D: U-5132

SCT: 45155.1.

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

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STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 45155.1.1 (U-5132) F.A. PROJ. DOD-0024(39)

COUNTY ONSLOW

PROJECT DESCRIPTION BRIDGE ON NEW BASE ENTRY ROAD OVER NC 24

MARINE CORPS BASE, CAMP LEJEUNE, NC

N.C. 45155.1.1 (U-5132) 1 9

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STLDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARGUS FIELD BORNO LOGS. ROCK CORES. AND SOL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGREERING UNIT AT 1999 250-4088, NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORNO LOGS. ROCK CORES, OR SOL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVALABLE SUBSUMFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSUMFACE CONDITIONS BETWEEN BORNDAS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN STIU IN-PLACED TEST DATA CAN BE RELED ON ONLY TO THE DEGREE OF RELIABILITY IMPERBAT IN THE STANDARD TEST METHOD. THE OBSETVED WATER LEVELS OR SOIL MOSITURE CONDITIONS NOWLATED IN THE SUBSUMFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOSITURE CONDITIONS MAY VARY CONSIDERABLY WITH THE ACCORDING TO CLIMATIC CONDITIONS MAY VARY CONSIDERABLY WITH THE ACCORDING TO CLIMATIC CONDITIONS MAY VARY CONSIDERABLY WITH THE ACCORDING TO CLIMATIC CONDITIONS MAY VARY CONSIDERABLY WITH THE ACCORDING TO CLIMATIC CONDITIONS MAY DEVELOPED THE ACCORDING TO CLIMATIC FORDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BODER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DEFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DIOS NOT WARRANT OR GUARANTE HE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MODE, OR OPINION OF THE BIDDER OR CONTRACTOR AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE COUNTIERED. THE BIDDER OR CONTRACTOR IS CALTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS RECESSARY TO SATISTY HINSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS 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 NOICATED IN THE SUBSURFACE INFORMATION.

B. Deobald

J. Howard

F. Cox

J. Cook

S. Gollamudi

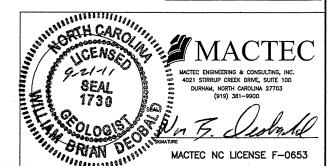
INVESTIGATED BY MACTEC

CHECKED BY J. Veith

SUBMITTED BY B. Deobald

DATE 09/21/2011

PERSONNEL



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

NOTE - 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,

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

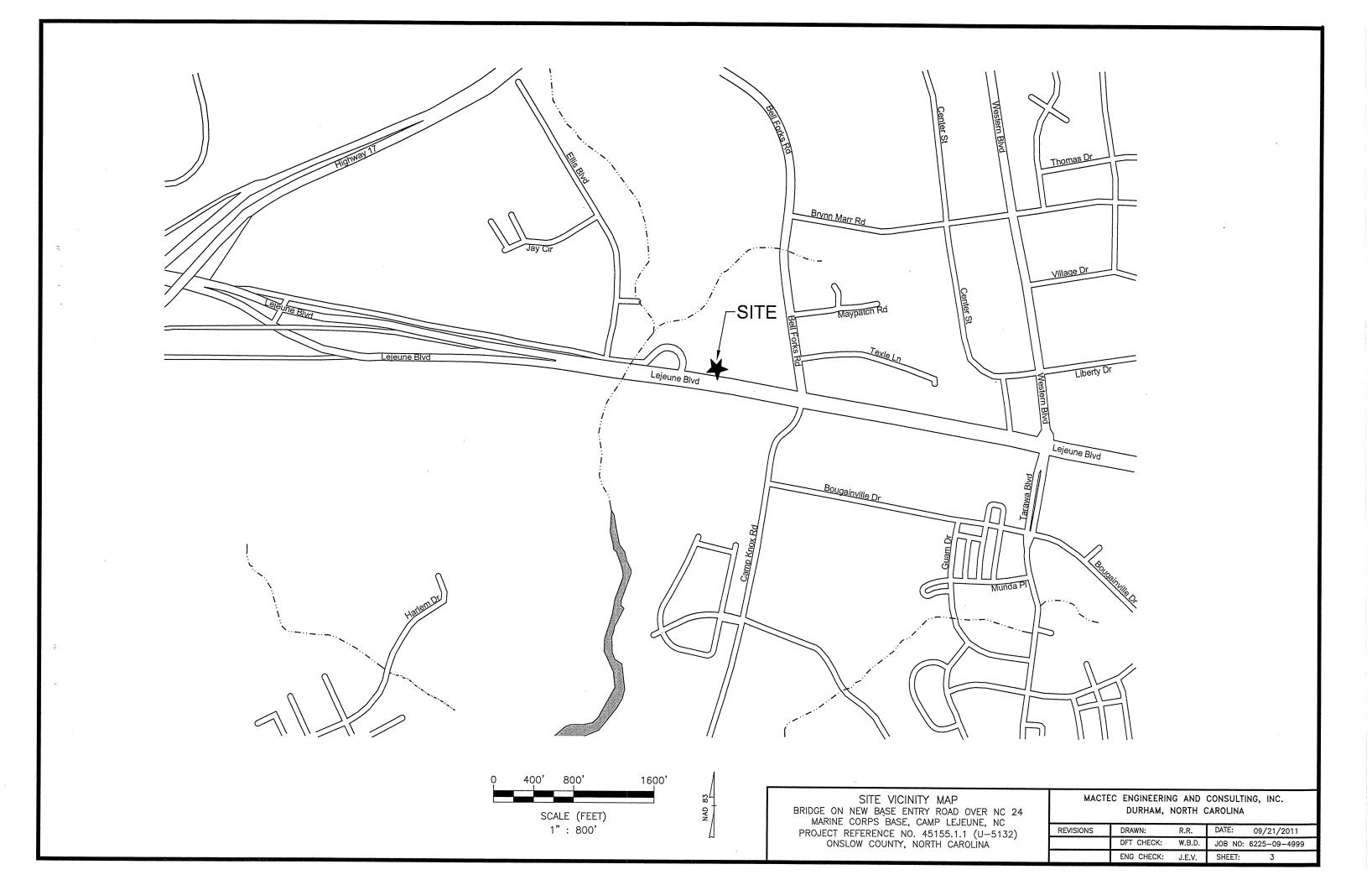
SUBSURFACE INVESTIGATION

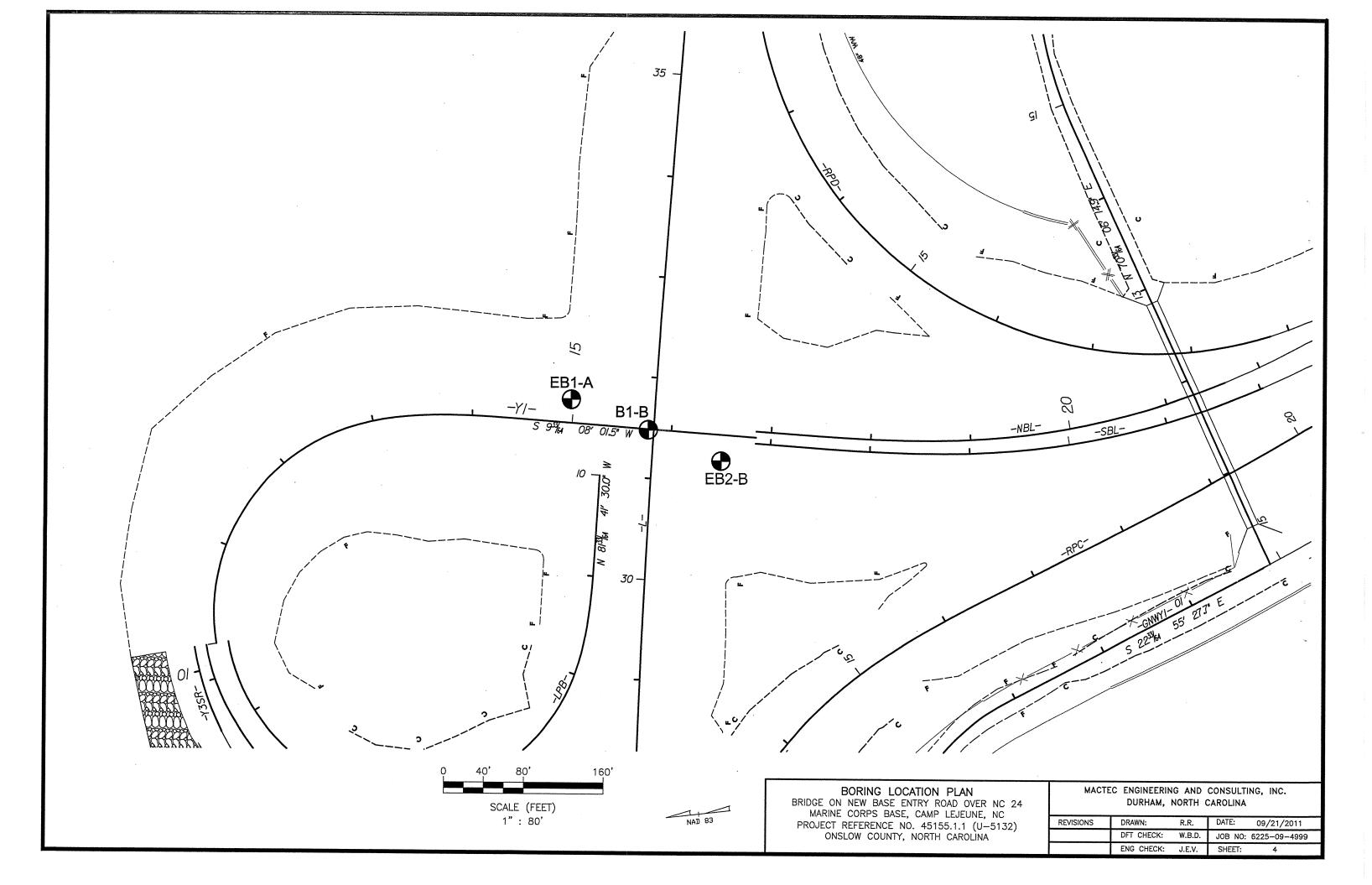
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS SOIL DESCRIPTION WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARS UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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 TERMS AND DEFINITIONS SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO 1206, ASTM D-1586) SOTI GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. AGUIFER - A WATER BEARING FORMATION OR STRATA. CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCL CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTIN AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: ANGULARITY OF GRAINS ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 SUBANGULAR, SUBROUNDED, OR ROUNDED. WEATHERED ROCK (WR) OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. SOIL LEGEND AND AASHTO CLASSIFICATION MINERALOGICAL COMPOSITION ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GENERAL SILT-CLAY MATERIALS (> 35% PASSING *200) CRYSTALLINE ROCK (CR) ORGANIC MATERIALS WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. GROUND SURFACE. (≤ 35% PASSING *200) CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-6, A-7 A-7-6 A-3 A-6, A-7 A-1 A-3 Δ-2 FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN CROUP NON-CRYSTALLINE ROCK (NCR) A-2-4 A-2-5 A-2-6 A-2-7 CLASS. 1-1-n A-1-h SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED. ROCK TYPE COLLUYIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50 SLIGHTLY COMPRESSIBLE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.

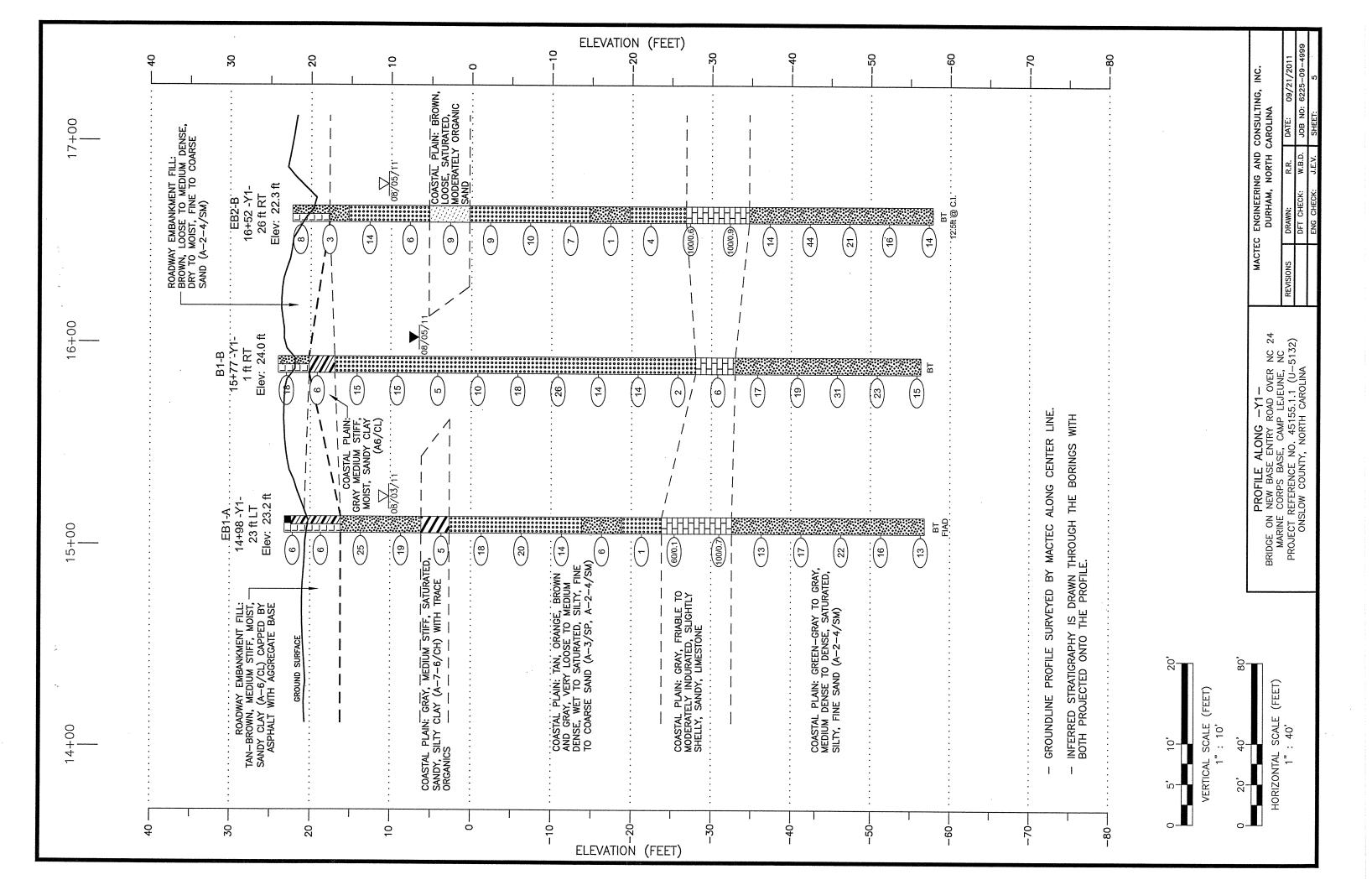
COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD

SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE SYMBOL OASTAL PLAIN EDIMENTARY ROCK CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTA LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. ENTAGE OF MATERIAL PASSING * 10 GRANULAF MUCK. $\overline{ ext{DIKE}}$ - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. CLAY ORGANIC MATERIAL SOILS PEAT OTHER MATERIAL SOILS SOILS SOILS 15 MX 25 MX 18 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 * 200 ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER RACE OF ORGANIC MATTER FRESH 1 - 10% 10 - 20% 20 - 35% $\underline{\text{DIP}}$ - The angle at which a stratum or any planar feature is inclined from the Horizontal. TRACE 48 MX 41 MN 11 MN 11 MN 18 MX 18 MX 11 MN 11 MN HAMMER IF CRYSTALLINE. TOUR LOUGH 5 - 12% LITTLE VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, SOILS WITH MODERATELY ORGANIC 5 - 10% 12 - 20% SOME LASTIC INDEX <u>DIP DIRECTION (DIP AZIMUTH) -</u> THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. LITTLE OR HIGHLY ORGANIC >20% (V SLI HIGH! Y HIGHLY CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF 35% AND ABOVE 8 8 MODERATE 8 4 MX 8 MX 12 MX 16 MX No MX OF A CRYSTALLINE NATURE. GROUND WATER AMOUNTS OF AULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE USUAL TYPES STONE FRAGS, OF MAJOR GRAVEL, AND SAND ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO SOILS SILTY OR CLAYEY SILTY CLAYEY WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONA GRAVEL AND SAND SOILS SOTIS MATTER ATERIALS SAND **Y**___ CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. STATIC WATER LEVEL AFTER 24 HOURS GEN. RATING MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN VPW. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS EXCELLENT TO GOOD PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA FAIR TO POOR POOR LINSUITARI (MOD.) POOR SUBGRADE DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED SPRING OR SEFE FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS> LL - 30 ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL MODERATELY CONSISTENCY OR DENSENE MISCELLANEOUS SYMBOLS AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH SEVERE ORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN RANGE OF STANDARD RANGE OF UNCONFINED COMPACTNESS OR MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. COMPRESSIVE STRENGTH TEST BORING PRIMARY SOIL TYPE PENETRATION RESISTENCE ROADWAY EMBANKMENT (RE) CONSISTENCY DPT DMT TEST BORING -0- IF TESTED. WOULD YIELD SPT REFUSAL W/ CORE WITH SOIL DESCRIPTION JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED SEVERE VERY LOOSE LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. AUGER BORING - SPT N-VALUE STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME SOIL SYMBOL LOOSE GRANUL AR EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. MEDIUM DENSE MATERIAL (NON-COHESIVE) 10 TO 30 ARTIFICIAL FILL (AF) OTHER CORE BORING REF SPT REFUSAL IF TESTED. YIELDS SPT N VALUES > 100 BPF DENSE 30 TO 50 LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. THAN ROADWAY EMBANKMENT VERY DENSE ERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT >50 MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE, INFERRED SOIL BOUNDAR ™O. MONITORING WELL V SEV.) THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VERY SOFT <Ø.25 2 TO 4 4 TO 8 PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF A GENERALLY Ø.25 TO Ø.50 STETTE INFERRED ROCK LINE PIEZOMETER VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF SILT-CLAY MEDIUM STIFF ERVENING IMPERVIOUS STRATUM. Ø.5 TO 1.0 INSTALLATION ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND MATERIAL. STIFF COMPLETE 1 TO 2 ALLUVIAL SOIL BOUNDARY RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. VERY STIFF SLOPE INDICATOR SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS (COHESIVE) \bigcirc 2 TO 4 ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND HARD >30 ALSO AN EXAMPLE. DIP & DIP DIRECTION OF ROCK STRUCTURES TEXTURE OR GRAIN ST CONE PENETROMETER TEST ROCK HARDNESS EXPRESSED AS A PERCENTAGE. CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES .S. STD. SIEVE SIZE SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE SOUNDING ROD PENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053 SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL ABBREVIATIONS CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED COARSE FINE BOULDER COBBLE GRAVEL TO DETACH HAND SPECIMEN. SILT CLAY (CL.) AUGER REFUSAL VST - VANE SHEAR TEST WEA. - WEATHERED SAND MED. - MEDIUM TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. (BLDR.) (COB.) MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE BT - BORING TERMINATED MICA. - MICACEOUS SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED HARD CL. - CLAY MOD. - MODERATELY - UNIT WEIGHT 2.0 0.25 0.05 0.005 CPT - CONE PENETRATION TEST BY MODERATE BLOWS. 7- DRY UNIT WEIGHT SIZE IN. 12 CSE. - COARSE CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. 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 WIT DRG. - DRGANTC MEDIUM SOIL MOIS URE - CORRELATION OF TERMS DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF SAMPLE ABBREVIATIONS SOIL MOISTURE SCALE DPT - DYNAMIC PENETRATION TEST POINT OF A GEOLOGIST'S PICK. SAP. - SAPROLITIC A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS GUIDE FOR FIELD MOISTURE DESCRIPTION - VOID RATIO HAN Ø.1 FOOT PER 60 BLOWS. SAND, SAND SS - SPLIT SPOON CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS DESCRIPTION SOFT - FINE SI . - STI T. STI TY ST - SHELBY TUBE FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGT OF STRATUM AND EXPRESSED AS A PERCENTAGE. FOSS. - FOSSILIFEROUS USUALLY LIQUID: VERY WET, USUALLY PIECES CAN BE BROKEN BY FINGER PRESSURE. RS - ROCK FRAC. - FRACTURED, FRACTURES FROM BELOW THE GROUND WATER TABLE RT - RECOMPACTED TRIAXIAL (SAT.) TCR - TRICONE REFUSAL 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 VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH LIQUID LIMIT FRAGS. - FRAGMENTS MOISTURE CONTENT CBR - CALIFORNIA BEARING SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY .ASTIC HI. - HIGHLY V - VERY RATIO SEMISOLID: REQUIRES DRYING TO FINGERNAIL. TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. RANGE - WET - (W) EQUIPMENT USED ON SUBJECT PROJECT ATTAIN OPTIMUM MOISTURE (PI) FRACTURE SPACING TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. PLASTIC LIMIT TERM DRILL UNITS: HAMMER TYPE: TERM SPACING THICKNESS BENCH MARK: - MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE VERY THICKLY BEDDED OPTIMUM MOISTURE VERY WIDE MORE THAN 10 FEET > 4 FEET X AUTOMATIC __ MANUAL X CLAY BITS THICKLY BEDDED 1.5 - 4 FFFT _ MOBILE B- _ SHRINKAGE LIMIT THINLY BEDDED
VERY THINLY BEDDED MODERATELY CLOSE 1 TO 3 FEET 6 CONTINUOUS FLIGHT AUGER REQUIRES ADDITIONAL WATER TO CORE SIZE: CLOSE Ø.Ø3 - Ø.16 FEET - DRY - (D) _ BK-51 0.008 - 0.03 FEE ATTAIN OPTIMUM MOISTURE VERY CLOSE THICKLY LAMINATED NOTES: LESS THAN Ø.16 FEET - 8" HOLLOW AUGERS ___-B____ THINLY LAMINATED PLASTICIT' __ CME-45C _ HARD FACED FINGER BITS INDURATION __-N___ PLASTICITY INDEX (PI) FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. DRY STRENGTH _ TUNG-CARRIDE INSERTS NONPLASTIC VERY LOW __-H___ Ø-5 X CME-55 RUBBING WITH FINGER FREES NUMEROUS GRAINS 6-15 _ CASING _ W/ ADVANCER SLIGHT GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. HAND TOOLS: MED. PLASTICITY 16-25 MEDIUM __ PORTABLE HOIST HIGH PLASTICIT __ TRICONE __ 26 OR MORE STEEL TEETH GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; _ POST HOLE DIGGER MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER. X TRICONE 2 7/8" STEEL TEETH HAND AUGER GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE: INDURATED _ CORE BIT SOLINDING ROD DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). DIFFICULT TO RREAK WITH HAMMER MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. VANE SHEAR TEST SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; EXTREMELY INDURATED SAMPLE BREAKS ACROSS GRAINS.

PROJECT REFERENCE NO. SHEET NO. 45155.1.1 (U-5132) 2







		-					
	ID. U-5132	COUNTY Onslow	GEOLOGIST J. Howard		ID. U-5132	COUNTY Onslow	GEOLOGIST J. Howard
	New Base Entry Road over NC 24	-Marine Corps Base, Camp Lejeu	une, NC (MACTEC 6225-09-4999) GROUND WTR (ft)				une, NC (MACTEC 6225-09-4999) GROUND WTR (ft)
BORING NO. EB1-A	STATION 14+98	OFFSET 23ft LT	ALIGNMENT -Y1- 0 HR. 13.0	BORING NO. EB1-A	STATION 14+98	OFFSET 23ft LT	
COLLAR ELEV. 23.2 ft	TOTAL DEPTH 80.0 ft	NORTHING 365,939	EASTING 2,483,617 24 HR. FIAD		TOTAL DEPTH 80.0 ft	NORTHING 365,939	
DRILL MACHINE CME-55	DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	DRILL MACHINE CME-55	DRILL METHOD Mud Rotary	1000 300,939	
START DATE 08/03/10	COMP. DATE 08/03/10	SURFACE WATER DEPTH N		START DATE 08/03/10	COMP. DATE 08/03/10	OUDEA OF MATER PERSON	HAMMER TYPE Automatic
ELEV DRIVE DEPTH BLOW COUN		OT SAMP.				SURFACE WATER DEPTH	N/A DEPTH TO ROCK 47.0 ft
(ft) (ft) (ft) 0.5ft 0.5ft	0.5ft 0 25 50	75 100 100	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)	ELEV DRIVE DEPTH BLOW COUNTY (ft) (ft) 0.5ft 0.5ft 0		75 100	SOIL AND ROCK DESCRIPTION
			DEF (H (II)	(ii) soit soit s	7 9	75 100 NO. MOI G	
25							
23.2 + 0.0			GROUND SURFACE 0.0	-55 -55.3 \(\frac{78.5}{6} \) 6 6	Match Line		
2 3	3 6		22.4 ROADWAY EMBANKMENT 0.8		7 13.	SS-17 Sat.	-56.8 80.0 Boring Terminated at Elevation -56.8 ft
20 19.7 3.5			0.0-0.3ft: Asphalt; 0.3-0.8ft: Aggregate Base Course	-60			Coastal Plain: Silty SAND (A-2-4/SM)
	3 6	: :::: SS-2 M	ROADWAY EMBANKMENT Tan-brown, sandy CLAY (A-6/CL)	T I I			-
15 +			16.2				-
15 14.7 - 8.5 11 13			COASTAL PLAIN Tan and red-brown, silty, fine SAND	-65 +			-
	25	: 35-3 W	(A-2-4/SM)				
10 9.7 13.5	$ \dots \dots \dots \dots $	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		-70			-
	11 • 19	· · · · · SS-4 Sat.		 -70 			_
1 1 1 1			62				
5 4.7 18.5			COASTAL PLAIN	75			
	3		Gray, sandy, silty CLAY (A-7-6/CH) with 2.7 trace organics 20.5	±			-
0 0 03 235		Sat. Sat.	COASTAL PLAIN Orange, tan to gray, fine SAND (A-3/SP)				
-0.3 - 23.3	10	· · · · · SS-6 Sat.	-	-80 T			_
	1			1 1 7 1 1 1			
-5 -5.3 28.5				-85			
1 7 9	11 20	SS-7 Sat.					-
1 1 1 1 1							
-10 -10.3 33.5 7 6	8	0000		-90 +			
	0 14 1 1 1 1 1 1 1 1	SS-8 Sat.					
<u>-15</u> <u>-15.3</u> 38.5			-13.8				
70.0 2 2	4	· · · · · SS-9 Sat.	Green gray to dark gray, silty, fine SAND	<u>-95</u>			-
			(A-2-4/SM)				
-20 -20.3 43.5			COASTAL PLAIN 42.0	-100			
1 WOH	1 •1:	SS-10 Sat.	Dark gray, fine SAND (A-3/SP)		•		-
-25 -25 3 + 48 5			-23.8 47.0				
-25 -25.3 48.5 60/0.1		60/0.1 SS-11 Sat.	COASTAL PLAIN SEDIMENTARY ROCK Brown-gray, friable to moderately indurated, slightly shelly LIMESTONE	<u>-105</u>			_
			slightly shelly LIMESTONE	‡			
-30 -30.3 + 53.5		· · · · ·		-110			
42 58/0.2		100/0.7 SS-12 Sat.					-
-35 -35.3 -58.5		:T::::	COASTAL PLAIN 55.8				
	7	+	Green gray, silty, fine SAND (A-2-4/SM)	-115 ‡			_
3 6	13.	SS-13 Sat.					
3 -40 -40.3 63.5				1 100			
	9	SS-14 Sat.		<u>-120</u> <u>T</u>			-
-45 -45.3 - 68.5				<u>-125</u>			
6 10	12 22	SS-15 Sat.		T			-
-50 -50.3 73.5 5 7	9	+		-130 ‡		<u> </u>	_
	16	SS-16 Sat.					
-55	-			1-135		[
		17474				1 1 1 5	i i

<u>-</u>	ID. U-5132 COUNTY Onslow	GEOLOGIST J. Howard	PROJECT NO. 45155.1.1	ID. U-5132	COUNTY Onslow	GEOLOGIST J. Howard			
	ew Base Entry Road over NC 24-Marine Corps Base, Camp Leje		SITE DESCRIPTION Bridge on Ne	ew Base Entry Road over NC 24-	Marine Corps Base, Camp Le	ejeune, NC (MACTEC 6225-09-4999) GROUND WTR			
ORING NO. B1-B	STATION 15+77 OFFSET 1ft RT	ALIGNMENT -Y1- 0 HR. 4.0	BORING NO. B1-B	STATION 15+77	OFFSET 1ft RT	ALIGNMENT -Y1- 0 HR.			
OLLAR ELEV. 24.0 ft	TOTAL DEPTH 80.3 ft NORTHING 365,865	EASTING 2,483,581 24 HR. 17.5	COLLAR ELEV. 24.0 ft	TOTAL DEPTH 80.3 ft	NORTHING 365,865	EASTING 2,483,581 24 HR . 1			
RILL MACHINE CME-55	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	DRILL MACHINE CME-55	DRILL METHOD Mud Rotary	, , , , , , , , , , , , , , , , , , , ,	HAMMER TYPE Automatic			
TART DATE 08/04/10	COMP. DATE 08/04/10 SURFACE WATER DEPTH 1	N/A DEPTH TO ROCK 52.0 ft	START DATE 08/04/10	COMP. DATE 08/04/10	SURFACE WATER DEPTH				
EV DRIVE DEPTH BLOW COUNT	T BLOWS PER FOOT SAMP. V L	SOIL AND ROCK DESCRIPTION	ELEV DRIVE DEPTH BLOW COUNT		T SAMP.				
ft) (ft) (ft) 0.5ft 0.5ft 0.		ELEV. (ft) DEPTH (ft)	(ft) ELEV (ft) 0.5ft 0.5ft 0	0 25 50	75 100 NO. MOI G				
25 24.0 0.0				Match Line					
		24.0 GROUND SURFACE 0.0 ROADWAY EMBANKMENT		9 •15	. SS-17 Sat.	56.3			
202 + 30	8 • 18	Brown, silty, fine to coarse SAND (A-2-4/SM)			.	Boring Terminated at Elevation -56.3 ft Coastal Plain: Silty SAND (A-2-4/SM)			
20 20.2 † 3.8 2 3			-60 +			F			
1 1 1 1		Orange, gray, sandy CLAY (A-6/CL) 7.0 7.0	1 1 1 1 1			<u> </u>			
5 15.2 8.8	0000	COASTAL PLAIN Tan-orange to gray, fine SAND (A-3/SP)	-65			<u> </u>			
	9 •15 SS-3 W	-				-			
I I	9 . •15					ļ.			
0 10.2 13.8 6 7	8	-	70 +			_			
	15 35-4 W 0000 000					<u> </u>			
5.2 18.8	- / · · · · · · · · · · · · · ·		1			t			
4 3 2	2 6 5		-75			E			
0.2 + 23.8 5 5 5	5 . •10	·	80			F			
	9 1 6 10	•				F			
_		:				-			
5 -4.8	9 SS-7 Sat	-	<u>-85</u> 			<u> </u>			
1 1 1 1	4 SS-8 Sat.					<u> </u>			
9.8 + 33.8	0000		-90			F			
7 12 1	926	•				-			
 									
5 -14.8 + 38.8 6 7	7	-	-95			_			
	-					-			
0 -19.8 + 43.8			1-100			-			
	6	-	-100			-			
‡	- /					E			
5 -24.8 + 48.8	1 /	· -	-105			Ł			
	7					E			
0 -29.8 + 53.8		COASTAL PLAIN SEDIMENTARY ROCK	140			Ł			
21 5 1	1 6	Gray, friable, sandy, LIMESTONE	-110			-			
	SS-12 Sat.	_33.0 57.0				F			
5 -34.8 + 58.8 6 7 1		COASTAL PLAIN Green-gray, silty, fine SAND (A-2-4/SM)	-115			E			
1 1 1 1 1 1 1	0					F			
0 -39.8 + 63.8						F			
6 9 1	019	-	-120			F			
						F			
5 -44.8 + 68.8			-125			ļ.			
T 9 14 1	7 •31 SS-15 Sat.					F			
						F			
0 -49.8 † 73.8 10 10 11	3 SS-16 Sat.	_	_130						
	3 SS-16 Sat.								
		1							

1	DJECT NO. 45155.1.1 ID. U-5132 E DESCRIPTION Bridge on New Base Entry Road over NC																		OJEC	T NO. 45	155.1.	1	ID. (U-5132	COUNTY					ST J. Howard	
-				idge o					er NC 24-				Camp L				GROUND WTR	t) SIT	E DE	CRIPTIO	N Brid	ige on	New Ba	ase Entry Road over NC 24-	Marine Cor	ps Base,	Camp Le	jeune, NC (MA	ACTEC 6225-09-499	99) GROUND WTR (
	ING NO						TION 16			OFFSET 26ft RT ALIGNMENT -Y1- 0 HR. 12.0								BORING NO. EB2-B					ATION 16+52	OFFSET			ALIGNMI	0 HR. 12			
	LAR EL					TOTAL DEPTH 80.1 ft				DEPTH 80.1 ft NORTHING 365,795 EASTING 2,483,544 24 HR . 12.5ft						NORTHING 365,795 EASTING 2,483,544 24 HR. 12.5ft CI				ELEV. 2	2.3 ft		TO	TAL DEPTH 80.1 ft	NORTHI	IG 365,	795	EASTING	3 2,483,544	24 HR. 12.5ft	
DRIL	L MACHINE CME-55 DRILL METHOD Mud Rotary							HAMMER TYPE Automatic				DRILL MACHINE CME-55					ILL METHOD Mud Rotary				<u>-</u>	HAMMER TYPI									
STA		DATE 08/05/10 COMP. DATE 08/05/10 SURFACE WATER DEPTH N					H N/A	/A DEPTH TO ROCK 49.1 ft			STA	ART D	ATE 08/	05/10		COI	MP. DATE 08/05/10	SURFAC	E WATE	R DEPTH	N/A	DEPTH TO ROCK 49.1 ft									
ELEV	DRIVE ELEV	DEPTH	BL	OW CO					PER FOO		11	SAMP.	'/	L O	SOI	L AND ROCK DES	CRIPTION	ELE	/ DR	VE DEPTI	BLC	ow cor		BLOWS PER FOO	T	SAMF	. / [:]			
(ft)	(ft)	(ft)	0.5ft	0.5f	t 0.5	oft C) 2	5 L	50	75 	100	NO.	MOI	G ELEV.	. (ft)		DEPTH	(ft)	(f	t) (ft)	0.5ft	0.5ft	0.5ft	0 25 50	75 10	0 NO.	MOI G	6	SOIL AND ROCK DE	SCRIPTION	
	25 _	+												L					5	5	 	$oxed{oxed}$		Match Line		<u></u>	L				
	22.3	‡ _{0.0}												- 22.3		GROUND SURF	ACE	0.0	-56	78.6	4	7	7	14		99.17	Sat.	<u></u>			
20		Ŧ	1	4	4		. ∳ 8					SS-1	D	17.7		OADWAY EMBAN ty, fine SAND (A-2	IKMENT			#				V 14		1 33-17	Sat.		Boring Terminated at Ele	8 evation -57.8 ft	
	18.7	3.6	<u> </u>	<u> </u>	<u> </u>	4									Diown, on	organics	-yow) war tace	-60	1	+								-	Coastal Plain: Silty SAN	ND (A-2-4/SM)	
		‡	1	1	2		3':::				• • •	SS-2	М	17.7		COASTAL PL		.6		‡								[
15	40.7	‡ 。				-	7							15.3	Orange	coastal PL		.0 -65		#								L			
	13.7	<u>↓ 8.6</u>	4	7	7	\dashv	14				:::	SS-3	М		Orange-f	tan, fine to coarse	SAND (A-3/SP)			‡								E			
10		‡								1	: : :									‡								Ē			
· · ·	8.7	13.6	<u> </u>	<u> </u>		_	./		1	.			8	***				-70	1	+								E			
		‡	5	4	2		6 6			: : :	:::	SS-4	Sat.							<u>†</u>								F			
5	_	‡					<u> </u>	• • • •		• • •			0	5.3		COASTAL PL	1	.075		土								F			
	3.7	18.6	3	4	5		.1			: : :	: : : }	SS-5	Sat.	麩	Brov	vn, moderately org	anic SAND			Ŧ								F			
_		‡					: F : :		1:::		: ::	35-5	Sat.	<u>\$</u>			_			Ŧ								F			
0	-1.3	23.6				\parallel	-1 1		 	- 		ĺ	<u>`</u>	0.3		COASTAL PLA	AIN	<u>-80</u>	-	Ŧ								Ė			
		1	2	3	6		9		1:::	1		SS-6	Sat.	000	Dark br	own to gray, fine S	AND (A-3/SP)			Ŧ								-			
-5		Ŧ								1		. [0				المدينة يبي	-85		Ŧ								-			
	-6.3	28.6	4	5	5	$-\!$	-						000						1	‡								F			
		Ŧ	"	"	'		•10		: : :	ì	· • • F	SS-7	Sat.	• • • •						‡			Ì					-			
-10	11 2] 33.6				1	-		+				0 0	•				-90	4	#								_			
	-11.5	+ 33.0	2	4	3	$\exists 1$	7					SS-8	Sat.	000						‡											
- 15		Ŧ					<i>[</i> : : :		: : :				0 0	-14.7			3	0 05		‡								E			
	-16.3	38.6	<u> </u>	14/01	<u> </u>	_ 7			 	-					Dark o	COASTAL PLA ray, silty, fine SAN	AIN	<u>-95</u>	1	‡								E			
		‡	1	WOF	1 1		1: : : :	· · · ·	: : :		:: -	SS-9	Sat.		Dan g	ray, sity, title only	5 (A-2-4/OW)			‡								E			
-20	-	‡				<u> </u>			1	<u> </u>				-19.7		COASTAL PLA		<u>-100</u>		#								E			
	-21.3	43.6	2	2	2	- }	14		: : :	: : :	:: -	SS-10	Sat.	000	Dar	rk gray, fine SAND	(A-3/SP)			‡								F			
-25		‡						·;		: : :	::		0 0	000						‡								F			
-25	-26.3 ·	48.6				╛			† * * * * *	7			0 0	-26.8				-105	-	+								F			
		‡	4	55	45/0		: : : :			: : 10	00/0.6	SS-11	Sat.	-26.8	COASTA	L PLAIN SEDIME	NTARY ROCK	 		1								F			
-30	-	‡								-	<u>·· </u>			土	Gray, friab	ole to moderately in LIMESTONE	durated, sandy,	-110		Ī								F			
	-31.3	53.6	9	8	92/0	.4	: : : :		:::	: : :	:: []	SS-12	Sat E	#						Ŧ								F			
		‡					: : : :			<u>:</u>	100/0.9	30-12	Jal. H	丑						Ŧ								F			
-35	-36.3	58.6				1						1		-34.7		COASTAL PLA	in — — — — <u>5</u>	<u>-115</u>	4	Ŧ											
		 	5	6	8		. • • • • • • • • • • • • • • • • • • •	::				SS-13	Sat.	¥.	Green-gra with limes	ay to gray, silty, SA stone and shell frag	ND (A-2-4/SM) ments at 59.0ft			‡		-						F			
-40		Ī					````\		:::	: : :				*		,		-120		‡								<u> </u>			
	-41.3	63.6	6	20	24	$\exists \Gamma$:/(1	-				#				120	1	‡								 -			
- 45		Ŧ	6	20	24		::::		14	: ::	::	SS-14	Sat.	#						‡								<u> </u>			
- 45	46.0	F 60.0				1		· /· ·						#				-125		‡								E			
	-40.3 -	68.6	8	9	12	+	21	/· · · ·		: : :		SS-15	Sat.	*						‡								E			
-50	-	‡					$\vdots \vdots f$::			#						‡								E			
-00	-51.3 ₋	73.6							 	1				#				-130	-	+] .							F			
	-	+	5	7	1 9	11	4		1	.	1 1	SS-16	Sat.	#L				1 1	1	1	1 1					1	1 1	Γ			