300B K REFERENCE

SEE SHEET 3 FOR PLAN SHEET LAYOUT

AT TIME OF INVESTIGATION

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APPENDIX I **SHEETS** SPT & CPT LOGS 7 - 16

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

ROADWAY SUBSURFACE INVESTIGATION

> COUNTY _PENDER PROJECT DESCRIPTION NC 417 (HAMPSTEAD BYPASS) FROM SOUTH OF NC 210 TO US-17 NORTH OF HAMPSTEAD SITE DESCRIPTION HIGHWAY 17 NORTH AND SLOOP POINT LOOP ROAD SUBSIDANCE **INVESTIGATION** INVENTORY ADDENDUM

STATE PROJECT REFERENCE NO. 16 R-3300B

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 (1991) 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 SUBSUFFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BORCHOLE. 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 METHOL. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE OR 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 INTERRETATIONS 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:

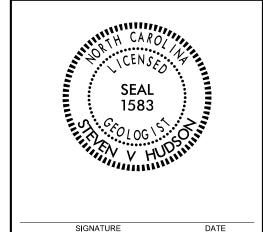
 1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.

 2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES BY 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.

L. G. PUGH D. T. CHALMERS, CWD **EDDIE SWAIN** INVESTIGATED BY S. V. HUDSON, LG DRAWN BY S. V. HUDSON, LG CHECKED BY __J. L. STONE, LG SUBMITTED BY S. V. HUDSON, LG



DATE __MAY 2020



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REPERENCE NO. SHEET NO. 2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED	TERMS AND DEFINITIONS
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	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.	ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM DI586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING:	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	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	AQUIFER - A WATER BEARING FORMATION OR STRATA.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK, ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
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	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	WEATHERED WAS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	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.
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERALOGICAL COMPOSITION	CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
LLASS. (\$\(\sigma\) 354 MASSING *2001 (>\(\sigma\) 354 PASSING *2001	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-0 A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-4-A-5 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
9999999999999	SLIGHTLY COMPRESSIBLE LL < 31	ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	OF SLOPE.
SYMBOL BOODGOOD STATE OF STATE	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
7. PASSING SILT- MUCK,	PERCENTAGE OF MATERIAL	(CP) SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*40 38 MX 58 MX 51 MN SOILS SOILS SOILS PEAT	GRANULAR SILT - CLAY	- WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
*200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL PASSING *40	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	HORIZONTAL.
LL	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF	<u>DIP DIRECTION (DIP AZIMUTH)</u> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
P1 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN MX MX 12 MX 11 MN 11 MN MX	GROUND WATER	OF A CRYSTALLINE NATURE.	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
ODCANIC SUILS		SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER OF MAJOR GRAYEL, AND SAND SOURCE AND SAND SOURCE.	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER 24 HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	<u> </u>	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	- SPRING OR SEEP	WITH FRESH ROCK.	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
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
PANCE OF STANDARD PANCE OF LINCONFINED		(MOD.SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTINESS OF PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) ROADWAY EMBANKMENT (RE) DIP & DIP DIRECTION OF ROCK STRUCTURES	<u>IF TESTED, WOULD YIELD SPT REFUSAL</u>	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
(N-VALUE) (TONS/FT²) VERY LOOSE < 4	┨ ╚┦	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT (SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	ITS LATERAL EXTENT.
GENERALLY LOOSE 4 TO 10	SOIL SYMBOL SOIL SYMBOL SLOPE INDICATOR INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
MATERIAL MEDIUM DENSE 10 10 30 N/A	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 50	THAN ROADWAY EMBANKMENT THOUGH BURNING TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0,25	— INFERRED SOIL BOUNDARY — CORE BORING ■ SOUNDING ROD	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MN MONITORING WELL TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BFF</u> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES,) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2	WITH COME	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	TTTTT ALLUVIAL SOIL BOUNDARY ALLUVIAL SOIL BOUNDARY INSTALLATION SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION - TAN UNCLASSIFIED EXCAVATION -	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	□ STABLE WASTE	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNCLASSIFIED EXCAVATION - UNDERCUT UNCLASSIFIED EXCAVATION - EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
(BLDR.) (COB.) (GR.) (SE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY MOD MODERATELY 7 - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 - DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE CHIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS) DESCRIPTION GOIDE FOR FIELD HOISTORE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH	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
(SAT.) FROM BELOW THE GROUND WATER TABLE	F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC SEMISOLID; REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE (PI) PL PLASTIC LIMIT	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING	BENCH MARK: BORING AND SOUNDING LOCATIONS AND ELEVATIONS
	EQUIPMENT USED ON SUBJECT PROJECT	TERM SPACING TERM THICKNESS VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	OBTAINED WITH A RTK VRS SURVEY GRADE GLOBAL POSITIONING SYSTEM
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: FEET
SL SHRINKAGE LIMIT	CME-45C CLAY BITS AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	6: CONTINUOUS ELICHT AUGER	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	FIAD = FILLED IMMEDIATELY AFTER DRILLING
	CME-55 8*HOLLOW AUGERS CORE SIZE: -BH	INDURATION	•
PLASTICITY		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	= CPT DATA OUT OF RANGE
PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC 0-5 VERY LOW	X CME-550	DURDING WITH FINCED EDEEC NUMEROUS CRAINS.	
SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST X CASING W/ ADVANCER HAND TOOLS:	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	_ _ _	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;	
COLOR	PORTABLE HOIST X TRICONE 2 15/6 STEEL TEETH HAND AUGER	BREAKS EASILY WHEN HIT WITH HAMMER.	
CULUN	X CPT TRICONE TUNGCARB. SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT VANE SHEAR TEST	CHARP HAMMER BLOWS REGULDED TO RREAK SAMPLE.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-1

3300B

STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

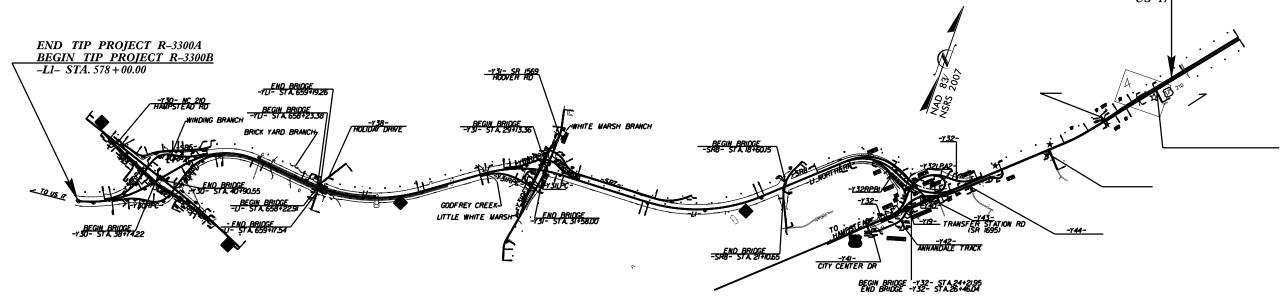
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3 16 R-3300B STATE PROJ. NO. 40237.1.1 40237.2.1 R/W

PENDER COUNTY

LOCATION: NC 417 (HAMPSTEAD BYPASS) FROM SOUTH OF NC 210 TO EAST OF SR 1563 (SLOOP POINT LOOP ROAD).

TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURES, SIGNALS, AND CULVERTS



INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION -PART OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF HAMPSTEAD. -THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.

END TIP PROJECT R-3300B

-L- STA. 332 + 54.76

GRAPHIC SCALES DESIGN DATA ADT 2016 = N/A

PROFILE (HORIZONTAL)

ADT 2040 = 55,400DHV = 8 % D = 60 %

T = 6 % *V = 70 MPH*(TTST 2% + DUALS 4%) FUNC CLASS = FREEWAY PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-3300B = 6.893 MILES LENGTH STRUCTURE TIP PROJECT R-3300B = 0.023 MILES TOTAL LENGTH TIP PROJECT R-3300B = 6.916 MILES

PREPARED IN THE OFFICE OF:

STANTEC CONSULTING
801 Jones Franklin Road | Suite 300 | Raleigh, NC 27606
Tel. (919) 851-686 | Fax. (919) 851-7024 | www.stantec.co **Stantec** FOR THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION 2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: MICHAEL D. LINDGREN, P.E. APRIL 1, 2019 LETTING DATE: SEPTEMBER 10, 2020

ROADWAY DESIGN **ENGINEER**

HYDRAULICS ENGINEERS



REGIONAL TIER

TRACE HOWELL, P.E.

-CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY MODIFIED METHOD III.

WBS Number: 40237.1.1
TIP Number: R-3300B
F.A .Project N/A
County: Pender

Description: NC 417 (Hampstead Bypass) From South of NC 210 to US-17 North of

Hampstea

Site Description: Highway 17 North and Sloop Point Loop Road Subsidence Investigation

CATLIN Number: 220033

SUBJECT: Geotechnical Inventory Report Addendum

Project Description

This project begins at the northern terminus of NCDOT TIP Project R-3300A, north of Wilmington and extends northward for approximately 6± miles. This Geotechnical Investigation Addendum (Addendum) was confined to an area of observed subsidence along existing US Highway 17 North (Alignment -LRT-) between approximate Stations 317+00 and 330+00. Alignment -LRT- was previously investigated by Falcon Engineering under TIP U-5732.

Fieldwork associated with this Addendum was conducted from in March 2020. Twelve Cone Penetration Tests (CPT) borings were advanced at approximately 100 foot intervals along -LRT- then three (3) Standard Penetration Tests (SPT) borings were advanced adjacent to three (3) of the CPT borings to facilitate collection of representative soil samples in addition to identifying materials which the CPT was unable to penetrate. Representative soil samples have been collected for visual classification in the field and for laboratory analysis. A subsurface profile along the area of investigation including laboratory analytical results is included in this report.

Areas of Special Geotechnical Interest

- 1) The entire area of investigation exhibit high groundwater.
- 2) The following sections contain organic soils that have the potential to cause embankment/subgrade and or slope stability problems during construction.

<u>Line</u>	Station (±)
-LRT-	317+00 to 319+73
-LRT-	320+13 to 321+90
-LRT-	326+13 to 327+84

3) No cohesive soils that have the potential to cause embankment/subgrade and or slope stability problems during construction were identified during this Addendum investigation.

Sheet 3A

- 4) No water wells were encountered.
- 5) No ponds were encountered in the vicinity of this investigation.

Physiography and Geology

This project corridor is located within the Coastal Plain Physiographic Province. Topography along the project is nearly flat to gently sloping. Ground elevations range from $20\pm$ to $65\pm$ feet above sea level.

Surficial soils in this area are generally classified as alluvial and undivided coastal plain sediments.

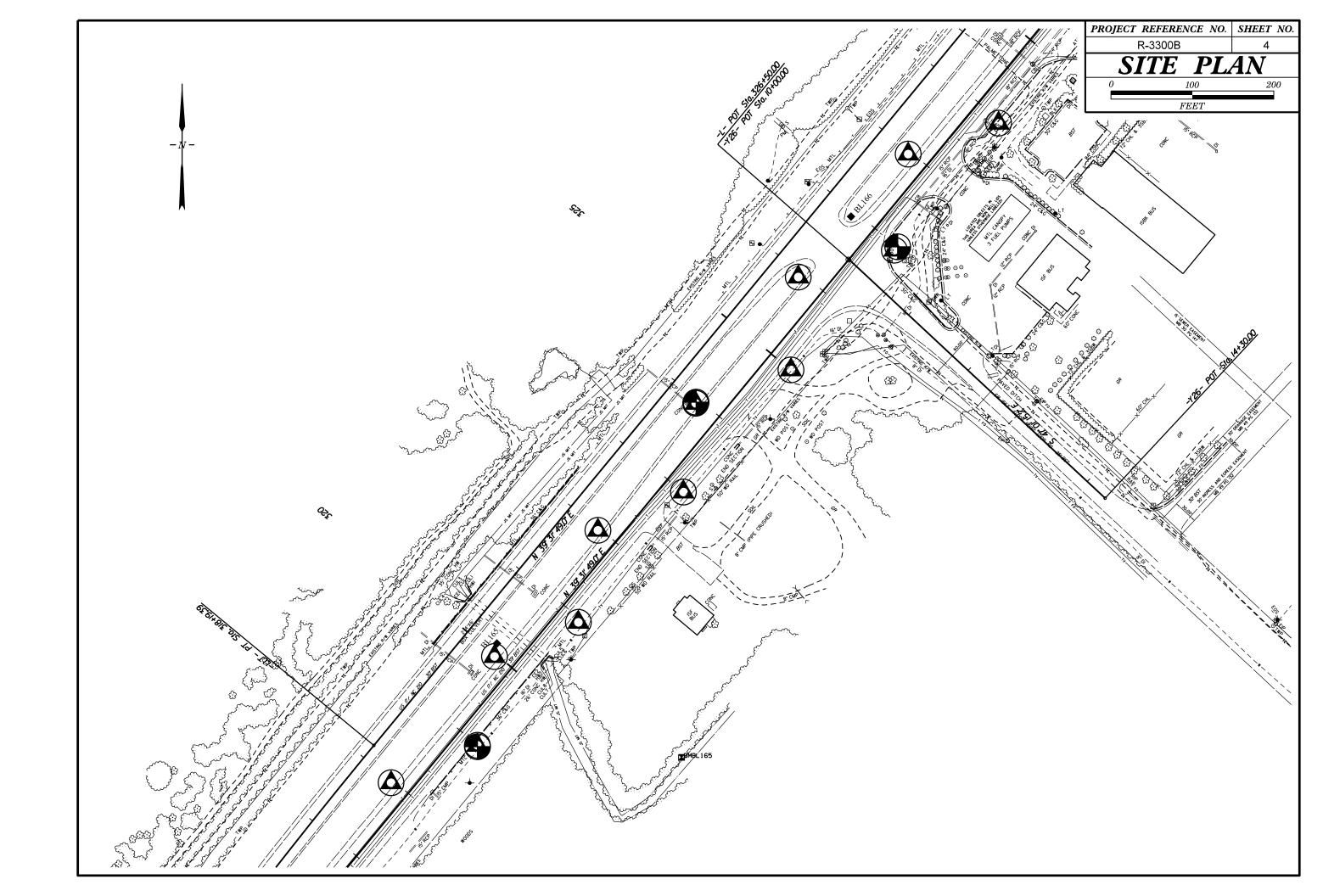
Ground Water

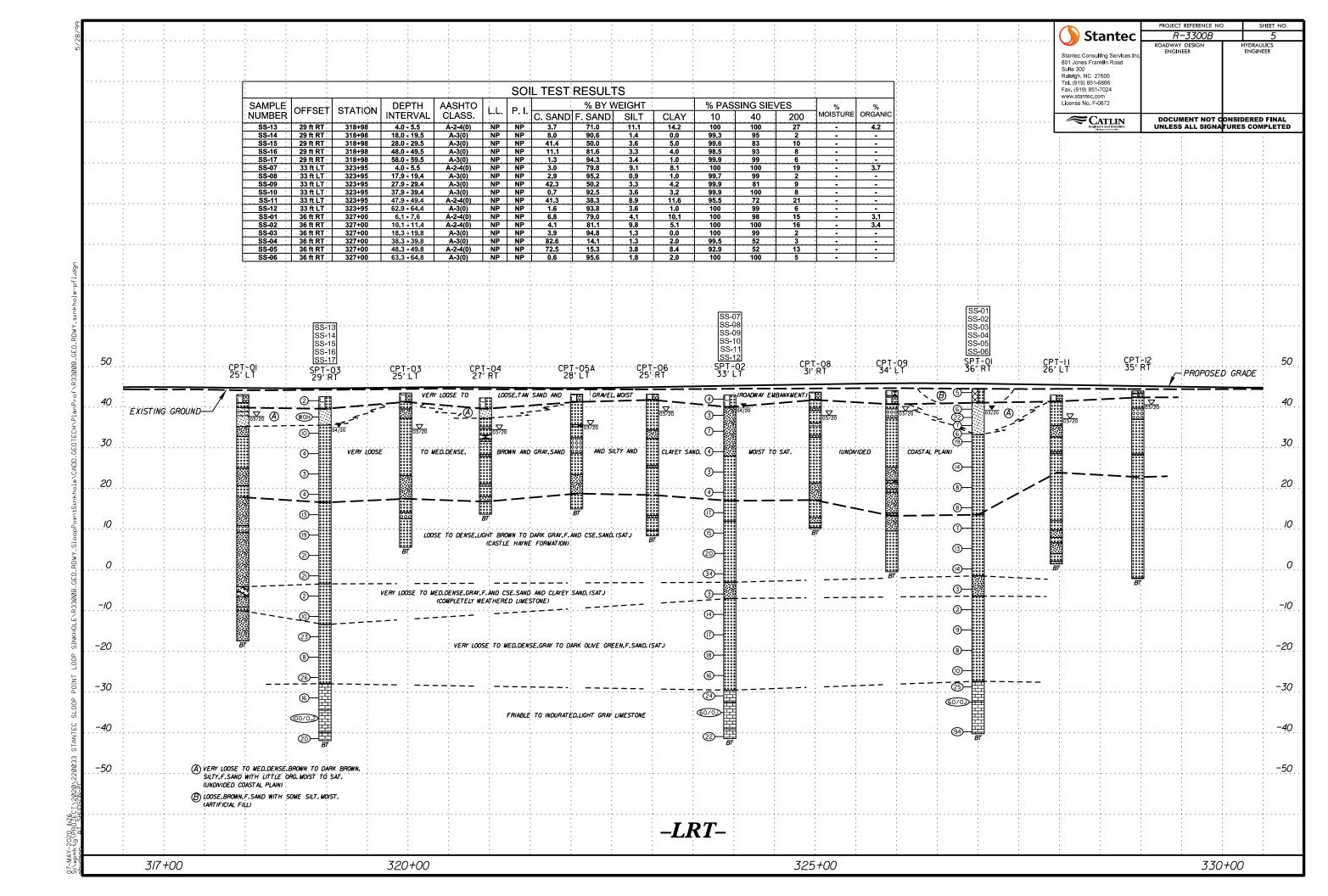
Groundwater was measured in open boreholes 24 hours subsequent to borehole completion of SPT borings at depths ranging from 3.2 feet to 7.6 feet below existing land surface (BLS). Pore pressure measurements were used from the CPT borings to estimate groundwater depths; these estimated values ranged from 3.4 to 8.9 feet BLS with an average depth of 5.8 feet BLS.

Soils

Soils encountered along the area of investigation include roadway embankment, artificial fill, undivided coastal plain sediments, and those belonging to the Castle Hayne Formation.

- Roadway Embankment soils were identified adjacent to existing roadways and consists of 2± to 3± feet of very loose to loose, sand and silty sand (A-3, A-2-4, and A-1).
- Artificial fill consisting of 3± feet of loose sand (A-3) was encountered adjacent to an existing business located near the intersection of US 17 North and Sloop Point Loop Road.
- Undivided Coastal Plain (U.C.P) soils primarily consist of approximately 23 feet of very loose to medium dense sand and clayey and clayey sand (A-3, A-2-4 and A-2-6). Organic soils were also encountered above the sands. They are primarily comprised of 4± to 8± feet of very loose to medium dense silty sand with trace to moderate organic matter. Laboratory analysis of these organic soils returned organic contents ranging from 3.1% to 4.2%.
- The Castle Hayne Formation underlies the U.C.P. soils along the area of investigation at an average elevation of approximately 17 feet. A loose to dense layer of fine and coarse sand was identigied to an average elevation of -3± where an approximate two (2) to three (3) foot thick layer of very loose to medium sand and clayey sand that resembled "completely" weathered limestone was encountered. Very loose to medium dense sand was described beneath the weathered limestone to an average elevation of -28± feet where friable to moderately indurated limestone was encountered in the SPT borings to their termination ranging from 84.5 to 84.8 feet BLS.





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

APPENDIX I BORING LOGS



		PENETROMETER T ORING REPORT	EST						220033	3 220 Old Dairy Roak Wilmington, NC 284 Corporate Licensure No. for Engineering Se	Scientists	EFERENCE NO. SHER 3300B 7
WBS: 40237.1.1		OUNTY: PENDER	GEOLOGIST: S. HUDSON		WBS: 4	40237.1.1	TIP : R-33	800B COL	JNTY: PENDER		GEOLOGIST: S. HU	DSON
SITE DESCRIPTION: HWY 17	NORTH AND SLOOP POINT LO	OP ROAD		GROUND WTR (ft)	SITE DE	SCRIPTION: HV	VY 17 NORTH AND SL	OOP POINT LOOF	ROAD		_	GROUND WTR (f
BORING NO.: CPT-01	STATION : 317+97	OFFSET: 25 ft LT	ALIGNMENT: -L-	EST. 0 HR. 5.4	BORING	NO.: CPT-02	STATION:	318+99	OFFSET: 2	28 ft RT	ALIGNMENT: -L-	EST. 0 HR. 4.
COLLAR ELEV.: 43.1 ft	TOTAL DEPTH: 60.5 ft	NORTHING: 243,728	EASTING: 2,405,807	24 HR. N/A	COLLA	R ELEV.: 42.9 ft	TOTAL DE	EPTH: 60.5 ft	NORTHING:	: 243,774	EASTING : 2,405,913	3 24 HR. N/.
CPT RIG/MAX. DOWN PRESSURE:	CATLIN CPT/DPT-01 / 9 tons - NO AND	CHORS CONE TYPE: TYPE	PE II PIEZOCONE CO	ONE ID: DSG0867	CPT RIG/I	MAX. DOWN PRESSI	URE: CATLIN CPT/DPT-0	01 / 9 tons - NO ANCHO	DRS	CONE TYPE: TYPE	II PIEZOCONE	CONE ID: DSG0867
DRILLER: EDDIE SWAIN	OPERATOR: CATLIN			ATER DEPTH: N/A	DRILLE	R: EDDIE SWAII			START DATE: 0			RF. WATER DEPTH: N/A
ELEV DEP. (ft) (ft) (ft) FRICTION (tsf) CONE (tsf) 1,5 1,0 0,5 0 50 1001:	RESISTANCE FRICTION RATIO (%) 50 200 250 300 350	PORE PRESSURE (tsf) EQUIVALENT SPT N _{60%} 8 1	TYPE (QT)(1990) O	UNDRAINED SHEAR	ELEV DEP (ft) (ft)	FRICTION (tsf) . 1,5 1,0 0,5 5(CONE RESISTANCE (tsf) 0 100150200250300350	FRICTION RATIO (%) 0 1 2 3 4 : : : :	PORE PRESSURE (tsf)	EQUIVALENT SPT N _{60%} 30 25 50 75 : :	SOIL BEHAVIOR TYPE (QT)(1990) : : 1 2 3 4 5 6 7 8 : : : : : : : : : : : : : : : : : :	L UNDRAINED SHEAR O Sμ (tsf) G 0 5 10
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55 55	<i>\$</i>				-10 	3						

PROJECT REFERENCE NO. SHEET GEOTECHNICAL BORING REPORT CATLIN Engineers and Scientists R-3300B 8 **BORE LOG** GEOLOGIST: L. PUGH **TIP**: R-3300B COUNTY: PENDER COUNTY: PENDER GEOLOGIST: L. PUGH WBS: 40237.1.1 WBS: 40237.1.1 TIP: R-3300B SITE DESCRIPTION: HWY 17 NORTH AND SLOOP POINT LOOP ROAD **GROUND WTR (ft)** SITE DESCRIPTION: HWY 17 NORTH AND SLOOP POINT LOOP ROAD **GROUND WTR (ft)** OFFSET: 29 ft RT ALIGNMENT: -L-OFFSET: 29 ft RT ALIGNMENT: -L-**BORING NO.:** SPT-03 **STATION**: 318+98 0 HR. 5.1 BORING NO.: SPT-03 **STATION**: 318+98 0 HR. 5.1 **EASTING:** 2,405,913 COLLAR ELEV.: 42.6 ft TOTAL DEPTH: 84.5 ft **NORTHING:** 243,772 **EASTING**: 2,405,913 TOTAL DEPTH: 84.5 ft **NORTHING**: 243,772 24 HR. 7.6 COLLAR ELEV.: 42.6 ft 24 HR. 7.6 **DRILL RIG/HAMMER EFF./DATE:** CAT1303 CME-550 93.7% 03/11/2020 **DRILL METHOD:** MUD ROTARY **HAMMER TYPE: AUTOMATIC DRILL RIG/HAMMER EFF./DATE:** CAT1303 CME-550 93.7% 03/11/2020 DRILL METHOD: MUD ROTARY HAMMER TYPE: AUTOMATIC **DRILLER:** D.T. CHALMERS. JR. **START DATE:** 03/31/20 COMP. DATE: 03/31/20 SURFACE WATER DEPTH: N/A **DRILLER:** D.T. CHALMERS, JR. START DATE: 03/31/20 COMP. DATE: 03/31/20 SURFACE WATER DEPTH: N/A ELEV DRIVE DEPTH BLOW COUNT ELEV DRIVE DEPTH BLOW COUNT **BLOWS PER FOOT BLOWS PER FOOT** SAMP # SAMP SOIL AND ROCK DESCRIPTION SOIL AND ROCK DESCRIPTION RESULT (ft) RESUL (ft) (ft) 0.5ft 0.5ft 0.5ft 0.5ft 0.5ft 0.5ft 75 100 MOI G 50 75 100 (ft) ELEV. (ft) DEPTH (ft Match Line <u>-35</u> <u>-35.4 78.0 100/0.;</u> NO RECOVERY FROM SAMPLE - CUTTING Sat. **GROUND SURFACE** INDICATE LIMESTONE (continued) 42.6 ROADWAY EMBANKMENT M BROWN, F. SAND -40 -40.4 + 83.0 LIGHT GRAY, WEATHERED LIMESTONE UNDIVIDED COASTAL PLAIN worl worl worl DARK BROWN, SILTY, F. SAND, WITH SS-13 A-2-4(0) Sat. Boring Terminated at Elevation -41.9 ft IN LITTLE (4.2%) ORGANICS MOD. INDURATED WEATHERED - - - . LIMESTONE (CASTLE HAYNE BROWN TO LIGHT BROWN, F. SAND 34.6 FORMATION) Sat. 29.6 2 Sat. 24.6 + 18.0 SS-14 A-3(0) Sat. 20 19.6 + 23.0 Sat. COASTAL PLAIN SEDIMENTARY ROCK 14.6 + 28.0 DARK GRAY GRADING TO GRAY-BROWN, Sat. A-3(0) (CASTLE HAYNE FORMATION) Sat. - - - -10 F. SAND Sat. Sat. DARK GRAY, F. SAND WITH LITTLE CSE. SS-16 A-3(0) Sat. -10.4 + 53.0 5 Sat. DARK OLIVE GREEN, F. SAND 56.0 -15.4 SS-17 A-3(0) Sat. . . . -20 Sat. -25.4 + 68.0Sat. LIGHT GRAY, WEATHERED LIMESTONE Sat.

			ENETRON ORING RE	METER TE	ST								2200	CATLIN S 33 220 Old Dairy Road Willmington, NC 28060 Corporate Licensure No. for Engineering Servi		efere 3300E	
WBS: 40237.1.1	TIP:		OUNTY: PENDER		GEOLOGIST: S. HU	DSON		WBS : 4	0237.1.1		TIP : R-33	00B CO	UNTY: PENDER	 {	GEOLOGIST: S. HU	DSON	
SITE DESCRIPTION	ON: HWY 17 NORTH AN	D SLOOP POINT LOC	OP ROAD		'		GROUND WTR (ft)	SITE DES	SCRIPTION:	HWY 17	NORTH AND SL	OOP POINT LOC	P ROAD				GROUND WTR (ft)
BORING NO.: C	PT-03 STAT	ON : 319+97	OFFSET: 2	25 ft LT	ALIGNMENT: -L-		EST. 0 HR. 8.9	BORING	NO.: CPT-0	04	STATION:	320+95	OFFSET:	27 ft RT	ALIGNMENT: -L-		EST. 0 HR. 7.8
COLLAR ELEV.:	43.5 ft TOTA	L DEPTH: 37.9 ft	NORTHING:	243,883	EASTING: 2,405,934	1	24 HR. N/A	COLLAR	ELEV .: 42	.3 ft	TOTAL DE	PTH : 28.6 ft	NORTHING	: 243,925	EASTING: 2,406,037	7	24 HR. N/A
CPT RIG/MAX. DOW	N PRESSURE: CATLIN CPT/	OPT-01 / 9 tons - NO ANCI	HORS	CONE TYPE: TYPE I	I PIEZOCONE	CC	ONE ID: DSG0867	CPT RIG/M	AX. DOWN PR	RESSURE:	CATLIN CPT/DPT-0	01 / 9 tons - NO ANCH	ORS	CONE TYPE: TYPE II	PIEZOCONE	CON	IE ID: DSG0867
DRILLER: EDDI	E SWAIN OPERATO	R: CATLIN	START DATE: 0	3/17/20 COMP . C	DATE: 03/17/20 SU	RF. W	ATER DEPTH: N/A	DRILLER	: EDDIE S'	WAIN	OPERATOR: (CATLIN	START DATE:	03/16/20 COMP. D	ATE: 03/16/20 SU	RF. WA	TER DEPTH: N/A
ELEV DEP. (tsf)	CONE RESISTANCE (tsf) 1 0 50 100 150 200 250 300 3	FRICTION RATIO (%)	PORE PRESSURE (tsf)	EQUIVALENT SPT N _{60%}	SOIL BEHAVIOR TYPE (QT)(1990)	L O	UNDRAINED SHEAR Sµ (tsf)	ELEV DEP.	FRICTION (tsf)		E RESISTANCE (tsf)	FRICTION RATIO (%) 0 2 4 6 8	PORE PRESSURE (tsf)	11	SOIL BEHAVIOR TYPE (QT)(1990)	LO	UNDRAINED SHEAR Sµ (tsf)
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			NETRON RING RE	METER TE	ST								220033	CATLIN SE 220 Old Dairy Road Willmington, NC 28405 Corporate Licensure No. for Engineering Service	projects PROJECT RE	EFERE 300E	
WBS : 40237.1.1	TIP: R-330		NTY: PENDER		GEOLOGIST: S. HU	DSON	N	WBS : 4	0237.1.1		TIP : R-33	00B COL	JNTY: PENDER		GEOLOGIST: S. HUE	DSON	
SITE DESCRIPTION: HWY	17 NORTH AND SLO	OOP POINT LOOF	ROAD				GROUND WTR (ft)	SITE DES	SCRIPTION	: HWY 17 I	NORTH AND SL	OOP POINT LOOF	PROAD	-			GROUND WTR (ft)
BORING NO.: CPT-05	STATION:	321+97	OFFSET: 2	6 ft LT	ALIGNMENT: -L-		EST. 0 HR. 8.4	BORING	NO.: CPT-	-05A	STATION:	322+07	OFFSET: 2	3 ft LT	ALIGNMENT: -L-		EST. 0 HR. 7.6
COLLAR ELEV.: 43.2 ft	TOTAL DEF	PTH: 16.2 ft	NORTHING:	244,038	EASTING: 2,406,06	1	24 HR. N/A	COLLAR	ELEV .: 43	3.2 ft	TOTAL DE	PTH : 28.2 ft	NORTHING:	244,047	EASTING: 2,406,066	i	24 HR. N/A
CPT RIG/MAX. DOWN PRESSURE	E: CATLIN CPT/DPT-01	1 / 9 tons - NO ANCHO	DRS	CONE TYPE: TYPE I	I PIEZOCONE	C	ONE ID: DSG0867	CPT RIG/M	AX. DOWN P	RESSURE: (CATLIN CPT/DPT-0	1 / 9 tons - NO ANCHO	ORS (ONE TYPE: TYPE II	PIEZOCONE	CON	E ID: DSG0867
DRILLER: EDDIE SWAIN	OPERATOR: C	CATLIN S	START DATE: 0	3/18/20 COMP. C	DATE: 03/18/20 SU	RF. W	VATER DEPTH: N/A	DRILLER	: EDDIE S	SWAIN	OPERATOR: (CATLIN	START DATE: 03	/18/20 COMP. D	ATE: 03/18/20 SUF	RF. WA	TER DEPTH: N/A
ELEV DEP. /tef)	ONE RESISTANCE (tsf)	FRICTION RATIO (%)	PORE PRESSURE (tsf)	EQUIVALENT SPT N _{60%}	SOIL BEHAVIOR TYPE (QT)(1990)	L O	UNDRAINED SHEAR Sµ (tsf)	ELEV DEP.	FRICTION (tsf)		RESISTANCE (tsf)	FRICTION RATIO (%)	PORE PRESSURE (tsf)	EQUIVALENT SPT N _{60%}	SOIL BEHAVIOR TYPE (QT)(1990)	L O	UNDRAINED SHEAR Sµ (tsf)
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							PRESSURE)	20		{ }		3]			3
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																	Boring Terminated WITH CONE PENETRATION
02/																	TEST REFUSAL at Elevation 15.0 ft
02/00																	(0 HR. GROUNDWATER ESTIMATED FROM PORE PRESSURE)
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CONE PENETROMETER BORING REPORT	TEST		220033 Carpinate Licenser Mo. (Ir September) English Road Corporate Licensers Mo. (Ir September) Services (Ir September	PROJECT REFERENCE NO. SHEET R-3300B 11
WBS: 40237.1.1 TIP: R-3300B COUNTY: PENDER	GEOLOGIST: S. HUDSON	WBS: 40237.1.1 TIP: R-3300B CO	UNTY: PENDER	GEOLOGIST: S. HUDSON
SITE DESCRIPTION: HWY 17 NORTH AND SLOOP POINT LOOP ROAD	GROUND WTR (ft)	SITE DESCRIPTION: HWY 17 NORTH AND SLOOP POINT LOC	P ROAD	GROUND WTR (ft)
BORING NO.: CPT-06 STATION: 323+00 OFFSET: 25 ft RT	ALIGNMENT: -L- EST. 0 HR. 4.2	BORING NO.: CPT-07 STATION: 323+94	OFFSET: 33 ft LT	ALIGNMENT: -L- EST. 0 HR. 4.8
COLLAR ELEV.: 43.2 ft TOTAL DEPTH: 34.8 ft NORTHING: 244,085	EASTING: 2,406,166 24 HR. N/A	COLLAR ELEV.: 43.0 ft TOTAL DEPTH: 44.2 ft	NORTHING: 244,194	EASTING : 2,406,181 24 HR . N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / 9 tons - NO ANCHORS CONE TYPE:	YPE II PIEZOCONE CONE ID: DSG0867	CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / 9 tons - NO ANCH	ORS CONE TYPE: TYPE II P	PIEZOCONE CONE ID: DSG0867
DRILLER: EDDIE SWAIN OPERATOR: CATLIN START DATE: 03/16/20 CO	MP. DATE: 03/16/20 SURF. WATER DEPTH: N/A	DRILLER: EDDIE SWAIN OPERATOR: CATLIN	START DATE: 03/18/20 COMP. DA	ATE: 03/18/20 SURF. WATER DEPTH: N/A
ELEV DEP. FRICTION CONE RESISTANCE FRICTION PORE EQUIVALE FRICTION PRESSURE (tsf) SPT N ₅₀	NT SOIL BEHAVIOR L UNDRAINED SHEAR TYPE (QT)(1990) O Sµ (tsf)	ELEV DEP. (tsf) CONE RESISTANCE FRICTION RATIO (%)	PORE EQUIVALENT PRESSURE (tsf) SPT N _{60%}	SOIL BEHAVIOR L UNDRAINED SHEAR TYPE (QT)(1990) O Sµ (tsf)
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	Boring Terminated WITH CONE PENETRATION TEST REFUSAL at			
	Elevation 8.4 ft (0 HR. GROUNDWATER	40		
	ESTIMATED FROM PORE PRESSURE)			
			1 1	Boring Terminated WITH
				CONE PENETRATION TEST REFUSAL at Elevation -1.2 ft
				(0 HR. GROUNDWATER ESTIMATED FROM PORE
				PRESSURE)

SHEET GEOTECHNICAL BORING REPORT CATLIN Engineers and Scientists PROJECT REFERENCE NO. R-3300B **BORE LOG** GEOLOGIST: L. PUGH COUNTY: PENDER GEOLOGIST: L. PUGH WBS: 40237.1.1 **TIP**: R-3300B WBS: 40237.1.1 **TIP:** R-3300B COUNTY: PENDER SITE DESCRIPTION: HWY 17 NORTH AND SLOOP POINT LOOP ROAD **GROUND WTR (ft)** SITE DESCRIPTION: HWY 17 NORTH AND SLOOP POINT LOOP ROAD **GROUND WTR (ft)** ALIGNMENT: -L-OFFSET: 33 ft LT **BORING NO.:** SPT-02 **STATION**: 323+95 OFFSET: 33 ft LT 0 HR. 3.8 BORING NO.: SPT-02 **STATION**: 323+95 ALIGNMENT: -L-0 HR. 3.8 TOTAL DEPTH: 84.4 ft **NORTHING:** 244,195 **EASTING**: 2,406,182 TOTAL DEPTH: 84.4 ft **NORTHING**: 244,195 COLLAR ELEV.: 43.0 ft 24 HR. 3.2 COLLAR ELEV.: 43.0 ft **EASTING**: 2,406,182 24 HR. 3.2 DRILL RIG/HAMMER EFF./DATE: CAT1303 CME-550 93.7% 03/11/2020 **DRILL METHOD:** MUD ROTARY **HAMMER TYPE: AUTOMATIC** DRILL RIG/HAMMER EFF./DATE: CAT1303 CME-550 93.7% 03/11/2020 **DRILL METHOD:** MUD ROTARY **HAMMER TYPE: AUTOMATIC** DRILLER: D.T. CHALMERS. JR. | START DATE: 03/31/20 COMP. DATE: 03/31/20 SURFACE WATER DEPTH: N/A **DRILLER:** D.T. CHALMERS, JR. **START DATE:** 03/31/20 COMP. DATE: 03/31/20 SURFACE WATER DEPTH: N/A ELEV DRIVE DEPTH BLOW COUNT ELEV DRIVE DEPTH BLOW COUNT **BLOWS PER FOOT BLOWS PER FOOT** SAMP # SAMP SOIL AND ROCK DESCRIPTION SOIL AND ROCK DESCRIPTION RESULT (ft) (ft) RESUL (ft) (ft) 0.5ft 0.5ft 0.5ft 0.5ft 0.5ft 0.5ft 75 100 MOI G (ft) 50 75 100 ELEV. (ft) DEPTH (ft Match Line -35 60/0.1 NO RECOVERY FROM SAMPLE - CUTTING **GROUND SURFACE** 43.0 INDICATE LIMESTONE (continued) ROADWAY EMBANKMENT M LIGHT GRAY, WEATHERED LIMESTONE -40 <u>-39.9 T 82.9</u> UNDIVIDED COASTAL PLAIN 13 39.0 Sat. LIGHT BROWN, SILTY AND CLAYEY, F. SS-07 A-2-4(0) Sat. Boring Terminated at Elevation -41.4 ft IN SAND GRADING TO F. SAND MOD. INDURATED WEATHERED LIMESTONE (CASTLE HAYNE FORMATION) - - - . 35.1 Sat. 30.1 Sat. 15.0 25.1 SS-08 Sat. 20 20.1 1 22.9 Sat. COASTAL PLAIN DARK GRAY, F. AND CSE. SAND SS-09 A-3(0) Sat. (CASTLE HAYNE FORMATION) LIGHT BROWN TO GRAY BROWN, F. SAND 10.1 Sat. Sat. 12 22 Sat. GRAY, CSE. AND F. SAND WITH LITTLE (COMPLETELY WEATHERED LIMESTONE) Sat. SS-11 A-2-4(0) GRAY BROWN GRADING TO DARK OLIVE 5 Sat. -14.9 <u>T</u> 57.9 6 Sat. -19.9 **T** 62.9 Sat. A-3(0) <u>-24.9 T 67.9</u> Sat. -29.9 1 72.9 LIGHT GRAY, WEATHERED LIMESTONE 10 Sat. NO RECOVERY FROM SAMPLE - CUTTING INDICATE LIMESTONE

				ENETROI DRING RE	METER TE	ST								220033	CATLIN E 220 Old Dairy Road Wilmington, NC 28405 Corporate Licensure No. for Engineering Service	PROJECT RE	EFERE	
WBS:	40237.1.1	TIP : R-33		UNTY: PENDER		GEOLOGIST: S. HU	DSON		WBS: 4	0237.1.1		TIP : R-33	00B CO L	JNTY: PENDER		GEOLOGIST: S. HUE	DSON	
SITE D	ESCRIPTION:	HWY 17 NORTH AND SI				l		GROUND WTR (ft)					OOP POINT LOOF					GROUND WTR (ft)
BORIN	G NO. : CPT-08	STATION:	325+00	OFFSET:	31 ft RT	ALIGNMENT: -L-		EST. 0 HR. 5.7	BORING	NO .: C	PT-09	STATION:	325+94	OFFSET: 3	4 ft LT	ALIGNMENT: -L-		EST. 0 HR. 5.1
COLLA	AR ELEV.: 43.7	7 ft TOTAL DI	EPTH: 33.5 ft	NORTHING	: 244,235	EASTING: 2,406,298	3	24 HR. N/A	COLLAR	ELEV.:	44.1 ft	TOTAL DE	PTH: 44.5 ft	NORTHING:	244,349	EASTING: 2,406,307	,	24 HR. N/A
CPT RIG	6/MAX. DOWN PRE	SSURE: CATLIN CPT/DPT-	01 / 9 tons - NO ANCH	IORS	CONE TYPE: TYPE I	I PIEZOCONE	СС	ONE ID: DSG0867	CPT RIG/M	IAX. DOW	N PRESSURE:	CATLIN CPT/DPT-0	11 / 9 tons - NO ANCHO	ORS	CONE TYPE: TYPE II	PIEZOCONE	CON	E ID : DSG0867
DRILLI	ER: EDDIE SW	/AIN OPERATOR :	CATLIN	START DATE: (03/19/20 COMP. [DATE: 03/19/20 SU	RF. W	ATER DEPTH: N/A	DRILLER	R: EDDI	E SWAIN	OPERATOR:	CATLIN S	START DATE: 03	3/18/20 COMP. D	ATE: 03/18/20 SUF	RF. WA	TER DEPTH: N/A
ELEV DE	FRICTION (tsf)	CONE RESISTANCE (tsf)	FRICTION RATIO (%)	PORE PRESSURE (tsf)	EQUIVALENT SPT N _{60%}	SOIL BEHAVIOR TYPE (QT)(1990)	L O	UNDRAINED SHEAR Sµ (tsf)	ELEV DEP.	FRICTI (tsf)		IE RESISTANCE	FRICTION RATIO (%)	PORE PRESSURE (tsf)	EQUIVALENT SPT N _{60%}	SOIL BEHAVIOR TYPE (QT)(1990)	L	UNDRAINED SHEAR Su (tsf)
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02/06					<u>- </u>		0000	Boring Terminated WITH	10 35	ļ .						A-7		
GDT								Boring Terminated WITH CONE PENETRATION TEST REFUSAL at		ļ <u>.</u>								
								Elevation 10.2 ft (0 HR. GROUNDWATER	5	ļ .								 :
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NCDOT CPT DOUBLE (PORTRAIT) NO-LITH R3300B_RDWY_SLOOPPOINT_SINKHOLE.GPJ N									0									Boring Terminated WITH CONE PENETRATION TEST REFUSAL at Elevation -0.4 ft (0 HR. GROUNDWATER ESTIMATED FROM PORE PRESSURE)

				NETROI PRING RE	METER TE	ST								220033	CATLIN S 220 Old Dairy Road Wilmington, NC 28405 Corporate Licensure No. for Engineering Servi	PROJECT RI R-3	EFEREI 300B	NCE NO. SHEET 14
WBS: 402	 237.1.1	TIP : R-33		JNTY: PENDER		GEOLOGIST: S. HU	JDSON		WBS : 4	0237.1.1		TIP : R-33	soob cou	JNTY: PENDER		GEOLOGIST: S. HUI	DSON	
		17 NORTH AND SL				1 222 3.110		GROUND WTR (ft)			N : HWY 17		OOP POINT LOOP					GROUND WTR (ft)
BORING N	O .: CPT-10	STATION:	326+94	OFFSET:	36 ft RT	ALIGNMENT: -L-		EST. 0 HR. 4.1	BORING	NO.: CPT	 Γ-11	STATION:	327+96	OFFSET: 2	26 ft LT	ALIGNMENT: -L-		EST. 0 HR. 5.8
COLLAR	LEV.: 44.9 ft	TOTAL DE	EPTH: 49.7 ft	NORTHING	: 244,382	EASTING: 2,406,425	5	24 HR. N/A	COLLAR	ELEV.: 4	43.0 ft	TOTAL DE	PTH: 41.7 ft	NORTHING:		EASTING : 2,406,442	<u>)</u>	24 HR. N/A
CPT RIG/MA	X. DOWN PRESSURE	: CATLIN CPT/DPT-0	01 / 9 tons - NO ANCH	ORS	CONE TYPE: TYPE I	II PIEZOCONE	CONE	E ID: DSG0867	CPT RIG/M	AX. DOWN P	PRESSURE:	CATLIN CPT/DPT-0	01 / 9 tons - NO ANCH	DRS	CONE TYPE: TYPE II	PIEZOCONE	CONE	ID: DSG0867
DRILLER:	EDDIE SWAIN	OPERATOR:	CATLIN	START DATE: (03/18/20 COMP. C	DATE: 03/18/20 SU	JRF. WAT	TER DEPTH: N/A	DRILLER	: EDDIE	SWAIN	OPERATOR:	CATLIN S	START DATE: 0	3/18/20 COMP. D	ATE: 03/18/20 SUI	RF. WAT	ER DEPTH: N/A
ELEV DEP.	(tef)	NE RESISTANCE (tsf)	FRICTION RATIO (%)	PORE PRESSURE (tsf)	EQUIVALENT SPT N _{60%}	SOIL BEHAVIOR TYPE (QT)(1990)	L	UNDRAINED SHEAR Sµ (tsf)	ELEV DEP.	FRICTION (tsf)	N CONE	RESISTANCE (tsf)	FRICTION RATIO (%)	PORE PRESSURE (tsf)	EQUIVALENT SPT N _{60%}	SOIL BEHAVIOR TYPE (QT)(1990)	L O	UNDRAINED SHEAR Sµ (tsf)
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JOLE I	}	F			···		0000											(0 HR. GROUNDWATER ESTIMATED FROM PORE
NINK	ξ: ;	<i>></i>	\geq			5				:								PRESSURE)
IN								Boring Terminated WITH CONE PENETRATION										
0440								TEST REFUSAL at Elevation -4.8 ft										
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PROJECT REFERENCE NO. SHEET GEOTECHNICAL BORING REPORT CATLIN Engineers and Scientists R-3300B 15 **BORE LOG** GEOLOGIST: L. PUGH COUNTY: PENDER COUNTY: PENDER GEOLOGIST: L. PUGH WBS: 40237.1.1 **TIP**: R-3300B WBS: 40237.1.1 TIP: R-3300B SITE DESCRIPTION: HWY 17 NORTH AND SLOOP POINT LOOP ROAD **GROUND WTR (ft)** SITE DESCRIPTION: HWY 17 NORTH AND SLOOP POINT LOOP ROAD **GROUND WTR (ft)** OFFSET: 36 ft RT ALIGNMENT: -L-OFFSET: 36 ft RT ALIGNMENT: -L-BORING NO.: SPT-01 **STATION**: 327+00 0 HR. 5.2 BORING NO.: SPT-01 **STATION**: 327+00 0 HR. 5.2 **EASTING**: 2,406,429 COLLAR ELEV.: 44.6 ft TOTAL DEPTH: 84.8 ft **NORTHING:** 244,386 **EASTING**: 2,406,429 TOTAL DEPTH: 84.8 ft **NORTHING**: 244,386 24 HR. 5.3 COLLAR ELEV.: 44.6 ft 24 HR. 5.3 **DRILL RIG/HAMMER EFF./DATE:** CAT1303 CME-550 93.7% 03/11/2020 **DRILL METHOD:** MUD ROTARY **HAMMER TYPE: AUTOMATIC DRILL RIG/HAMMER EFF./DATE:** CAT1303 CME-550 93.7% 03/11/2020 DRILL METHOD: MUD ROTARY **HAMMER TYPE: AUTOMATIC** DRILLER: D.T. CHALMERS. JR. | START DATE: 03/30/20 COMP. DATE: 03/30/20 SURFACE WATER DEPTH: N/A **DRILLER:** D.T. CHALMERS, JR. **START DATE:** 03/30/20 COMP. DATE: 03/30/20 SURFACE WATER DEPTH: N/A ELEV DRIVE DEPTH BLOW COUNT ELEV DRIVE DEPTH BLOW COUNT **BLOWS PER FOOT BLOWS PER FOOT** SAMP # SAMP SOIL AND ROCK DESCRIPTION SOIL AND ROCK DESCRIPTION RESULT (ft) (ft) RESUL (ft) (ft) 0.5ft 0.5ft 0.5ft 0.5ft 0.5ft 0.5ft 75 100 MOI G (ft) 50 75 100 ELEV. (ft) DEPTH (ft Match Line -35 **GROUND SURFACE** LIGHT GRAY, LIMESTONE (continued) ARTIFICIAL FILL BROWN, F. SAND WITH SOME SILT <u>-38.7 † 83.3</u> 49 45 UNDIVIDED COASTAL PLAIN -40 Sat. Sat. DARK BROWN, SILTY, F. SAND WITH Boring Terminated at Elevation -40.2 ft IN INDURATED WEATHERED LIMESTONE LITTLE (3.1-3.4%) ORGANICS 10 SS-01 Sat (CASTLE HAYNE FORMATION) A-2-4(0) SS-02 Sat. GRAY BROWN, F. SAND Sat. 30 SS-03 A-3(0) Sat. 20 Sat. Sat. COASTAL PLAIN GRAY, CSE. AND F. SAND Sat. SS-04 A-3(0) Sat. Sat. GRAY, CLAYEY, CSE. AND F. SAND (COMPLETELY WEATHERED LIMESTONE) Sat. A-2-4(0) GRAY GRADING TO GREEN GRAY, F. SAND Sat. Sat. SS-06 A-3(0) Sat. Sat. GREEN AND GRAY, F. SAND WITH SOME -27.7 12 Sat. SILT AND LIMESTONE FRAGS. WEATHERED LIMESTONE (DRILLER NOTED SLIGHT RIG CHATTER -32.3 + 76.9 AT 71.9') LIGHT GRAY, LIMESTONE

CONE PENETROMETER TEST BORING REPORT COUNTY: PENDER **TIP**: R-3300B GEOLOGIST: S. HUDSON WBS: 40237.1.1 GROUND WTR (ft) SITE DESCRIPTION: HWY 17 NORTH AND SLOOP POINT LOOP ROAD **STATION**: 328+96 OFFSET: 35 ft RT ALIGNMENT: -L-BORING NO.: CPT-12 EST. 0 HR. 3.4 COLLAR ELEV.: 44.0 ft TOTAL DEPTH: 46.1 ft **NORTHING**: 244,538 **EASTING**: 2,406,553 24 HR. N/A CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / 9 tons - NO ANCHORS CONE TYPE: TYPE II PIEZOCONE CONE ID: DSG0867 DRILLER: EDDIE SWAIN **OPERATOR**: CATLIN START DATE: 03/18/20 | COMP. DATE: 03/18/20 | SURF. WATER DEPTH: N/A EQUIVALENT SPT N_{60%} SOIL BEHAVIOR TYPE (QT)(1990) UNDRAINED SHEAR Sµ (tsf) CONE RESISTANCE PORE PRESSURE (tsf) (tsf) (tsf) (tsf) (tsf) .-1 0 1 2 3. .0 25 50 75 35 30 20 20 15 Boring Terminated WITH CONE PENETRATION TEST REFUSAL at Elevation -2.1 ft (0 HR. GROUNDWATER ESTIMATED FROM PORE

CATLIN Engineers Scientists
220033 220 Old Dairy Road Wilmington, NC 28405

PROJECT REFERENCE NO. SHEET
R-3300B 16