

CULVERT SKEW: 78°

*ARTESIAN WELL CONDITIONS ENCOUNTERED.

8/23/$
$DATE$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** FUTRAL, C.	
SITE DESCRIPTION CULVERT NO. 263 ON -Y38- (HOLIDAY DR.) STATION 19+80 OVER HARRISONS CREEK				**GROUND WTR (ft)**
BORING NO. CULY38-1980-LT	**STATION** 19+78	**OFFSET** 21 ft LT	**ALIGNMENT** -Y38-	**0 HR.** N/A
COLLAR ELEV. 27.6 ft	**TOTAL DEPTH** 24.6 ft	**NORTHING** 233,032	**EASTING** 2,382,709	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 94% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 07/09/19	**COMP. DATE** 07/10/19	**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										
	27.6	0.0	1	1	2	3		D		27.6 GROUND SURFACE 0.0 **ARTIFICIAL FILL** GRAY TO TAN, FINE SAND (A-3)
25										24.6 3.0
	23.5	4.1	2	1	2	3	SS-43	21%		**UNDIVIDED COASTAL PLAIN** GRAY, SILTY SAND (A-2-4)
20	18.8	8.8	WOH	WOH	WOH	0		W		19.6 8.0 GRAY, SANDY CLAY (A-6), MOD. PLASTIC
								46%		
15	13.8	13.8	WOH	1	2	3	SS-44	41%		14.6 13.0 GRAY, SILTY CLAY (A-7-6), HIGHLY PLASTIC
10	8.8	18.8	1	1	1	2	SS-45	31%		9.6 18.0 GRAY, CLAYEY SAND (A-2-6) W/ SHELL FRAGMENTS
										6.6 21.0 **COASTAL PLAIN SEDIMENTARY ROCK**
5	3.8	23.8	19	81/0.3		100/0.8		Sat.		LIGHT GRAY, HARD, SANDY LIMESTONE (CASTLE HAYNE FORMATION) 3.0 24.6 Boring Terminated at Elevation 3.0 ft IN CPSR: SANDY LIMESTONE

ARTESIAN WELL, HEAD ELEVATION 28.0'

Other Samples:
ST-7 (10.5 - 12.7)

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** FUTRAL, C.	
SITE DESCRIPTION CULVERT NO. 263 ON -Y38- (HOLIDAY DR.) STATION 19+80 OVER HARRISONS CREEK				**GROUND WTR (ft)**
BORING NO. CULY38-1980-RT	**STATION** 19+83	**OFFSET** 21 ft RT	**ALIGNMENT** -Y38-	**0 HR.** 2.3
COLLAR ELEV. 25.7 ft	**TOTAL DEPTH** 20.3 ft	**NORTHING** 233,051	**EASTING** 2,382,671	**24 HR.** 1.1
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 94% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 07/10/19	**COMP. DATE** 07/10/19	**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
30										
	25.7	0.0	WOH	2	2	4				25.7 GROUND SURFACE 0.0 **UNDIVIDED COASTAL PLAIN**
25										23.2 2.5 DARK GRAY AND BLACK, SILT (A-4) W/ LITTLE ORGANICS
	21.5	4.2	9	10	15	25		Sat.		GRAY, FINE SAND (A-3)
20										18.7 7.0
	16.9	8.8	WOH	WOH	1	1	SS-46	43%		GRAY, SILTY CLAY (A-7-6), HIGHLY PLASTIC, W/ SHELL FRAGMENTS
15										
	11.9	13.8	WOH	WOH	2	2	SS-47	40%		
10										7.7 18.0
	6.9	18.8	2	2	2	4	SS-48	30%		GRAY, SILTY SAND (A-2-4) W/ SHELL FRAGMENTS 5.4 20.3 Boring Terminated at Elevation 5.4 ft IN UCP: SILTY SAND

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	24

REFERENCE: R-3300B

PROJECT: 40237

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY PENDER

PROJECT DESCRIPTION HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD

SITE DESCRIPTION CULVERT NO. 264 ON -L1- (HAMPSTEAD BYPASS) STATION 660+85 OVER HARRISONS CREEK

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.

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

CATLIN

FUTRAL, C.

INVESTIGATED BY CATLIN

DRAWN BY CROCKETT, S.C.

CHECKED BY HAMM, J. R.

SUBMITTED BY FALCON

DATE FEBRUARY 2020

NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C CROCKETT

Stephen C Crockett 2/4/2020

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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] CME-45B
- [ ] _____

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 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.

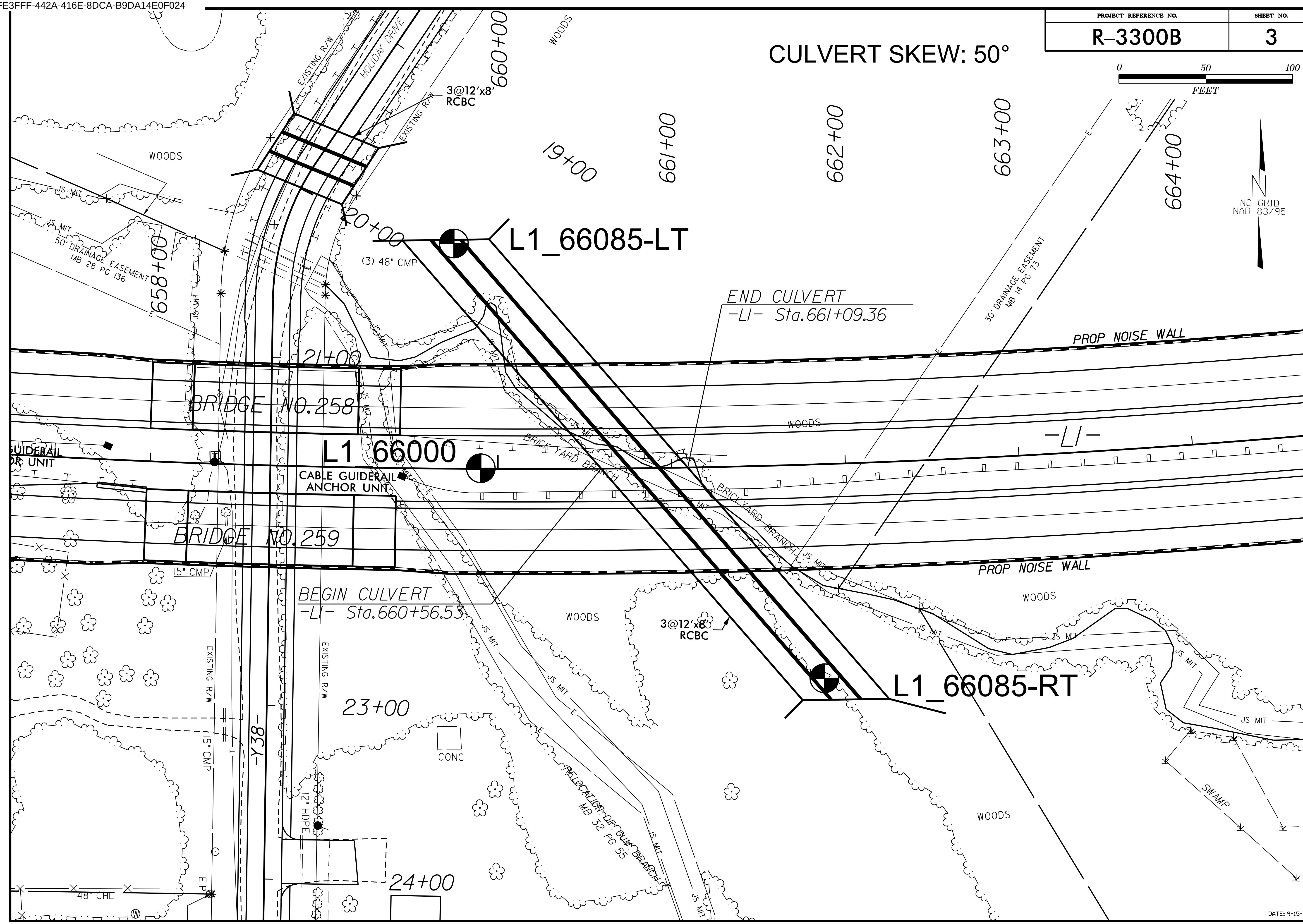
BENCH MARK: ELEVATIONS TAKEN FROM R3300B_LS_TNL_190919.TIN
DATED 09/19

ELEVATION: FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14



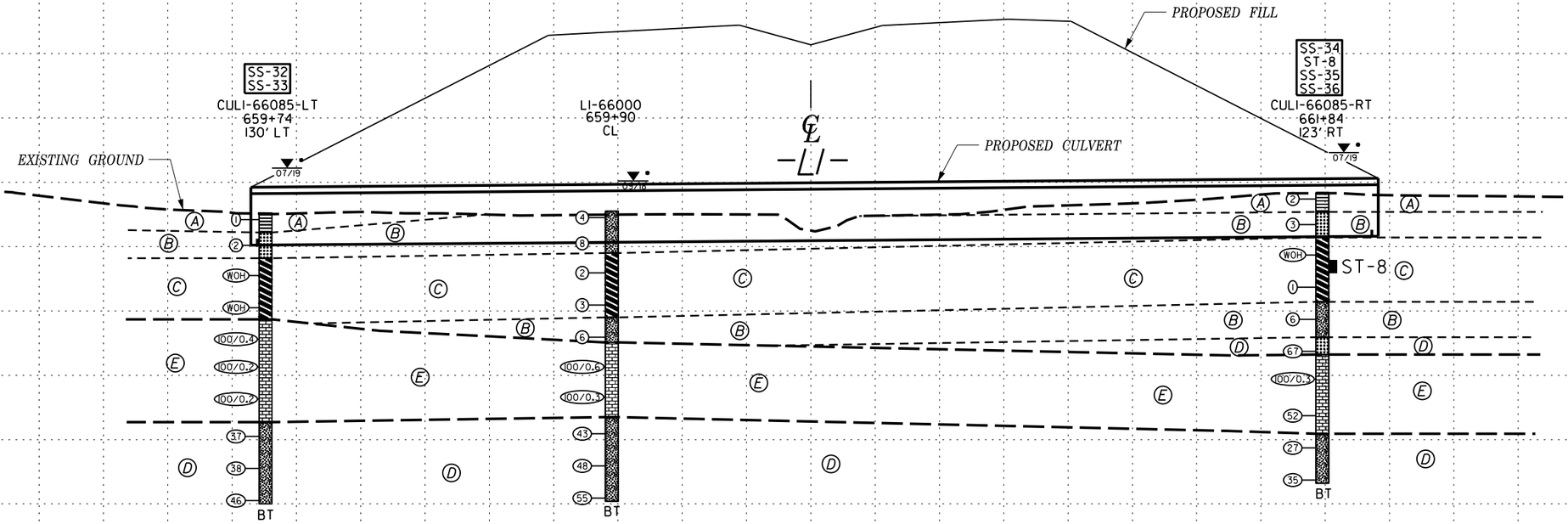
0 40 80
FEET

VE = 2

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-32	130 FT LT	659+74	8.7'-10.2'	A-7-6	64	45	0	12	51	37	100	100	97	52	-
SS-33	130 FT LT	659+74	13.7'-15.2'	A-7-6	45	27	8	42	21	29	100	95	59	42	-
SS-34	123 FT RT	661+84	8.7'-10.2'	A-7-6	47	25	0	15	50	35	100	100	95	42	-
ST-8	123 FT RT	661+84	10.5'-12.7'	A-7-6	48	25	2	14	48	36	100	98	84	43	-
SS-35	123 FT RT	661+84	13.7'-15.2'	A-7-6	50	32	7	23	54	16	99	94	77	37	-
SS-36	123 FT RT	661+84	18.7'-20.2'	A-2-4	25	7	73	10	5	12	80	42	15	25	-

(A) **UNDIVIDED COASTAL PLAIN:** DARK GRAY AND BLACK, DRY TO MOIST, V.SOFT TO SOFT, SILT (A-4), LITTLE TO MODERATELY ORGANIC WITH TRACE ROOTS
(B) **UNDIVIDED COASTAL PLAIN:** GRAY AND TAN, WET TO SAT., V.LOOSE TO LOOSE, SILTY SAND AND FINE SAND (A-2-4, A-3) WITH SHELL FRAGS.
(C) **UNDIVIDED COASTAL PLAIN:** GRAY, WET, V.SOFT TO SOFT, MOD.TO HIGHLY PLASTIC, SILTY CLAY (A-7-6) WITH TRACE SHELL FRAGS.
(D) **COASTAL PLAIN:** LIGHT GRAY AND GRAY, SAT., MED.DENSE TO V.DENSE, SILTY SAND AND SAND (A-2-4, A-3) WITH SHELL FRAGS. (CASTLE HAYNE FORMATION)
(E) **COASTAL PLAIN SEDIMENTARY ROCK:** GRAY, HARD, SANDY LIMESTONE WITH SHELL FRAGS. (CASTLE HAYNE FORMATION)



660+84.49

NOTES:

GROUNDLINE PROFILE ALONG CULVERT DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED NOVEMBER 2019.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

CULVERT SKEW: 50°

* ARTESIAN WELL CONDITIONS ENCOUNTERED

8/23/9

$DATE$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** FUTRAL, C.	
SITE DESCRIPTION CULVERT NO. 264 ON -L1- (HAMPSTEAD BYPASS) STATION 660+85 OVER HARRISONS CREEK				**GROUND WTR (ft)**
BORING NO. CUL1-66085-LT	**STATION** 659+74	**OFFSET** 130 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 25.2 ft	**TOTAL DEPTH** 45.2 ft	**NORTHING** 232,995	**EASTING** 2,382,769	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 94% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 07/10/19	**COMP. DATE** 07/11/19	**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)
										GROUND SURFACE	25.2	0.0
								D		**UNDIVIDED COASTAL PLAIN** DARK GRAY TO BLACK, MODERATELY ORGANIC SILT (A-4)		
	21.2	4.0	WOH	WOH	1	1				GRAY, FINE SAND (A-3)	22.2	3.0
			3	1	1	2		Sat.			18.2	7.0
	16.5	8.7	WOH	WOH	WOH	0	SS-32	52%		GRAY, SILTY CLAY (A-7-6), HIGHLY PLASTIC		
	11.5	13.7	WOH	WOH	WOH	0	SS-33	42%				
	6.5	18.7	2	100/0.4		100/0.4		Sat.			8.7	16.5
										COASTAL PLAIN SEDIMENTARY ROCK GRAY, HARD, SANDY LIMESTONE W/ SHELL FRAGMENTS (CASTLE HAYNE FORMATION)		
	1.5	23.7		100/0.2		100/0.2		Sat.				
	-3.5	28.7		100/0.2		100/0.2		Sat.				
	-8.5	33.7	26	20	17	37		Sat.			-7.3	32.5
										COASTAL PLAIN LIGHT GRAY, SILTY SAND (A-2-4) W/ LIMESTONE FRAGMENTS		
	-13.5	38.7	13	18	20	38		Sat.				
	-18.5	43.7	28	30	16	46		Sat.			-20.0	45.2
										Boring Terminated at Elevation -20.0 ft IN CP: SILTY SAND ARTESIAN WELL, HEAD ELEVATION 32.2'		

NCDOT BORE SINGLE R3300_GEO_CATLIN_CULVERT_GINT_LOGS.GPJ NC_DOT.GDT 2/4/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** ALEXANDER, C.	
SITE DESCRIPTION CULVERT NO. 264 ON -L1- (HAMPSTEAD BYPASS) STATION 660+85 OVER HARRISONS CREEK				**GROUND WTR (ft)**
BORING NO. L1-66000	**STATION** 659+90	**OFFSET** CL	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 25.5 ft	**TOTAL DEPTH** 45.1 ft	**NORTHING** 232,866	**EASTING** 2,382,787	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 94% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 09/10/18	**COMP. DATE** 09/11/18	**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)
										GROUND SURFACE	25.5	0.0
			1	2	2	4		M		**UNDIVIDED COASTAL PLAIN** GRAY, SILTY SAND (A-2-4)		
	21.5	4.0	2	2	6	8		Sat.			19.0	6.5
	16.9	8.6	1	1	1	2		W		GRAY, SILTY CLAY (A-7) W/ SHELL FRAGMENTS		
	11.9	13.6	WOH	1	2	3		W			9.0	16.5
	6.9	18.6	2	3	3	6		Sat.		GRAY, SILTY F. SAND (A-2-4) W/ SHELL FRAGMENTS	5.1	20.4
										COASTAL PLAIN SEDIMENTARY ROCK GRAY, HARD, SANDY LIMESTONE W/ SHELL FRAGMENTS (CASTLE HAYNE FORMATION)		
	1.9	23.6	80	20/0.1		100/0.6		Sat.				
	-3.1	28.6	100/0.3			100/0.3		Sat.				
	-8.1	33.6	47	17	26	43		Sat.			-6.5	32.0
										COASTAL PLAIN GRAY, SILTY SAND (A-2-4) W/ LIMESTONE FRAGMENTS		
	-13.1	38.6	55	27	21	48		Sat.				
	-18.1	43.6	7	17	38	55		Sat.			-19.6	45.1
										Boring Terminated at Elevation -19.6 ft IN CP: SILTY SAND ARTESIAN WELL, HEAD ELEVATION 30.2'		

NCDOT BORE SINGLE R3300_GEO_CATLIN_CULVERT_GINT_LOGS.GPJ NC_DOT.GDT 2/4/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** FUTRAL, C.	
SITE DESCRIPTION CULVERT NO. 264 ON -L1- (HAMPSTEAD BYPASS) STATION 660+85 OVER HARRISONS CREEK				**GROUND WTR (ft)**
BORING NO. CUL1-66085-RT	**STATION** 661+84	**OFFSET** 123 ft RT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 28.4 ft	**TOTAL DEPTH** 45.2 ft	**NORTHING** 232,749	**EASTING** 2,382,987	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 94% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 07/12/19	**COMP. DATE** 07/12/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
									ELEV. (ft) / DEPTH (ft)
30									
	28.4	0.0	WOH	1	1		M		28.4 GROUND SURFACE 0.0
									UNDIVIDED COASTAL PLAIN DARK GRAY AND BLACK, SILT (A-4) W/ LITTLE ORGANICS, TRACE ROOTS
25	24.4	4.0	2	1	2		Sat.		25.4 3.0 TAN, FINE SAND (A-3) (NO RECOVERY)
									21.4 7.0 GRAY, SILTY CLAY (A-7-6), MOD. TO HIGHLY PLASTIC W/ TRACE SHELL FRAGMENTS
20	19.7	8.7	WOH	WOH	WOH	SS-34	42%		
							43%		
15	14.7	13.7	WOH	WOH	1	SS-35	37%		
									11.4 17.0 GRAY, SILTY SAND (A-2-4) W/ SHELL FRAGMENTS
10	9.7	18.7	4	3	3	SS-36	25%		
									5.9 22.5 **COASTAL PLAIN** GRAY, FINE TO COARSE SAND (A-3) W/ SHELL FRAGMENTS
5	4.7	23.7	4	3	64		Sat.		3.2 25.2 **COASTAL PLAIN SEDIMENTARY ROCK** LIGHT GRAY, SOFT TO HARD, SANDY LIMESTONE W/ SHELL FRAGMENTS (CASTLE HAYNE FORMATION)
0	-0.3	28.7	100/0.3				Sat.		
-5	-5.3	33.7	45	25	27		Sat.		
-10	-10.3	38.7	11	12	15		Sat.		-9.1 37.5 **COASTAL PLAIN** LIGHT GRAY AND GRAY, SILTY SAND (A-2-4) W/ LIMESTONE AND SHELL FRAGMENTS
-15	-15.3	43.7	25	23	12		Sat.		-16.8 45.2 Boring Terminated at Elevation -16.8 ft IN CP: SILTY SAND

ARTESIAN WELL, HEAD ELEVATION 34.6'

Other Samples:
ST-8 (10.5 - 12.7)

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	20

REFERENCE: R-3300B

PROJECT: 40237

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY PENDER

PROJECT DESCRIPTION HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD

SITE DESCRIPTION CULVERT NO. 265 ON -L1- (HAMPSTEAD BYPASS) STATION 712+62 OVER TRIBUTARY TO GODFREY CREEK

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.

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

CATLIN

INVESTIGATED BY CATLIN

DRAWN BY CROCKETT, S.C.

CHECKED BY HAMM, J. R.

SUBMITTED BY FALCON

DATE APRIL 2020

NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C CROCKETT

DocuSigned by:
Stephen C Crockett 4/9/2020
C5CA5FED48E0435...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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] CME-45B
- [ ] _____

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 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: ELEVATIONS TAKEN FROM R3300B_LS_TNL_190919.TIN
DATED 09/19

ELEVATION: FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	3

CULVERT SKEW: 59°

0 50 100
FEET

709+00
710+00
711+00
712+00
713+00
714+00
715+00
716+00

NC GRID
NAD 83/95

L1_71262-LT

END CULVERT
-LI- Sta.712+76.79

JS MIT
GODFREY CREEK

TO NC 210 -LI-

2@12'x7'
RCBC

TO SR 1569

L1_71262-RT

-Y31RPC-

BEGIN CULVERT
-LI- Sta.712+47.59

5+00
6+00
7+00
8+00
9+00
10+00

WOODS

DATE: 9-15-14

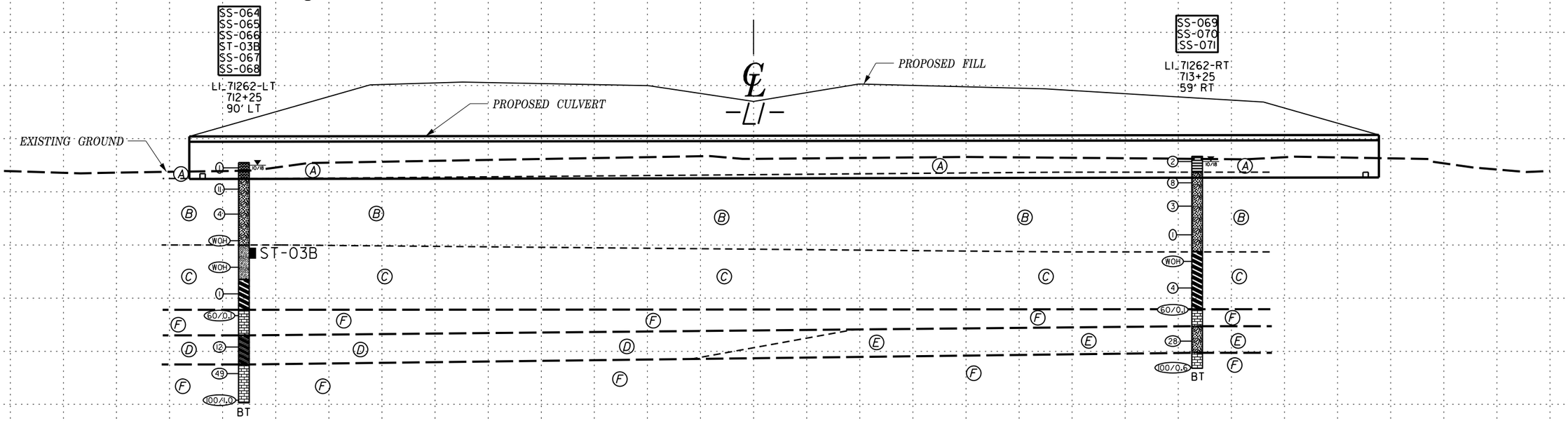
8/23/9

0 20 40
FEET
VE = 1

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-064	90 FT LT	712+25	0.0'-1.5'	A-4	NP	NP	25	41	31	4	94	85	37	–	22
SS-065	90 FT LT	712+25	4.0'-5.5'	A-2-4	NP	NP	0	81	7	12	100	100	25	–	–
SS-066	90 FT LT	712+25	13.7'-15.2	A-2-4	NP	NP	11	70	15	4	100	96	32	–	–
ST-03B	90 FT LT	712+25	16.0'-18.0'	A-4	27	5	1	48	38	14	100	100	52	38	1
SS-067	90 FT LT	712+25	23.7'-25.2'	A-7-6	43	22	5	29	47	19	100	96	80	–	–
SS-068	90 FT LT	712+25	33.7'-35.2'	A-6	30	11	23	31	19	26	100	84	52	–	–
SS-069	59 FT RT	713+25	4.0'-5.5'	A-2-4	NP	NP	16	71	4	9	100	98	17	21	–
SS-070	59 FT RT	713+25	13.8'-15.3'	A-2-4	NP	NP	22	62	11	5	99	90	23	32	–
SS-071	59 FT RT	713+25	23.8'-25.3'	A-7-6	45	24	9	33	40	18	100	93	75	65	–

(A) **UNDIVIDED COASTAL PLAIN:** DARK GRAY, BROWN, AND BLACK, MOIST TO WET, V. SOFT TO SOFT, MOD. ORGANIC SILT AND MUCK (A-4) W/ TRACE F. SAND
(B) **UNDIVIDED COASTAL PLAIN:** WHITE AND GRAY, SAT., V. LOOSE TO MED. DENSE, SILTY F. TO CSE. SAND (A-2-4)
(C) **COASTAL PLAIN:** DARK GRAY, WET TO SAT., V. SOFT TO SOFT, SILT AND SANDY SILTY CLAY (A-4, A-7-6) (CASTLE HAYNE FORMATION)
(D) **COASTAL PLAIN:** WHITE, WET, STIFF, CALCEROUS, SANDY CLAY (A-6)
(E) **COASTAL PLAIN:** WHITE, SAT., MED. DENSE, CLAYEY SILTY SAND (A-2-4) W/ LIMESTONE FRAGMENTS
(F) **COASTAL PLAIN SEDIMENTARY ROCK:** LIGHT GRAY AND WHITE, SOFT TO HARD, SANDY LIMESTONE



NOTES:

GROUNDLINE PROFILE ALONG CULVERT DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED NOVEMBER 2019.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

CULVERT SKEW: 59°

$DATE$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** PUGH, L	
SITE DESCRIPTION CULVERT NO. 265 ON -L1- (HAMPSTEAD BYPASS) STATION 712+62 OVER TRIBUTARY TO GODFREY CREEK				**GROUND WTR (ft)**
BORING NO. L1_71262-LT	**STATION** 712+25	**OFFSET** 90 ft LT	**ALIGNMENT** -L1-	**0 HR.** N/A
COLLAR ELEV. 35.5 ft	**TOTAL DEPTH** 45.2 ft	**NORTHING** 235,096	**EASTING** 2,387,394	**24 HR.** 0.5
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 94% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 10/12/18	**COMP. DATE** 10/18/18	**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)
40										
35	35.5	0.0	WOH	WOH	1	1 11	SS-064			35.5 GROUND SURFACE 0.0 **UNDIVIDED COASTAL PLAIN** DARK BROWN, SILT, HIGHLY ORGANIC (MUCK)
	31.5	4.0	3	5	6		SS-065	Sat.		32.5 3.0 WHITE AND DARK GRAY, SILTY FINE TO COARSE SAND (A-2-4)
30	26.8	8.7	3	2	2	4		Sat.		
25	21.8	13.7	WOH	WOH	WOH	0	SS-066	W		20.0 15.5 **COASTAL PLAIN** DARK GRAY, SILT (A-4) (CASTLE HAYNE FORMATION)
20	16.8	18.7	WOH	WOH	WOH	0		38% W		
15	11.8	23.7	WOH	WOH	1	1	SS-067	W		13.5 22.0 DARK GRAY, SILTY CLAY (A-7-6) W/ TRACE SHELL FRAGMENTS
10	6.8	28.7	60/0.1			60/0.1				7.8 27.7 **COASTAL PLAIN SEDIMENTARY ROCK** LIGHT GRAY, HARD, SANDY LIMESTONE
5	1.8	33.7	10	5	7	12	SS-068	W		3.0 32.5 **COASTAL PLAIN** WHITE, CALCAREOUS, SANDY CLAY (A-6)
0	-3.2	38.7	18	22	27	49				-2.5 38.0 **COASTAL PLAIN SEDIMENTARY ROCK** LIGHT GRAY TO WHITE, SOFT TO HARD, SANDY LIMESTONE
-5	-8.2	43.7	17	40	60	100/1.0				-9.7 45.2 Boring Terminated at Elevation -9.7 ft IN CPSR: SANDY LIMESTONE Other Samples: ST-03B (16.0 - 18.0)

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** HOLLAND, J	
SITE DESCRIPTION CULVERT NO. 265 ON -L1- (HAMPSTEAD BYPASS) STATION 712+62 OVER TRIBUTARY TO GODFREY CREEK				**GROUND WTR (ft)**
BORING NO. L1_71262-RT	**STATION** 713+25	**OFFSET** 59 ft RT	**ALIGNMENT** -L1-	**0 HR.** 1.5
COLLAR ELEV. 36.7 ft	**TOTAL DEPTH** 39.9 ft	**NORTHING** 235,027	**EASTING** 2,387,560	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 94% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Chalmers, D. T.	**START DATE** 10/18/18	**COMP. DATE** 10/18/18	**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
40										
35	36.7	0.0	WOH	1	1	2				36.7 GROUND SURFACE 0.0 **UNDIVIDED COASTAL PLAIN** DARK GRAY AND BLACK SILT (A-4)
	32.7	4.0	4	4	4	8	SS-069	21%		33.7 3.0 W/ TRACE FINE SAND, MOD. ORGANICS WHITE AND GRAY, SILTY SAND (A-2-4)
30	28.3	8.4	1	1	2	3		Sat.		
25	22.9	13.8	WOH	WOH	1	1	SS-070	32%		
20	17.9	18.8	WOH	WOH	WOH	0		W		18.7 18.0 **COASTAL PLAIN** GRAY, SANDY SILTY CLAY (A-7-6) (CASTLE HAYNE FORMATION)
15	12.9	23.8	WOH	4	WOH	4	SS-071	65%		
10	7.9	28.8	60/0.1			60/0.1				7.9 28.8 **COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE
5	2.9	33.8	17	20	8	28		Sat.		4.7 32.0 **COASTAL PLAIN** WHITE, CLAYEY SILTY SAND (A-2-4) W/ LIMESTONE FRAGMENTS
0	-2.1	38.8	8	42	58/0.1	100/0.6				-0.3 37.0 **COASTAL PLAIN SEDIMENTARY ROCK** WHITE, HARD, SANDY LIMESTONE -3.2 39.9 Boring Terminated at Elevation -3.2 ft IN CPSR: SANDY LIMESTONE

REFERENCE: R-3300B

PROJECT: 40237

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	5

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *PENDER*

PROJECT DESCRIPTION *HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD*

SITE DESCRIPTION *CULVERT ON -Y32- (US 17) STATION 18+00 OVER UNNAMED TRIBUTARY TO OLD TOPSAIL CREEK*

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.

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

MID-ATLANTIC

D.J. GOODNIGHT

INVESTIGATED BY *FALCON*

DRAWN BY *CROCKETT, S.C.*

CHECKED BY *HAMM, J. R.*

SUBMITTED BY *FALCON*

DATE *APRIL 2020*

NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C CROCKETT

DocuSigned by:
Stephen C Crockett 4/9/2020
C5CA5FED48E0435...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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] CME-45B
- [ ] _____

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 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: ELEVATIONS TAKEN FROM R3300B_LS_TNL_190919.TIN
DATED 09/19

ELEVATION: FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	3

BEGIN CULVERT
-Y32- Sta.17+95.77

END CULVERT
-LI- Sta.712+76.79

Y32_18+00-LT

Y32_18+00-RT

CULVERT SKEW: 109° -Y32-, 99° -Y40-, 114° -Y19-

1@8'x6' RCBC

NAD 83/NSRS 2007 NC GRID

0 50 100
FEET

-Y32-
-Y40-
-Y19-
-L-

15+00
20+00
22+00
225+00
240+00
242+00
716+00

12" DI
9"CHL & 3SBW
FSS
FO
TC
RIP RAP
GATE
25' BST
TWP(3)
16" DI
EXISTING R/W VARIES
10" PVC
30" C&G
WWP(3)
BST
TWP
MTL
CONC
BOX CULVERT
JS MH
JS MIT
ANNANDALE TRC
POST
CR
US 17 / NC 210
LT
DI
TOP=38.41'

8/23/9

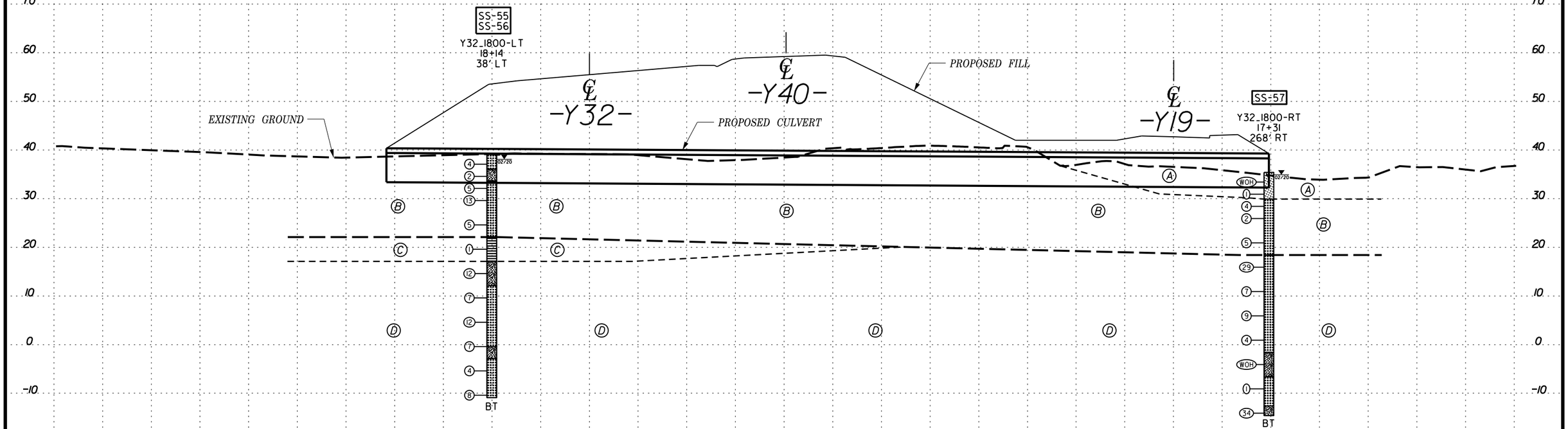
0 40 80
FEET

VE = 2

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-57	268 FT RT	17+31	38.5'-40.0'	A-2-4	18	1	57	31	2	10	98	63	13	25	-
SS-55	38 FT LT	18+14	18.5'-20.0'	A-7-6	50	30	18	34	15	33	100	93	51	42	7
SS-56	38 FT LT	18+14	39.5'-40.0'	A-2-4	19	3	25	55	3	17	98	91	21	23	-

Ⓐ **UNDIVIDED COASTAL PLAIN:** BROWN AND GRAY, MOIST TO SAT., V.LOOSE, SLIGHTLY SILTY FINE SAND (A-3) WITH LITTLE ORGANICS (WOOD FRAGMENTS)
Ⓑ **UNDIVIDED COASTAL PLAIN:** TAN AND BROWN, MOIST TO SAT., V.LOOSE TO MED.DENSE, SILTY SAND AND FINE SAND (A-2-4, A-3) WITH TRACE ORGANICS
Ⓒ **COASTAL PLAIN:** BROWN-GRAY, WET, V. SOFT, SANDY SILTY CLAY (A-7-6) WITH LITTLE ORGANICS (WOOD FRAGMENTS) (CASTLE HAYNE FORMATION)
Ⓓ **COASTAL PLAIN:** GRAY AND TAN, SAT., V.LOOSE TO DENSE, CLAYEY SILTY SAND, SILTY SAND, AND FINE SAND (A-2-4, A-3) WITH TRACE LIMESTONE FRAGMENTS (CASTLE HAYNE FORMATION)



NOTES:

GROUNDLINE PROFILE ALONG CULVERT DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED NOVEMBER 2019.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

CULVERT SKEW: 109° -Y32-, 99° -Y40-, 114° -Y19-

$DATE$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION CULVERT ON -Y32- (US 17) STA. 18+00 OVER UNNAMED TRIBUTARY TO OLD TOPSAIL CREEK				**GROUND WTR (ft)**
BORING NO. Y32_1800-LT	**STATION** 18+14	**OFFSET** 38 ft LT	**ALIGNMENT** -Y32-	**0 HR.** 3.7
COLLAR ELEV. 39.1 ft	**TOTAL DEPTH** 50.0 ft	**NORTHING** 238,368	**EASTING** 2,399,992	**24 HR.** 1.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/06/20	**COMP. DATE** 02/06/20	**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)
40											
	38.1	1.0	3	2	2	4		M		39.1 GROUND SURFACE	0.0
35	35.6	3.5	1	1	1	2		Sat.		**UNDIVIDED COASTAL PLAIN** TAN, FINE SAND (A-3)	
	33.1	6.0	2	2	3	5		Sat.		36.1 BROWN, SILTY FINE SAND (A-2-4) W/ TRACE ORGANICS	3.0
30	30.6	8.5	4	6	7	13		Sat.		33.6 TAN-BROWN TO TAN, FINE SAND (A-3) W/ TRACE ORGANICS	5.5
25	25.6	13.5	1	2	3	5		Sat.			
20	20.6	18.5	WOH	WOH	1	1	SS-55	42%		22.1 **COASTAL PLAIN** BROWN-GRAY, SANDY SILTY CLAY (A-7) W/ LITTLE ORGANICS (WOOD FRAGS) (CASTLE HAYNE FORMATION)	17.0
15	15.6	23.5	6	7	5	12		Sat.		17.1 LIGHT GRAY, SILTY SAND (A-2-4)	22.0
10	10.6	28.5	4	3	4	7		Sat.		12.1 TAN, FINE SAND (A-3)	27.0
5	5.6	33.5	3	5	7	12		Sat.			
0	0.6	38.5	5	5	2	7	SS-56	23%		-0.4 LIGHT GRAY, CLAYEY SILTY SAND (A-2-4)	39.5
-5	-4.4	43.5	3	2	2	4		Sat.		-2.9 TAN, FINE SAND (A-3)	42.0
-10	-9.4	48.5	4	4	4	8		Sat.		-10.9 Boring Terminated at Elevation -10.9 ft IN CP: SAND	50.0

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION CULVERT ON -Y32- (US 17) STA. 18+00 OVER UNNAMED TRIBUTARY TO OLD TOPSAIL CREEK				**GROUND WTR (ft)**
BORING NO. Y32_1800-RT	**STATION** 17+31	**OFFSET** 268 ft RT	**ALIGNMENT** -Y32-	**0 HR.** 1.8
COLLAR ELEV. 35.4 ft	**TOTAL DEPTH** 50.0 ft	**NORTHING** 238,147	**EASTING** 2,400,289	**24 HR.** 0.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/05/20	**COMP. DATE** 02/05/20	**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
40										
	34.4	1.0	1	WOH	WOH	0		M		35.4 GROUND SURFACE 0.0
35	31.9	3.5	WOH	1	0	1		Sat.		**UNDIVIDED COASTAL PLAIN** BROWN & GRAY, SLIGHTLY SILTY FINE SAND (A-3) W/ LITTLE ORGANICS (WOOD FRAGS)
	29.4	6.0	1	2	2	4		Sat.		29.9 TAN, FINE SAND (A-3) 5.5
30	26.9	8.5	2	1	1	2		Sat.		
25	21.9	13.5	2	3	2	5		Sat.		
20	16.9	18.5	11	12	17	29		Sat.		18.4 **COASTAL PLAIN** GRAY, SLIGHTLY SILTY FINE SAND (A-3) W/ FEW THIN LENSES OF CLAY (CASTLE HAYNE FORMATION) 17.0
15	11.9	23.5	7	4	3	7		Sat.		
10	6.9	28.5	5	4	5	9		Sat.		
5	1.9	33.5	4	2	2	4		Sat.		
0	-3.1	38.5	WOH	WOH	WOH	0	SS-57	25%		-1.6 GRAY, SILTY SAND (A-2-4) 37.0
-5	-8.1	43.5	WOH	WOH	1	1		Sat.		-6.6 TAN, FINE SAND (A-3) 42.0
-10	-13.1	48.5	8	13	21	34		W		-12.6 TAN, SILTY SAND (A-2-4) W/ TRACE LIMESTONE FRAGMENTS 48.0 -14.6 50.0 Boring Terminated at Elevation -14.6 ft IN CP: SILTY SAND

REFERENCE: R-3300B

PROJECT: 40237

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	5

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *PENDER*

PROJECT DESCRIPTION *HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD*

SITE DESCRIPTION *CULVERT ON -L- (US-17) STATION 320+01 OVER UNNAMED TRIBUTARY TO NIXON CREEK*

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.

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

M.A.D.

GOODNIGHT, D.J.

INVESTIGATED BY *GOODNIGHT, D.J.*

DRAWN BY *CROCKETT, S.C.*

CHECKED BY *HAMM, J. R.*

SUBMITTED BY *FALCON*

DATE *AUGUST 2021*

NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C CROCKETT

DocuSigned by:
Stephen Crockett
C5CA5FED48E0435...

8/17/2021

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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] CME-45B
- [ ] _____

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 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: ELEVATIONS TAKEN FROM R3300B_LS_TNL_190919.TIN
DATED 09/19

ELEVATION: FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

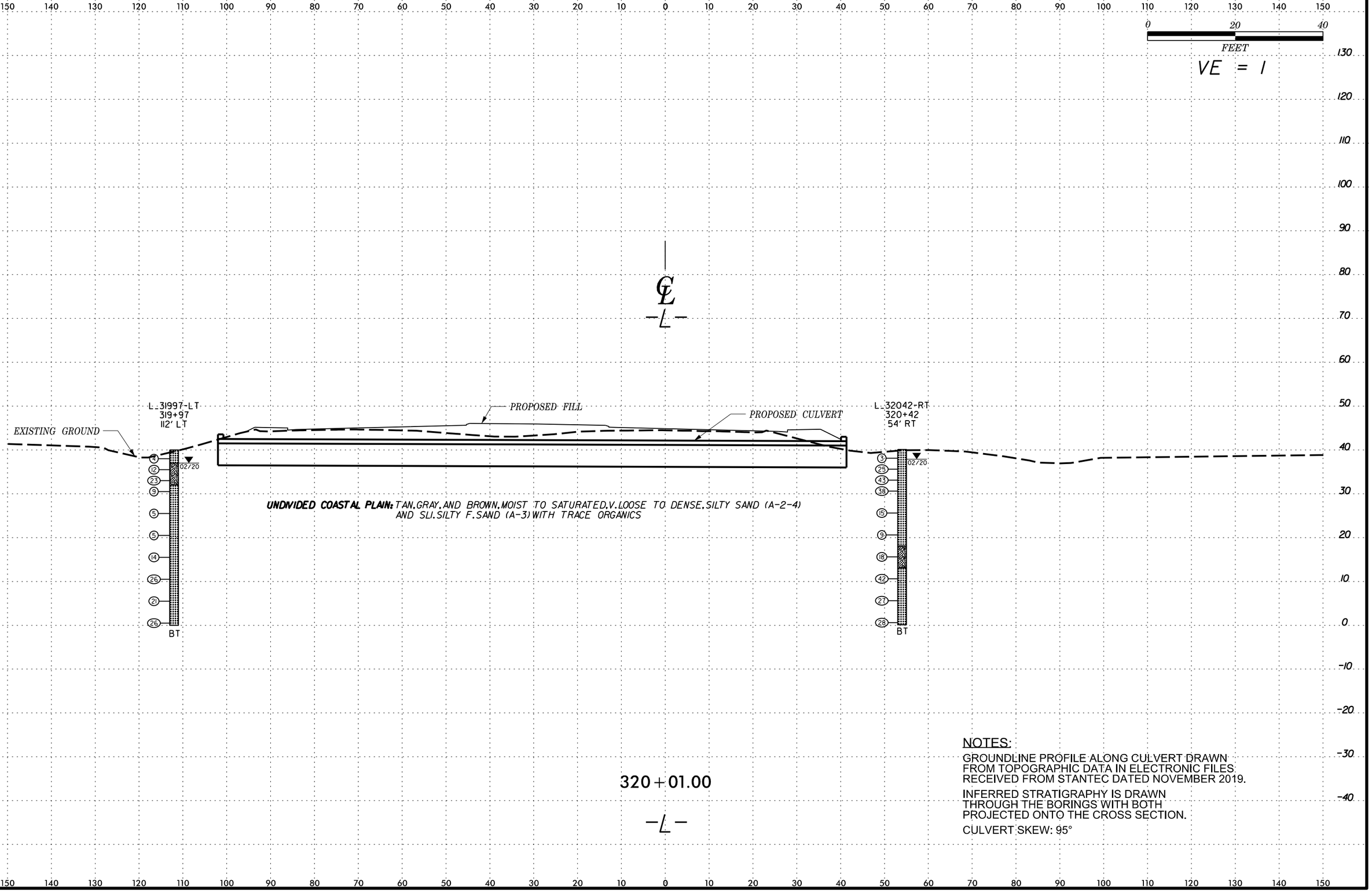
PROJECT REFERENCE NO.	SHEET NO.
R-3300B	3

0 50 100
FEET

317+00
318+00
319+00
320+00
321+00
322+00

SOIL
SOIL
TWP
TC
EXISTING R/W VARIES
FSS
10" PVC
JS MIT
L_31997-LT
INV=38.06'
TOP=44.06'
INV=38.47'
MTL
CAT-1
36" C&G
26" CONC HW
15" RCP
4'X6' BOX CULVERT
4'X6' BOX CULVERT
-LLT-
US 17/ NC 210 30' BST
N 39° 31' 49.0" E
TO ANANNANDALE
LONG LEAF DRIVE
SR 1675
INV=38.45'
TOP=40.95'
CONC
INV=38.66'
TOP=41.26'
CONC
TO WOODSIDE
SLOOP POINT ROAD
SR 1563
-L-
US 17/ NC 210 39' BST
N 39° 31' 49.0" E
-LRT-
DI
TOP=43.57'
INV=40.43'
MTL
36" C&G
26" CONC HW
MTL
15" CMP
INV=39.42'
16" DI
CAT-1
GRAU 350 TL-3
TWP
15" RCP
BEGIN CULVERT
-L- Sta. 319+93.97
EXISTING R/W VARIES
L_32042-RT
END CULVERT
-L- Sta. 320+08.02
BST
FES
CONC
15" RCP
50" WD RAIL
50" WD RAIL
FES CONC
INV=39.85'
SOIL
8" CMP (PIPE CRUSHED)
WOODS
ISF
BUS
CONC
JS MIT
NAD 83/NSRS 2007
NC GRID
CULVERT SKEW: 95°
BMBL 165
8" CMP
INV=38.90'
INV=38.79'
DATE: 9-15-14

0 20 40
FEET
VE = 1



NOTES:

GROUNDLINE PROFILE ALONG CULVERT DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM STANTEC DATED NOVEMBER 2019.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

CULVERT SKEW: 95°

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION CULVERT ON -L- (US-17) STATION 320+01 OVER UT TO NIXON CREEK				**GROUND WTR (ft)**
BORING NO. L_31997-LT	**STATION** 319+97	**OFFSET** 112 ft LT	**ALIGNMENT** -L-	**0 HR.** 3.3
COLLAR ELEV. 40.0 ft	**TOTAL DEPTH** 40.0 ft	**NORTHING** 243,938	**EASTING** 2,405,867	**24 HR.** 3.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/04/20	**COMP. DATE** 02/04/20	**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)
40										40.0 GROUND SURFACE	0.0
	39.0	1.0	1	1	3	4		W		**UNDIVIDED COASTAL PLAIN** GRAY, FINE SAND (A-3) WITH TRACE ORGANICS	
35	36.5	3.5	2	5	7	12		W		37.0 BROWN, SILTY FINE SAND (A-2-4) WITH TRACE ORGANICS	3.0
	34.0	6.0	6	11	12	23		Sat.		32.0 TAN AND GRAY, FINE SAND (A-3)	8.0
30	31.5	8.5	4	4	5	9		Sat.			
25	26.5	13.5	2	2	3	5		Sat.			
20	21.5	18.5	1	2	3	5		Sat.			
15	16.5	23.5	3	6	8	14		Sat.			
10	11.5	28.5	7	9	17	26		Sat.			
5	6.5	33.5	7	9	12	21		Sat.			
0	1.5	38.5	10	10	16	26		Sat.		0.0 Boring Terminated at Elevation 0.0 ft IN UCP: SAND (A-3)	40.0

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION CULVERT ON -L- (US-17) STATION 320+01 OVER UT TO NIXON CREEK				**GROUND WTR (ft)**
BORING NO. L_32042-RT	**STATION** 320+42	**OFFSET** 54 ft RT	**ALIGNMENT** -L-	**0 HR.** 1.0
COLLAR ELEV. 40.1 ft	**TOTAL DEPTH** 40.0 ft	**NORTHING** 243,867	**EASTING** 2,406,024	**24 HR.** 2.2
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/04/20	**COMP. DATE** 02/04/20	**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										
40	39.1	1.0	2	1	2	3		W		40.1 GROUND SURFACE 0.0
	36.6	3.5	3	9	16	25		Sat.		**UNDIVIDED COASTAL PLAIN** DARK BROWN, BROWN, AND TAN, SLIGHTLY SILTY FINE SAND (A-3) WITH TRACE ORGANICS
35	34.1	6.0	11	18	25	43		Sat.		
30	31.6	8.5	13	18	20	38		Sat.		
25	26.6	13.5	3	6	9	15		Sat.		
20	21.6	18.5	3	5	4	9		Sat.		
15	16.6	23.5	7	7	11	18		Sat.		18.1 GRAY, SILTY SAND (A-2-4) 22.0
10	11.6	28.5	11	19	23	42		Sat.		13.1 TAN, FINE SAND (A-3) 27.0
5	6.6	33.5	9	13	14	27		Sat.		
	1.6	38.5	6	11	17	28		Sat.		0.1 Boring Terminated at Elevation 0.1 ft IN UCP: SAND (A-3) 40.0

REFERENCE: R-3300B

PROJECT: 40237

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	11

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *PENDER*

PROJECT DESCRIPTION *HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD*

SITE DESCRIPTION *RETAINING WALL NO. 1, -WL1-, FROM -Y40- STATION 249+62.70, 13.60' RT TO -Y40- STATION 256+19.51, 11.50' RT*

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.

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

GOODNIGHT, D.J.

MID-ATLANTIC

INVESTIGATED BY *FALCON*

DRAWN BY *CROCKETT, S.C.*

CHECKED BY *HAMM, J. R.*

SUBMITTED BY *FALCON*

DATE *MAY 2020*

NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C CROCKETT

Stephen C Crockett 5/13/2020

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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	50 MX													
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	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] CME-45B
- [ ] _____

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 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: ELEVATIONS TAKEN FROM R3300B_LS_TNL_190919.TIN
DATED 09/19

ELEVATION: FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

DocuSign Envelope ID: 4FFAE203-F598-46C7-99B5-12A8FFC4B147

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	3

0 60 120
FEET

-LI_NORTH-
-Y32LPA2-
-Y40-
-L-
-Y43-

BEGIN RETAINING WALL NO.1
-WLI- STA.10+00.00
-Y40- STA.249+62.70
13.60' RT

END RETAINING WALL NO.1
-WLI- STA.16+62.72
-LI_NORTH- STA.866+15.00
63.52' RT

RW1-01
RW1-02
RW1-03
RW1-04
RW1-05
RW1-06
RW1-07
RW1-08
RW1-09
RW1-10
RW1-11
RW1-12
RW1-13
RW1-14

248+00
250+00
255+00
856+00
860+00
865+00
5+00
6+00
7+00
8+00
9+00
35+00
40+00
11+00
12+00

CABLE GUIDERAIL ANCHOR UNIT
TYPE III
EXISTING R/W VARIES
TWP(3) 10 ", PVC
ARV
WV CONC WITNESS POST
BK WALL
CEMETERY (158 GRAVES)
TRAFFIC BOX ON CONC PAD
SR 1695 TRANSFER STATION RD 22' BST
EXISTING R/W
PM
48" CHAIN
MOBILE HOME SALES LOT (MOVABLE HTR'S THROUGHOUT)
US 17 / NC 210 BST
GR
NC GRID NAD 83/NSRS 2007

DATE: 9-15-14

0 100 200
FEET
VE = 5

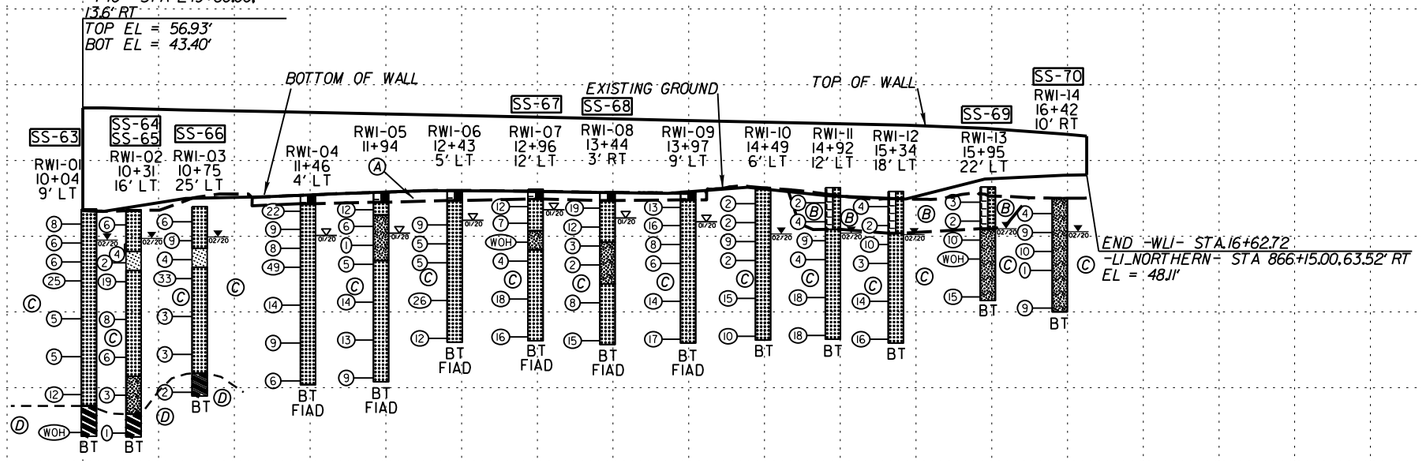
PROJECT REFERENCE NO.	SHEET NO.
R-3300B	4

RETAINING WALL NO. 1, -WL1-, FROM -Y40- STATION 249+62.70, 13.60' RT TO -Y40- STATION 256+19.51, 11.50' RT

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-63	9 FT LT	10+04	28.5'-30.0'	A-7-6	56	38	0	20	45	35	100	100	91	42	-
SS-64	16 FT LT	10+31	23.5'-25.0'	A-2-4	24	6	19	53	8	20	98	90	31	30	-
SS-65	16 FT LT	10+31	28.5'-30.0'	A-7-6	53	35	1	26	44	29	100	100	88	39	-
SS-66	25 FT LT	10+75	23.5'-25.0'	A-6	39	25	13	45	16	26	99	93	47	36	-
SS-67	12 FT LT	12+96	6.0'-7.5'	A-2-4	NP	NP	15	74	6	5	100	99	12	32	-
SS-68	3 FT RT	13+44	8.5'-10.0'	A-2-4	NP	NP	13	80	0	7	100	100	7	32	-
SS-69	22 FT LT	15+95	8.5'-10.0'	A-2-4	NP	NP	13	82	1	4	100	99	6	24	-
SS-70	10 FT RT	16+42	8.5'-10.0'	A-2-4	NP	NP	10	84	3	3	100	100	9	30	-

(A) **ROADWAY EMBANKMENT:** BITUMENOUS CONCRETE
(B) **ROADWAY EMBANKMENT:** TAN, GRAY, AND BROWN, MOIST TO SATURATED, V. LOOSE TO LOOSE, FINE SAND WITH TRACE TO LITTLE GRAVEL AND ASPHALT DEBRIS
(C) **UNDIVIDED COASTAL PLAIN:** GRAY, BROWN, AND TAN, MOIST TO SATURATED, V. LOOSE TO DENSE, SILTY SAND AND FINE SAND (A-2-4, A-3) WITH TRACE GRAVEL, TRACE TO LITTLE ORGANICS AND THIN INTERMITTENT CLAY LENSES
(D) **UNDIVIDED COASTAL PLAIN:** GRAY, SATURATED, V. SOFT TO SOFT, SANDY CLAY AND FINE SANDY SILTY CLAY (A-6, A-7-6)



NOTES:

ADOPTED FROM PLANS PROVIDED BY STANTEC DATED APRIL, 2020.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT			**GROUND WTR (ft)**
BORING NO. RW1-01	**STATION** 10+04	**OFFSET** 9 ft LT	**ALIGNMENT** -WL1- **0 HR.** 2.5
COLLAR ELEV. 43.6 ft	**TOTAL DEPTH** 30.0 ft	**NORTHING** 238,949	**EASTING** 2,400,878 **24 HR.** 4.1
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER WIGGINS, M.	**START DATE** 02/03/20	**COMP. DATE** 02/03/20	**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)
45										43.6 GROUND SURFACE 0.0
	42.6	1.0	3	4	4	8		M		**UNDIVIDED COASTAL PLAIN** GRAY, BROWN, AND TAN, FINE SAND (A-3) W/ INTERMITTENT CLAY LENSES
40	40.1	3.5	3	3	3	6		Sat.		
	37.6	6.0	2	3	3	6		Sat.		
35	35.1	8.5	7	10	15	25		Sat.		
30	30.1	13.5	2	3	2	5		Sat.		
25	25.1	18.5	2	2	3	5		Sat.		
20	20.1	23.5	13	8	4	12		Sat.		17.6 26.0 GRAY, FINE SANDY SILTY CLAY (A-7-6)
15	15.1	28.5	WOH	WOH	WOH	0	SS-63	42%		13.6 30.0 Boring Terminated at Elevation 13.6 ft IN UCP: SANDY SILTY CLAY

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT			**GROUND WTR (ft)**
BORING NO. RW1-02	**STATION** 10+31	**OFFSET** 16 ft LT	**ALIGNMENT** -WL1- **0 HR.** 2.2
COLLAR ELEV. 43.5 ft	**TOTAL DEPTH** 30.0 ft	**NORTHING** 238,966	**EASTING** 2,400,899 **24 HR.** 3.8
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER WIGGINS, M.	**START DATE** 02/04/20	**COMP. DATE** 02/04/20	**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										43.5 GROUND SURFACE 0.0
	42.5	1.0	3	3	3	6		M		**UNDIVIDED COASTAL PLAIN** TAN TO TAN BROWN, FINE SAND (A-3) W/ TRACE ORGANICS
40	40.0	3.5	3	2	2	4		Sat.		38.0 5.5 DARK BROWN, SILTY FINE SAND (A-2-4) W/ LITTLE ORGANICS
	37.5	6.0	1	1	1	2		Sat.		35.5 8.0 TAN, FINE SAND (A-3)
35	35.0	8.5	4	8	11	19		Sat.		
30	30.0	13.5	3	3	5	8		Sat.		
25	25.0	18.5	3	3	3	6		Sat.		21.5 22.0 GRAY, SILTY SAND (A-2-4)
20	20.0	23.5	3	2	1	3	SS-64	30%		16.5 27.0 GRAY, FINE SANDY SILTY CLAY (A-7-6)
15	15.0	28.5	WOH	WOH	1	1	SS-65	39%		13.5 30.0 Boring Terminated at Elevation 13.5 ft IN UCP: SANDY SILTY CLAY

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT				**GROUND WTR (ft)**
BORING NO. RW1-03	**STATION** 10+75	**OFFSET** 25 ft LT	**ALIGNMENT** -WL1-	**0 HR.** 3.3
COLLAR ELEV. 43.9 ft	**TOTAL DEPTH** 25.0 ft	**NORTHING** 238,994	**EASTING** 2,400,934	**24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/04/20	**COMP. DATE** 02/04/20	**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)
45										43.9 GROUND SURFACE	0.0
	42.9	1.0	3	2	4	6		M		**UNDIVIDED COASTAL PLAIN** TAN TO BROWN, FINE SAND TO SLIGHTLY SILTY FINE SAND (A-3) W/ TRACE ORGANICS	
40	40.4	3.5	2	4	5	9				38.4 DARK BROWN, SILTY FINE SAND (A-2-4) W/ LITTLE ORGANICS	5.5
	37.9	6.0	2	1	3	4		Sat.		35.9 TAN, FINE SAND (A-3)	8.0
35	35.4	8.5	15	16	17	33		Sat.			
30	30.4	13.5	1	1	2	3		Sat.			
25	25.4	18.5	2	1	2	3		Sat.		21.9 GRAY, SANDY CLAY (A-6)	22.0
20	20.4	23.5	1	1	1	2	SS-66	36%		18.9 Boring Terminated at Elevation 18.9 ft IN UCP: SANDY SILTY CLAY	25.0

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT				**GROUND WTR (ft)**
BORING NO. RW1-04	**STATION** 11+46	**OFFSET** 4 ft LT	**ALIGNMENT** -WL1-	**0 HR.** 5.3
COLLAR ELEV. 45.4 ft	**TOTAL DEPTH** 25.0 ft	**NORTHING** 239,007	**EASTING** 2,401,007	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 01/30/20	**COMP. DATE** 01/30/20	**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											
45										45.4 GROUND SURFACE	0.0
	44.3	1.1	9	10	12	22		M		44.3 **ROADWAY EMBANKMENT** BITUMINOUS CONCRETE	1.1
	41.9	3.5	4	4	5	9				**UNDIVIDED COASTAL PLAIN** TAN, F. SAND (A-3) W/ TRACE ORGANICS AND INTERMITTENT THIN CLAY LENSES	
40	39.4	6.0	2	3	5	8		Sat.			
	36.9	8.5	8	18	31	49		W			
35	31.9	13.5	4	6	8	14		Sat.			
30	26.9	18.5	4	5	4	9		Sat.			
25	21.9	23.5	2	3	3	6		Sat.		20.4 Boring Terminated at Elevation 20.4 ft IN UCP: SAND	25.0

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT			**GROUND WTR (ft)**
BORING NO. RW1-05	**STATION** 11+94	**OFFSET** CL	**ALIGNMENT** -WL1-	**0 HR.** 5.4
COLLAR ELEV. 45.8 ft	**TOTAL DEPTH** 25.0 ft	**NORTHING** 239,025	**EASTING** 2,401,052	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER WIGGINS, M.	**START DATE** 01/30/20	**COMP. DATE** 01/30/20	**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)
50											
45										45.8 GROUND SURFACE	0.0
	44.5	1.3	6	7	5	12		M		44.5 **ROADWAY EMBANKMENT** BITUMINOUS CONCRETE	1.3
	42.3	3.5	3	3	3	6				42.8 **UNDIVIDED COASTAL PLAIN** TAN AND GRAY, F. SAND (A-3)	3.0
40	39.8	6.0	1	1	0	1		Sat.		TAN, SILTY F. SAND (A-2-4) W/ TRACE ORGANICS	
	37.3	8.5	WOH	1	4	5		Sat.		36.8	9.0
35										TAN, F. SAND (A-3)	
	32.3	13.5	5	6	8	14		Sat.			
30											
	27.3	18.5	3	6	7	13		Sat.			
25											
	22.3	23.5	5	4	5	9		Sat.		20.8 Boring Terminated at Elevation 20.8 ft IN UCP: SAND	25.0

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT			**GROUND WTR (ft)**
BORING NO. RW1-06	**STATION** 12+43	**OFFSET** 5 ft LT	**ALIGNMENT** -WL1-	**0 HR.** 3.9
COLLAR ELEV. 46.0 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 239,053	**EASTING** 2,401,092	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER WIGGINS, M.	**START DATE** 01/31/20	**COMP. DATE** 01/31/20	**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										
45										46.0 GROUND SURFACE 0.0
	42.5	3.5	3	4	5	9				44.7 **ROADWAY EMBANKMENT** BITUMINOUS CONCRETE 1.3
40	40.0	6.0	2	2	3	5		Sat.		**UNDIVIDED COASTAL PLAIN** TAN AND BROWN, F. SAND (A-3) W/ TRACE ORGANICS
	37.5	8.5	WOH	2	3	5		Sat.		
35										
	32.5	13.5	9	13	13	26		Sat.		
30										
	27.5	18.5	5	5	7	12		Sat.		26.0 Boring Terminated at Elevation 26.0 ft IN UCP: SAND 20.0

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT				**GROUND WTR (ft)**
BORING NO. RW1-07	**STATION** 12+96	**OFFSET** 12 ft LT	**ALIGNMENT** -WL1-	**0 HR.** 2.7
COLLAR ELEV. 46.2 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 239,085	**EASTING** 2,401,135	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 01/31/20	**COMP. DATE** 01/31/20	**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)
										46.2	GROUND SURFACE 0.0
	44.9	1.3	8	7	5	12				44.9	**ROADWAY EMBANKMENT** BITUMINOUS CONCRETE 1.3
	42.7	3.5	3	4	3	7		M			**UNDIVIDED COASTAL PLAIN** TAN AND BROWN, F. SAND (A-3)
	40.2	6.0	WOH	WOH	WOH	0	SS-67	32%		40.7	TAN-BROWN, SILTLY F. SAND (A-2-4) W/ TRACE ORGANICS 5.5
	37.7	8.5	1	1	3	4		Sat.		38.2	TAN AND BROWN, F. SAND (A-3) 8.0
	32.7	13.5	7	9	9	18		Sat.			
	27.7	18.5	6	7	9	16		Sat.		26.2	20.0
											Boring Terminated at Elevation 26.2 ft IN UCP: SAND

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT				**GROUND WTR (ft)**
BORING NO. RW1-08	**STATION** 13+44	**OFFSET** 3 ft RT	**ALIGNMENT** -WL1-	**0 HR.** 3.3
COLLAR ELEV. 45.7 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 239,097	**EASTING** 2,401,183	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 01/31/20	**COMP. DATE** 01/31/20	**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
										45.7 GROUND SURFACE 0.0
	44.7	1.0	4	10	9	19				44.7 **ROADWAY EMBANKMENT** BITUMINOUS CONCRETE 1.0
	42.2	3.5	3	5	7	12		W		**UNDIVIDED COASTAL PLAIN** TAN, F. SAND (A-3)
	39.7	6.0	5	2	1	3		Sat.		39.2 6.5
	37.2	8.5	WOH	1	1	2	SS-68	32%		BROWN, SILTY F. SAND (A-2-4)
	32.2	13.5	3	4	4	8		Sat.		33.7 12.0
	27.2	18.5	4	5	10	15		Sat.		TAN, F. SAND (A-3)
										25.7 20.0
										Boring Terminated at Elevation 25.7 ft IN UCP: SAND

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT				**GROUND WTR (ft)**
BORING NO. RW1-09	**STATION** 13+97	**OFFSET** 9 ft LT	**ALIGNMENT** -WL1-	**0 HR.** 4.0
COLLAR ELEV. 45.9 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 239,135	**EASTING** 2,401,222	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 01/31/20	**COMP. DATE** 01/31/20	**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)
										45.9 GROUND SURFACE	0.0
45	44.8	1.1	5	6	7	13		M		44.8 **ROADWAY EMBANKMENT** BITUMINOUS CONCRETE	1.1
	42.4	3.5	4	6	10	16				**UNDIVIDED COASTAL PLAIN** TAN AND BROWN, SLIGHTLY SILTY F. SAND (A-3)	
40	39.9	6.0	6	4	4	8		Sat.			
	37.4	8.5	WOH	2	4	6		Sat.			
35	32.4	13.5	6	7	7	14		Sat.			
30	27.4	18.5	6	7	10	17		Sat.		25.9	20.0
										Boring Terminated at Elevation 25.9 ft IN UCP: SAND	

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT				**GROUND WTR (ft)**
BORING NO. RW1-10	**STATION** 14+49	**OFFSET** 6 ft LT	**ALIGNMENT** -WL1-	**0 HR.** 2.8
COLLAR ELEV. 46.3 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 239,162	**EASTING** 2,401,267	**24 HR.** 6.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/03/20	**COMP. DATE** 02/03/20	**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
										46.3 GROUND SURFACE 0.0
45	45.3	1.0	1	1	1	2		M		**UNDIVIDED COASTAL PLAIN** TAN, FINE SAND (A-3) W/ TRACE GRAVEL
	42.8	3.5	WOH	1	1	2		Sat.		
40	40.3	6.0	2	4	5	9		Sat.		
	37.8	8.5	2	1	1	2		Sat.		
35	32.8	13.5	7	7	8	15		Sat.		
30	27.8	18.5	2	4	6	10		Sat.		26.3 20.0
										Boring Terminated at Elevation 26.3 ft IN UCP: SAND

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT				**GROUND WTR (ft)**
BORING NO. RW1-11	**STATION** 14+92	**OFFSET** 12 ft LT	**ALIGNMENT** -WL1-	**0 HR.** 4.1
COLLAR ELEV. 46.4 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 239,191	**EASTING** 2,401,299	**24 HR.** 6.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/03/20	**COMP. DATE** 02/03/20	**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)
50											
45	45.4	1.0	2	1	1	2		M		46.4 GROUND SURFACE	0.0
	42.9	3.5	WOH	2	2			Sat.		**ROADWAY EMBANKMENT** TAN, FINE SAND (A-3) W/ GRAVEL AND ASPHALT DEBRIS	
40	40.4	6.0	2	4	5	9		Sat.		40.9 **UNDIVIDED COASTAL PLAIN** TAN AND BROWN, FINE SAND (A-3) W/ TRACE ORGANICS	5.5
	37.9	8.5	2	2	2	4		Sat.			
35											
	32.9	13.5	7	8	10	18		Sat.			
30											
	27.9	18.5	5	7	11	18		Sat.		26.4 Boring Terminated at Elevation 26.4 ft IN UCP: SAND	20.0

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT				**GROUND WTR (ft)**
BORING NO. RW1-12	**STATION** 15+34	**OFFSET** 18 ft LT	**ALIGNMENT** -WL1-	**0 HR.** 4.7
COLLAR ELEV. 45.9 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 239,220	**EASTING** 2,401,329	**24 HR.** 5.7
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/03/20	**COMP. DATE** 02/03/20	**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										
45	44.9	1.0	2	2	2	4		M		45.9 GROUND SURFACE 0.0
	42.4	3.5	WOH	WOH	2	2				**ROADWAY EMBANKMENT** TAN, GRAY, AND BROWN, FINE SAND (A-3) W/ TRACE GRAVEL
40	39.9	6.0	3	4	6	10		Sat.		40.4 **UNDIVIDED COASTAL PLAIN** TAN AND BROWN, FINE SAND (A-3) W/ TRACE ORGANICS 5.5
	37.4	8.5	2	2	1	3		Sat.		
35										
	32.4	13.5	6	7	7	14		Sat.		
30										
	27.4	18.5	4	5	11	16		Sat.		25.9 Boring Terminated at Elevation 25.9 ft IN UCP: SAND 20.0

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT				**GROUND WTR (ft)**
BORING NO. RW1-13	**STATION** 15+95	**OFFSET** 22 ft LT	**ALIGNMENT** -WL1-	**0 HR.** 2.7
COLLAR ELEV. 46.5 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 239,259	**EASTING** 2,401,375	**24 HR.** 5.5
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/03/20	**COMP. DATE** 02/03/20	**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))
50										
										46.5 GROUND SURFACE 0.0
45	45.5	1.0	2	1	2	3 2		M		**ROADWAY EMBANKMENT** TAN, FINE SAND (A-3) W/ LITTLE GRAVEL
	43.0	3.5	WOH	1	1					
40	40.5	6.0	2	4	6	10		W		41.0 5.5 **UNDIVIDED COASTAL PLAIN** TAN TO BROWN, FINE SILTY SAND (A-2-4) W/ TRACE ORGANICS
	38.0	8.5	2	1	WOH	1	SS-69	24%		
35	33.0	13.5	6	7	8	15		Sat.		31.5 15.0 Boring Terminated at Elevation 31.5 ft IN UCP: SAND

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION RETAINING WALL NO. 1 FROM -Y40- STA. 249+62.70, 13.60' RT TO -Y40- STA. 256+19.51, 11.50' RT				**GROUND WTR (ft)**
BORING NO. RW1-14	**STATION** 16+42	**OFFSET** 10 ft RT	**ALIGNMENT** -WL1-	**0 HR.** 2.0
COLLAR ELEV. 45.0 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 239,263	**EASTING** 2,401,432	**24 HR.** 4.4
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 02/03/20	**COMP. DATE** 02/03/20	**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))
45										45.0 GROUND SURFACE 0.0
	44.0	1.0	2	2	2	4		M		**UNDIVIDED COASTAL PLAIN** TAN, FINE SILTY SAND (A-2-4)
40	41.5	3.5	2	3	6	9				
	39.0	6.0	5	6	4	10		Sat.		
35	36.5	8.5	1	WOH	1	1	SS-70	30%		
	31.5	13.5	3	3	6	9		Sat.		30.0 15.0 Boring Terminated at Elevation 30.0 ft IN UCP: SAND

REFERENCE: R-3300B

PROJECT: 40237

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3300B	1	9

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *PENDER*

PROJECT DESCRIPTION *HAMPSTEAD BYPASS FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD*

SITE DESCRIPTION *NOISE WALL 22 FROM -Y44- STATION 11+88.66, 25.5' LT TO -Y19- STATION 50+88.57, 22.0' RT*

RETAINING WALL NO. 2 FROM -Y19- STATION 47+85.00, 26.67' RT TO -Y19- STATION 50+20.00, 26.67' RT

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.

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

GOODNIGHT, D.J.

MID-ATLANTIC

INVESTIGATED BY *FALCON*

DRAWN BY *CROCKETT, S.C.*

CHECKED BY *HAMM, J. R.*

SUBMITTED BY *FALCON*

DATE *MAY 2020*

NORTH CAROLINA PROFESSIONAL SEAL 48207 ENGINEER STEPHEN C CROCKETT

DocuSigned by:
Stephen C Crockett 5/13/2020
C5CA5FED48E0435...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	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] CME-45B
- [ ] _____

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 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: ELEVATIONS TAKEN FROM R3300B_LS_TNL_190919.TIN
DATED 09/19

ELEVATION: FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-3300B	3

0 60 120
FEET

AN LIFT STA
BST
UNKNOWN STM
RIP RAP
FSS
44+00
45+00
-Y32-
JS NONMT
25' BST
TC
E
TWP (2)
TWP
FSS
END FENCE
EXISTING R/W RAD= 1660'
R/C
EXISTING R/W
265+00
267+00
269+00
10' ATT EASEMENT DB 3695 PG 163 DB 720 PG 180
WOODS
TWP
FQ
ATTENUATOR
ATTENUATOR
-L-
US 17/ NC 210 60' BST
BEGIN RETAINING WALL NO.2
-WL2- STA.10+00.00
-Y19- STA.47+85.00
26.67' RT
16" DI
END RETAINING WALL NO.2
-WL2- STA.12+35.0000
-Y19- STA.50+20.00
26.67' RT
50+00
BEGIN FENCE
EXISTING R/W VARIES
-Y19-
NW22-3
NW22-4
NW22-5
NW22-6
NW22-7
NW22-8
NW22-9
NW22-10
NW22-2
NW22-1
WOODS
JS NONMT
RAMP/DECK
GREU TL-3
55+00
-Y44-
CR
EXISTING R/W
PM
POOL
CONC
LT
AT-1
24' BST
23' BST
LEEWARD LN

-NW22- Sta.12+10.00 =
-Y19- Sta.47+88.57 (RT 22.0')

-NW22- Sta.11+95.00 =
-Y19- Sta.47+73.58 (RT 22.61')

-NW22- Sta.11+80.00 =
-Y19- Sta.47+58.70 (RT 24.54')

-NW22- Sta.11+65.00 =
-Y19- Sta.47+44.46 (RT 29.24')

-NW22- Sta.11+50.00 =
-Y44- Sta.10+39.04 (LT 28.56')

-NW22- Sta.11+35.00 =
-Y44- Sta.10+53.66 (LT 25.5')

BEGIN NOISE WALL 22 Sta.10+00.00 =
-Y44- Sta.11+88.66 (LT 25.5')

END NOISE WALL 22 Sta.15+10.00 =
-Y19- Sta.50+88.57 (RT 22.0')

NC GRID
NAD 83/NSRS 2007

0 100 200
FEET
VE = 2.5

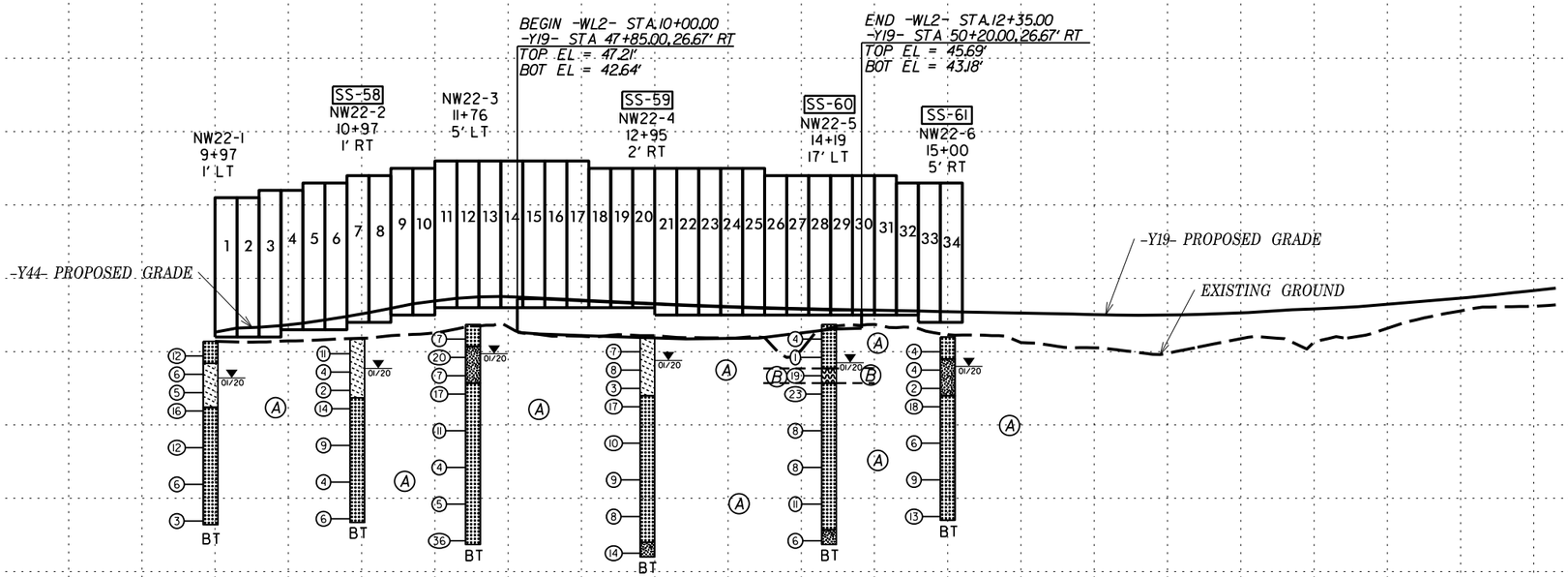
PROJECT REFERENCE NO.	SHEET NO.
R-3300B	4
NOISE WALL 22 AND RETAINING WALL 2 WALL PROFILES	

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-58	1 FT RT	10+97	6.0'-7.5'	A-2-4	NP	NP	8	83	1	8	100	100	10	31	4
SS-59	2 FT RT	12+95	6.0'-7.5'	A-2-4	NP	NP	12	73	6	9	100	98	16	66	10
SS-60	17 FT LT	14+19	28.5'-30.0'	A-2-4	18	2	40	45	1	14	99	82	16	20	-
SS-61	5 FT RT	15+00	6.0'-7.5'	A-2-4	NP	NP	9	75	1	15	100	99	18	37	-
SS-62	14 FT RT	-Y19- 51+78	3.5'-5.0'	A-2-4	NP	NP	7	74	6	13	100	100	20	32	6

(A) **UNDIVIDED COASTAL PLAIN:** TAN, BROWN, AND GRAY, MOIST TO SATURATED, V.LOOSE TO DENSE, SILTY SAND AND SAND (A-2-4, A-3), TRACE TO MODERATELY ORGANIC

(B) **UNDIVIDED COASTAL PLAIN:** ORGANICS (WOOD)



PANEL NUMBER	1-2	3-4	5-6	7-8	9-10	11-17	18-25	26-31	32-34
TOP ELEVATION	61'	62'	63'	64'	65'	66'	65'	64'	63'
PANEL(S) LENGTH	30'	30'	30'	30'	30'	105'	120'	90'	45'

NOTES:

ADOPTED FROM PLANS PROVIDED BY STANTEC DATED APRIL, 2020.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

-NW22-
-WL2-

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

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION NOISE WALL 22 FROM -Y10- STA. 47+25.36, 189.45' RT TO -Y19- STA. 55+06.18, 24.50' RT				**GROUND WTR (ft)**
BORING NO. NW22-1	**STATION** 9+97	**OFFSET** 1 ft LT	**ALIGNMENT** -NW22-	**0 HR.** 4.7
COLLAR ELEV. 41.4 ft	**TOTAL DEPTH** 25.0 ft	**NORTHING** 239,503	**EASTING** 2,402,005	**24 HR.** 5.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 01/30/20	**COMP. DATE** 01/30/20	**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)
45											
										41.4	0.0
										GROUND SURFACE	
40	40.4	1.0	5	7	5	12		M		**UNDIVIDED COASTAL PLAIN** TAN AND GRAY, F. SAND (A-3)	
	37.9	3.5	4	3	3	6				38.4	3.0
35	35.4	6.0	3	3	2	5		Sat.		BROWN, SILTY F. SAND (A-2-4) WITH LITTLE ORGANICS (WOOD FRAGMENTS)	
	32.9	8.5	1	6	10	16		Sat.		32.4	9.0
30										TAN AND LIGHT GRAY, F. SAND (A-3)	
	27.9	13.5	4	6	6	12		Sat.			
25											
	22.9	18.5	2	3	3	6		Sat.			
20											
	17.9	23.5	2	1	2	3		Sat.		16.4	25.0
										Boring Terminated at Elevation 16.4 ft IN UCP: SAND	

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION NOISE WALL 22 FROM -Y10- STA. 47+25.36, 189.45' RT TO -Y19- STA. 55+06.18, 24.50' RT				**GROUND WTR (ft)**
BORING NO. NW22-2	**STATION** 10+97	**OFFSET** 1 ft RT	**ALIGNMENT** -NW22-	**0 HR.** 3.4
COLLAR ELEV. 41.7 ft	**TOTAL DEPTH** 25.0 ft	**NORTHING** 239,581	**EASTING** 2,401,942	**24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 01/30/20	**COMP. DATE** 01/30/20	**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										
										41.7 GROUND SURFACE 0.0
40	40.7	1.0	5	6	5	11		M		**UNDIVIDED COASTAL PLAIN** GRAY AND BROWN, SLIGHTLY SILTY F. SAND (A-2-4) WITH LITTLE ORGANICS
	38.2	3.5	2	2	2	4				
35	35.7	6.0	WOH	1	1	2	SS-58	31%		33.7 8.0
	33.2	8.5	6	6	8	14		Sat.		TAN AND LIGHT GRAY, F. SAND (A-3) TRACE ORGANICS
30										
	28.2	13.5	3	4	5	9		Sat.		
25										
	23.2	18.5	2	2	2	4		Sat.		
20										
	18.2	23.5	3	3	3	6		Sat.		16.7 25.0
										Boring Terminated at Elevation 16.7 ft IN UCP: SAND

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.
SITE DESCRIPTION NOISE WALL 22 FROM -Y10- STA. 47+25.36, 189.45' RT TO -Y19- STA. 55+06.18, 24.50' RT			**GROUND WTR (ft)**
BORING NO. NW22-3	**STATION** 11+76	**OFFSET** 5 ft LT	**ALIGNMENT** -NW22- **0 HR.** 3.7
COLLAR ELEV. 43.7 ft	**TOTAL DEPTH** 30.0 ft	**NORTHING** 239,650	**EASTING** 2,401,912 **24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER WIGGINS, M.	**START DATE** 01/30/20	**COMP. DATE** 01/30/20	**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)
45										43.7 GROUND SURFACE	0.0
	42.7	1.0	2	3	4	7		M		**UNDIVIDED COASTAL PLAIN** LIGHT GRAY, F. SAND (A-3)	
40	40.2	3.5	8	10	10	20		Sat.		40.7 BROWN, SILTY F. SAND (A-2-4) WITH TRACE ORGANICS	3.0
	37.7	6.0	5	4	3	7		Sat.		35.7 TAN, F. SAND (A-3)	8.0
35	35.2	8.5	4	7	10	17					
30	30.2	13.5	3	4	7	11		Sat.			
25	25.2	18.5	4	2	2	4		Sat.			
20	20.2	23.5	3	2	3	5		Sat.			
15	15.2	28.5	15	19	17	36		Sat.		13.7 Boring Terminated at Elevation 13.7 ft IN UCP: SAND	30.0

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.
SITE DESCRIPTION NOISE WALL 22 FROM -Y10- STA. 47+25.36, 189.45' RT TO -Y19- STA. 55+06.18, 24.50' RT			**GROUND WTR (ft)**
BORING NO. NW22-4	**STATION** 12+95	**OFFSET** 2 ft RT	**ALIGNMENT** -NW22- **0 HR.** 3.6
COLLAR ELEV. 42.0 ft	**TOTAL DEPTH** 30.0 ft	**NORTHING** 239,728	**EASTING** 2,402,003 **24 HR.** 3.2
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER WIGGINS, M.	**START DATE** 01/29/20	**COMP. DATE** 01/29/20	**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										
	41.0	1.0	3	3	4	7				42.0 GROUND SURFACE 0.0
40	38.5	3.5	6	4	4	8		Sat.		**UNDIVIDED COASTAL PLAIN** DARK BROWN, SILTY F. SAND (A-2-4), MODERATELY ORGANIC
	36.0	6.0	2	1	2	3	SS-59	66%		34.0 TAN, F. SAND (A-3) 8.0
35	33.5	8.5	6	7	10	17		Sat.		
30	28.5	13.5	4	4	6	10		Sat.		
25	23.5	18.5	3	4	5	9		Sat.		
20	18.5	23.5	4	3	5	8		Sat.		
15	13.5	28.5	6	7	7	14		W		14.0 GRAY, SILTY SAND (A-2-4) 28.0 12.0 Boring Terminated at Elevation 12.0 ft IN UCP: SILTY SAND 30.0

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.
SITE DESCRIPTION NOISE WALL 22 FROM -Y10- STA. 47+25.36, 189.45' RT TO -Y19- STA. 55+06.18, 24.50' RT			**GROUND WTR (ft)**
BORING NO. NW22-5	**STATION** 14+19	**OFFSET** 17 ft LT	**ALIGNMENT** -NW22- **0 HR.** 3.9
COLLAR ELEV. 43.7 ft	**TOTAL DEPTH** 30.0 ft	**NORTHING** 239,825	**EASTING** 2,402,083 **24 HR.** 5.2
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER WIGGINS, M.	**START DATE** 01/29/20	**COMP. DATE** 01/29/20	**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)
45										43.7 GROUND SURFACE	0.0
	42.7	1.0	2	2	2	4		M		**UNDIVIDED COASTAL PLAIN** GRAY, TAN, AND BROWN, F. SAND (A-3)	
40	40.2	3.5	1	0	1	1					
	37.7	6.0	6	11	8	19				37.7 ORGANICS (WOOD)	6.0
35	35.2	8.5	7	10	13	23		Sat.		35.7 TAN, F. SAND (A-3) WITH INTERMITTENT LENSES OF SANDY CLAY	8.0
30	30.2	13.5	3	4	4	8		Sat.			
25	25.2	18.5	2	4	4	8		Sat.			
20	20.2	23.5	3	4	7	11		Sat.			
15	15.2	28.5	7	2	4	6	SS-60	20%		15.7 LIGHT GRAY, SILTY SAND (A-2-4)	28.0
										13.7 Boring Terminated at Elevation 13.7 ft IN UCP: CLAYEY SAND	30.0

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.
SITE DESCRIPTION NOISE WALL 22 FROM -Y10- STA. 47+25.36, 189.45' RT TO -Y19- STA. 55+06.18, 24.50' RT			**GROUND WTR (ft)**
BORING NO. NW22-6	**STATION** 15+00	**OFFSET** 5 ft RT	**ALIGNMENT** -NW22- **0 HR.** 3.4
COLLAR ELEV. 42.0 ft	**TOTAL DEPTH** 25.0 ft	**NORTHING** 239,863	**EASTING** 2,402,158 **24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER WIGGINS, M.	**START DATE** 01/29/20	**COMP. DATE** 01/29/20	**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											
	41.0	1.0	1	2	2	4				42.0 GROUND SURFACE	0.0
40	38.5	3.5	1	2	2	4		M		**UNDIVIDED COASTAL PLAIN** TAN AND GRAY, F. SAND (A-3)	
	36.0	6.0	WOH	WOH	2	2				39.0 DARK BROWN, SILTY F. SAND (A-2-4) WITH TRACE ORGANICS	3.0
35	33.5	8.5	6	8	10	18	SS-61	37%		34.0 TAN AND GRAY, F. SAND (A-3)	8.0
30	28.5	13.5	3	3	3	6		Sat.			
25	23.5	18.5	3	4	5	9		Sat.			
20	18.5	23.5	5	5	8	13		Sat.		17.0 Boring Terminated at Elevation 17.0 ft IN UCP: SAND	25.0

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION NOISE WALL 22 FROM -Y10- STA. 47+25.36, 189.45' RT TO -Y19- STA. 55+06.18, 24.50' RT				**GROUND WTR (ft)**
BORING NO. NW22-7	**STATION** 51+78	**OFFSET** 14 ft RT	**ALIGNMENT** -Y19-	**0 HR.** 1.4
COLLAR ELEV. 40.9 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 239,939	**EASTING** 2,402,223	**24 HR.** 3.1
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 01/29/20	**COMP. DATE** 01/29/20	**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)
										40.9	0.0
										GROUND SURFACE	
	39.9	1.0	2	2	3	5				**UNDIVIDED COASTAL PLAIN**	
	37.4	3.5	2	1	1	2				BROWN AND GRAY, SLIGHTLY SILTY F. SAND (A-3) WITH TRACE ORGANICS	
	34.9	6.0	1	1	1	2	SS-62	32%		37.9	3.0
	32.4	8.5	11	18	25	43		W		DARK BROWN, SILTY F. SAND (A-2-4), MODERATELY ORGANIC	
	27.4	13.5	4	7	8	15		W		32.9	8.0
	22.4	18.5	3	4	5	9		Sat.		TAN. F. SAND (A-3)	
								Sat.		20.9	20.0
										Boring Terminated at Elevation 20.9 ft IN UCP: SAND	

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.	
SITE DESCRIPTION NOISE WALL 22 FROM -Y10- STA. 47+25.36, 189.45' RT TO -Y19- STA. 55+06.18, 24.50' RT				**GROUND WTR (ft)**
BORING NO. NW22-8	**STATION** 52+76	**OFFSET** 14 ft RT	**ALIGNMENT** -Y19-	**0 HR.** 2.0
COLLAR ELEV. 42.2 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 240,005	**EASTING** 2,402,296	**24 HR.** 4.4
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER WIGGINS, M.	**START DATE** 01/29/20	**COMP. DATE** 01/29/20	**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
										42.2 GROUND SURFACE 0.0
	41.2	1.0	2	3	3	6		M		**UNDIVIDED COASTAL PLAIN** TAN-GRAY, F. SAND (A-3)
	38.7	3.5	4	4	6	10				39.2 3.0
	36.2	6.0	4	3	3	6		Sat.		DARK BROWN, SLIGHTLY SILTY F. SAND (A-2-4) WITH TRACE ORGANICS
	33.7	8.5	6	6	9	15		Sat.		34.2 8.0
	28.7	13.5	3	5	7	12		W		TAN, F. SAND (A-3)
	23.7	18.5	4	5	5	10		Sat.		22.2 20.0
										Boring Terminated at Elevation 22.2 ft IN UCP: SAND

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.
SITE DESCRIPTION NOISE WALL 22 FROM -Y10- STA. 47+25.36, 189.45' RT TO -Y19- STA. 55+06.18, 24.50' RT			**GROUND WTR (ft)**
BORING NO. NW22-9	**STATION** 53+84	**OFFSET** 22 ft RT	**ALIGNMENT** -Y19- **0 HR.** 2.4
COLLAR ELEV. 43.4 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 240,063	**EASTING** 2,402,381 **24 HR.** 4.0
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER WIGGINS, M.	**START DATE** 01/29/20	**COMP. DATE** 01/29/20	**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)
45											
										43.4	0.0
										GROUND SURFACE	
										UNDIVIDED COASTAL PLAIN	
										BROWN AND TAN, F. SAND (A-3)	
	42.4	1.0	4	4	3	7		M		40.4	3.0
40	39.9	3.5								TAN AND BROWN, SLIGHTLY SILTY F. SAND (A-2-4)	
			1	4	4	8					
	37.4	6.0						W			
			2	2	4	6				35.4	8.0
35	34.9	8.5								TAN, F. SAND (A-3)	
			3	3	3	6		Sat.			
30	29.9	13.5									
			2	5	7	12		Sat.			
25	24.9	18.5									
			5	6	6	12		W		23.4	20.0
										Boring Terminated at Elevation 23.4 ft IN UCP: SAND	

WBS 40237.1.1	**TIP** R-3300B	**COUNTY** PENDER	**GEOLOGIST** GOODNIGHT, D.J.								
SITE DESCRIPTION NOISE WALL 22 FROM -Y10- STA. 47+25.36, 189.45' RT TO -Y19- STA. 55+06.18, 24.50' RT			**GROUND WTR (ft)**								
BORING NO. NW22-10	**STATION** 54+92	**OFFSET** 24 ft RT	**ALIGNMENT** -Y19- **0 HR.** 1.5								
COLLAR ELEV. 46.2 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 240,090	**EASTING** 2,402,477 **24 HR.** 7.6								
DRILL RIG/HAMMER EFF./DATE MID1904 CME-45B 90% 03/01/2019		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic								
DRILLER WIGGINS, M.	**START DATE** 01/28/20	**COMP. DATE** 01/28/20	**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											
										46.2	0.0
										GROUND SURFACE	
										UNDIVIDED COASTAL PLAIN	
										TAN, BROWN, AND GRAY, F. SAND (A-3)	
45	45.2	1.0	1	2	2	4		M			
	42.7	3.5									
			2	2	2	4		W			
40	40.2	6.0								38.2	8.0
			3	4	5	9				DARK BROWN, SILTY F. SAND (A-2-4) WITH LITTLE ORGANICS	
	37.7	8.5						W			
			12	12	7	19					
35										34.2	12.0
	32.7	13.5								TAN, F. SAND (A-3)	
			12	22	24	46		W			
30											
	27.7	18.5									
			8	11	12	23		W		26.2	20.0
										Boring Terminated at Elevation 26.2 ft IN UCP: SAND	