STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4591	1	12

STATE PROJ.NO.	F.A.PROJ.NO.	DESCRIPTION
38421.1.1	BRZ-1002(23)	P.E.
		R/W & UTIL.

NOTE: SEE SHEET 2A FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	13+00 TO 35+20	4-5	6

CROSS SECTIONS

LINE	STATION	SHEET
-L-	16+50 TO 25+50	7-12

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

ROADWAY SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 38421.1.1 (B-4591) F.A. PROJ. BRZ-1002(23)

COUNTY NEW HANOVER & PENDER

PROJECT DESCRIPTION BRIDGE NO. 4 ON SR 1002 OVER ISLAND CREEK

INVENTORY

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION. GEOTECHNICAL ENGINEERING UNIT AT (919) 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 (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON 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.P. DELOATCH
R.E. SMITH
J.M. EDMONDSON

INVESTIGATED BY T.C. BOTTOMS
CHECKED BY D.N. ARGENBRIGHT
SUBMITTED BY D.N. ARGENBRIGHT
DATE SEPTEMBER 2011

DocuSigned by:
Tyler C. Bottoms
A181A1813F0A48D...
2/11/2014

NORTH CAROLINA LICENSED SEAL 2240 GEOLOGIST TYLER C. BOTTOMS
5/29/12

CONTRACT: ID: B-4591

DRAWN BY: C.P. TURNER

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.

PROJECT REFERENCE NO.	SHEET NO.
B-4591	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (CDB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO PODRLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

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

ABBREVIATIONS

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

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [ ] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HANMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT 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 VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION: FT.

NOTES:

TIP PROJECT: B-4591

CONTRACT:

See Sheet 1-A For Index of Sheets

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

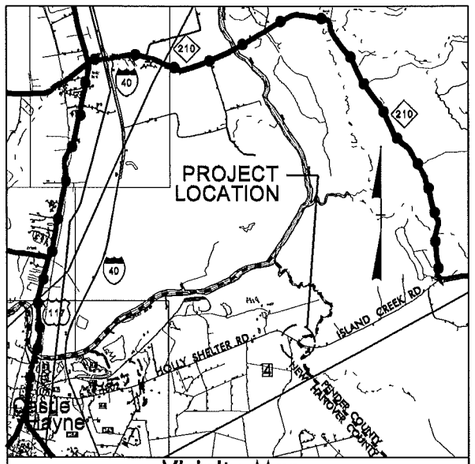
PENDER/ NEW HANOVER COUNTIES

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4591	2A	12

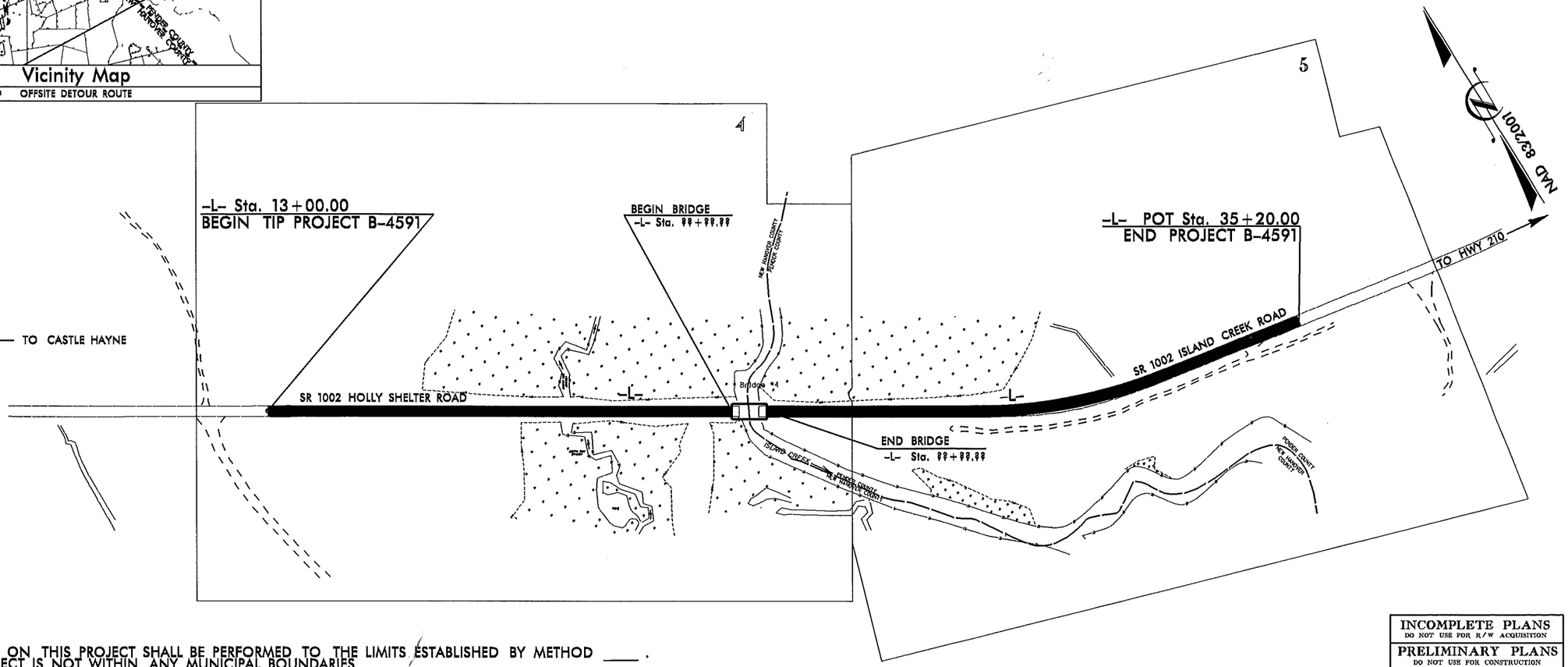
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
38421.1.1	BRZ-1002-(23)	PE
38421.2.1	BRZ-1002-(23)	RW,UTIL
38421.3.1	BRZ-1002-(23)	CONST.

LOCATION: BRIDGE 4 OVER ISLAND CREEK ON SR 1002 (HOLLY SHELTER RD./ISLAND CREEK RD.)

TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURE



Vicinity Map
OFFSITE DETOUR ROUTE



NOTES:
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD ____ .
THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES
TRAFFIC TO BE MAINTAINED WITH AN OFF SITE DETOUR

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

ADT 2011 = 3,516
ADT 2035 = 6,100
DHV = 12 %
D = 65 %
T = 9 % *
V = 60 MPH
* TTST 3 DUAL 6
FUNC CLASS =
RURAL MINOR COLLECTOR
SUBREGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY F.A. PROJECT BRZ-1002-(23) = .406
LENGTH STRUCTURE F.A. PROJECT BRZ-1002-(23) = ???
TOTAL LENGTH STATE PROJECT 38421.1.1 = .420

Prepared In the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
JUNE 21, 2013

LETTING DATE:
JUNE 17, 2014

JASON MOORE, PE
PROJECT ENGINEER

JEANIE TYSON
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER
SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER
SIGNATURE: P.E.

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA
P.E.
STATE HIGHWAY DESIGN ENGINEER

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

September 20, 2011

STATE PROJECT:	38421.1.1 (B-4591)
F.A. PROJECT:	BRZ-1002(23)
COUNTIES:	New Hanover & Pender
DESCRIPTION:	Bridge No. 4 on SR 1002 over Island Creek
SUBJECT:	Geotechnical Inventory

Project Description

This project is located in New Hanover and Pender County between I 40 and NC 210 over Island Creek. Proposed construction consists of widening SR 1002 to accommodate the proposed bridge structure. This geotechnical investigation was confined to the areas of proposed construction.

Fieldwork for this project was conducted during May of 2011. Hand auger borings were completed along various offsets of -L-. Representative soil samples were collected for visual classification in the field and for laboratory analysis by the Materials and Tests Unit.

The following alignment totaling 0.4± miles was investigated. Subsurface profiles and selected cross sections of this alignment are included in this report.

Line	Station(±)
-L-	13+00 to 35+20

Areas of Special Geotechnical Interest

1) The following sections contain cohesive soils which have the potential to cause embankment stability and/or long term settlement problems:

Line	Station(±)
-L-	13+00 to 18+25
-L-	34+25 to 35+20

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
1589 MAIL SERVICE CENTER
RALEIGH NC 27699-1589

TELEPHONE: 919-250-4088
FAX: 919-250-4237
Website: www.ncdot.org./doh

LOCATION:
CENTURY CENTER COMPLEX
ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC

2) The following sections contain organic soils, which have the potential for embankment stability and/or subgrade problems during construction:

Line	Station(±)
-L-	16+75 to 17+25
-L-	18+75 to 21+75
-L-	22+25 to 22+85
-L-	23+66 to 25+25

3) The entire project was found to exhibit seasonal high ground water.

4) A possible remnant sink hole was discovered during field investigation which has the potential to cause embankment stability and/or long term settlement problems. It appears to be confined to the following location:

Line	Station(±)	Diameter(±)
-L-	17+00	35'

Physiography and Geology

This project corridor is located within the Coastal Plain Physiographic Province. Topography along the project is nearly flat to gently sloping. Natural ground elevations ranged from 5± feet below sea level along the bed of Island Creek to 20± feet above sea level along the existing SR 1002 embankment.

Surficial soils in this area are generally classified as alluvial sediments.

Ground Water

Ground water data was collected in May 2011, during a time of normal precipitation. Ground water elevations ranged from sea level to 11± feet above sea level.

Soils

Soils within this project area have been divided into three categories: roadway embankment, artificial fill, and alluvial soils.

Roadway Embankment soils were encountered along the existing SR 1002 alignment. These soils are comprised of 1± to 10 or more feet of medium dense sand (A-2-4, A-3).

Soils classified as artificial fill are comprised of 6 or more feet of medium dense sand (A-2-4). This artificial fill was encountered near the existing bridge structure.

Alluvial soils were encountered within the floodplain of Island Creek. They are comprised of 1± to 10± feet of loose to medium dense sand (A-2-4, A-3), 1± to 8± feet of soft to medium stiff sandy silt and sandy and silty clay (A-4, A-6), loose sand with little to moderate organic material, very soft sandy silt with little to moderate organic material, and muck.

Laboratory analysis of these soils show organic percentages ranging from 4% to 65% and moisture contents ranging from 9% to 412%. Vane shear tests completed within these organic soils show shear strengths ranging from 176 psf to 1110 psf.

Undisturbed Samples

Undisturbed thin wall Shelby tube samples were collected at the following locations and submitted for testing.

Sample	Station	Depth	Test
ST-1	-L- 19+00, 32'LT	2.0-4.0	Consolidation
ST-2	-L- 19+00, 35'RT	2.0-4.0	Consolidation
ST-3	-L- 20+00, 35'RT	0.0-2.0	Consolidation

Respectfully Submitted,

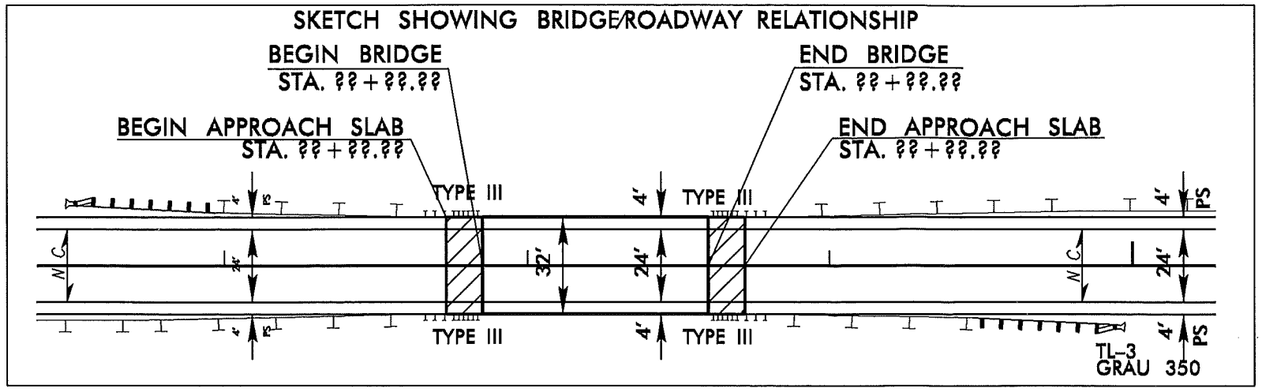
Tyler C. Bottoms, L.G.
Project Engineering Geologist

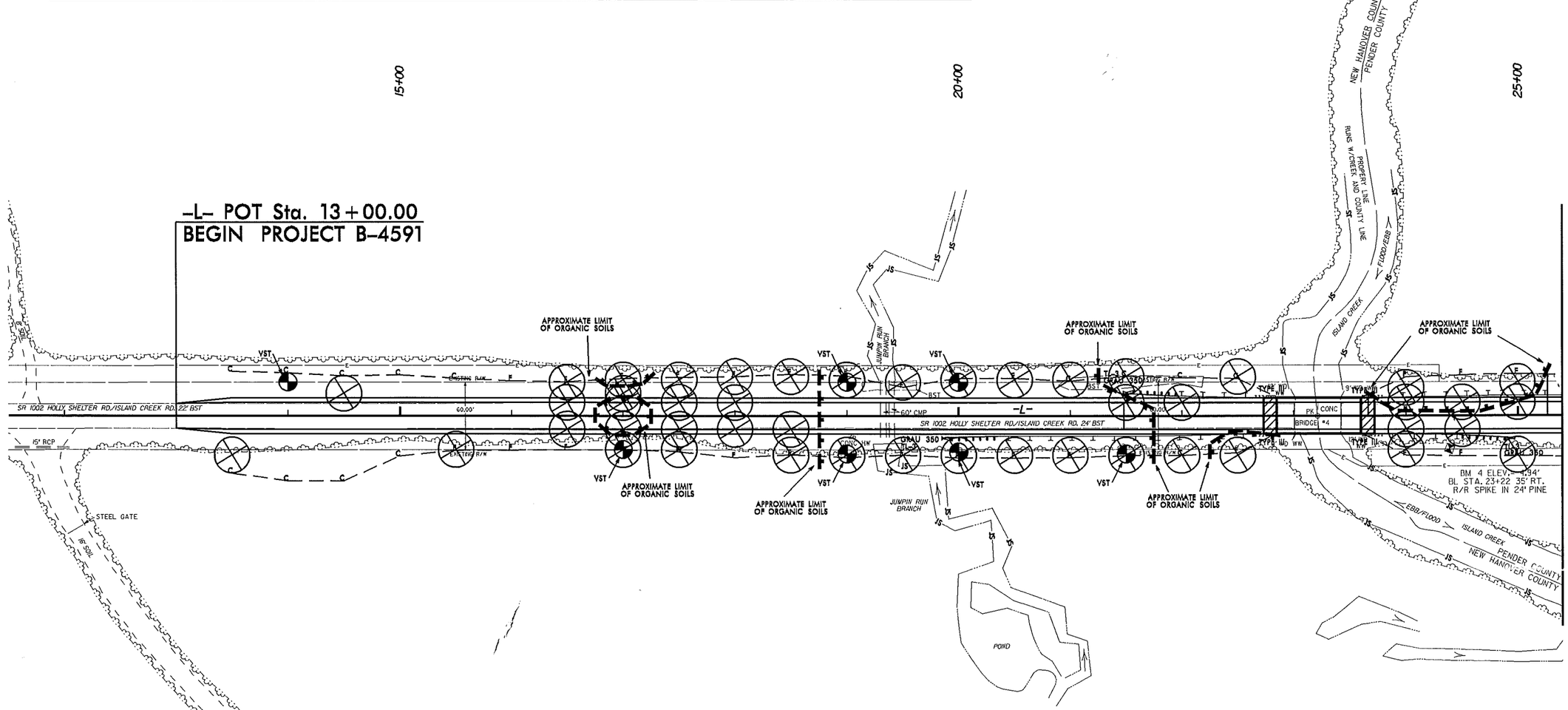
PROJECT REFERENCE NO.	SHEET NO.
B-4591	3B

EARTHWORK BALANCE SHEET

PROJECT REFERENCE NO.	SHEET NO.
B-4591	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION





REVISIONS

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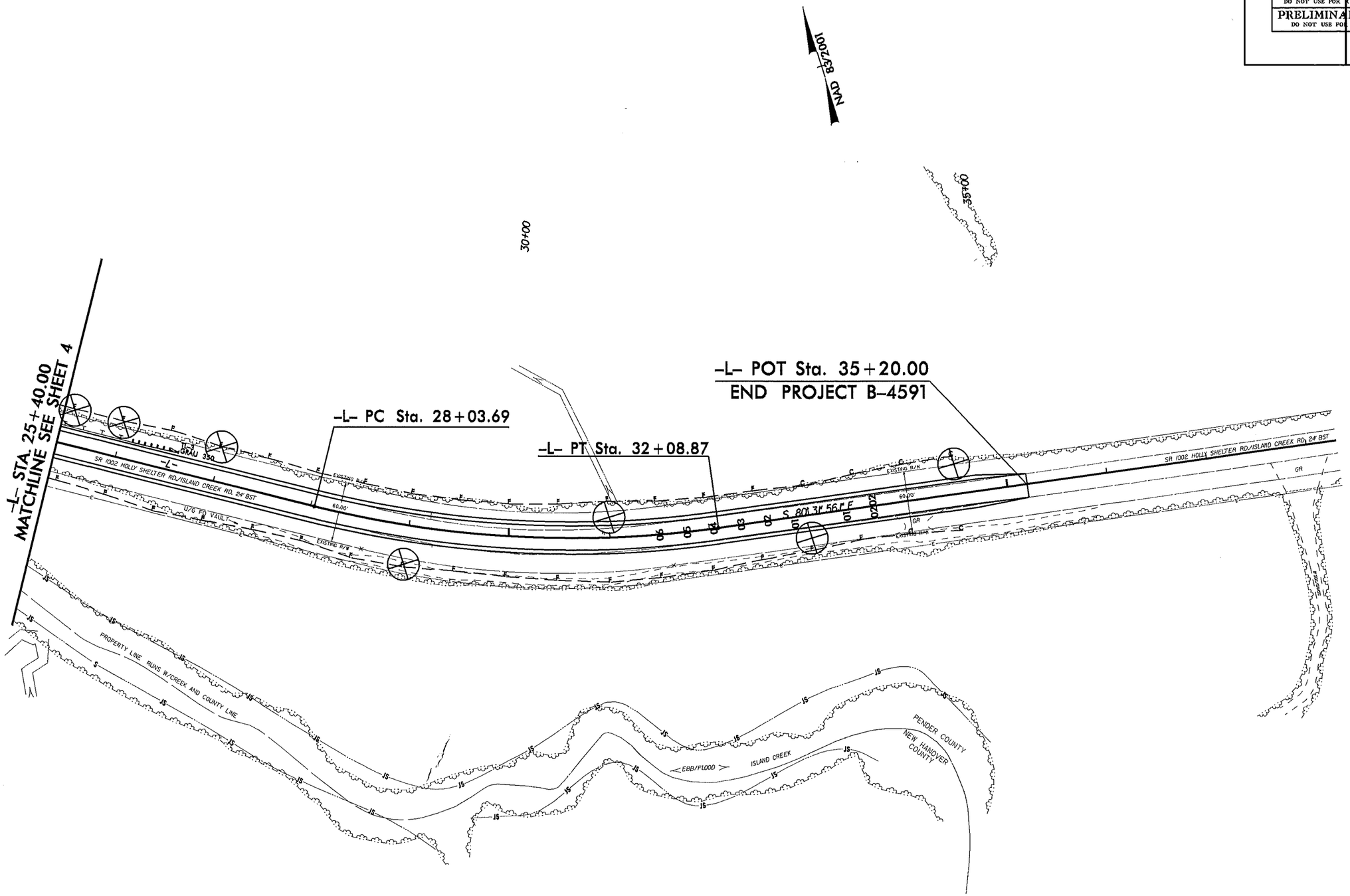
Jonathan.Jones@ncdot.gov

PROJECT REFERENCE NO.	SHEET NO.
B-4591	5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



REVISIONS

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5/28/99

PROJECT REFERENCE NO.	SHEET NO.
B-4591	6
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-1	35 RT	13+50	0.0-0.5	A-2-4(0)	26	NP	14.2	67.3	14.4	4.0	100	97	24	9.6	8.2
S-2	35 RT	13+50	3.0-5.0	A-3(0)	24	NP	4.5	92.0	1.4	2.0	100	99	6	-	-
S-3	35 RT	13+50	5.0-6.0	A-6(7)	31	11	1.4	37.2	33.1	28.3	100	100	78	26.6	-
S-4	20 LT	14+50	0.0-5.0	A-2-4(0)	20	NP	13.7	72.1	6.1	8.1	100	96	21	-	-
S-5	20 LT	14+50	5.0-6.0	A-6(8)	30	11	1.4	25.9	44.4	28.3	100	100	84	34.2	-
S-49	12 LT	16+50	3.5-11.0	A-6(15)	40	25	4.9	35.2	23.0	36.8	100	99	68	35.9	-
S-46	12 RT	18+50	7.0-8.0	-	-	-	-	-	-	-	-	-	-	-	20.3
S-47	12 LT	21+50	0.0-3.5	A-2-4(0)	22	NP	8.8	79.4	4.6	7.2	100	97	16	-	-
S-48	12 RT	21+50	3.5-4.5	-	-	-	-	-	-	-	-	-	-	-	5.0

VANE SHEAR TESTS

STATION	OFFSET	DEPTH	S (psf)
14+00	30' LT	0.0	648
14+00	30' LT	0.5	777
14+00	30' LT	1.0	870
14+00	30' LT	-1.5	666
14+00	30' LT	2.0	592
14+00	30' LT	2.5	851
14+00	30' LT	3.0	759
17+00	30' RT	0.0	481
17+00	30' RT	0.5	435

VANE SHEAR TESTS

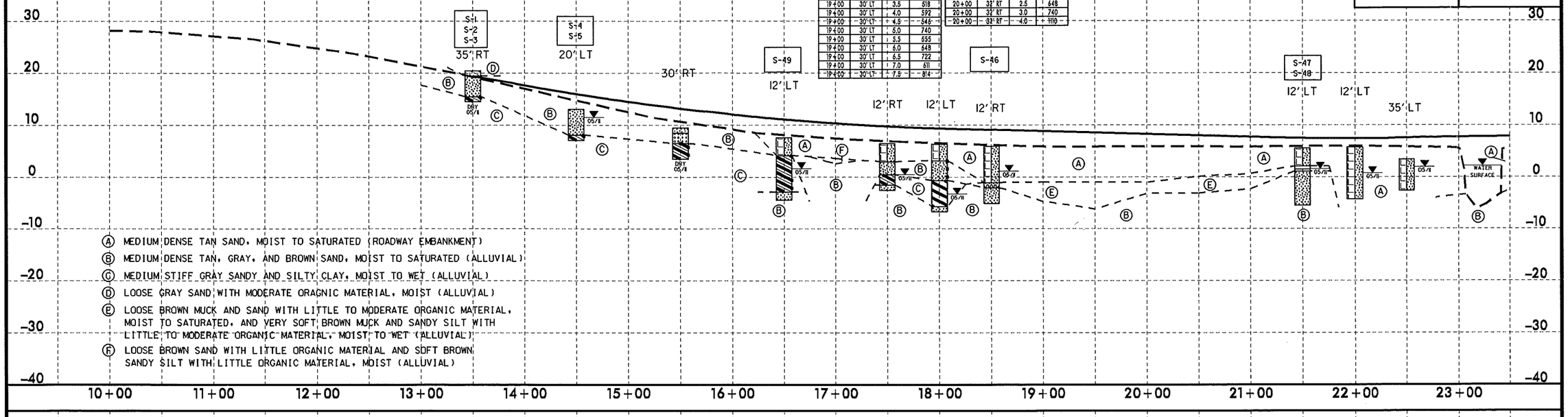
STATION	OFFSET	DEPTH	S (psf)
19+00	34' RT	2.5	259
19+00	34' RT	3.0	194
19+00	34' RT	3.5	342
19+00	34' RT	-4.0	722
19+00	34' RT	4.5	796
19+00	34' RT	5.0	583
19+00	34' RT	5.5	722
19+00	30' LT	0.5	481
19+00	30' LT	1.0	435
19+00	30' LT	-1.5	648
19+00	30' LT	2.0	685
19+00	30' LT	2.5	629
19+00	30' LT	3.0	537
19+00	30' LT	3.5	518
19+00	30' LT	4.0	592
19+00	30' LT	-4.5	546
19+00	30' LT	5.0	740
19+00	30' LT	5.5	555
19+00	30' LT	6.0	648
19+00	30' LT	6.5	722
19+00	30' LT	7.0	611
19+00	30' LT	-7.5	814

VANE SHEAR TESTS

STATION	OFFSET	DEPTH	S (psf)
20+00	30' LT	0.0	389
20+00	30' LT	0.5	324
20+00	30' LT	1.0	222
20+00	30' LT	-1.5	370
20+00	30' LT	2.0	204
20+00	30' LT	2.5	305
20+00	30' LT	3.0	389
20+00	30' LT	3.5	888
20+00	30' LT	4.0	389
20+00	30' LT	-4.5	-416
20+00	32' RT	0.0	176
20+00	32' RT	1.0	407
20+00	32' RT	2.0	592
20+00	32' RT	2.5	648
20+00	32' RT	3.0	740
20+00	32' RT	-4.0	+1110

VANE SHEAR TESTS

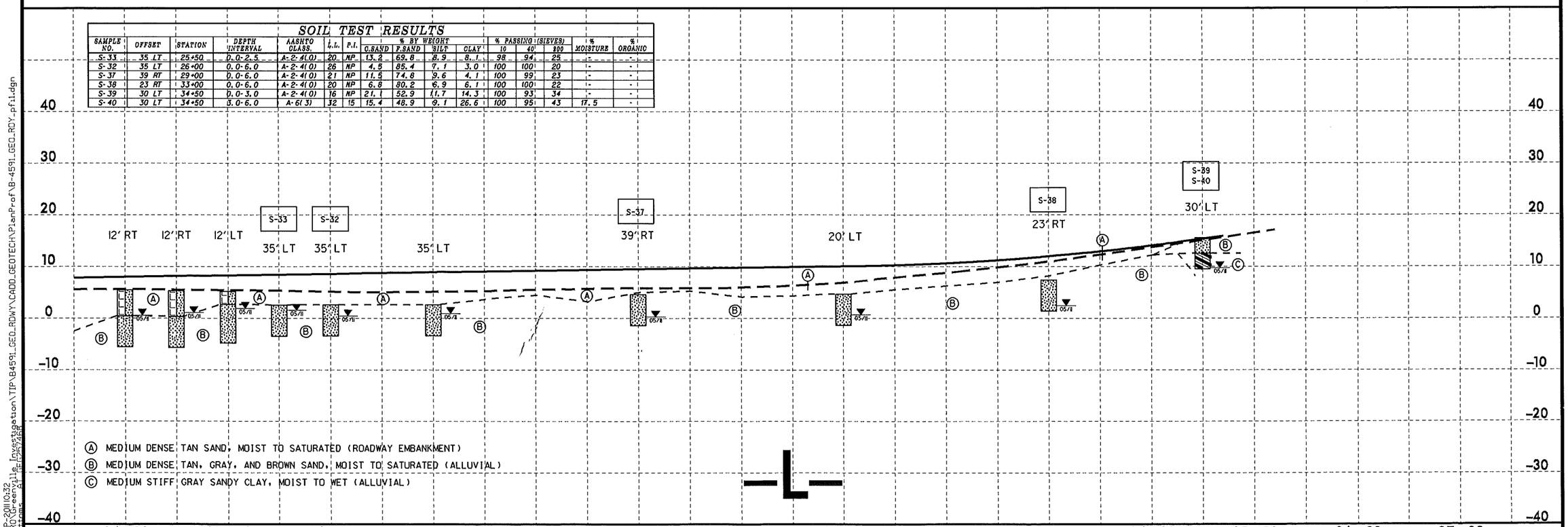
STATION	OFFSET	DEPTH	S (psf)
21+50	34' RT	0.0	296
21+50	34' RT	0.5	361
21+50	34' RT	1.0	370
21+50	34' RT	-1.5	-537
22+50	34' RT	1.5	389
22+50	34' RT	2.0	324
22+50	34' RT	2.5	222
22+50	34' RT	3.0	370
22+50	34' RT	3.5	204
22+50	34' RT	-4.0	-305
22+50	34' RT	4.5	389
22+50	34' RT	5.0	888
22+50	34' RT	6.0	389



Ⓐ MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)
Ⓑ MEDIUM DENSE TAN, GRAY, AND BROWN SAND, MOIST TO SATURATED (ALLUVIAL)
Ⓒ MEDIUM STIFF GRAY SANDY AND SILTY CLAY, MOIST TO WET (ALLUVIAL)
Ⓓ LOOSE GRAY SAND WITH MODERATE ORAGNIC MATERIAL, MOIST (ALLUVIAL)
Ⓔ LOOSE BROWN MUCK AND SAND WITH LITTLE TO MODERATE ORGANIC MATERIAL, MOIST TO SATURATED, AND VERY SOFT BROWN MUCK AND SANDY SILT WITH LITTLE TO MODERATE ORGANIC MATERIAL, MOIST TO WET (ALLUVIAL)
Ⓕ LOOSE BROWN SAND WITH LITTLE ORGANIC MATERIAL AND SOFT BROWN SANDY SILT WITH LITTLE ORGANIC MATERIAL, MOIST (ALLUVIAL)

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-33	35 LT	25+50	0.0-2.5	A-2-4(0)	20	NP	13.2	69.8	8.9	8.1	98	94	25	-	-
S-32	35 LT	26+00	0.0-6.0	A-2-4(0)	26	NP	4.5	85.4	7.1	3.0	100	100	20	-	-
S-37	39 RT	29+00	0.0-6.0	A-2-4(0)	21	NP	11.5	74.8	9.6	4.1	100	99	23	-	-
S-38	23 RT	33+00	0.0-6.0	A-2-4(0)	20	NP	6.8	80.2	6.9	6.1	100	100	22	-	-
S-39	30 LT	34+50	0.0-3.0	A-2-4(0)	16	NP	21.1	52.9	11.7	14.3	100	93	34	-	-
S-40	30 LT	34+50	3.0-6.0	A-6(3)	32	15	15.4	48.9	9.1	26.6	100	95	43	17.5	-



Ⓐ MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)
Ⓑ MEDIUM DENSE TAN, GRAY, AND BROWN SAND, MOIST TO SATURATED (ALLUVIAL)
Ⓒ MEDIUM STIFF GRAY SANDY CLAY, MOIST TO WET (ALLUVIAL)

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PROJ. REFERENCE NO.	SHEET NO.
B-4591	7

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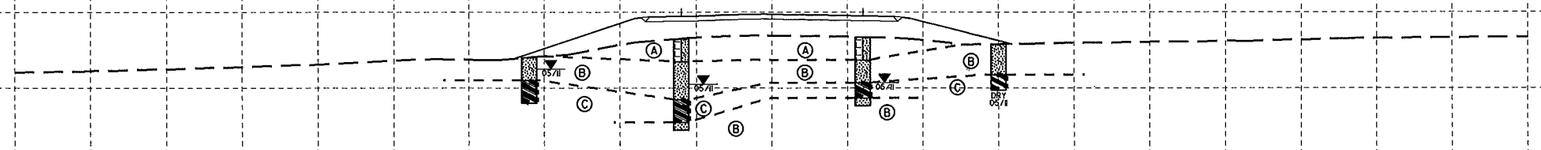
Ⓐ MEDIUM DENSE TAN SAND, MOIST (ROADWAY EMBANKMENT)
Ⓑ MEDIUM DENSE TAN AND GRAY SAND, MOIST TO SATURATED (ALLUVIAL)
Ⓒ MEDIUM STIFF GRAY SANDY CLAY, WET (ALLUVIAL)



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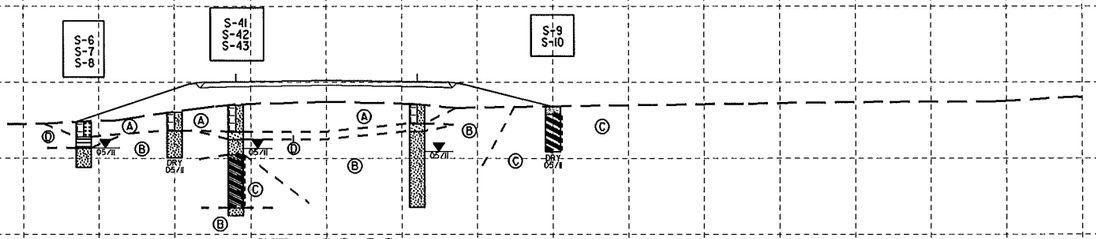
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-6	32 LT	17+00	0.0-2.0	A-3(0)	26	NP	15.7	79.6	2.7	2.0	100	96	8	-	-
S-7	32 LT	17+00	2.0-3.5	A-4(0)	30	NP	7.1	64.0	20.8	8.1	100	98	38	41.4	5.2
S-8	32 LT	17+00	3.5-6.0	A-2-4(0)	19	NP	7.5	71.9	14.5	6.1	100	98	30	-	-
S-9	30 RT	17+00	0.0-1.0	A-4(0)	18	NP	7.5	60.2	20.2	12.1	100	98	42	-	-
S-10	30 RT	17+00	1.0-6.0	A-7-6(19)	44	27	1.4	33.3	28.9	36.4	100	100	75	21.3	-
S-41	12 LT	17+00	3.5-4.5	A-2-4(0)	28	NP	8.4	67.1	16.3	8.2	100	98	33	-	4.8
S-42	12 LT	17+00	4.5-6.5	A-2-4(0)	18	NP	9.3	75.2	9.3	6.1	100	98	25	-	-
S-43	12 LT	17+00	6.5-13.5	A-6(2)	28	11	7.6	54.2	17.7	20.5	100	98	45	26.9	-

VANE SHEAR TESTS

STATION	OFFSET	DEPTH	S (psf)
17+00	30' RT	0.0	481
17+00	30' RT	0.5	493

Ⓐ MEDIUM DENSE TAN SAND, MOIST (ROADWAY EMBANKMENT)
~~Ⓑ MEDIUM DENSE TAN AND GRAY SAND, MOIST TO SATURATED (ALLUVIAL)~~
Ⓒ MEDIUM STIFF GRAY SANDY CLAY AND SANDY SILT, MOIST TO WET (ALLUVIAL)
Ⓓ LOOSE BROWN SAND WITH LITTLE ORGANIC MATERIAL AND SOFT BROWN SANDY SILT WITH LITTLE ORGANIC MATERIAL, MOIST (ALLUVIAL)



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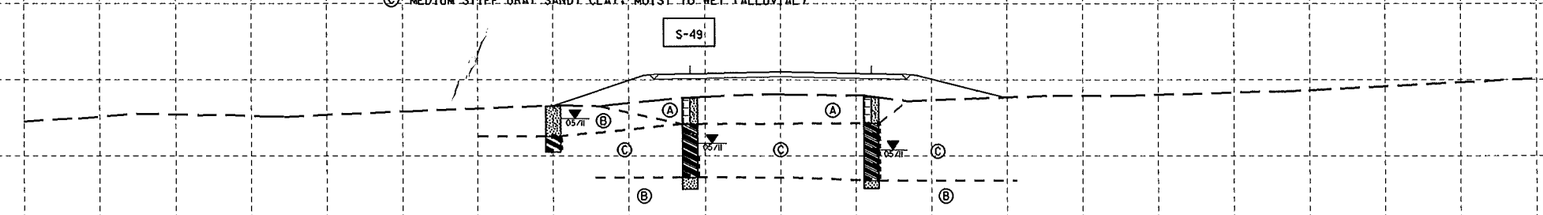
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-49	12 LT	16+50	3.5-11.0	A-6(15)	40	25	4.9	35.2	23.0	36.8	100	99	68	35.9	-

Ⓐ MEDIUM DENSE TAN SAND, MOIST (ROADWAY EMBANKMENT)
Ⓑ MEDIUM DENSE TAN AND GRAY SAND, MOIST TO SATURATED (ALLUVIAL)
Ⓒ MEDIUM STIFF GRAY SANDY CLAY, MOIST TO WET (ALLUVIAL)



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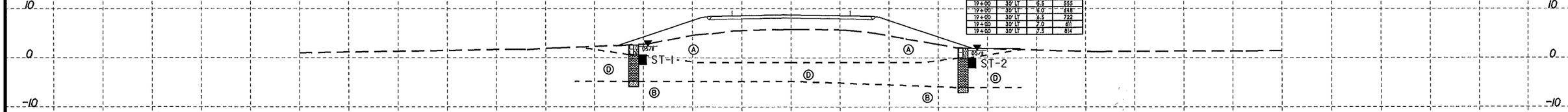
VANE SHEAR TESTS

STATION	OFFSET	DEPTH	S (psf)
19+00	34' RT	2.5	259
19+00	34' RT	3.0	194
19+00	34' RT	3.5	342
19+00	34' RT	4.0	722
19+00	34' RT	4.5	796
19+00	34' RT	5.0	583
19+00	34' RT	5.5	722
19+00	30' LT	0.5	481
19+00	30' LT	1.0	435
19+00	30' LT	1.5	648
19+00	30' LT	2.0	685
19+00	30' LT	2.5	629
19+00	30' LT	3.0	537
19+00	30' LT	3.5	518
19+00	30' LT	4.0	592
19+00	30' LT	4.5	546
19+00	30' LT	5.0	740
19+00	30' LT	5.5	555
19+00	30' LT	6.0	448
19+00	30' LT	6.5	722
19+00	30' LT	7.0	611
19+00	30' LT	7.5	814

(A) MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)
(B) MEDIUM DENSE TAN AND GRAY SAND, SATURATED (ALLUVIAL)
(D) VERY SOFT BROWN MUCK, WET (ALLUVIAL)



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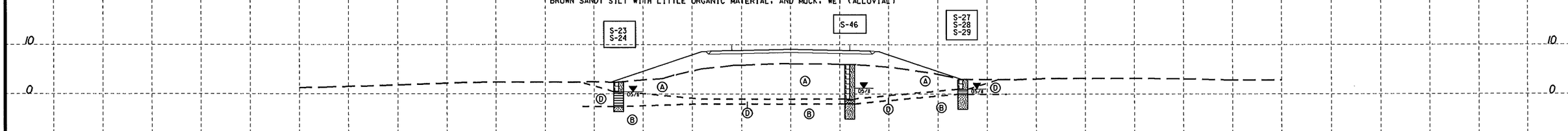
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-46	12 RT	18+50	7.0-8.0	-	-	-	-	-	-	-	-	-	-	-	20.3
S-27	35 RT	18+50	0.0-2.0	A-2-4(0)	25	NP	7.7	79.5	10.8	2.0	100	98	21	-	-
S-28	35 RT	18+50	2.0-3.0	A-4(0)	29	NP	13.3	58.2	20.4	8.1	100	96	37	-	5.8
S-29	35 RT	18+50	3.0-6.0	A-2-4(0)	18	NP	16.6	63.2	14.1	6.1	100	94	30	-	-
S-23	35 LT	18+50	0.0-2.0	A-2-4(0)	29	NP	19.3	60.4	13.2	7.1	99	95	23	-	4.6
S-24	35 LT	18+50	2.0-5.0	A-4(0)	33	NP	5.1	62.2	24.6	8.1	99	98	43	-	7.4

(A) MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)
(B) MEDIUM DENSE TAN AND GRAY SAND, SATURATED (ALLUVIAL)
(D) VERY LOOSE BROWN SAND WITH LITTLE ORGANIC MATERIAL, SATURATED, VERY SOFT BROWN SANDY SILT WITH LITTLE ORGANIC MATERIAL, AND MUCK, WET (ALLUVIAL)



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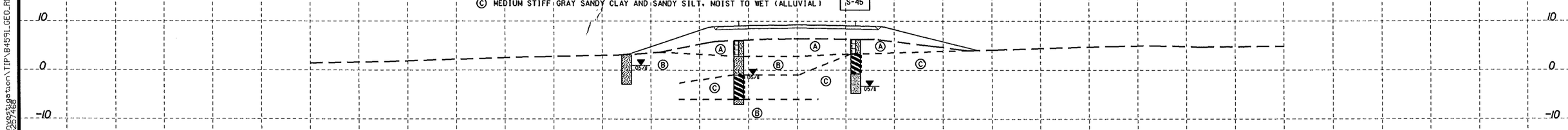
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-44	12 RT	18+00	3.0-7.0	A-7-6(17)	45	28	3.3	37.7	24.3	34.8	100	99	69	29.6	-
S-45	12 RT	18+00	7.0-11.0	A-4(0)	23	1	0.2	64.9	18.5	16.4	100	100	51	-	-

(A) MEDIUM DENSE TAN SAND, MOIST (ROADWAY EMBANKMENT)
(B) MEDIUM DENSE TAN AND GRAY SAND, MOIST TO SATURATED (ALLUVIAL)
(C) MEDIUM STIFF GRAY SANDY CLAY AND SANDY SILT, MOIST TO WET (ALLUVIAL)



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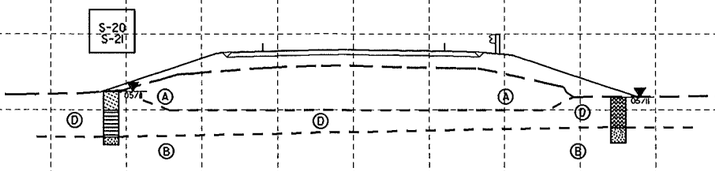
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-20	32 LT	20+50	0.0-2.5	A-2-4(0)	35	NP	3.6	81.3	11.0	4.0	98	97	25	-	5.6
S-21	32 LT	20+50	2.5-6.0	A-4(0)	25	NP	8.9	65.7	17.4	8.1	100	98	37	-	6.0

(A) MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)
(B) MEDIUM DENSE TAN AND GRAY SAND, SATURATED (ALLUVIAL)
(D) VERY LOOSE BROWN MODERATELY ORGANIC SAND, VERY SOFT BROWN SANDY SILT WITH LITTLE ORGANIC MATERIAL, AND MUCK, SATURATED AND WET (ALLUVIAL)



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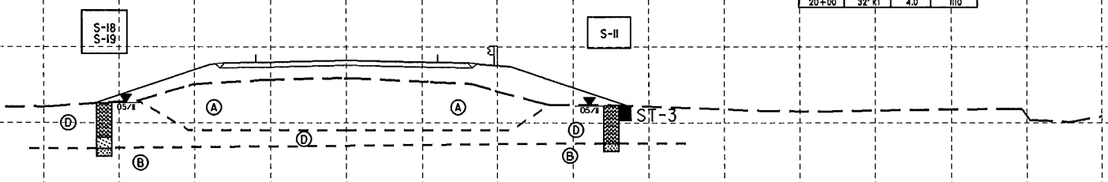
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-18	32 LT	20+00	0.0-4.5	A-2-5(0)	45	NP	20.2	52.3	19.4	8.1	100	94	33	-	15.5
S-19	32 LT	20+00	4.5-6.0	A-2-4(0)	28	NP	18.7	69.7	15.6	6.1	99	98	26	-	5.4
S-11	35 RT	20+00	0.0-5.0	A-5(1)	65	NP	35.2	17.0	31.7	16.2	98	70	49	311.1	26.5

(A) MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)
(B) MEDIUM DENSE TAN AND GRAY SAND, SATURATED (ALLUVIAL)
(D) VERY SOFT AND LOOSE BROWN MUCK AND MODERATELY ORGANIC SAND, WET AND SATURATED (ALLUVIAL)

VANE SHEAR TESTS

STATION	OFFSET	DEPTH	S (psf)
20+00	30' LT	0.0	389
20+00	30' LT	0.5	324
20+00	30' LT	1.0	222
20+00	30' LT	1.5	370
20+00	30' LT	2.0	204
20+00	30' LT	2.5	305
20+00	30' LT	3.0	389
20+00	30' LT	3.5	648
20+00	30' LT	4.0	389
20+00	30' LT	4.5	416
20+00	32' RT	0.0	176
20+00	32' RT	1.0	407
20+00	32' RT	2.0	592
20+00	32' RT	2.5	648
20+00	32' RT	3.0	740
20+00	32' RT	4.0	1110



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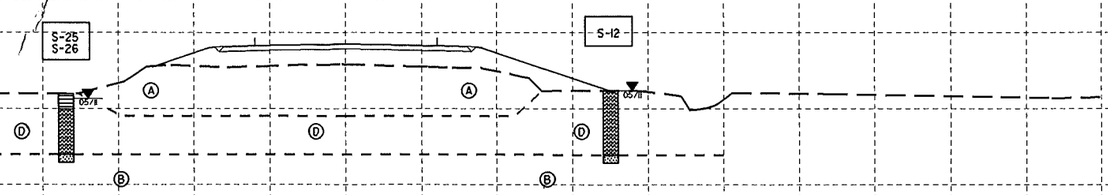
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-12	35 RT	19+50	0.0-8.5	A-7-5(19)	82	13	10.9	13.7	47.1	28.3	98	90	77	179.8	30.1
S-25	37 LT	19+50	0.0-2.0	A-4(1)	39	5	19.6	37.4	26.9	16.2	100	93	46	-	12.9
S-26	37 LT	19+50	2.0-8.0	A-2-5(0)	82	NP	31.5	39.4	21.0	8.1	89	70	30	254.5	30.2

(A) MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)
(B) MEDIUM DENSE TAN AND GRAY SAND, SATURATED (ALLUVIAL)
(D) VERY SOFT BROWN MUCK AND MODERATELY ORGANIC SANDY SILT, WET (ALLUVIAL)



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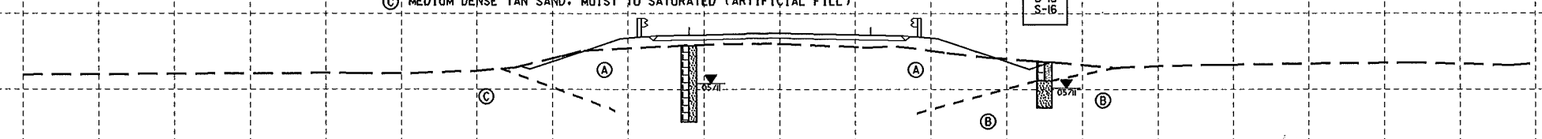
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-15	35 RT	22+00	0.0-2.5	A-4(1)	25	7	1.8	59.8	18.2	20.2	100	100	53	18.3	-
S-16	35 RT	22+00	2.5-6.0	A-2-4(0)	23	NP	2.7	84.6	10.6	2.0	100	100	26	-	-

(A) MEDIUM DENSE TAN SAND AND SANDY SILT, MOIST TO SATURATED (ROADWAY EMBANKMENT)
(B) MEDIUM DENSE TAN AND GRAY SAND, MOIST TO SATURATED (ALLUVIAL)
(C) MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ARTIFICIAL FILL)



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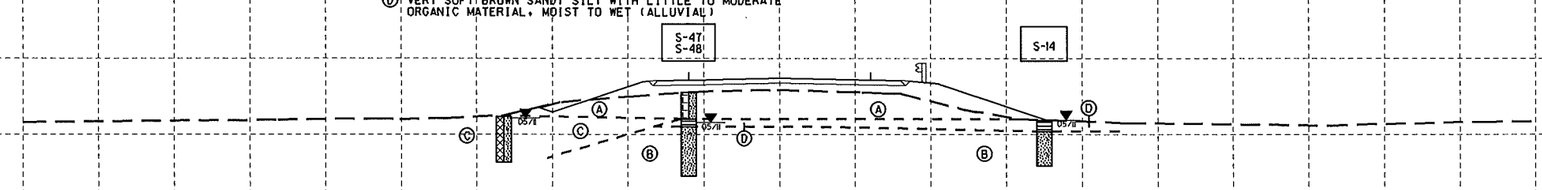
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-47	12 LT	21+50	0.0-3.5	A-2-4(0)	22	NP	8.8	79.4	4.6	7.2	100	97	16	-	
S-48	12 LT	21+50	3.5-4.5	-	-	-	-	-	-	-	-	-	-	-	5.0
S-14	35 RT	21+50	0.0-1.5	A-5(0)	56	NP	14.7	50.1	27.1	8.1	98	90	41	105.0	16.2

(A) MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)
(B) MEDIUM DENSE TAN AND GRAY SAND, MOIST TO SATURATED (ALLUVIAL)
(C) MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ARTIFICIAL FILL)
(D) VERY SOFT BROWN SANDY SILT WITH LITTLE TO MODERATE ORGANIC MATERIAL, MOIST TO WET (ALLUVIAL)

VANE SHEAR TESTS

STATION	OFFSET	DEPTH	S (psf)
21+50	34' RT	0.0	296
21+50	34' RT	0.5	351
21+50	34' RT	1.0	370
21+50	34' RT	1.5	527



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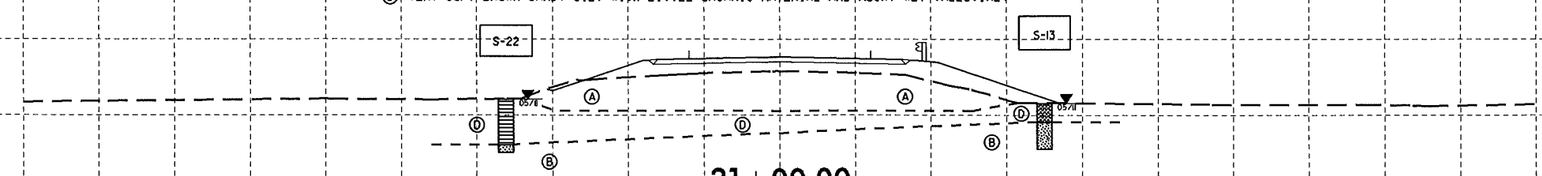
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-22	36 LT	21+00	0.0-6.0	A-4(0)	27	NP	4.6	59.8	23.4	12.1	99	97	49	-	6.9
S-13	35 RT	21+00	0.0-2.5	A-5(1)	79	NP	34.7	20.6	28.5	16.2	92	67	44	412.3	26.7

(A) MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)
(B) MEDIUM DENSE TAN AND GRAY SAND, SATURATED (ALLUVIAL)
(D) VERY SOFT BROWN SANDY SILT WITH LITTLE ORGANIC MATERIAL AND MUCK, WET (ALLUVIAL)



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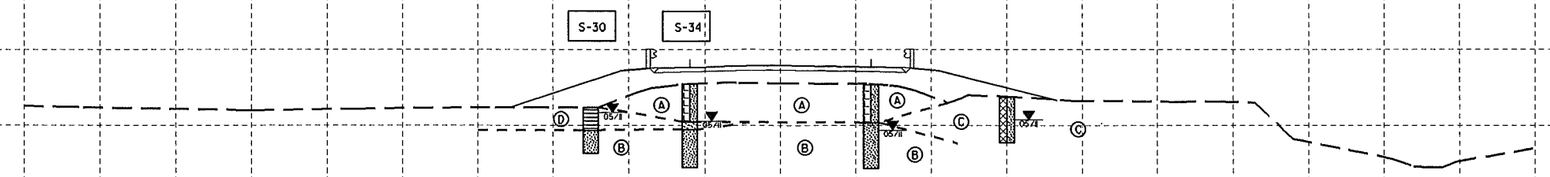
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-30	25 LT	24+00	0.0-3.0	A-4(0)	32	NP	3.8	65.5	10.5	20.2	100	100	45	55.9	5.7
S-34	12 LT	24+00	5.0-6.0	-	-	-	-	-	-	-	-	-	-	-	5.4

(A) MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)
(B) MEDIUM DENSE TAN AND GRAY SAND, MOIST TO SATURATED (ALLUVIAL)
(C) MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ARTIFICIAL FILL)
(D) VERY SOFT BROWN SANDY SILT WITH LITTLE ORGANIC MATERIAL, MOIST TO WET, AND VERY LOOSE BROWN MODERATELY ORGANIC SAND, SATURATED (ALLUVIAL)



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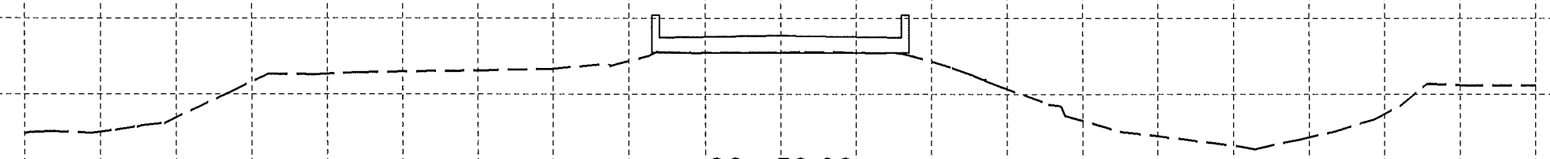

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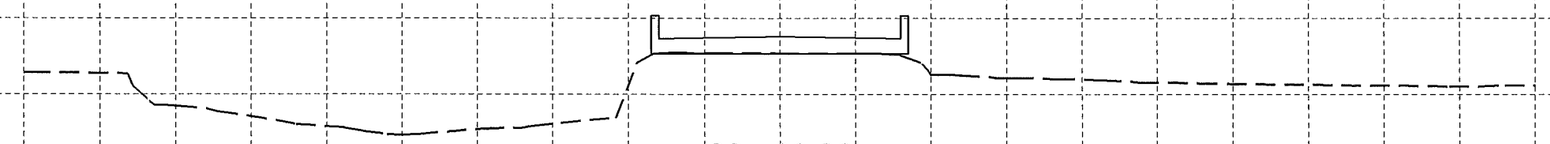

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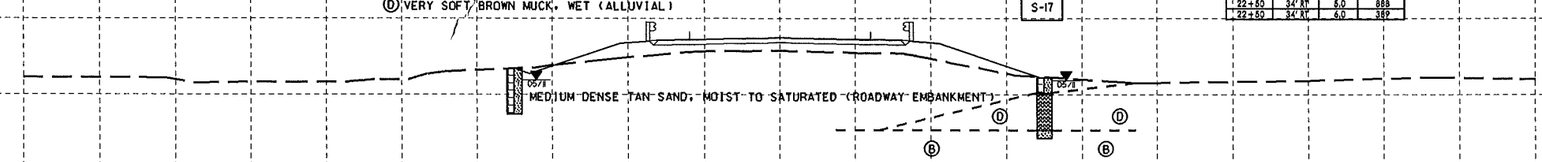
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-17	35 RT	22+50	2.0-7.0	A-5(1)	173	NP	50.5	6.5	34.9	8.1	89	49	39	851.5	64.6

(B) MEDIUM DENSE TAN AND GRAY SAND, SATURATED (ALLUVIAL)
(D) VERY SOFT BROWN MUCK, WET (ALLUVIAL)

VANE SHEAR TESTS

STATION	OFFSET	DEPTH	S (psf)
22+50	34' RT	1.5	389
22+50	34' RT	2.0	324
22+50	34' RT	2.5	222
22+50	34' RT	3.0	370
22+50	34' RT	3.5	204
22+50	34' RT	4.0	305
22+50	34' RT	4.5	389
22+50	34' RT	5.0	868
22+50	34' RT	6.0	389



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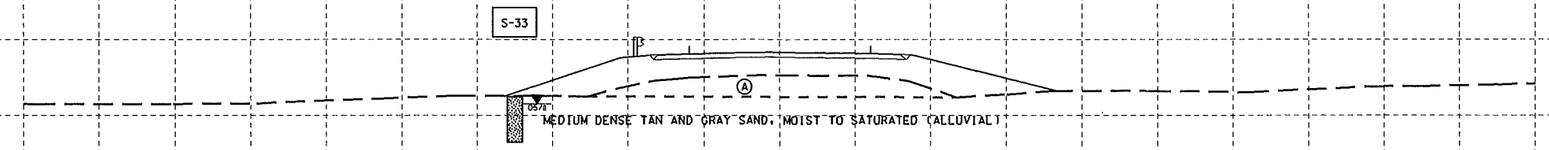
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-33	35 LT	25+50	0.0-2.5	A-2-4(0)	20	NP	13.2	69.8	8.9	8.1	98	94	25	-	-

Ⓐ MEDIUM DENSE TAN SAND, MOIST (ROADWAY EMBANKMENT)



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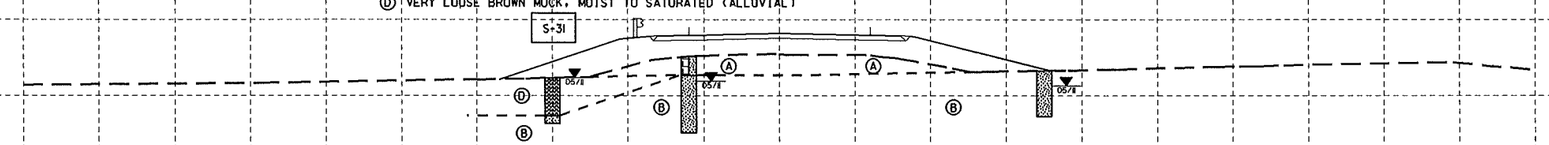
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-31	30 LT	25+00	0.0-5.0	A-2-5(0)	48	NP	16.2	63.2	14.5	6.1	97	91	28	101.5	12.6

Ⓐ MEDIUM DENSE TAN SAND, MOIST (ROADWAY EMBANKMENT)
Ⓑ MEDIUM DENSE TAN AND GRAY SAND, MOIST TO SATURATED (ALLUVIAL)
Ⓓ VERY LOOSE BROWN MUCK, MOIST TO SATURATED (ALLUVIAL)



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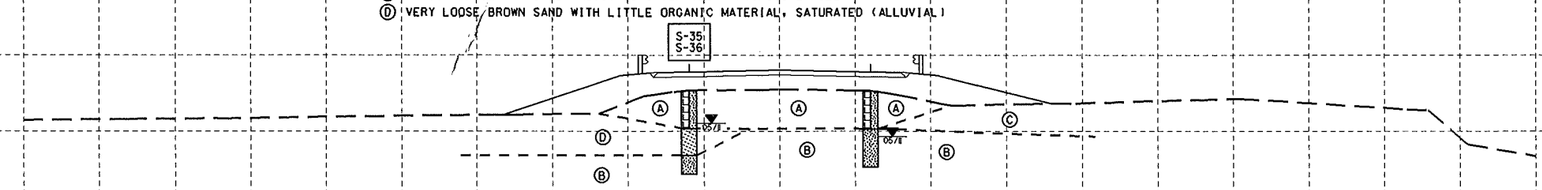
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
S-35	12 LT	24+50	0.0-5.0	A-2-4(0)	19	NP	16.7	68.4	3.7	11.3	100	95	22	-	-
S-36	12 LT	24+50	5.0-8.5	A-2-4(0)	29	NP	5.5	78.0	12.4	4.1	100	99	26	-	3.8

Ⓐ MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ROADWAY EMBANKMENT)
Ⓑ MEDIUM DENSE TAN AND GRAY SAND, MOIST TO SATURATED (ALLUVIAL)
Ⓒ MEDIUM DENSE TAN SAND, MOIST TO SATURATED (ARTIFICIAL FILL)
Ⓓ VERY LOOSE BROWN SAND WITH LITTLE ORGANIC MATERIAL, SATURATED (ALLUVIAL)



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