ID: B-3693

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OJECT: 33233.1.1

## STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

## STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33233.1.1(B-3693)

COUNTY ROBESON

PROJECT DESCRIPTION BRIDGE NO. 211 ON SR 1527 OVER

RAFT SWAMP

INVENTORY

N.C.  $\frac{\text{STATE PROJECT REFERENCE NO.}}{33233.1.1(B-3693)}$   $\frac{\text{SHEET}}{1}$   $\frac{\text{Totals}}{\text{SHEET}}$ 

#### 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 EMBINEERING UNIT AT 1919 250-4088. NETHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 INCESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNES OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY 10 THE DESPREY OF RELIBBLITY INTERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS NIDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION, THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS AND 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 ENCOUNTEED. 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 THS 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.

PERSONNEL

J.I. MILKOVITS, JR.

H.R. CONLEY

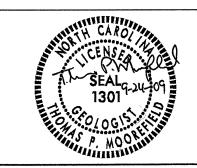
J.R. TURNAGE

INVESTIGATED BY JJ. MILKOVITS, JR.

CHECKED BY T.P. MOOREFIELD

SUBMITTED BY N.T. ROBERSON

DATE SEPTEMBER 2009



PROJECT REFERENCE	NO.	SHEET	NO.
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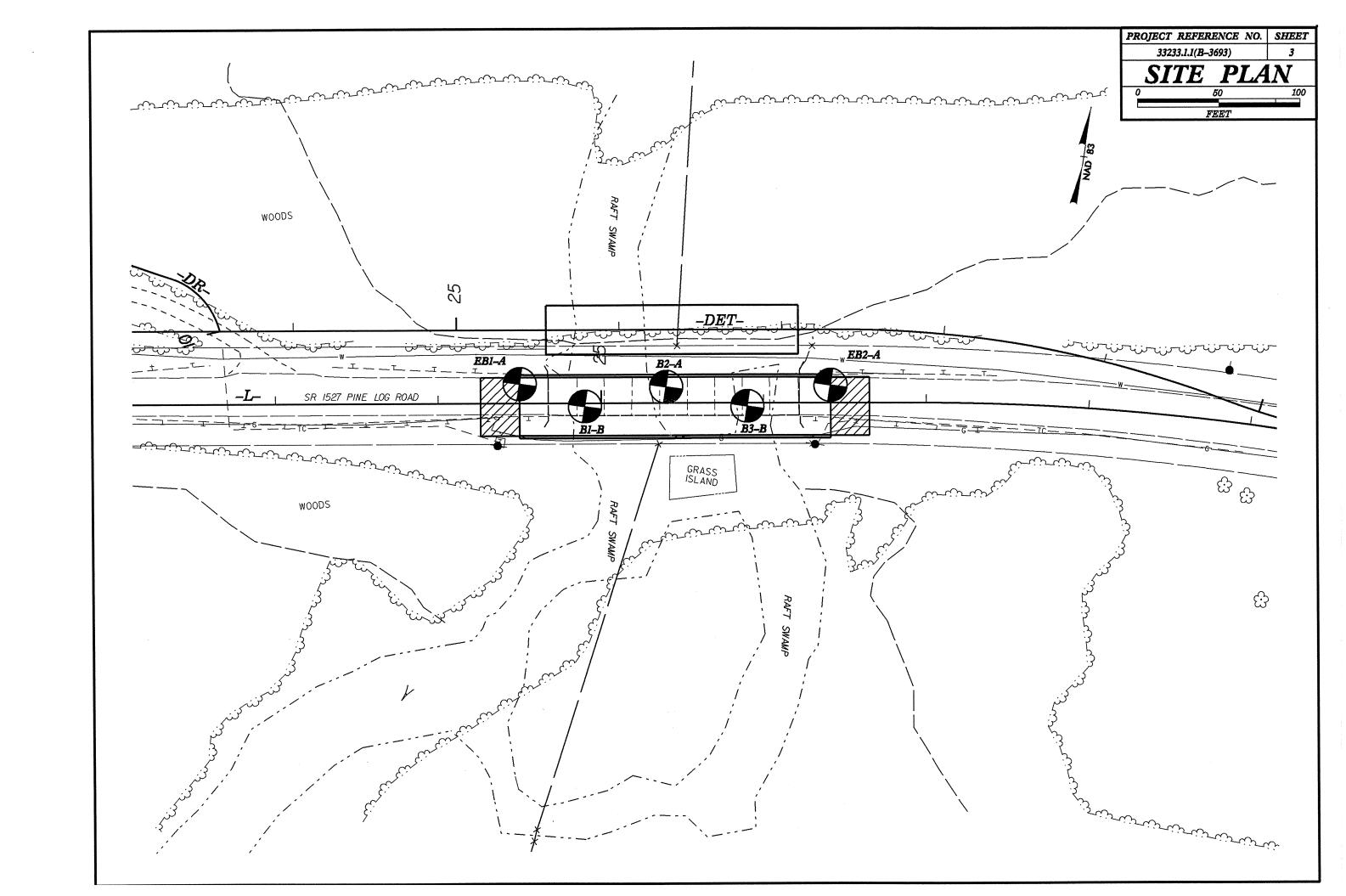
### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

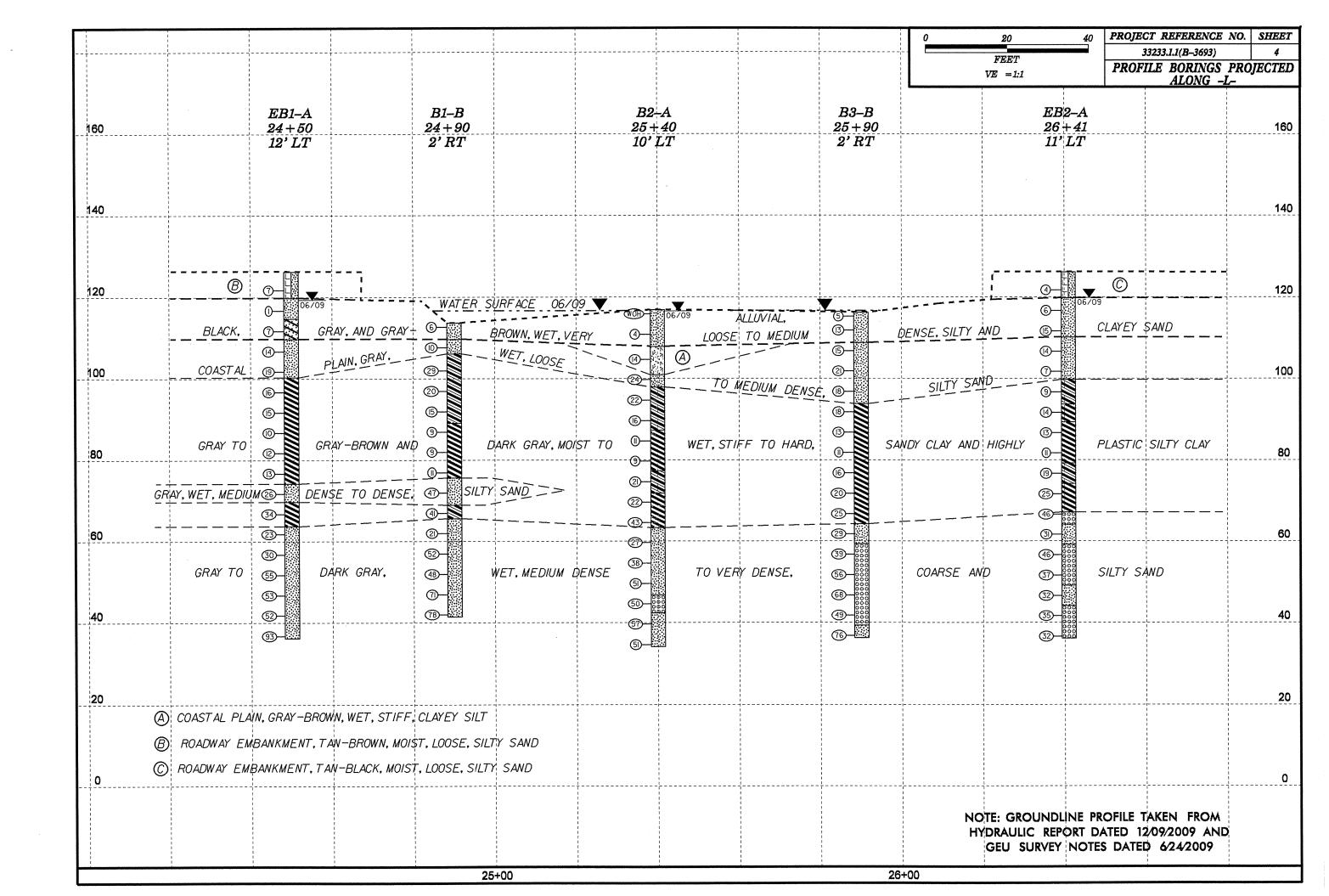
### DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

## SUBSURFACE INVESTIGATION

		SOIL AND	ROCK LEGEND, TERM	S, SYMBOLS	, AND ABBREVIA	TIONS	
SOIL DE	SCRIPTION	GRADATION		1		SCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEN	MI-CONSOLIDATED. OR WEATHERED EARTH MATERIALS	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATE	SIZES FROM FINE TO COARSE. ELY THE SAME SIZE. (ALSO	ROCK LINE INDICA	TES THE LEVEL AT WHICH NON-COAS	TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED STAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT 100 BLOWS PER FOOT ACCORDING TO STANDARD PENET	RATION TEST (AASHTO T206, ASTM D-1586), SOIL	POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF T	WD OR MORE SIZES.	IN NON-COASTAL	PLAIN MATERIAL, THE TRANSITION I	MPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE	ADUIFER - A WATER BEARING FORMATION OR STRATA.  ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
CLASSIFICATION IS BASED ON THE AASHTD SYSTEM. BE CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLAS		ANGULARITY OF GR		OF WEATHERED RO ROCK MATERIALS	ICK. ARE TYPICALLY DIVIDED AS FOLLOW	6:	ARGILLACEDUS - APPLIED TO ACCES THAT THEY BEEN BENTED FROM SHID ON THAT CONTAIN SHID.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTU	JRE, PLASTICITY, ETC. EXAMPLE: FREDDED FINE SAND LAVERS, NIGHT! PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED SUBANGULAR, SUBROUNDED, OR ROUNDED.	BY THE TERMS: ANGULAR.	WEATHERED ROCK (WR)		N MATERIAL THAT WOULD YIELD SPT N VALUES > 100	OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.
	ASHTO CLASSIFICATION	MINERALOGICAL COMPO	SITION		BLOWS PER FOOT I	F TESTED. RAIN IGNEOUS AND METAMORPHIC ROCK THAT	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
GENERAL GRANULAR MATERIALS	SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ET WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	C. ARE USED IN DESCRIPTIONS	CRYSTALLINE RDCK (CR)	WOULD YIELD SPT GNEISS, GABBRO, SCI	REFUSAL IF TESTED. RUCK TYPE INCLUDES GRANITE,	GROUND SURFACE.  CALCAREOUS (CALC.) - SDILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. (≤ 35% PASSING *200)	(> 35% PASSING *200)  A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	COMPRESSIBILIT	Y	NDN-CRYSTALLINE	FINE TO COARSE GF	AGIN METAMORPHIC AND NON-CDASTAL PLAIN THAT WOULD YELLD SPT REFUSAL IF TESTED, ROCK TYPE	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
GROUP A-1 A-3 A-2- CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-		SLIGHTLY COMPRESSIBLE LIQUI	D LIMIT LESS THAN 31	ROCK (NCR) COASTAL PLAIN	INCLUDES PHYLLITE	SLATE, SANDSTONE, ETC.  JIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE.
SYMBOL 000000000000000000000000000000000000		HIGHLY COMPRESSIBLE LIQUI	D LIMIT EQUAL TO 31-50 D LIMIT GREATER THAN 50	SEDIMENTARY ROCK	SPT REFUSAL. ROCK	TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	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.
% PASSING	GRANULAR SILT- MUCK,	PERCENTAGE OF MA	FERIAL	107		HERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
* 10 50 MX * 40 30 MX 50 MX 51 MN	SOILS SOILS PEAT	URGANIC MATERIAL SOILS SOILS	OTHER MATERIAL			TS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.  DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
* 200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 M	MX 36 MN 36 MN 36 MN 36 MN	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% LITTLE ORGANIC MATTER 3 - 5% 5 - 12%	TRACE 1 - 10% LITTLE 10 - 20%	1	R IF CRYSTALLINE.	SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN.	HORIZONTAL.
LIQUID LIMIT	IN 48 MX 41 MN 40 MX 41 MN SOILS WITH N 100 MX 10 MX 11 MN 11 MN LITTLE OR HIGHLY	MODERATELY ORGANIC 5 - 10% 12 - 20% HIGHLY ORGANIC >10% >20%	SOME 20 - 35% HIGHLY 35% AND ABOVE	(V SLI.) CRYST	ALS ON A BROKEN SPECIMEN FACE	SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 8 8 8 4 MX	8 MX 12 MX 16 MX No MX MODERATE DRGANIC			ł	CRYSTALLINE NATURE. GENERALLY FRESH. JOINTS STAINED	AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY OF MAJOR GRAVEL, AND SAME STONE	SILTY CLAYEY ORGANIC	WATER LEVEL IN BORE HOLE IMMEDIATELY	AFTER DRILLING			IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR RYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND SAND GRAVEL AND SAND	SOILS SOILS MATTER	STATIC WATER LEVEL AFTER 24 HOURS		MODERATE SIGNII	FICANT PORTIONS OF ROCK SHOW DIS	SCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GENLRATING AS A EXCELLENT TO GOOD	FAIR TO POOR FAIR TO POOR UNSUITABLE	LE PERCHED WATER, SATURATED ZONE, OR WATE	R BEARING STRATA			DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL.
SUBGRADE DI OF A-7-E CHECEGUE IC < 11 - 20	Ø ; PI OF A-7-6 SUBGROUP IS > LL - 30	SPRING OR SEEP			FRESH ROCK.	R STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
	Y OR DENSENESS	MISCELLANEOUS SY	MBOLS	SEVERE AND E	ISCOLORED AND A MAJORITY SHOW I	KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
PRIMARY SOIL TYPE COMPACTNESS OR	RANGE OF STANDARD RANGE OF UNCONFINED PENETRATION RESISTENCE COMPRESSIVE STRENGTH	RDADWAY EMBANKMENT (RE)  WITH SOIL DESCRIPTION  SPT CPT  DPT DPT TEST	ST BORING SAMPLE DESIGNATIONS		AN BE EXCAVATED WITH A GEOLOGIS STED, WOULD YIELD SPT REFUSAL	ST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
CONSISTENCY	(N-VALUE) (TONS/FT <sup>2</sup> )		S - BULK SAMPLE			R STAINED.ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED TOID ROCKS ALL FELDSPARS ARE KADLINIZED TO SOME	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
GENERALLY VERY LOOSE LOOSE GRANULAR LOOSE	44 4 TO 10	SOIL SYMBOL HOGER	SS - 9PLIT SPOON	EXTE	IT. SOME FRAGMENTS OF STRONG RO	CK USUALLY REMAIN.	ITS LATERAL EXTENT.  LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
MATERIAL MEDIUM DENSE (NON-COHESIVE) DENSE	10 TO 30 N/A 30 TO 50	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT - CORE B	βΑΜΡLE DRING ST - SHELBY TUBE		STED, YIELDS SPT N VALUES > 100 OCK EXCEPT QUARTZ DISCOLORED D	BFF R STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN
VERY DENSE	>50	INFERRED SOIL BOUNDARY	BAMPLE	(V SEV.) THE N	MASS IS EFFECTIVELY REDUCED TO S	SOIL STATUS, WITH DNLY FRAGMENTS OF STRONG ROCK ROCK WEATHERED TO A DEGREE SUCH THAT DNLY MINDR	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
VERY SOFT GENERALLY SOFT	<2 <0.25 2 TO 4 0.25 TO 0.50	THEEDER PORT INE	RING WELL RS - ROCK SAMPLE			REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF	INTERVENING IMPERVIOUS STRATUM.
SILT-CLAY MEDIUM STIFF MATERIAL STIFF	4 TO 8 0.5 TO 1.0 8 TO 15 1 TO 2	ALLUVIAL SOIL BOUNDARY				T DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
(COHESIVE) VERY STIFF HARD	15 TO 30 2 TO 4 >30 >4		INDICATOR		AN EXAMPLE.		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 AN
TEXTURE O	OR GRAIN SIZE	ROCK STRUCTURES - SPT N-	RATIO SAMPLE			HARDNESS	EXPRESSED AS A PERCENTAGE.  SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE
U.S. STD. SIEVE SIZE 4 10		SOUNDING ROD REF SPT RE			IDT BE SCRATCHED BY KNIFE OR SH RAL HARD BLOWS OF THE GEOLOGIS	ARP PICK. BREAKING OF HAND SPECIMENS REQUIRES T'S PICK.	PARENT ROCK.
OPENING (MM) 4.76 2.00		ABBREVIATION				ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL
BOULDER COBBLE GRAVEL	COARSE FINE SILT CLAY	AR - AUGER REFUSAL HI HIGHLY	₩ - MOISTURE CONTENT V - VERY	1	BETACH HAND SPECIMEN.  BE SCRATCHED BY KNIFF OR PICK.	GOUGES OR GROOVES TO 0,25 INCHES DEEP CAN BE	TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
(BLDR.) (COB.) (GR.)	(CSE. SD.) (F SD.) (SE.)	BT - BORING TERMINATED MED MEDIUM CL CLAY MICA MICACEDUS	VST - VANE SHEAR TEST	HARD EXC		DIST'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 SIZE IN. 12 3	Ø.25 Ø.05 Ø.005	CPT - CONE PENETRATION TEST MOD MODERATELY CSE CDARSE NP - NON PLASTIC	WEA WEATHERED	MEDIUM CAN	BE GROOVED OR GOUGED 0.05 INCHE	S 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 WITH
SOIL MOISTURE - C	ORRELATION OF TERMS	DMT - DILATOMETER TEST ORG ORGANIC  DPT - DYNAMIC PENETRATION TEST PMT - PRESSUREMETER	7d- DRY UNIT WEIGHT		BE EXCAVATED IN SMALL CHIPS TO IT OF A GEOLOGIST'S PICK.	PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	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 MC (ATTERBERG LIMITS) DESCRIP		N e - VOID RATIO SAP SAPROLITIC				KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS BE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH
- SATUR		F - FINE SD SAND, SANDY FOSS FOSSILIFEROUS SL SILT, SILTY			ES CAN BE BROKEN BY FINGER PRE		OF STRATUM AND EXPRESSED AS A PERCENTAGE.
(SAT.		FRAC FRACTURED, FRACTURES SLI SLIGHTLY FRAGS FRAGMENTS TCR - TRICONE REFUSA	aL.			CAVATED READILY WITH POINT OF PICK. PIECES 1 INCH BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	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
PLASTIC	SEMISOLID: REQUIRES DRYING TO			FING	ERNAIL.		TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.  TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE < - WET - WET - WET - PLASTIC LIMIT	- (W) ATTAIN DPTIMUM MOISTURE	EQUIPMENT USED ON SUBJ		TERM	URE SPACING SPACING	BEDDING TERM THICKNESS	RENCH MARK: BL-3 AT -L- STA, 24+34,90, 21,46' LT
	T - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS:	HAMMER TYPE:  AUTOMATIC MANUAL	VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED > 4 FEET THICKLY BEDDED 1.5 - 4 FEET	BENCH MARK: BE-3 AT -E- STA, 24134.30, 2640 ET
OM OPTIMUM MOISTURE - MOIST SL SHRINKAGE LIMIT	1 - (M) SOLIDARI ON NERN OFFINGA MOISTONE	MOBILE B- CLAY BITS		WIDE MODERATELY CL	3 TO 10 FEET OSE 1 TO 3 FEET	THINLY BEDDED 0.16 - 1.5 FEET	ELEVATION: 125.89 FT.
- DRY	REQUIRES ADDITIONAL WATER TO	6° CONTINUOUS FLIGHT AU	1	CLOSE VERY CLOSE	0.16 TD 1 FEET LESS THAN 0.16 FEET	VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	NOTES:
	HITHIN OF THOS HOISTONE		-B			THINLY LAMINATED < 0.008 FEET RATION	-
	ASTICITY TY INDEX (PI) DRY STRENGTH	CME-45C HARD FACED FINGER BITS		FOR SEDIMENTARY R		OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	7
NONPLASTIC Ø-		TUNGCARBIDE INSERTS		FRIABLE		ITH FINGER FREES NUMEROUS GRAINS:	
	-15 SLIGHT -25 MEDIUM	CASING W/ ADVANC	HAND TUULS:	7	GENILE BL	OW BY HAMMER DISINTEGRATES SAMPLE. N BE SEPARATED FROM SAMPLE WITH STEEL PROBE:	
HIGH PLASTICITY 26	OR MORE HIGH		<del>                                    </del>	MODERATE		SILY WHEN HIT WITH HAMMER.	
	COLOR	TRICONE TUNG	SOUNDING ROD	INDURATE		E DIFFICULT TO SEPARATE WITH STEEL PROBE; TO BREAK WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR O MODIFIERS SUCH AS LIGHT, DARK, STREAKED,	COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	DRAG BIT	VANE SHEAR TEST	EYTREME		TO BREAK WITH HAMMER.  IMER BLOWS REQUIRED TO BREAK SAMPLE;	
ווטטנו זבווט טטטוו אס בנטווו, טאוא, סוותבאובט,	, OULD TO DESCRIPE INTERMINE			1 LATINEPIEC		REAKS ACROSS GRAINS	1



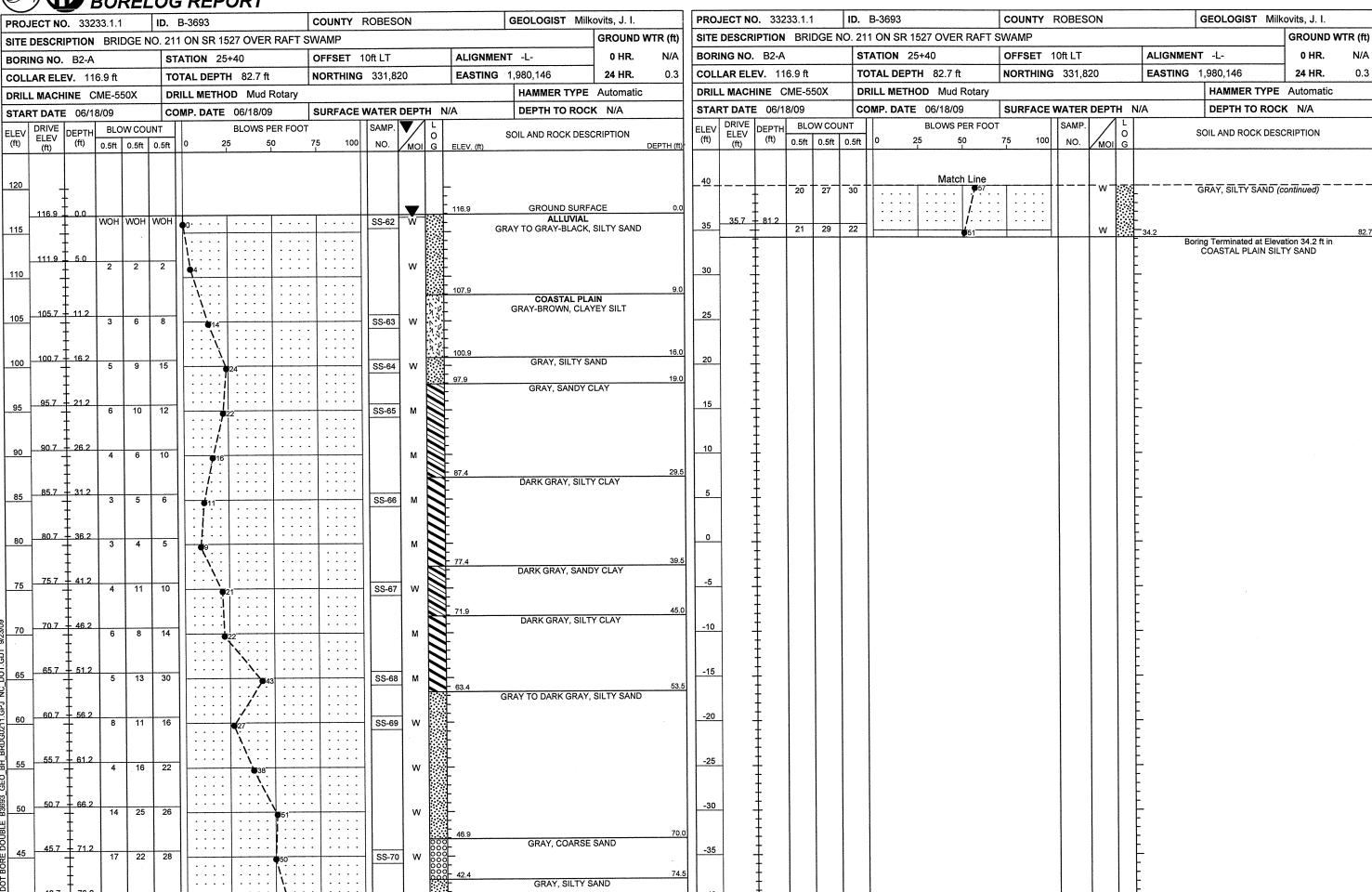


PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milkovits, J. I.	PR	ROJECT NO. 33233	5.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Milko	vits, J. I.
SITE DESCRIPTION BRIDGE NO	O. 211 ON SR 1527 OVER RAFT	SWAMP	GROUND WTR (ft)	SIT	TE DESCRIPTION	BRIDGE N	IO. 211 ON SR 1527 OVER RAFT	SWAMP		GROUND WTR
BORING NO. EB1-A	STATION 24+50	OFFSET 12ft LT ALIGNM	MENT -L- 0 HR. N/A	ВО	ORING NO. EB1-A		STATION 24+50	OFFSET 12ft LT	ALIGNMENT -L-	0 HR. 1
COLLAR ELEV. 126.3 ft	TOTAL DEPTH 90.0 ft	NORTHING 331,808 EASTIN	<b>G</b> 1,980,057 <b>24 HR.</b> 7.0	CO	OLLAR ELEV. 126.	3 ft	TOTAL DEPTH 90.0 ft	NORTHING 331,808	<b>EASTING</b> 1,980,057	24 HR.
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	·	HAMMER TYPE Automatic	DR	RILL MACHINE CM	E-550X	DRILL METHOD Mud Rotary		HAMMER TYPE	Automatic
START DATE 06/16/09	COMP. DATE 06/17/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A	ST/	TART DATE 06/16/0		COMP. DATE 06/17/09	SURFACE WATER DEPTH	N/A DEPTH TO ROCK	N/A
DRIVE   DEPTH   BLOW COUI   COUI	NT BLOWS PER FOO 0.5ft 0 25 50	OT SAMP.	SOIL AND ROCK DESCRIPTION DEPTH (ft)	ELE' (ft)	E  E(/	BLOW COU		T SAMP. L C		RIPTION
125 125 1228 - 3.5 120	3	1 1-1:4	GROUND SURFACE 0.0  ROADWAY EMBANKMENT TAN-BROWN, SILTY SAND  6.5	45	47.8 - 78.5	24 27 23 24	26 Match Line 53.	·   · · · · ·	GRAY TO DARK GRAY, S (continued)	LTY SAND
117.8 - 8.5 WOH WOH	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		BLACK, SILTY SAND			36 44	49		- 36.3  Boring Terminated at Elevat	ion 36 3 ft in
112.8 - 13.5 3 3	4		GRAY, CLAYEY SAND						COASTAL PLAIN SILT	/ SAND
107.8 + 18.5 4 6	8		COASTAL PLAIN GRAY, SILTY SAND	25	$\exists \ \exists \ \mid$				-	
102.8 + 23.5   6   7	12	W - 100.3	GRAY, HIGHLY PLASTIC SILTY CLAY	0 20	0				- - -	
95 97.8 + 28.5 4 5	11 16			15	5				-	
90 92.8 + 33.5 4 6	9			10	0					
82.8 43.5 4 4	6 . 10	SS-59 M		5	5   †				-	
77.8 48.5 4 5	8			0					-	
75	15	74.3 SS-60 W	GRAY, SILTY SAND	.0 -5	5   †				-	
67.8 - 58.5 7 14	20 34		DARK GRAY, HIGHLY PLASTIC SILTY CLAY	.5 -10					-	
60 62.8 - 63.5 10 11	12	SS-61 M	GRAY TO DARK GRAY, SILTY SAND	.5 -15					-	
57.8 - 68.5 12 17	13	w #		-25	25				-	
52.8 - 73.5	29	:: ::::			+				<u> </u>	

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### SHEET 6

PROJECT NO. 33233.1.1 ID. B-3693								1	COL	JNTY	ovits, J. I.						
					1		ON SR 1527 OVER RA	FT S							1 3 2 2 3 3 1 1 1 1 1 1 1	GROUND W	TR (fft)
	NG NO.						ATION 24+90			SET 2	ff RT			ALIGNMEN	NT -L-	0 HR.	N/A
	AR ELE				_		TAL DEPTH 72.2 ft			331,8	00		EASTING		24 HR.	N/A	
DRIL	_ MACH	INE C	ME-5	50X	DI	RII	ILL METHOD Mud Rota	1							HAMMER TYPE	Automatic	
<b></b>	T DATE						MP. DATE 06/22/09	,	SUR	FACE	WATER	DEPT	TH 3		DEPTH TO ROC		
ELEV	DRIVE	DEPTH		w cou		П	BLOWS PER F	I		T	SAMP.		11				
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft		0 25 50		75 	100	NO.	MOI	O G		SOIL AND ROCK DESC	CRIPTION	
						П						V			WATER SURFACE (0	6/19/09)	
115						Ш										<u> </u>	
	113.7 -	0.0	WOH	2	4	H	<u> </u>		Т.		00.74	101	2000	113.7	GROUND SURFA	/CE	0.0
	-	[	WOII	-	7	Ш	6				SS-71	W			GRAY-BROWN, SILT	Y SAND	
110	_ 	- 5.0				H			+					109.7	COASTAL PLA	IN	4.0
	100.7		3	4	6	11	10				SS-72	w		•	GRAY, SILTY SA		
105	-								:					106.2 GR/	AY TO GRAY-BROWN,	SANDY CLAY	7.5
	103.0	10.7							1.					-			
	-		7	14	15	]]	29		:	: : :	SS-73	М					
100	_	F					· · · · ·   · · · · · · · · · · · · ·		+					<del>-</del>			
	98.0	15.7	4	9	11	$\  \ $	7					м		• •			
95	_						20		:	: : :				-			
	93.0	20.7												-			
	-	-	4	7	8	11	•15		:		SS-74	М		•			
90	_	F					-		+-					- <sub>89.2</sub>			24.5
	88.0	25.7	2	4	5	$\  \ $			:	: : :	SS-75	м		DA	ARK GRAY, HIGHLY PL CLAY	ASTIC SILTY	
85	-	ļ	_	.	·		9			:::	33-75	171		•			
-55	83.0	30.7							<b>†</b> -					<del>-</del> -			j
	- 00.U -	-30.7	2	3	6		9		:	: : :		м		- -			
80	-	‡							1:					- 			
	78.0	35.7	2	5	6	$\  \ $			:	: : :		۱		- -			
75		‡	2		0		• •11 • • • • • •	 	:			М		- - 75.7			38.0
75	70.0	‡ <u></u> -				H			╁.					<del>-</del> -	GRAY, SILTY SA	ND	
	73.0	40.7	3	17	30	11	47.		:		SS-76	w		-			
70	_	‡					· · · ·   · · · ·     ·		<u> </u> :					-  69.0			44.7
	68.0	45.7	4	16	25	$\  \ $	:::: :::/: :		:		L	١		- 09.0	GRAY, SANDY C	LAY	44.7
65		‡	] "	10	25		41		:		SS-77	M		65.7			48.0
00	-	‡ <u></u>							+-					_ G -	RAY TO DARK GRAY,	SILTY SAND	.
	63.0	50.7	8	8	13	11	21		:	: : :	SS-78	w		- -			
60	·	‡					· · · ·   ·		<u> </u> :					<u>-</u>			
	58.0	55.7	1						1:	: : :		1		<u>-</u>			
		‡	13	22	30		52		1:	: : :	SS-79	W		<u>-</u> -			
55	-	‡							+-					<del>-</del>			
	53.0	60.7	13	18	30	$\ $			1:	: : :		w		<u>-</u>			
50		‡							<u> </u>	]				<u>-</u>			
	48.0	65.7							.	: : : ]				-			
		<u> </u>	27	30	41			`	71 •			W		- -			
45	-	†							+					<del></del>			
	43.0	70.7	28	41	37	-			\ .			w		- - 41.5			72.2
40		Ē	<del>                                     </del>			T	<u> </u>		<b>1</b> ♥/8	1		<del>  ''</del>	۳		oring Terminated at Elev COASTAL PLAIN SIL	ation 41.5 ft in	12.2
		‡												<b>-</b>	OUNG THE FLAIN SIL	I I OANU	
		t												_			
35	l	Ι	<u> </u>	L	<u></u>	L						<u></u>					



	ID. B-3693	COUNTY ROI	BESON		GEOLOGIST Mil	<del></del>		ļ	DJECT NO				B-3693	COUNTY	ROBES	SON		GEOLOGIST Mi	<del></del>
SITE DESCRIPTION BRIDGE N	O. 211 ON SR 1527 OVER RAFT	<del></del>				GROUND W	TR (ft)	-		<del></del>	BRIDGE	<del></del>	11 ON SR 1527 OVER RAFT	<del></del>					GROUND WT
BORING NO. B3-B	STATION 25+90	OFFSET 2ft R	T	ALIGNME	NT -L-	0 HR.	N/A	BOF	RING NO.	B3-B		ST	<b>TATION</b> 25+90	OFFSET	2ft RT		ALIGNMEN	T -L-	0 HR.
COLLAR ELEV. 116.1 ft	TOTAL DEPTH 80.0 ft	NORTHING 3	31,815	EASTING	1,980,198	24 HR.	N/A	COL	LLAR ELE	<b>V</b> . 116	5.1 ft		OTAL DEPTH 80.0 ft	NORTHIN	<b>G</b> 331,8	315	EASTING	1,980,198	24 HR.
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary				HAMMER TYPE	Automatic		DRII	LL MACH	INE CN	VIE-550X	DF	RILL METHOD Mud Rotary				,,	HAMMER TYPE	Automatic
START DATE 06/23/09	COMP. DATE 06/23/09	SURFACE WA	TER DEPTH (	).2ft	DEPTH TO ROO	CK N/A		STA	ART DATE				OMP. DATE 06/23/09	SURFACE	WATER	DEPTH	0.2ft	DEPTH TO ROO	K N/A
ELEV CHI		11	MP. L O IO. MOI G		SOIL AND ROCK DES		EPTH (ft)	ELEV (ft)		DEPTH (ft)	BLOW CO		BLOWS PER FOC 0 25 50	75 100	SAMP.	MOI G		SOIL AND ROCK DES	SCRIPTION
120							***************************************	40					Match Line						
					WATER SURFACE	(06/23/09)	0.0		37.6	- - 78.5 -	20 35	41		76		w	39 1 36.1	DARK GRAY, SILT	Y SAND
115 10.0 1 2	3		w		ALLUVIAL GRAY, SILTY S	· · · · · · · · · · · · · · · · · · ·		35	-	-				<b></b>	1		Bori	ng Terminated at Elec COASTAL PLAIN SII	ation 36.1 ft in
112.7 + 3.4   5   7	6			-	0.000, 0.200												E		
110 1 1 1	13.	1 1 1	l W	- -				30		-							-		
107.6 + 8.5				- 108.6 -	COASTAL PL	AIN	7.5			-							<b> </b>		
	8	: : : : : : : : : : : : : : : : : : : :	S-80 M	-	GRAY, SILTY S	SAND		25		-							<u> </u>		
105				<u> </u>				25		-							F		
102.6 + 13.5   8   9	12		м	- -			1			-							F		
100 ‡	1 1			_				20									F		
97.6 + 18.5	: : :   : : : :   : : :			<del>-</del> -			- 11			-							E		
95	11		M	-				15									E		
T I I I		1 11		- 93.6	AY TO DARK GRAY, H	ICHI V DI ASTIC	22.5										E		
92.6 + 23.5   5   8	10	· · · · ·   S	S-81 M	- GR/ -	SILTY CLA	Y											-		
90 ‡				_				10		-							-		
87.6 + 28.5 3 5	8			_						_							-		
85 7 8	8 13			_				5	_   -	-							<u>-</u>		
82.6 + 33.5				-					-								-		
3 3	8 . 11		м	-				0	-								-		
80 1				<del>_</del> -				"									F		
77.6 + 38.5 4 7	9		M	<del>-</del> -					-								-		
75 ‡				<u>-</u>				-5	-	-							F		
72.6 + 43.5				-													F		
90 + 4 8 + 70 + 8	12 20		M	F				-10									E		
7				E					] -								E		
67.6 + 48.5 5 10 65 65	15		м	E						<u> </u>							E		
				64.1			52.0	-15	4 -	<u> </u>							-		
62.6 + 53.5 10 13	16				DARK GRAY, SIL	TY SAND				<u> </u>							ţ		
10 13 10 13 10 13 10 13 10 13 10 13 10 13 10 10 10 10 10 10 10 10 10 10 10 10 10	16 29	s :   : : :   s	S-82 W					-20		<u> </u>					İ		E		
T   335			000	59.1	GRAY, COARSE	SAND	57.0			<u> </u>							<u> </u>		
H 12 17	22 39	<u>s</u>	S-83 W 000	E					.   -	<u> </u>							ţ		
H 55 T			000	F				-25	H -	<u> </u>							F		
52.6 + 63.5   16   26	30		S-83 W 000 000 000 000 000 000 000 000 000	L					-	ţ l							<u> </u>		
50 10 20			VV 000	L				-30		‡							L		
ш ш 47.6 + 68.5		:	000	L						‡							<u> </u>		
19 28	40	68	W 000	Ł						ţ							F		
<u>45</u> <u>+</u>			000	-				-35	<mark>거 -</mark>	<u>†</u>							F		
42.6 73.5 23 23	26		W 000	L						‡							F		
Š 10   I   23   23	49		VV 000	<b>)</b> _				1 40	,   .	+ 1							F		

DRILL MACHINE CME-550X   DRILL METHOD Mud Rotary   DRILL METHOD Mud Rotary   START DATE 06911/09   COMP. DATE 08911/09   SURFACE WATER DEPTH N/A   DEPTH TO ROCK N/A   START DATE 06911/09   SURFACE WATER DEPTH N/A   DEPTH TO ROCK N/A   START DATE 06911/09   SURFACE WATER DEPTH N/A   DEPTH TO ROCK N/A   START DATE 06911/09   SURFACE WATER DEPTH N/A   DEPTH TO ROCK N/A   START DATE 06911/09   SURFACE WATER DEPTH N/A   DEPTH TO ROCK N/A   START DATE 06911/09   SURFACE WATER DEPTH N/A   DEPTH TO ROCK N/A   START DATE 06911/09   SURFACE WATER DEPTH N/A   DEPTH TO ROCK N/A   START DATE 06911/09   SURFACE WATER DEPTH N/A   DEPTH TO ROCK N/A   D	GROUND WTR 0 HR. 1 1,980,246 24 HR. HAMMER TYPE Automatic
COLLAR ELEV. 128.2 ft TOTAL DEPTH 90.0 ft NORTHING 331,836 EASTING 1,980,246 24 R. 6.4  DRILL MACHINE CME-550X DRILL METHOD Mud Rotary  TOTAL DEPTH 90.0 ft NORTHING 331,836 EASTING 1,980,246 24 R. 6.4  DRILL MACHINE CME-550X DRILL METHOD Mud Rotary  TOTAL DEPTH 90.0 ft NORTHING 331,836 EASTING 1,980,246 25 M. M. DEPTH NORTH NORT	1,980,246 <b>24 HR</b> .
DRILL MACHINE CME-550X   DRILL METHOD Mud Rotary   START DATE   06/11/109   SURFACE WATER DEPTH NA   DEPTH TO ROCK N/A	
START DATE   06/11/09     SURFACE WATER DEPTH   N/A   DEPTH TO ROCK   N/A   DEPTH TO R	HAMMER TYPE Automatic
SEAST   SEAS	
(f) (f) 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,	DEPTH TO ROCK N/A
128  129  120  121  122  123  124  125  127  128  128  129  120  120  120  120  120  120  120	SOIL AND ROCK DESCRIPTION
127 3.5 4 2 2 127 8.5 1 2 4 2 2 117.7 8.5 1 2 4 3 4 4 7 7 7 105 100 100 100 100 100 100 100 100 100	
127 - 3.5	DARK GRAY, SILTY SAND
110	GRAY, COARSE SAND
1177 8.5	
110	Boring Terminated at Elevation 36.2 ft in
110	CÓASTAL PLAIN COARSE SAND
105	
100 102.7 + 23.5	•
97.7 + 28.5 3 3 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
95 92.7 + 33.5	
90 + 4 5 9	
87.7 - 38.5 3 5 8	
85	
80 77.7 + 48.5 GRAY, SANDY CLAY	
75	
72.7 + 53.5	
677 586	
65 8 16 30	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
57.7 + 68.5	
55	

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LDI-A															
	SOIL TEST RESULTS														
SAMPLE			DEPTH	AASHTO				% BY W	/EIGHT		% PAS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-54	12'LT	24+50	3.5-5.0	A-2-4(0)	16	NP	60.5	28.6	3.8	7.1	98	60	12	, =	•
SS-55	12'LT	24+50	8.5-10.0	A-2-4(0)	25	NP	25.2	52.9	9.6	12.3	100	86	26	-	•
SS-56	12'LT	24+50	13.5-15.0	A-2-6(0)	36	13	59.5	12.9	13.4	14.1	94	47	29	-	-
SS-57	12'LT	24+50	18.5-20.0	A-2-4(0)	32	6	25.2	49.4	17.3	8.1	98	86	33	-	-
SS-58	12'LT	24+50	28.5-30.0	A-7-5(9)	46	14	16.8	27.4	35.6	20.2	100	91	64	-	-
SS-59	12'LT	24+50	38.5-40.0	A-7-6(47)	68	41	0.6	4.6	34.2	60.5	100	100	97	-	-
SS-60	12'LT	24+50	53.5-55.0	A-2-4(0)	25	NP	14.0	76.0	2.9	7.1	100	99	11	•	-
SS-61	12'LT	24+50	63.5-65.0	A-2-4(0)	21	NP	70.2	18.6	2.1	9.1	100	58	12	-	•

R	1_	R

BI-B															
	SOIL TEST RESULTS														
SAMPLE			DEPTH	AASHTO				% BY W	VEIGHT		% PAS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-71	2'RT	24+90	0.0-1.5	A-2-4(0)	31	NP	47.2	28.7	16.0	8.1	97	67	26	-	-
SS-72	2'RT	24+90	5.0-6.5	A-2-4(0)	30	4	33.8	34.8	17.3	14.1	99	82	35	-	-
SS-73	2'RT	24+90	10.7-12.2	A-6(3)	35	12	25.0	38.5	26.3	10.1	100	84	47		-
SS-74	2'RT	24+90	20.7-22.2	A-6(7)	37	13	7.1	44.6	34.2	14.1	100	97	66	•	-
SS-75	2'RT	24+90	25.7-27.2	A-7-5(26)	58	26	1.4	21.8	38.4	38.3	100	100	85	-	-
SS-76	2'RT	24+90	40.7-42.2	A-2-4(0)	23	NP	7.9	79.7	3.3	9.1	100	99	14	•	-
SS-77	2'RT	24+90	45.7-47.2	A-6(12)	39	22	24.2	11.9	13.4	50.5	100	84	67	•	-
SS-78	2'RT	24+90	50.7-52.2	A-2-4(0)	19	2	63.1	21.6	1.2	14.1	99	63	16	-	-
SS-79	2'RT	24+90	55.7-57.2	A-2-4(0)	17	NP	64.2	23.9	3.8	8.1	100	73	14		-

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			S	OIL T	TE.	ST	RE	SUL	LTS						
SAMPLE			DEPTH	AASHTO				% BY W	/EIGHT		% PAS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-62	10'LT	25+40	0.0-1.5	A-2-4(0)	38	NP	22.8	51.9	17.3	8.1	100	87	30	-	**
SS-63	10'LT	25+40	11.2-12.7	A-5(8)	46	10	4.6	45.0	40.3	10.1	100	98	69	-	
SS-64	10'LT	25+40	16.2-17.7	A-2-4(0)	33	NP	55.3	33.0	9.7	2.0	99	72	15		-
SS-65	10'LT	25+40	21.2-22.7	A-6(8)	38	13	9.5	34.3	44.1	12.1	100	95	69		-
SS-66	10'LT	25+40	31.2-32.7	A-7-6(24)	54	25	2.2	22.6	46.9	28.3	100	99	84		-
SS-67	10'LT	25+40	41.2-42.7	A-6(4)	35	19	34.3	23.0	8.4	34.3	100	83	45	-	•
SS-68	10'LT	25+40	51.2-52.7	A-7-6(14)	44	25	25.0	9.9	12.6	52.5	98	80	66	-	
SS-69	10'LT	25+40	56.2-57.7	A-2-4(0)	18	NP	51.1	32.8	3.0	13.1	100	78	17	-	•
SS-70	10'LT	25+40	71.2-72.7	A-1-b(0)	19	NP	79.3	12.0	4.6	4.0	99	34	10	-	•

## *B3-B*

DJ-D			S	OIL 7	TE.	ST	RE	SUL	TS						
SAMPLE			DEPTH	AASHTO				% BY W	/EIGHT		% PAS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-80	2'RT	25+90	8.5-10.0	A-2-4(0)	40	NP	69.7	20.9	4.3	5.0	96	52	12	-	-
SS-81	2'RT	25+90	23.5-25.0	A-7-6(13)	41	19	8.3	27.4	36.0	28.3	100	96	73	-	
SS-82	2'RT	25+90	53.5-55.0	A-2-4(0)	20	NP	61.4	23.2	3.3	12.1	100	60	17		
SS-83	2'RT	25+90	58.5-60.0	A-1-b(0)	19	NP	76.3	14.4	2.2	7.1	99	50	11	-	-

## EB2-A

			S	OIL T	TE.	ST	RE	SUL	TS						
SAMPLE			DEPTH	AASHTO				% BY W	EIGHT		% PAS	SING (S	SIEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-43	11'LT	26+41	3.5-5.0	A-2-4(0)	19	NP	22.7	63.2	8.9	5.1	100	90	19		*
SS-44	11'LT	26+41	8.5-10.0	A-2-4(0)	32	NP	15.4	67.4	14.1	3.0	100	92	24	-	
SS-45	11'LT	26+41	13.5-15.0	A-2-4(0)	33	NP	47.7	28.9	16.2	7.1	98	70	27	-	
SS-46	11'LT	26+41	18.5-20.0	A-2-4(0)	33	NP	83.6	5.5	6.9	4.1	97	66	13	•	-
SS-47	11'LT	26+41	23.5-25.0	A-2-4(0)	24	NP	55.6	32.3	5.0	7.1	93	62	12	-	-
SS-48	11'LT	26+41	28.5-30.0	A-6(14)	38	20	1.6	33.5	46.6	18.3	100	99	78	-	-
SS-49	11'LT	26+41	33.5-35.0	A-7-6(24)	47	25	1.6	17.1	48.8	32.5	100	99	89	-	
SS-50	11'LT	26+41	38.5-40.0	A-7-6(39)	61	36	1.2	9.5	50.7	38.6	100	99	94	-	-
SS-51	11'LT	26+41	48.5-50.0	A-6(2)	28	14	23.4	36.2	7.9	32.5	100	91	44	-	-
SS-52	11'LT	26+41	58.5-60.0	A-1-b(0)	18	NP	80.3	10.9	3.8	5.1	100	39	10	-	-
SS-53	11'LT	26+41	63.5-65.0	A-2-4(0)	17	NP	56.4	30.7	3.8	9.1	100	76	15	-	-

# FIELD SCOUR REPORT

WBS:	33233.1.1	TIP: B-3	3693	COUNTY: Robeso	on		
DESCRIPTION(1):	Bridge No. 211 on	-L- (SR 1527,	Pine Log Road)	over Raft Swamp			
		EX	ISTING BRID	<u>GE</u>			
Information from:	Field Insp Other (e	pection X_ xplain)	Microfilm	(reel	_ pos:	_) -	
Bridge No.:2 Foundation Type:	211 Length: _ Timber piles reinfo	155.1 Total brced by steel H	Bents: <u>10</u> B I beams	ents in Channel: _	4 Bents in	Floodplain: _	6
EVIDENCE OF S Abutments or E	COUR(2) End Bent Slopes: N	None observed					
Interior Bents:	None observed						
Channel Bed:							
Channel Bank:	Some erosion of b	oanks from high	water				
	JR PROTECTION Abutment wall	,					
	At both end bents						
Effectiveness(5):	Effective						
Obstructions(6):	None observed						

#### **INSTRUCTIONS**

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- **9** Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoritical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

		DESIGN IN	IFORMA	TION	1				
Channel Bed Material(7)	: Alluvial san	id (SS-71)							
Channel Bank Material(8)	: Alluvial san	nd (SS-71)							
Channel Bank Cover(9)	: Grass, brus	sh, small to lar	ge trees						
Floodplain Width(10)	: <u>+/-1400 fe</u>	et							
Floodplain Cover(11)	: Wetland for	rest							
Stream is(12)	: Aggra	ading X	Degra	ding_		Sta	tic		
annel Migration Tendency(13)	: Toward the	south							
Observations and Other Com	ments:								
•									
DESIGN SCOUR ELEVATION	NS(14)			Fee	et <b>X</b>	Mete	ers		
BENTS									
<u>B1</u>		B3	т т		1 1				
111.9	115.5 1	15.5							
	-								
			<b> </b>						
Comparison of DSE to Hydrau	ilics Unit the	oretical scour:							
The Geotechnical Engineering				t's the	oretical sco	our eleva	itions at	B1(111.9	) and
B2/B3(115.5).									
SOIL ANALYSIS RESULTS I	EDOM CHAN	INEL DED AN	ID DANK	MATE	DIAI				
Bed or Bank	-KOW CHAN	INEL BED AN	D BANK	WATE	NIAL	<u> </u>		<u> </u>	
Sample No.									
Retained #4			<u> </u>						
Passed #10									
Passed #40									
Passed #200									
Coarse Sand	See Sheet N	lo. 10							
Fine Sand	"Soil Test Re	esults",							
Silt	for sample S	SS-71.							
Clay									
LL									
PI									
AASHTO							***************************************	ļ	
Station									
Offset									
Depth		<u></u>	1					<u> </u>	

Reported by:

Form GEU-017e Revised 7/26/2007

SHEET

Date: 6/18/2009

## SITE PHOTOGRAPH

Bridge No. 211 on -L- (SR 1527) Over Raft Swamp



**CONTENTS** 

5-7

DESCRIPTION

TITLE SHEET

LEGEND

SITE PLAN PROFILE(S)

BORE LOG(S)

SCOUR REPORT

SOIL TEST RESULTS

SITE PHOTOGRAPH(S)

## STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

## **STRUCTURE** SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33233.1.1(B-3693) \_ F.A. PROJ. *BRZ-1527(2)* COUNTY ROBESON PROJECT DESCRIPTION BRIDGE NO 207 ON SR 1527 OVER HOLLY SWAMP

INVENTORY

STATE PROJECT REFERENCE NO. 33233.1.1(B-3693)

#### **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 VARBOUS FIELD BORNING LOOS, 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 1999 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 UIN-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 MOSTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOSTURE CONDITIONS OF THE OBSERVED AND THE STANDARD TEST METHOD. 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 PROLECT. THE DEPARTMENT DOES NOT WARRANT OR CUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR PINNON OF THE EXPERTATION AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDIER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISTY HUNSELF 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 INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL J.I. MILKOVITS, JR.

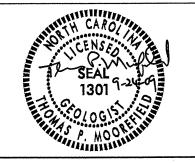
H.R. CONLEY

J.R. TURNAGE

INVESTIGATED BY J.I. MILKOVITS, JR.

T.P. MOOREFIELD SUBMITTED BY N.T. ROBERSON

SEPTEMBER 2009



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.

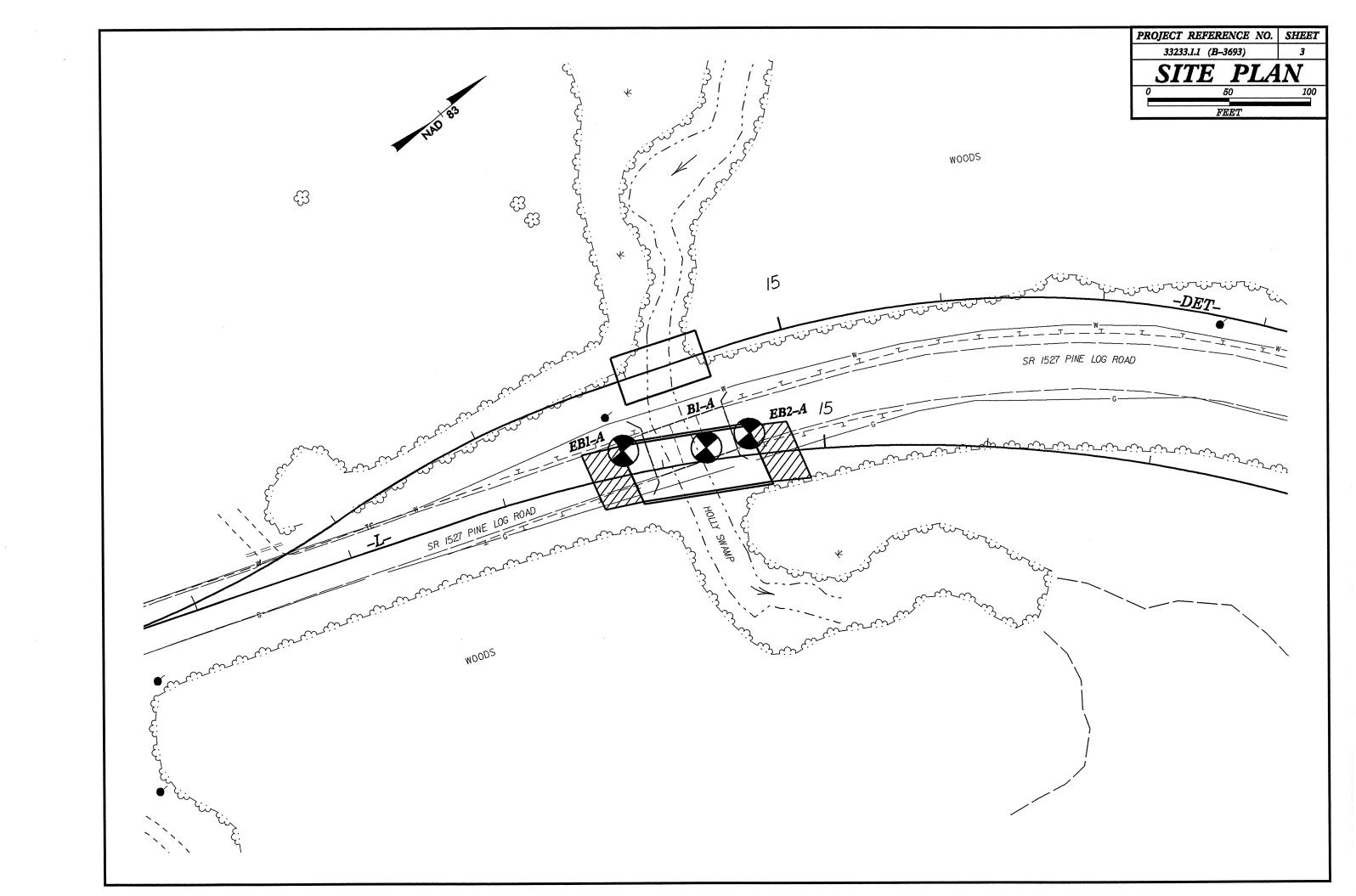
### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

#### DIVISION OF HIGHWAYS

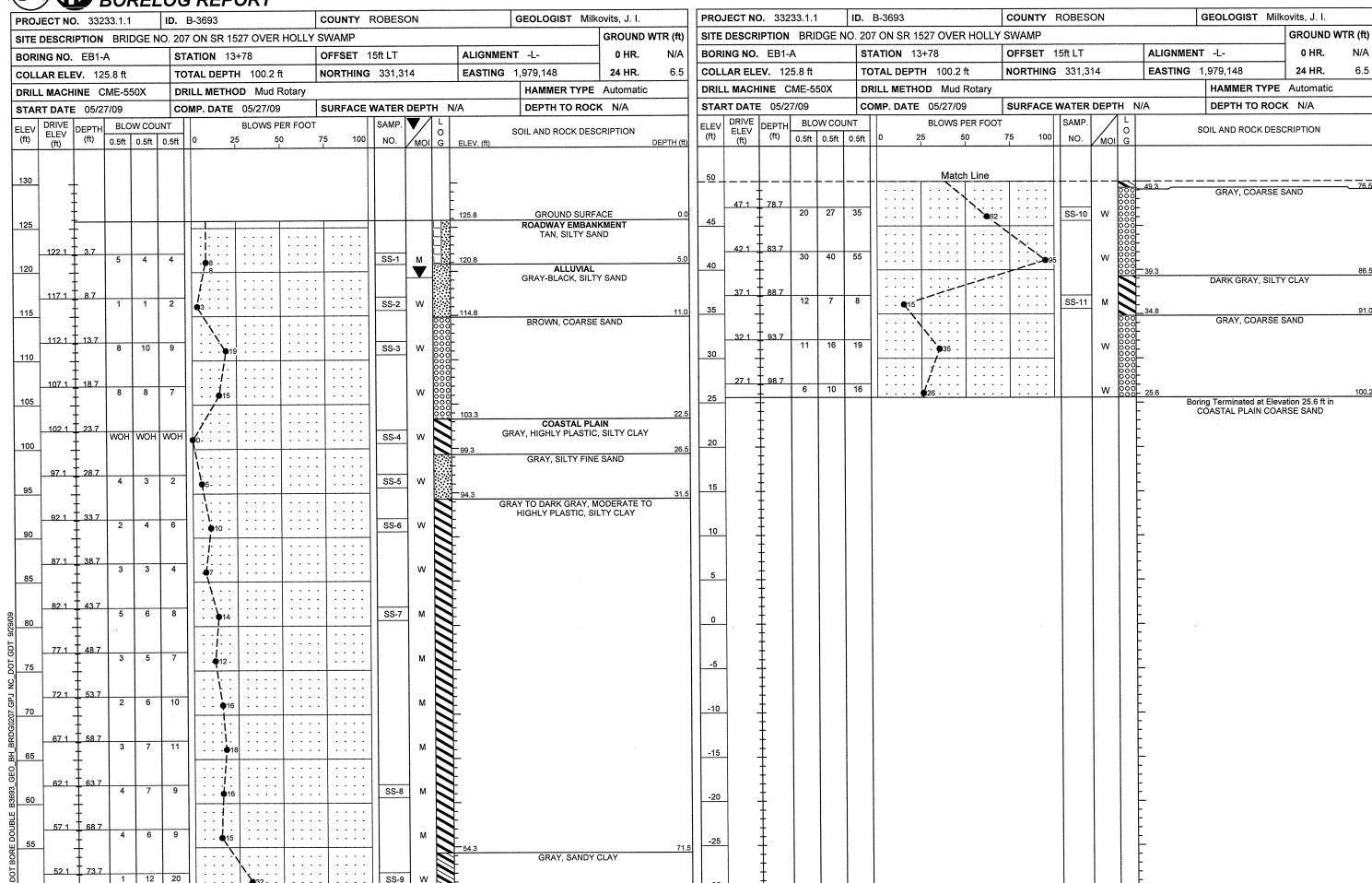
GEOTECHNICAL ENGINEERING UNIT

## SUBSURFACE INVESTIGATION

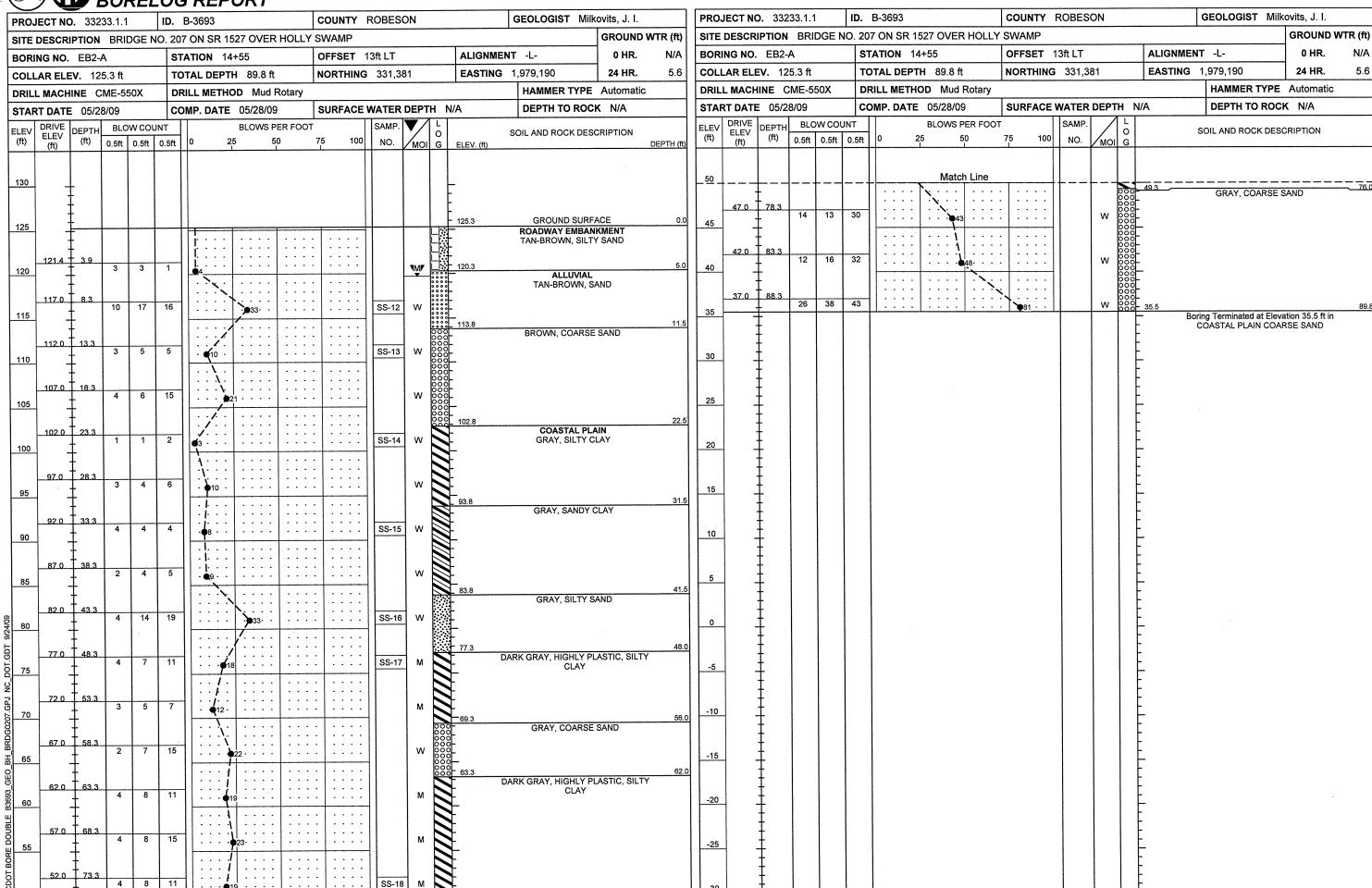
	SOIL AND ROCK LEGEND, TERM	S, SYMBOLS, AND ABBREVIATIONS	
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOUL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.  UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO	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.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL	POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 REPRESENTED BY A ZONE	AGUIFER - A WATER BEARING FORMATION OR STRATA.
CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE:	ANGULARITY OF GRAINS	OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR,	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:  WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION AS SHALE, SLATE, ETC.
VERY STAFF, GRAV, SETY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 ROCK (WR) BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION	CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
GENERAL CRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KADLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER 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	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-CDASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED, ROCK TYPE	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-5 A-3 A-6, A-7	SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31	INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	OF SLOPE.
SYMBOL DOGGGGOOGG	MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK PYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	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.
V DOCUME - CONTROL OF THE CONTROL OF	PERCENTAGE OF MATERIAL	(CP) SHELL BEDS, ETC. WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
# 10   GRANULAR   SILT- CLAY   PEAT   SOILS   CAY   PEAT   PE	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL		ROCKS OR CUTS MASSIVE ROCK.
# 40 38 MX 50 MX 51 MN	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.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
LIQUID LIMIT 48 MX 41 MN SOILS WITH	LITTLE ORGANIC MATTER	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF
PLASTIC INDEX 6 MX NP 18 MX 18 MX 11 MN 11 MN 10 MX 18 MX 11 MN 11 MN LITTLE OR HIGHLY	HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX No MX MODERATE ORGANIC	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JDINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY ORGANIC	water level in bore hole immediately after drilling	(SLI,) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND SOILS SOILS MATTER	STATIC WATER LEVEL AFTER 24 HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN. RATING AS A EXCELLENT TO GOOD FAIR TO POOR UNSUITABLE	PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MDD,) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	PARENT MATERIAL.
AS A EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE SUBGRADE	SPRING OR SEEP	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	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		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	THE STREAM.
CONSISTENCY OR DENSENESS  RANGE OF STANDARD RANGE OF UNCONFINED	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH  (MOD, SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
PRIMARY SOIL TYPE COMPACTNESS OR PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE)  WITH SOIL DESCRIPTION  ROADWAY EMBANKMENT (RE)  OFF CPT  DET TEST BORING  SAMPLE  DESIGNATIONS	IF TESTED, WOULD YIELD SPT REFUSAL	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
MAAHTDE3 (1010) 1 1	S - BULK SAMPLE	SEVERE 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	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
GENERALLY LOOSE 4 TO 10	SOIL SYMBOL AUGER BORING SS - SPLIT SPOON	EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	ITS LATERAL EXTENT.
MATERIAL MEDIUM DENSE 10 TO 50	ARTIFICIAL FILL (AF) OTHER CORE BORING SAMPLE  THAN ROADWAY EMBANKMENT CORE BORING CT. CHIERY TUBE	IF TESTED, YIELDS SPT N VALUES > 100 BPF	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
(NON-COHESIVE) VERY DENSE >50	ST - SHELBY TUBE	VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT (V SEV.) THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH DNLY FRAGMENTS OF STRONG ROCK	SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
VERY SOFT <2 <0.25	MONITORING WELL PS - POCK SAMPLE	REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. 1F TESTED, YIELDS SPT N VALUES < 180 BPF	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY   SOFT   2 TO 4   0.25 TO 0.50	INFERRED RUCK LINE PIEZOMETER DT DECOMPOSTED TRIAVIAL	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	TTERES ALLUVIAL SOIL BOUNDARY INSTRUCTION SAMPLE	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
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD >30 >4	25/825 DIP & DIP DIRECTION OF SLOPE INDICATOR INSTALLATION CBR - CALIFORNIA BEARING	ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	ROCK STRUCTURES RATIO SAMPLE  SPT N-VALUE	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SDIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	SDUNDING ROD     REF SPT REFUSAL	VERY HARD  CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES  SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	PARENT ROCK.
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	ABBREVIATIONS	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTERN, THAT HAS BEEN EMPLACED PARALLEL
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	AR - AUGER REFUSAL HI, - HIGHLY # - MOISTURE CONTENT	TO DETACH HAND SPECIMEN.	TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	BT - BORING TERMINATED MED MEDIUM V - VERY	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
GRAIN MM 305 75 2.0 0.25 0.05 0.005	CL CLAY MICA MICACEOUS VST - VANE SHEAR TEST CPT - CONE PENETRATION TEST MOD MODERATELY WEA WEATHERED	BY MODERATE BLOWS.	SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	CSE COARSE NP - NON PLASTIC 7 - UNIT WEIGHT	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.  HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH
SOIL MOISTURE - CORRELATION OF TERMS	DMT - DILATOMETER TEST ORG ORGANIC $\gamma_d$ - DRY UNIT WEIGHT DPT - DYNAMIC PENETRATION TEST PMT - PRESSUREMETER TEST $\cdot$	POINT OF A GEOLOGIST'S PICK.	A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO DR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION  (ATTERBERG LIMITS) DESCRIPTION	e - VOID RATIO SAP SAPROLITIC	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	Strata core recovery (srec.) - total length of strata material recovered divided by total length
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	F - FINE SD SAND, SANDY FOSS FOSSILIFEROUS SL SILT, SILTY	PIECES CAN BE BROKEN BY FINGER PRESSURE.	OF STRATUM AND EXPRESSED AS A PERCENTAGE.
(SAT.) FROM BELOW THE GROUND WATER TABLE	FRAC FRACTURED, FRACTURES SLI SLIGHTLY FRAGS FRAGMENTS TCR - TRICONE REFUSAL	VERY CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH	Strata rock quality designation (srdd) - 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
PLASTIC LIQUID LIMIT	FRHOS FRHOMEN IS ICK - INJUNE REPOSHE	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGERNAIL.	TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
RANGE - WET - (W) SEMISULIDI, REMOIRES DIVING TO	EQUIPMENT USED ON SUBJECT PROJECT	FRACTURE SPACING BEDDING	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
(PI) PL PLASTIC LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	TERM SPACING TERM THICKNESS  VERY THICKLY BEDDED > 4 FEET	BENCH MARK: BL-IAT -L- STA. 13+00.99, 20.12'LT
DM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	automatic Manual	VERY WIDE MORE THAN 10 FEET THICKLY BEDDED 1.5 - 4 FEET	E. E. T. 101 70 ET
SL SHRINKAGE LIMIT	MOBILE B-	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	ELEVATION: 125.30 FT.
- DRY - (D) - ATTAIN OPTIMISM MATER TO	6° CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE 0.06 TO THEE! THICKLY LAMINATED 0.008 - 0.03 FEET	NOTES:
HITHIN OF THOSTONE	O ROLLOW HUBERS	INDURATION < 0.008 FEET	
PLASTICITY	CME-45C	INDURATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
PLASTICITY INDEX (PI) DRY STRENGTH	TUNG,-CARBIDE INSERTS	DUDDING WITH EINEED EDEED MINEDONG CRAING	
NONPLASTIC         0-5         VERY LOW           LOW PLASTICITY         6-15         SLIGHT	CASING W/ ADVANCER HAND TODLS:	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MED, PLASTICITY 16-25 MEDIUM HIGH PLASTICITY 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE:	
	TRICONE TUNG,-CARB. HAND AUGER	BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	CORE BIT 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).  MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	DRAG BIT VANE SHEAR TEST	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. HRE USED TO DESCRIBE APPEARANCE.	JIND DIT	SAMPLE BREAKS ACROSS GRAINS.	



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				j		i 			FEET		3.1.1(B-3693)	4
						 		L	VE = 1:1	PROFILE	BORINGS PROJE ALONG -L-	EGT:
1 1 1 1				EB1	A	1 1 4 1	<i>B1</i> – <i>A</i>	EB2-2	4			
160				13 + 7 15 ' L'		1	14+28 8'LT	14+5a 13° LT				1
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140						1 1 1 1 1 1 1 1						1
						1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	~		NEWENT	+	
120		ROADWAY EMBANKM	ENT. TAN MOIST,	LOOSE,		<b>V</b>	(4) 3006/09	405	ROADWAY EMBA TAN-BROWN, MOIST, LOC	SE, SILTY_SAND_		1
] ! ! !		Ġ	RAY-BLACK. BRO	③—③ ₩N, (9)	ALLO AND TAN TO	VIAL, O TAN-GRAY.	(1) W	33-:::: ET, (D)-:::	VERY LOOSE TO DENSE	SAND.		
100				ARSE (5)			2	SAND 2				1
100		GRAY, WET,	LOOSE, SILTY S	AND 5			(I)—(II)	(i)—(ii)—(ii)—(ii)—(ii)—(ii)—(ii)—(ii)—				
 					COAS	STAL PLAIN,	8	8		 		
80				(1)— <b>(1)</b> — <b>(4)</b> — <b>(</b>				> < 33	GRAY, WET, DENSE, SIL			
		GRAY 7	O DARK GRAY		MOIST TO WE	T, VERY SOFT	① TO	HARD, (B)	SANDY AND SILTY CLAY			
       				® <b>W</b>			(A)	22 0000	GRAY, WET, MEDIUM DENSE	, COARSE SAND		
60							18	(B)				
 				_ 32		<		9				
40		GRAY,	WET. MEDIUM D	ENSE 62 888	TO VERY DE	ENSE, COARSE	(31) SAN	43 688 O AND 48 688	SILTY SAND			
1 1 1			-		0		28-	81 - 2000				
 				(35) 688 888 888 26 688 26 688			(34)—[22] 	 		1 1 1 1		
20	(A) COASTAL PLAIN	,GRAY,WET,VERY STIFF,S	ANDY SILT									
 		I, GRAY. WET, DENSE, SILTY	1	í ! !		 						
0	© COASTAL PLAN,	, DARK GRAY, MOIST, VERY	STIFF, SILTY CL	AY		1 1 1 1 1	! ! ! !					
									NOTE: GROUNDLINE PROF HYDRAULIC REPORT DA	LE TAKEN FRO	M 9	
	13+0	00			1.	4+00				15+00		



<b>BOREL</b> PROJECT NO. 33233.1.1	ID. B-3693	COUNTY ROBESON	GEOLOGIST Mi	ilkovits, J. I.	PRO	DJECT N	O. 33233	3.1.1	ID.	B-3693	COUNTY ROBES	SON		GEOLOGIST Mill	<del></del>
SITE DESCRIPTION BRIDGE N	O. 207 ON SR 1527 OVER HOLL	LY SWAMP		GROUND WTR	ft) SIT	E DESC	RIPTION	BRIDG	E NO. 20	07 ON SR 1527 OVER HOLLY	SWAMP				GROUND WTR (
BORING NO. B1-A	STATION 14+28	OFFSET 8ft LT ALIGN	MENT -L-	0 HR. N	/A BOI	RING NO	). B1-A		S.	<b>STATION</b> 14+28	OFFSET 8ft LT		ALIGNMEN	T -L-	0 HR. N
COLLAR ELEV. 119.1 ft	TOTAL DEPTH 89.1 ft	NORTHING 331,355 EASTI	NG 1,979,179	24 HR. (	.3 <b>CO</b> I	LLAR EL	. <b>EV.</b> 119.	1 ft	T	OTAL DEPTH 89.1 ft	NORTHING 331,	355	EASTING	1,979,179	24 HR. 0
DRILL MACHINE CME-550X	DRILL METHOD Mud Rotary	у	HAMMER TYPE	E Automatic	DRI	LL MAC	HINE CM	1E-550>	D	DRILL METHOD Mud Rotary				HAMMER TYPE	Automatic
START DATE 06/02/09	COMP. DATE 06/03/09	SURFACE WATER DEPTH N/A	DEPTH TO RO	CK N/A	STA		E 06/02/			OMP. DATE 06/03/09	SURFACE WATER	<del></del>	/A	DEPTH TO ROC	K N/A
ELEV DRIVE DEPTH BLOW COL		11 17 101	SOIL AND ROCK DE	SCRIPTION	ELE	V DRIVE ELEV	IDEC !!!	BLOW		BLOWS PER FOOT	1 1	1/101	\$	SOIL AND ROCK DES	CRIPTION
(ft) ELEV (ft) 0.5ft 0.5ft	0.5ft 0 25 50	75 100 NO. MOI G ELEV. (ft)		DEPTI	1 (ft) (ft)	(ft)	(ft) C	0.5ft 0.	5ft 0.5ft	0 25 50	75 100 NO.	MOI G			
120		119.1	GROUND SUR	FACE	0.0 40	<del></del>	<b>∔-</b>			Match Line	<del></del>	+		GRAY, SILTY SAND (	continued)
119.1 0.0 WOH WOH	4		ALLUVIAI TAN-GRAY, SILT	L			‡				.			(	· · · · · · · · · · · · · · · · · · ·
116.5 + 2.6   5   5	6	0.0.00	TAN, SAN		2.5	36.5	<del>+ 82.6</del> +	7 1	2 16	-		w			
115					6.0		Ŧ			\	1 11		-		
111.5 + 7.6			BROWN, COARS	SE SAND		31.5	87.6			_    : : : :   : : :   : : : :					
110 4 5	7 • • i2 · · · · · · · ·	SS-21 W 000			30	-	‡	8 1	5 19	34	<u> </u>	l w		ing Terminated at Elev	ation 30.0 ft in
		1 1 1 1 1 1 1 1 1					‡							COASTAL PLAIN SIL	
106.5 + 12.6   5   5	7				25		‡					F			
105		· · · · · · ·			16.0		Ŧ						-		
101.5 + 17.6			COASTAL PI GRAY, SILTY	LAIN			‡								
100 1 3	4	SS-22 W	GIVAT, OILTT	OBA	20	_	‡						-		
		1 1 1 1 90.1	GRAY TO DARK GRAY		21.0		‡								
96.5 + 22.6 3 5	6		GIAT TO BAIR GIAT	, OAND I OLIVI	15		‡								
95 ] 3   3	1						‡								
91.5 + 27.6							‡								
90 + 1 4	4 8	··   · · · ·         w			10		1						<del>-</del>		
<u> </u>							‡								
86.5 + 32.6 2 5	7				5		‡								
85 2 3	12				36.0		<b>†</b>						<del></del>		
81.5 + 37.6		:: ::::	GRAY, SAND		00.0		1					1	•		
80 5 8	15 • • • • • • • • • • • • • • • • • • •	· · · · · · SS-25 W			0	_	‡						· •••		
1 1	:::/ :::: ::	78.6	DARK GRAY, SAN		40.5		‡						•		
76.5 + 42.6	6				-5		‡						•		
75   1   3   3	<u> </u>	<del>  </del>     " 📚				_	‡						<del>-</del> ·		
74.5 + 47.6							‡						•		
70 71.5 + 47.6 3 4	10	· · ·   · · · ·         w			-10		<b>‡</b>						· <del>-</del>		
							‡						•		
66.5 + 52.6 2 6	8   : :   : : : : : : : : : : : : : : :				-1		‡						•		
65 I 2 0°	<u>• • • • • • • • • • • • • • • • • • • </u>				-1	ή	<b>†</b>						<del>-</del>		
							‡						•		
60 + 57.6 5 8	10	· · ·   · · · · ·         w			-20	2	<b>‡</b>						<del>-</del>		
Ŧ		57.6			61.5		1								
56.5 7 62.6	23	💮 -	GRAY, SILTY	SAND		_	<b>†</b>								
55	23 46	SS-26 W			-2	~	<b>†</b>						<del>-</del> -		
		52.6	DARK GRAY, SA	NDY CLAY	66.5		‡						• -		
50 51.5 + 67.6 2 8	12		Since Siver, On		-30	0	<b>‡</b>						- 		
T							‡			·			<del>.</del>		
46.5 + 72.6						_	± 1						- -		
45	22 37	w			-3	5	+ 1						<del></del>		
	:::: ;/::: ::	42.6	OBAY OUT	CAND	76.5		†						- -		
41.5 + 77.6   9	<del> </del>    · · · · ·   /· · · ·   · ·		GRAY, SILTY	SAND			I		- 1				-		



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SHEET 8 33233.1.1(B-3693)

EB1-A															
			S	OIL T	TE.	ST	RE	SUL	TS						
SAMPLE			DEPTH	AASHTO				% BY W	/EIGHT		% PAS	SING (S	(SIEVES	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-1	15'LT	13+78	3.7-5.0	A-2-4(0)	19	3	40.4	38.6	7.8	13.1	100	77	23		-
SS-2	15'LT	13+78	8.7-10.2	A-2-4(0)	23	NP	28.7	57.2	10.0	4.0	100	87	17	•	-
SS-3	15'LT	13+78	13.7-15.2	A-1-b(0)	19	NP	85.7	11.6	2.6	0.0	91	27	3	-	
SS-4	15'LT	13+78	23.7-25.2	A-7-6(37)	62	36	4.0	9.5	33.9	52.6	100	97	90	-	-
SS-5	15'LT	13+78	28.7-30.2	A-2-4(0)	23	NP	12.9	66.0	7.9	13.1	100	92	26	-	-
SS-6	15'LT	13+78	33.7-35.2	A-7-6(20)	41	24	1.2	24.3	34.1	40.4	100	100	85	-	•
SS-7	15'LT	13+78	43.7-45.2	A-7-6(29)	50	29	2.0	7.9	21.3	68.8	100	99	93	-	-
SS-8	15'LT	13+78	63.7-65.2	A-7-6(25)	47	26	2.8	11.5	27.0	58.6	100	99	89	-	-
SS-9	15'LT	13+78	73.7-75.2	A-6(7)	30	15	13.8	26.1	23.8	36.4	100	95	63	_	-
SS-10	15'LT	13+78	78.7-80.2	A-1-b(0)	19	2	73.7	15.2	7.1	4.0	96	38	13	-	-
SS-11	15'LT	13+78	88.7-90.1	A-7-6(24)	48	24	6.5	3.2	41.8	48.5	100	94	92	-	-

<i>B1-A</i>															
			S	OIL 7	TE.	ST	RE	SUL	TS						
SAMPLE			DEPTH	AASHTO				% BY W	/EIGHT		% PAS	SING (S	SIEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-19	8'LT	14+28	0.0-1.5	A-2-4(0)	29	NP	54.3	35.6	7.1	3.0	100	74	11	-	-
SS-20	8'LT	14+28	2.6-4.1	A-3(0)	20	NP	72.3	23.4	3.2	1.0	100	63	6	-	-
SS-21	8'LT	14+28	7.6-9.1	A-1-b(0)	20	NP	94.0	4.9	1.0	0.0	100	35	1	-	
SS-22	8'LT	14+28	17.6-19.1	A-7-5(4)	46	16	42.4	19.6	25.9	12.1	100	65	44	-	
SS-23	8'LT	14+28	22.6-24.1	A-6(5)	30	13	5.7	49.3	34.9	10.1	100	98	58	-	-
SS-24	8'LT	14+28	32.6-34.1	A-6(15)	38	18	1.0	23.6	30.9	44.4	100	99	85	-	-
SS-25	8'LT	14+28	37.6-39.1	A-4(1)	28	5	11.7	51.9	18.2	18.2	100	94	52	-	-
SS-26	8'LT	14+28	62.6-64.1	A-2-4(0)	18	NP	64.8	23.1	4.9	7.1	99	74	14	-	•
SS-27	8'LT	14+28	77.6-79.1	A-2-4(0)	26	4	7.7	64.3	9.8	18.2	79	78	24	-	-

EB2-A			2.	OIL 7	re:	$\overline{CT}$	RF	CIII	TS						
SAMPLE			DEPTH	AASHTO				% BY W			% PAS	SING (S	SIEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-12	13'LT	14+55	8.3-9.8	A-3(0)	19	NP	64.6	29.5	4.9	1.0	100	57	9	•	
SS-13	13'LT	14+55	13.3-14.8	A-1-b(0)	15	NP	94.1	4.6	1.3	0.0	81	16	1	•	
SS-14	13'LT	14+55	0.0-0.0	A-7-5(4)	52	15	40.4	18.2	27.2	14.2	100	67	46	•	•
SS-15	13'LT	14+55	33.3-34.8	A-6(3)	28	11	16.8	40.8	32.3	10.1	99	88	52	-	-
SS-16	13'LT	14+55	43.3-44.8	A-2-4(0)	21	NP	7.4	69.3	1.1	22.2	100	98	31	-	-
SS-17	13'LT	14+55	48.3-49.8	A-7-6(44)	68	40	3.6	3.2	8.2	84.9	100	97	94	-	-
SS-18	13'LT	14+55	73.3-74.8	A-7-6(38)	60	34	1.4	2.0	27.8	68.8	100	99	97	-	-

# FIELD SCOUR REPORT

WBS:	33233.1.1	TIP:	B-3693	COUNTY: Robe	eson									
DESCRIPTION(1):	Bridge No.207 o	n -L- (SR	1527, Pine Log	Road) over Holly Swar	mp									
	EXISTING BRIDGE													
Information from:	ormation from: Field Inspection X Microfilm (reel pos: ) Other (explain)													
Bridge No.: Foundation Type:		54	Total Bents:	4 Bents in Channel:	1_ Bents in Floodplain:3_									
EVIDENCE OF S Abutments or E	SCOUR(2) End Bent Slopes:	None obs	served											
Interior Bents:	None observed													
Channel Bed:	None observed													
Channel Bank:	Some erosion of	f bank duri	ing high water											
	UR PROTECTIO Abutment wall	N												
Extent(4):	At both end bent	ts												
Effectiveness(5):	Effective													
Obstructions(6):	None observed													

#### **INSTRUCTIONS**

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- 9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoritical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

		DES	SIGN IN	<b>IFORM</b>	ATIO	N				
Channel Bed Material(7)	: Alluvial s	and (S	S-20, SS	-21)and s	silty sar	nd (SS-19	)			
Channel Bank Material(8)	: Alluvial s	and (S	S-12) and	d silty sar	nd (SS-	2)				
Channel Bank Cover(9): Grass, brush, small to large trees										
Floodplain Width(10)	Floodplain Width(10): _+/- 1400 feet									
Floodplain Cover(11)	: Wetland	forest							····	
Stream is(12)	: Ag	grading	X	Degr	ading _	OFFICE AND ADDRESS OF THE STREET	Sta	ntic		
annel Migration Tendency(13)	: Toward	the sout	theast	***************************************						
Observations and Other Com	ments:									
DESIGN SCOUR ELEVATIO BENT B1	NS(14)				Fee	et <u>X</u>	Mete	ers	-	
114.0							I			
Comparison of DSE to Hydrain The Geotechnical Engineering	g Unit agre	es with	the Hyd	raulics U			cour at e	levation	114.0 fee	et.
Bed or Bank	1 TON ON		. DLD AI	T DAIN	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	-1/1//-				
Sample No.										
Retained #4										
Passed #10	See Shee									
Passed #40	"Soil Test		s",			Weekler Committee Committe				
Passed #200	for sampl	es:								
Coarse Sand	SS-2									
Fine Sand	SS-12									
Silt	SS-19					MANAGE STREET, AND STREET, STR				
Clay	SS-20									
LL	SS-21									
PI				1						
AASHTO										
Station Offset										
Depth										
Debuil				.L					l	

Reported by: Joseph July 1.

Form GEU-017e Revised 7/26/2007

Date: 6/24/2009

## **SITE PHOTOGRAPH**

Bridge No. 207 on -L- (SR 1527) Over Holly Swamp



**CONTENTS** 

DESCRIPTION

TITLE SHEET

LEGEND

SITE PLAN PROFILE(S)

BORE LOG(S)

SCOUR REPORT

SOIL TEST RESULTS

SITE PHOTOGRAPH(S)

## STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

## STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33233.1.1(B-3693) F.A. PROJ. BRZ-1527(2)

COUNTY ROBESON

PROJECT DESCRIPTION BRIDGE NO. 210 ON SR 1527 OVER

RAFT SWAMP (OVERFLOW)

INVENTORY

 STATE
 STATE PROJECT REPERENCE NO.
 SMEST STOPALS SHEETS

 N.C.
 33233.1.1(B-3693)
 1
 9

#### 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, CEOTECHNICAL ENGINEERING LINT AT 1999 250-0408. RHITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 BORRHOULE. THE LABORATORY SAMPLE DATA AND THE IN SITU IN-PLACED TEST DATA CAN BE RELIED ON ONLY TO THE DESCREE OF RELIABILITY INSERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOL MOISTURE CONDITIONS NIONATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION, THESE WATER LEVELS OR SOLL MOISTURE CONDITIONS ONLY THE OBSERVED WATER LEVELS OR SOLL 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 THAS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR CUARANTEE 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 HANGELF 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 MIXICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

J.I. MILKOVITS JR.

H.R. CONLEY

J.R. TURNAGE

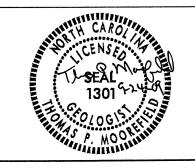
INVESTIGATED BY J.I. MILKOVITS, JR.

CHECKED B

T.P. MOOREFIELD

SUBMITTED BY N.T. ROBERSON

SEPTEMBER 2009



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.

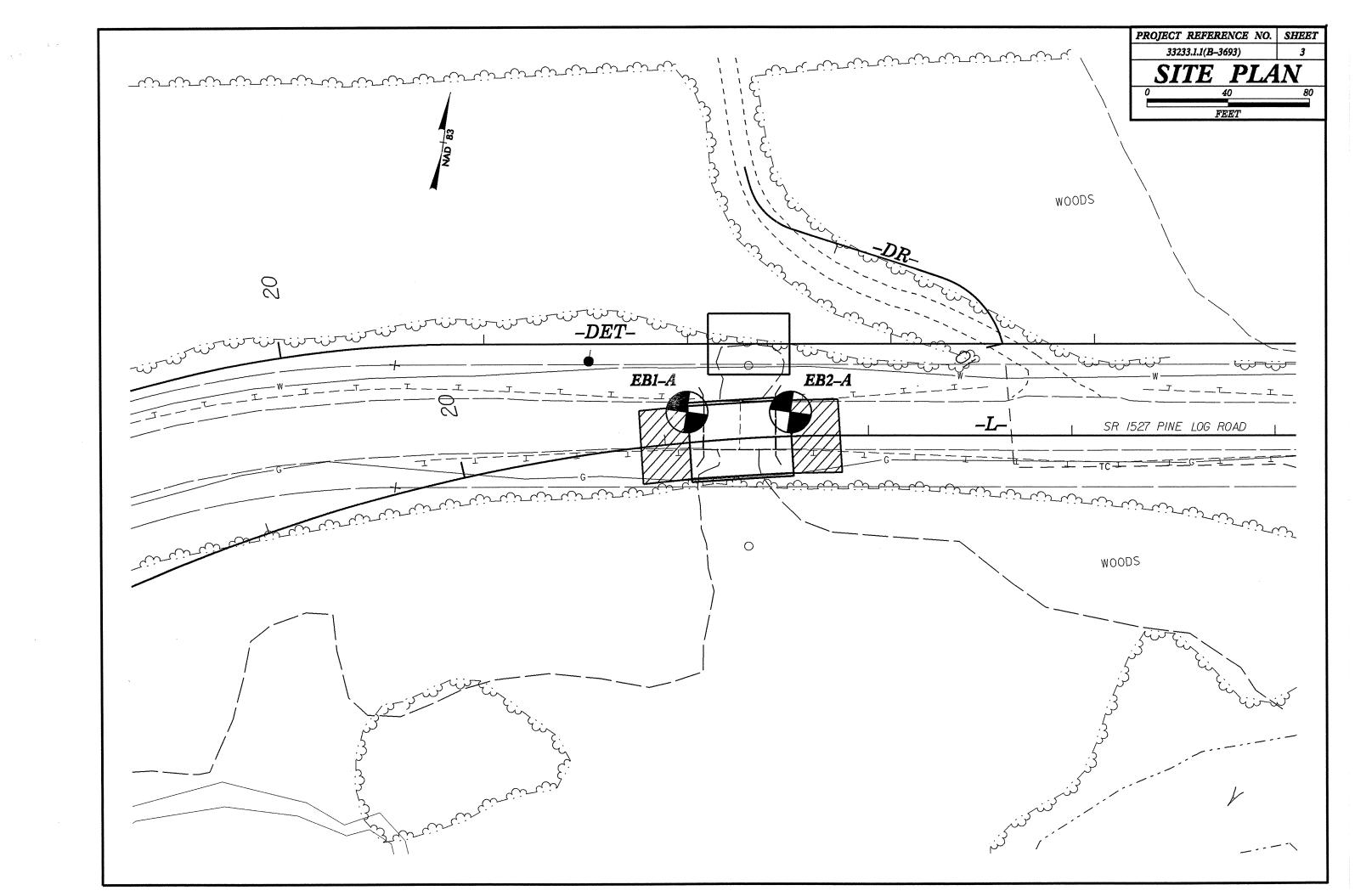
### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

#### DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

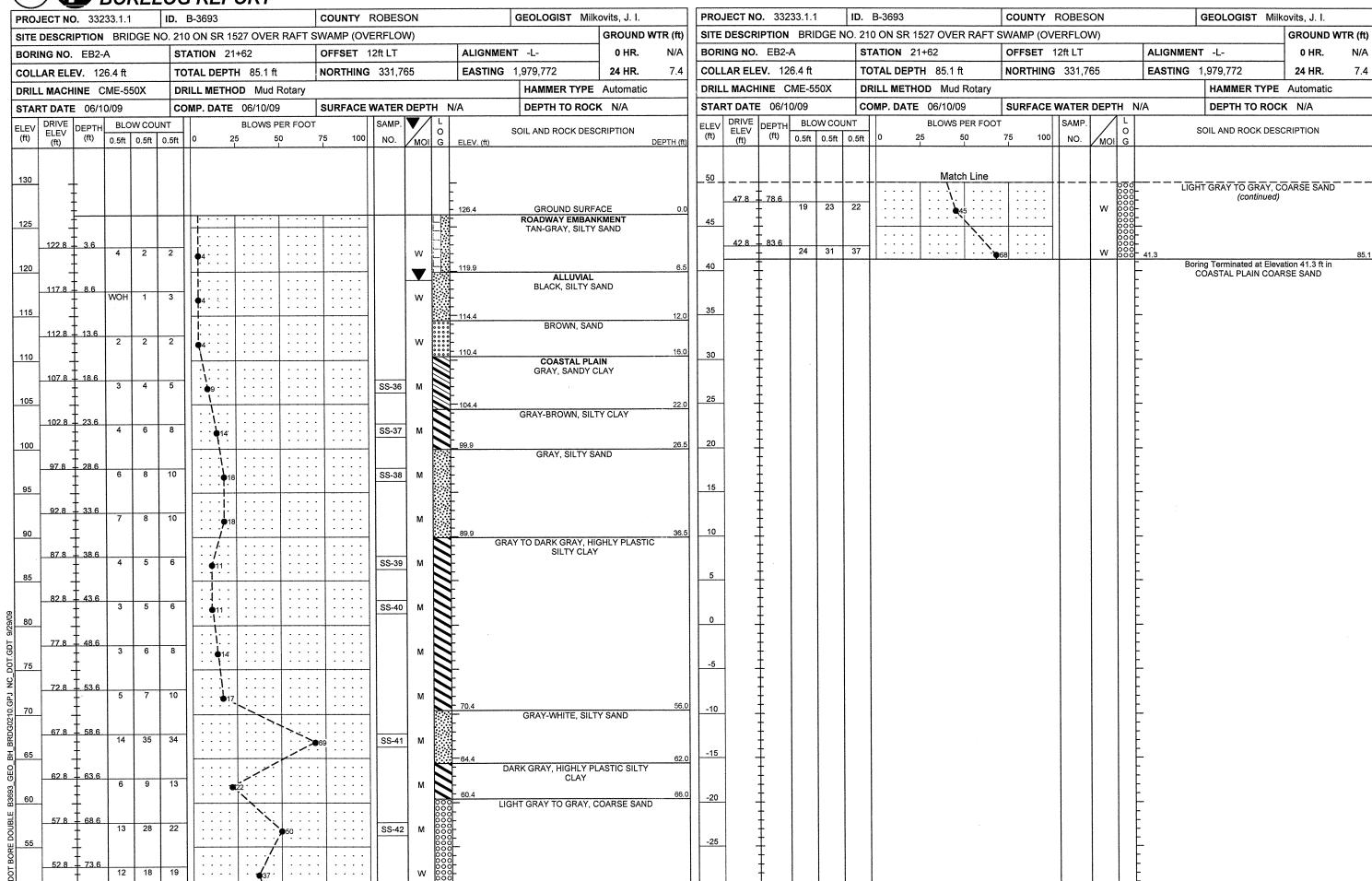
## SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS							
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS				
SDIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO	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.	ALLUVIUM (ALLUV.) - SDILS THAT HAVE BEEN TRANSPORTED BY WATER.				
THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO 1206, ASTM D-1586), SOIL	PODRLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES 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 REPRESENTED BY A ZONE	ADDIFER - A WATER BEARING FORMATION OR STRATA.				
CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	OF WEATHERED ROCK.  ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	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,				
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:  VERY STAFF, GRAY, SETY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, MOREY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF GOIL GRAINS IS DESIGNATED BY THE TERMS; ANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100	OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.				
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION	ROCK (WR)  BLOWS PER FOOT IF TESTED.  COVETALLINE  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	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 DR ABOVE THE				
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGREOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GREISS, GABBRO, SCHIST, ETC.	GROUND SURFACE.  CALCAREOUS (CALC.) SDILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.				
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) CROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM				
CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-6 A-3 A-6, A-7	SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31	ROCK (NCR) INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.  COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE.				
SYMBOL DOCOGROCOG	MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50	SEDIMENTARY ROCK SPT REFUSAL ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED (CP) SHELL BEDS, ETC.	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.				
X PASSING SILT- SILT- MUCK,	PERCENTAGE OF MATERIAL  GRANULAR SILT - CLAY	WEATHERING	<u>DIKE</u> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.				
* 40 30 MX 50 MX 51 MN SOILS SOILS SOILS PEAT	URGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE				
	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.  VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN.	HORIZONTAL.				
LIDGUID LIMIT	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 OF A CRYSTALLINE NATURE.	<u>DIP DIRECTION (DIP AZIMUTH) -</u> THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.				
GROUP INDEX 8 8 9 4 MX 8 MX 12 MX 16 MX No MX MODERATE ORGANIC	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO DNE ANOTHER PARALLEL TO THE FRACTURE.				
OF MATOR GRAVEL AND FINE SILTY OR CLAYEY SILTY CLAYEY ORGANIC	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.				
MATERIALS SAND SHIND SHI	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				
SUBGRADE FAIR TO POOR FAIR TO POOR UNSUITABLE  SUBGRADE	PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) 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.	PARENT MATERIAL.  FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY				
PI OF A-7-5 SUBGROUP IS $\leq$ LL - 30; PI OF A-7-6 SUBGROUP IS $>$ LL - 30	SPRING OR SEEP	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	THE STREAM.				
CONSISTENCY OR DENSENESS  RANGE OF STANDARD RANGE OF UNCONFINED	MISCELLANEOUS SYMBOLS	SEVERE 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,	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.				
PRIMARY SOIL TYPE COMPACTNESS OR PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE)  WITH SOIL DESCRIPTION  POPT DAT TEST BORING  DESIGNATIONS	IF TESTED, WOULD YIELD SPT REFUSAL	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS DCCURRED.				
VERY LODGE	S - BULK SAMPLE  AUGER BORING	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED (SEV.) IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KADLINIZED TO SOME	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO				
GENERALLY	SS - SPLIT SPOON ARTIFICIAL FILL (AF) OTHER  ARTIFICIAL FILL (AF) OTHER	EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.  IF TESTED, YIELDS SPT N VALUES > 100 BPF	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.				
MATERIAL   DENSE   30 TO 50	THAN ROADWAY EMBANKMENT - CORE BORING ST - SHELBY TUBE	VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.				
VERY SOFT <2 <0.25	INFERRED SOIL BOUNDARY  MONITORING WELL  DO DOO'S CAMPLE	(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	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN				
GENERALLY SOFT 2 TO 4 0.25 TO 0.50 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE   PIEZOMETER  PIEZOMETER  PIEZOMETER  PIEZOMETER  PIEZOMETER	VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, VIELDS SPT N VALUES &lt; 100 BPF</u> IAL COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	INTERVENING IMPERVIOUS STRATUM.  RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.				
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	TTT- ALLUVIAL SOIL BOUNDARY INSTALLATION SAMPLE	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				
HARD >30 >4	25/025 DIP & DIP DIRECTION OF SLOPE INDICATOR  SLOPE INDICATOR  INSTALLATION CBR - CALIFORNIA BEARI	ROCK HARDNESS	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.				
TEXTURE OR GRAIN SIZE	SPT N-VALUE	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE				
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	SOUNDING ROD REF SPT REFUSAL	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	PARENT ROCK.  SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND				
COARSE FINE	ABBREVIATIONS	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.				
BOULDER	AR - AUGER REFUSAL HI HIGHLY # - MOISTURE CONTENT BT - BORING TERMINATED MED MEDIUM V - VERY	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				
GRAIN MM 305 75 2.0 0.25 0.05 0.005	CL CLAY MICA MICACEDUS VST - VANE SHEAR TEST CPT - CONE PENETRATION TEST MOD MODERATELY WEA WEATHERED	BY MODERATE BLOWS.	SLIP PLANE.  STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF				
SIZE IN. 12 3	CSE COARSE NP - NON PLASTIC 7 - UNIT WEIGHT DMT - DILATOMETER TEST ORG ORGANIC 7- DRY UNIT WEIGHT	MEDIUM 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 I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	STANDARD FEREITATION TEST FEREITATION RESISTANCE ISSTIZ- NUMBER OF BELOWS AN OR BEFTO 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				
SOIL MOISTURE - CORRELATION OF TERMS  SOIL MOISTURE SCALE FIELD MOISTURE COURTE FOR FIELD MOISTURE DESCRIPTION	DPT - DYNAMIC PENETRATION TEST PMT - PRESSUREMETER TEST	POINT OF A GEOLOGIST'S PICK.  SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS	THAN 0.1 FOOT PER 60 BLOWS.				
(ATTERBERG LIMITS)  FIELD MOISTONE GUIDE FOR FIELD MOISTURE DESCRIPTION	F - FINE SD SAND, SANDY	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 LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.				
- SATURATED - USUALLY LTOUTD; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	FOSS FOSSILIFEROUS SL SILT, SILTY FRAC FRACTURED, FRACTURES SLI SLIGHTLY	PIECES CAN BE BROKEN BY FINGER PRESSURE.  VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY				
LL_ LIQUID LIMIT	FRAGS FRAGMENTS TCR - TRICONE REFUSAL	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	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.				
PLASTIC   SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	FRACTURE SPACING BEDDING	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.				
(PI) PL PLASTIC LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	TERM SPACING IERM THICKNESS	BENCH MARK: BL-2 AT -L- STA. 18+69.33, 79.46'LT				
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	CLAY PLTC	- VERT WIDE MORE ITHIN 10 FEE! THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: 126.88 FT.				
SL SHRINKAGE LIMIT	MOBILE B- CHT BITS CONTINUOUS FLIGHT AUGER CORE SIZE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.03 - 0.16 FEET  CLOSE 0.16 TO 1 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET					
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	BK-51 St HOLLOW AUGERS -B	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	NOTES:				
PLASTICITY	CME-45C HARD FACED FINGER BITS -N	INDURATION					
PLASTICITY INDEX (PI) DRY STRENGTH	TUNG,-CARBIDE INSERTS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.					
NONPLASTIC 0-5 VERY LOW LOW PLASTICITY 6-15 SLIGHT	CASING W/ ADVANCER HAND TODLS:	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS: GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.					
MED. PLASTICITY         16-25         MEDIUM           HIGH PLASTICITY         26 OR MORE         HIGH	PORTABLE HOIST TRICONE STEEL TEETH POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;					
COLOR	TRICONE TUNGCARB. HAND AUGER	BREAKS EASILY WHEN HIT WITH HAMMER.  INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;					
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT SDUNDING ROD VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER.					
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	DRAG BIT VANE SHEAR TEST	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.					



ROPING PROPRIES   ROPING PRO		; ! !	; ; !	1		1	 	t f		0	20 40		E NO. SHEET
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150 I TAN ORAN FERRINGENT OF SHORE AND SHORE A				1		 	21	+62	1	 			
140  THY-SURVINET, LOSE, SULY SAND  BLACK AND BROWN,  CONSTAL FLAW, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF, HIGHLY PLASTIC SULTY CLAY  CONSTAL FLAW, DARK SRAY, MOST, VERY STIFF,		i ! !			15' LT		12	LT	1	 			i !
120  TAN GRAY, WET, LOSSE, SULY SHAD.  BURK AND BROWN.  GRAY TO GRAY-BLACK.  GRAY TO GRAY BURN.  GRAY TO GRAY BURN.  GRAY TO GRAY GRAY WGST TO WET.  GRAY TO GRAY GRAY WGST TO WET.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO COASTAL PLANK, DARK GRAY WGST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  AND THE GROUNDLINE PROFILE TAKEN FROM.	160	; 		·			i   	; ; - <del> </del>	; 	\ 	; ; ;	·	160
120  TAN GRAY, WET, LOSSE, SULY SHAD.  BURK AND BROWN.  GRAY TO GRAY-BLACK.  GRAY TO GRAY BURN.  GRAY TO GRAY BURN.  GRAY TO GRAY GRAY WGST TO WET.  GRAY TO GRAY GRAY WGST TO WET.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO COASTAL PLANK, DARK GRAY WGST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  AND THE GROUNDLINE PROFILE TAKEN FROM.				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		 	 	! ! !	1	 			1 1 1
120  TAN GRAY, WET, LOSSE, SULY SHAD.  BURK AND BROWN.  GRAY TO GRAY-BLACK.  GRAY TO GRAY BURN.  GRAY TO GRAY BURN.  GRAY TO GRAY GRAY WGST TO WET.  GRAY TO GRAY GRAY WGST TO WET.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO COASTAL PLANK, DARK GRAY WGST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  AND THE GROUNDLINE PROFILE TAKEN FROM.		1 1 1		! ! !		1 1 1	1 	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	 	 			
120  TAN GRAY, WET, LOSSE, SULY SHAD.  BURK AND BROWN.  GRAY TO GRAY-BLACK.  GRAY TO GRAY BURN.  GRAY TO GRAY BURN.  GRAY TO GRAY GRAY WGST TO WET.  GRAY TO GRAY GRAY WGST TO WET.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO GRAY AND TAN-WHITE, WGST TO WET. WEDINN DENSE.  GRAY TO COASTAL PLANK, DARK GRAY WGST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  AND THE GROUNDLINE PROFILE TAKEN FROM.	140					1 1 1 1	! ! !	i 1 1		1			140
120  TAN-GRAY, WET, LOOSE, SULTY SAND  BLACK AND BROWN, BLACK AND BROWN, BLACK AND BROWN, BLACK AND BROWN, BROWN, MOST TO WET, BROWN, MOST TO FIFF, BROWN, MOST TO WET, BROWN, MOST TO WET	140						 	 					140
120  TAN-GRAY, WET, LOOSE, SULTY SAND  BLACK AND BROWN, BLACK AND BROWN, BLACK AND BROWN, BLACK AND BROWN, BROWN, MOST TO WET, BROWN, MOST TO FIFF, BROWN, MOST TO WET, BROWN, MOST TO WET		 		! ! !			 	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1	 		1 1 1 1	} } } }
120  TAN-GRAY, WET, LOOSE, SULTY SAND  BLACK AND BROWN, BLACK AND BROWN, BLACK AND BROWN, BLACK AND BROWN, BROWN, MOST TO WET, BROWN, MOST TO FIFF, BROWN, MOST TO WET, BROWN, MOST TO WET	_		AY FMRANKMENT		· <del></del>	•	 			; AY FMRANKMEN	<u></u>		1
BLACK AND BROWN, WET, VERY LOOSE TO MEDIUM DENSE, SAND AND SILTY SAND  COASTAL PLAIN, SAND SILTY CLAY  BOOK GRAY TO GRAY BLACK, SILTY SAND  GRAY TO DARK GRAY, MOIST TO WET.  GRAY TO DARK GRAY AND TAN-WHITE, MOIST TO WET, MEDIUM DENSE  TO VERY DENSE, COARSE AND SILTY SAND  GRAY TO GRAY AND TAN-WHITE, MOIST TO WET, MEDIUM DENSE  TO VERY DENSE, COARSE AND SILTY SAND  GRAY TO COASTAL PLAIN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  DENSE, COARSE AND SILTY SAND  ADDRESS, COARSE AND SILTY SAND  TO VERY DENSE, COARSE AND SILTY SAND	120				<u> </u>		10					<u> </u>	120
100 GRAY TO GRAY BLACK BROWN, MOIST STIFF, Q SANDY AND SILTY CLAY  80 GRAY TO DARK GRAY, MOIST TO WET. STIFF TO VERY STIFF.  80 GRAY TO DARK GRAY MOIST TO WET. STIFF TO VERY STIFF.  80 GRAY TO DARK GRAY MOIST TO WET. STIFF TO VERY STIFF.  80 GRAY TO DARK GRAY MOIST TO WET. STIFF TO VERY STIFF.  80 GRAY TO DARK GRAY MOIST TO WET. STIFF TO VERY STIFF.  80 GRAY TO DARK GRAY MOIST TO WET. STIFF TO VERY STIFF. HIGHLY PLASTIC SILTY CLAY  80 GRAY TO DARK GRAY MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  80 GRAY TO DARK GRAY MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  80 GRAY TO DARK GRAY MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  80 MICHIGAN TO DARK GRAY MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  81 TO WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  81 TO VERY DENSE, COARSE AND SILTY SAND  82 TO VERY DENSE, COARSE AND SILTY SAND  83 TO VERY DENSE, COARSE AND SILTY SAND  84 TO VERY DENSE, COARSE AND SILTY SAND  85 TO VERY DENSE, COARSE AND SILTY SAND  86 TO VERY DENSE, COARSE AND SILTY SAND  87 TO WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  87 TO WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  86 TO VERY DENSE, COARSE AND SILTY SAND  87 TO WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  87 TO WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  88 TO VERY DENSE, COARSE AND SILTY SAND  89 TO VERY DENSE, COARSE AND SILTY SAND  90 TO VERY DENSE, COARSE AND SILTY SAND  90 TO VERY DENSE, COARSE AND SILTY SAND  90 TO VERY DENSE, COARSE AND SILTY SAND  91		1 1 1 1	D( 40	K AND DOOWN	S 067	09	; ·	Tk()()	IN DENSE SAND	AND CUTY CA	N/D	 	
100 GRAY TO GRAY BLACK BROWN, MOIST STIFF. BANDY AND SILTY CLAY  80 GRAY TO DARK GRAY, MOIST TO WET. STIFF TO VERY STIFF. DESCRIPTION OF TO VERY STIFF. DESCRIPTION OF TO VERY DENSE, COARSE AND SILTY SAND  80 LIGHT GRAY TO GRAY AND TAN-WHITE, MOIST TO WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  80 COASTAL PLAIN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  80 NOTE GROUNDLINE PROFILE TAKEN FROM 0			+BLAU				<del> </del>	<b>-</b>	THE DENSE, SAND	AND SILIT SA		NAT SAMESHAR PROPERTY	
BO GRAY TO DARK GRAY, MOIST TO WET. STIFF TO VERY STIFF, OSSUDY CLAY AND HIGHLY PLASTIC, SILTY CLAY  BO LIGHT GRAY TO GRAY AND TAN-WHITE, MOIST TO WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  40 COASTAL PLAN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  NOTE: GROUNDLINE PROFILE TAKEN, FROM.	400		ODAY T	ODAY DIACK					AND CUTY CLAY				400
BO  GRAY TO DARK GRAY, MOIST TO WET.  STIFF TO VERY STIFF.  SANDY CLAY AND HIGHLY PLASTIC, SILTY CLAY  BO  GRAY TO DARK GRAY MOIST TO WET.  TO WET, MEDIUM DENSE  TO VERY DENSE, COARSE AND SILTY SAND  COASTAL PLAIN, DARK GRAY MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  O  NOTE, GROUNDLINE PROFILE TAKEN FROM  O  NOTE, GROUNDLINE PROFILE TAKEN FROM  O	100					i		SANUI	AND SILIT CLAF	; ; <del>; == == == ==</del> ;	 	<u></u>	100
80 GRAY TO DARK GRAY, MOIST TO WET. STIFF TO VERY STIFF. SANDY CLAY AND HIGHLY PLASTIC, SILTY CLAY  80 UIGHT GRAY TO GRAY AND TAN-WHITE, MOIST TO WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  40 (A) COASTAL PLAIN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  NOTE: GROUNDLINE PROFILE TAKEN, FROM						_ MEDIUM D	ENSE, (B)	SILTY	SAWD	 		1 1 1	1 1 1
80  LIGHT GRAY TO GRAY AND TAN-WHITE, MOIST TO WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  40  40  AC  COASTAL PLAIN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  NOTE: GROUNDLINE PROFILE TAKEN, FROM  O		; ; ; ;			(d)		0						1
60  LIGHT GRAY TO GRAY AND TAN-WHITE, MOIST OF WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  40  20  A COASTAL PLAIN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  NOTE: GROUNDLINE PROFILE TAKEN FROM	80	GRAY TO	DARK GRAY, MC	DIST TO WET,	@	STIFF TO VERY	STIFF. 🕦	SANDY	CLAY AND HIGHL	Y PLASTIC, SIL	Y CLAY		80
60  LIGHT GRAY TO GRAY AND TAN-WHITE, MOIST OF WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  40  20  A COASTAL PLAIN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  NOTE: GROUNDLINE PROFILE TAKEN FROM		 		 	@ <b>_</b>	 	(4)		; ; ;	! ! !			
60  LIGHT GRAY TO GRAY AND TAN-WHITE, MOIST OF WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  40  20  A COASTAL PLAIN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  NOTE: GROUNDLINE PROFILE TAKEN FROM				 						<del> </del>			!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
LIGHT GRAY TO GRAY AND TAN-WHITE, MOIST TO WET, MEDIUM DENSE TO VERY DENSE, COARSE AND SILTY SAND  40  20  A COASTAL PLAIN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  NOTE: GROUNDLINE PROFILE TAKEN FROM  0					000		69	<b>1</b>	> !			; ;	
40  20  (A) COASTAL PLAIN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  20  NOTE: GROUNDLINE PROFILE TAKEN FROM  0	60	; ;	 					000		 			60
40  (B) (B) (B) (B) (B) (B) (COAST AL PLAIN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  20  (A) COAST AL PLAIN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  20  NOTE: GROUNDLINE PROFILE TAKEN FROM  0		LIGHT GRAY T	O GRAY AND TA	N-WHITE, MOIS :	1624,324	TO WET, MEDIU:	V DENSE <sup>©</sup> ∃	70 V 	'ERY DENSE, COA	RSE AND SILT	Y SAND		{
20 (A) COASTAL PLAIN, DARK GRAY, MOIST, VERY STIFF, HIGHLY PLASTIC SILTY CLAY  O NOTE: GROUNDLINE PROFILE TAKEN FROM 0			1 1	 	64)—	1 1 1 1 1 1	45	000 000 000 	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	; ; ;		1	
20 (A) COASTAL PLAIN, DARK GRAY, MOIST, VERY \$TIFF, HIGHLY PLASTIC SILTY CLAY  O NOTE: GROUNDLINE PROFILE TAKEN FROM 0	40	i !	i	 	© <b>−</b>	 	68	000	i !	; ! !		<u> </u>	40
0 NOTE: GROUNDLINE PROFILE TAKEN FROM 0				 	<u> </u>	 	1 1 1 1			! ! !			1 1 1 1
0 NOTE: GROUNDLINE PROFILE TAKEN FROM 0			i i i i i i i i i i i i i i i i i i i	1		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	! ! !		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				 
0 NOTE: GROUNDLINE PROFILE TAKEN FROM 0			V MOVET WEDY	TIEE MANY		7 01 10	! ! !		i !			! !	
·	20 (A) (C	WASTAL PLAIN, DARK GRA	Y, MUISI, VERY S	STIFF, HIGHLY Y	PLASTIC SILI	Y CLAY	! ! 	 		! 	 		20
·				! ! !		1 1 1	! !		 	1		i !	
·				 		 	! ! !	1   1   1   1   1   1   1   1   1   1	1				 
·	0		; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	i ! !		 	f † † † † † † † † † † † † † † † † † † †	! ! !	NOT	E GROUNDIN	E PROFILE TAKE	N FROM	0
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				! ! !		: ! !	1	i 1 1		1			; ; ;

BORELO		COUNTY ROBESON	GEOLOGIST Milk	kovits II		PROJECT NO.	33233 1 1	n	D. B-3693	COUNTY ROBESON		GEOLOGIST Milk	covits, J. I.
PROJECT NO. 33233.1.1 II SITE DESCRIPTION BRIDGE NO.	O. B-3693	<u> </u>	JULIUS IVIIII	GROUND WTR	——	SITE DESCRIPTION BRIDGE N							
			MENT -L-	-	`` 'I	BORING NO.		<del></del>	STATION 21+12	OFFSET 15ft LT	ALIGNMEN	GROUND WTR  O HR.	
	STATION 21+12 TOTAL DEPTH 90.2 ft		NG 1,979,722		1 -	COLLAR ELEV			TOTAL DEPTH 90.2 ft	NORTHING 331,757	EASTING		<b>24 HR.</b> 9.
	DRILL METHOD Mud Rotary	NORTHING 331,737	HAMMER TYPE		The server	DRILL MACHIN			DRILL METHOD Mud Rotary			HAMMER TYPE	J
	COMP. DATE 06/09/09	SURFACE WATER DEPTH N/A	DEPTH TO ROC		H	START DATE			COMP. DATE 06/09/09	SURFACE WATER DEPTH	N/A	DEPTH TO ROC	K N/A
						ELEV DRIVE D		W COUNT		T SAMP.		COLL AND BOOK DESI	CRIPTION
ELEV ELEV (ft) (ft) 0.5ft 0.5ft 0.5	1	(2)			TH (ft)	(ft) ELEV (ft)	(ft) 0.5ft	0.5ft 0.5f		75 100 NO. MOI G	1	SOIL AND ROCK DES	CRIPTION
130	5ft 0 25 50  2	75 100 NO. MOI G ELEV. (ft)	GROUND SURF ROADWAY EMBAN TAN-GRAY, SILTY  BROWN, SAN  COASTAL PL GRAY, SILTY S  DARK GRAY, SANI  DARK GRAY, HIGHLY P CLAY  TAN-WHITE, SILT  GRAY, COARSE	AIN CLAY  PLASTIC SILTY  TY SAND	11	50 47.8 45 42.8 40	78.7 18 83.7 24	0.5ft 0.5f	Match Line    Match Line   Matc	75 100 NO. MOI C	39.5	GRAY, SILTY SAND (6	continued)
52.8 + 73.7	30		GRAY, SILTY	SAND		-30					<u>-</u>		



SHEET 7 33233.1.1 (B-3693)

#### EB1-A SOIL TEST RESULTS AASHTO % BY WEIGHT SAMPLE DEPTH % PASSING (SIEVES) % % CLASS. L.L. P.I. C.SAND F.SAND SILT CLAY 10 40 200 MOISTURE ORGANIC OFFSET STATION INTERVAL NO. 21+12 A-2-4(0) 17 NP 39.8 43.3 8.8 8.1 99 73 21 SS-28 15'LT 3.7-5.2 15'LT 21+12 8.7-10.2 A-2-4(0) 19 NP 68.3 20.7 3.9 7.1 98 52 12 SS-29 A-3(0) 25 NP 71.5 24.8 3.6 0.0 96 56 5 SS-30 15'LT 21+12 13.7-15.2 A-7-6(13) 46 20 15.8 26.7 33.3 24.2 100 88 68 SS-31 15'LT 21+12 18.7-20.2 21+12 28.7-30.2 A-2-4(0) 32 NP 60.6 28.6 9.8 1.0 99 66 14 SS-32 15'LT A-7-6(44) 64 39 0.6 2.0 16.1 53.7-55.2 81.2 100 100 98 . SS-33 15'LT 21+12 A-2-4(0) 18 NP 53.8 37.4 4.8 4.1 100 79 11 SS-34 15'LT 21+12 58.7-60.2 SS-35 15'LT 21+12 63.7-65.2 A-1-b(0) 22 NP 80.7 13.3 2.9 3.0 99 28 7

<i>EB2-A</i>															
	SOIL TEST RESULTS														
SAMPLE			DEPTH	AASHTO				% BY W	/EIGHT		% PAS	SING (S	IEVES)	%	%
NO.	OFFSET	STATION	INTERVAL	CLASS.	L.L.	P.I.	C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-36	12'LT	21+62	18.6-20.1	A-6(6)	40	16	22.3	31.7	29.7	16.2	99	84	55	-	-
SS-37	12'LT	21+62	23.6-25.1	A-7-6(13)	47	20	12.4	29.4	37.9	20.3	100	94	67	-	-
SS-38	12'LT	21+62	28.6-30.1	A-2-4(0)	35	NP	49.8	37.2	11.0	2.0	97	66	16	-	-
SS-39	12'LT	21+62	38.6-40.1	A-7-6(17)	41	20	1.0	32.1	46.6	20.3	100	100	84	•	•
SS-40	12'LT	21+62	43.6-45.1	A-7-6(62)	81	55	1.0	4.5	25.5	69.0	100	100	97	-	-
SS-41	12'LT	21+62	58.6-60.1	A-2-4(0)	17	NP	68.2	22.1	5.6	4.1	100	54	12	-	-
SS-42	12'LT	21+62	68.6-70.1	A-1-b(0)	17	NP	68.5	18.9	4.5	8.1	96	50	14		•

# FIELD SCOUR REPORT

WBS:	33233.1.1	TIP:	B-3693	CC	OUNTY: Robes	on								
DESCRIPTION(1): Bridge No. 210 on -L- (SR 1527, Pine Log Road) over Raft Swamp (Overflow)														
	EXISTING BRIDGE													
Information from:	Field In Other	spection _ (explain) _	X Mi	icrofilm	(reel	pos:	_)							
Bridge No.:2 Foundation Type:	210 Length: Timber piles	35.5'	Total Bents:	3 Bent	s in Channel: _	1 Bents in	Floodplain: 2							
EVIDENCE OF S Abutments or E	SCOUR(2) End Bent Slopes:	None obs	served											
Interior Bents:	None Observed													
Channel Bed:	None observed													
Channel Bank:	None observed													
	UR PROTECTIO Abutment wall	N												
Extent(4):	At both end ben	its												
Effectiveness(5):	Effective													
Obstructions(6):	None observed													

#### **INSTRUCTIONS**

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- **9** Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoritical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

Reported by:

Form GEU-017e Revised 7/26/2007

SHEET

Date: 6/24/2009

## **SITE PHOTOGRAPH**

Bridge No. 210 on -L- (SR 1527) Over Raft Swamp (Overflow)

