STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33310.1.1 (B-3864)	1	15

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33310.1.1 (B-3864) F.A. PROJ. BRSTP-70B(3)

COUNTY JOHNSTON

PROJECT DESCRIPTION BRIDGE NO. 40 ON US 70 BUSINESS OVER NEUSE RIVER AT -L- STATION 22+63

ID: B-3864

PROJECT: 33310.1.1

CONTENTS

CAUTION NOTICE

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INVESTIGATED BY N.D. MOHS

CHECKED BY N.T. ROBERSON

SUBMITTED BY N.T. ROBERSON

DATE APRIL 2011

NORTH CAROLINA LICENSED SEAL 21426 GEOLOGIST NATHAN DANIEL MOHS 8/11

DRAWN BY: N.D. MOHS

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PROJECT REFERENCE NO.	SHEET NO.
33310.1.1 (B-3864)	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 # 40 # 200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
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 (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

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

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT PLASTIC RANGE (PI) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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 POORLY 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	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	>10%	>20%	HIGHLY	35% AND ABOVE

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING 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
- [X] CME-55
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N XWL
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] 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 HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, 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: BM#2, -BL- STA. 12+33.4, 27.03' RT

ELEVATION: 128.61 FT.

NOTES:

REVISED 09/23/09

0	50	100
FEET		

PROJECT REFERENCE NO.	SHEET
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SITE PLAN

NAD 83

NEUSE RIVER

20+00

25+00

WOODS

GRAVEL

11' GRV

(ABAND)
TOP=128.37'
INV=121.52'

ELEC BOX

FSS 8"

TC

W

EB1-A

TFO

CONC. WW

12"

B1-A

B2-A

EB2-A

-L-

US 70 BUS.

BRIDGE NO#40
6- SPAN CONC. & STEEL
WITH 4-CONC WING WALLS

B1-B

B2-B

EB1-B

T&TFO

CONC. WW

8"

8"ABAND

12"

20"

24"

FORCE MAIN VALVE

WATER

WOODS

UNK SIZE

FSS

E01

12"

24" C&C

CONC.

48" WW

10' BST

FSS

TV&TVFO

12" 28' BST FIRST ST. DUCT

ELEC METER

ISBK BUS.

DECK

TV

TFO BST

DUCT 12"

END

TOP=140.24'
INV=137.23'

INV=137.54'

TV&TVFO

ELECTRIC BOX

UNK SIZE

T&TFO

CONC. WW

WOODEN WALKWAY

EO1

CONC.

SIGN

IFO

TLP

INV=137.60'

INV=137.72'
TOP=139.16'

20' BST FIRST ST.

48" IRON FENCE

ISF THEATER

6"TC

SS

10' BST

FSS

FORCE MAIN VALVE

SF

144 145 146 147 148 149 150 151 152 168 172 173

GROUNDLINE PROFILE AT CENTERLINE OF -L- TAKEN FROM ROADWAY DESIGN FILE DATED 2/17/11.

0 50 100
FEET
VE = 5:1

PROJECT REFERENCE NO.	SHEET
33310.1.1 (B-3864)	4

PROFILE OF BORINGS ALONG -L-

EB1-A
20+80
18' LT

B1-A
22+08
28' LT

B2-B
23+26
29' RT

EB2-B
24+41
30' RT

ASPHALT

ROADWAY EMBANKMENT, TAN-BROWN AND RED, MOIST, VERY LOOSE TO LOOSE, CLAYEY SAND, AND SOFT, SANDY SILT

ALLUVIAL, BROWN AND GRAY, MOIST TO SATURATED, VERY SOFT TO MEDIUM STIFF, SANDY SILT, SANDY CLAY, AND SILTY CLAY

NEUSE RIVER 3/15/11

03/11

GRAY, WET, LOOSE, COARSE SILTY SAND

RESIDUAL, VERY STIFF TO HARD, GRAY, MOIST, SANDY SILT

WEATHERED ROCK (PHYLLITE)

ROCK (PHYLLITE)

NON-CRYSTALLINE ROCK, GREEN-GRAY, MEDIUM TO MODERATELY HARD, FRESH TO SLIGHTLY WEATHERED, CLOSE TO MODERATELY CLOSE FRACTURE SPACING, NATURAL AND MECHANICAL BREAKS FOLLOW 30° FAINTLY VISIBLE FOLIATION PLANES, CONTAINS MINOR PYRITE, PHYLLITE

REC=85%
RQD=73%
RMR=42

REC=91%
RQD=70%
RMR=43

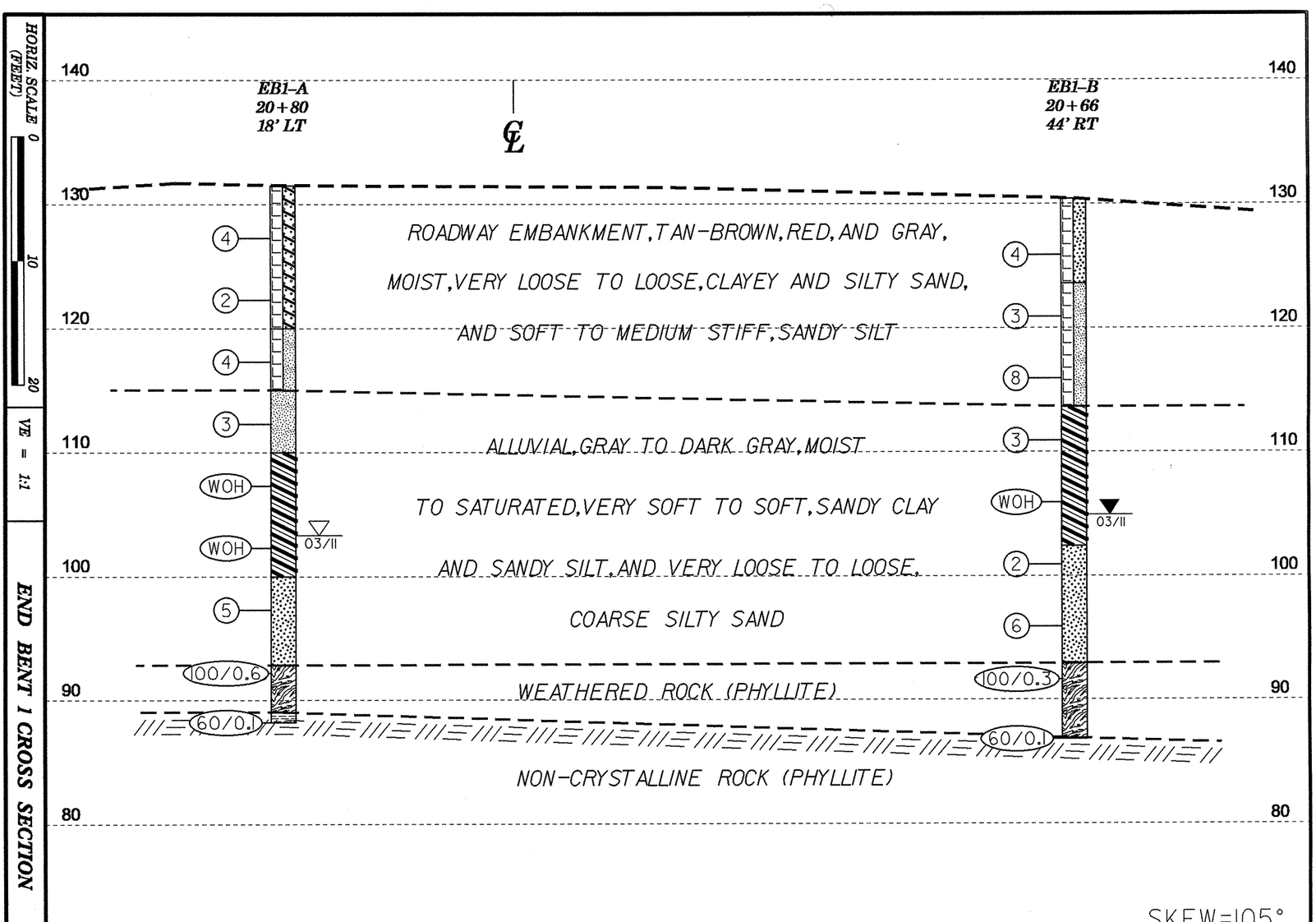
NON-CRYSTALLINE ROCK, GREEN-GRAY, MODERATELY HARD TO HARD, FRESH TO VERY SLIGHTLY WEATHERED, VERY CLOSE TO MODERATELY CLOSE FRACTURE SPACING, NATURAL AND MECHANICAL BREAKS FOLLOW 30° VISIBLE FOLIATION PLANES, CONTAINS MINOR PYRITE, PHYLLITE

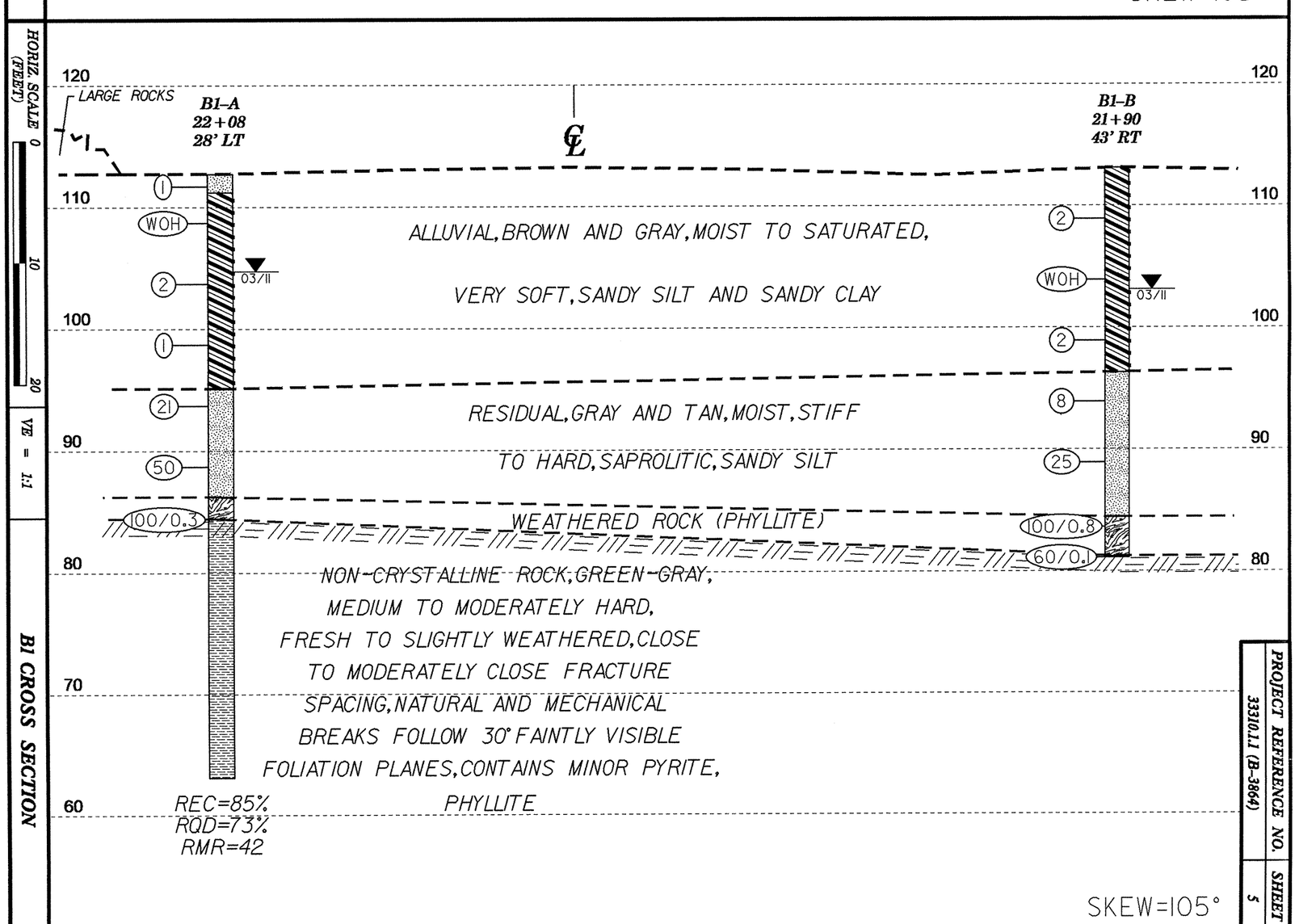
Ⓐ ALLUVIAL, BROWN, SATURATED, VERY LOOSE, COARSE SAND

ROADWAY EMBANKMENT, TAN, RED, AND BROWN, DRY TO MOIST, MEDIUM STIFF, SANDY SILT, SANDY CLAY, AND LOOSE, CLAYEY SAND TO MEDIUM STIFF, SILTY CLAY

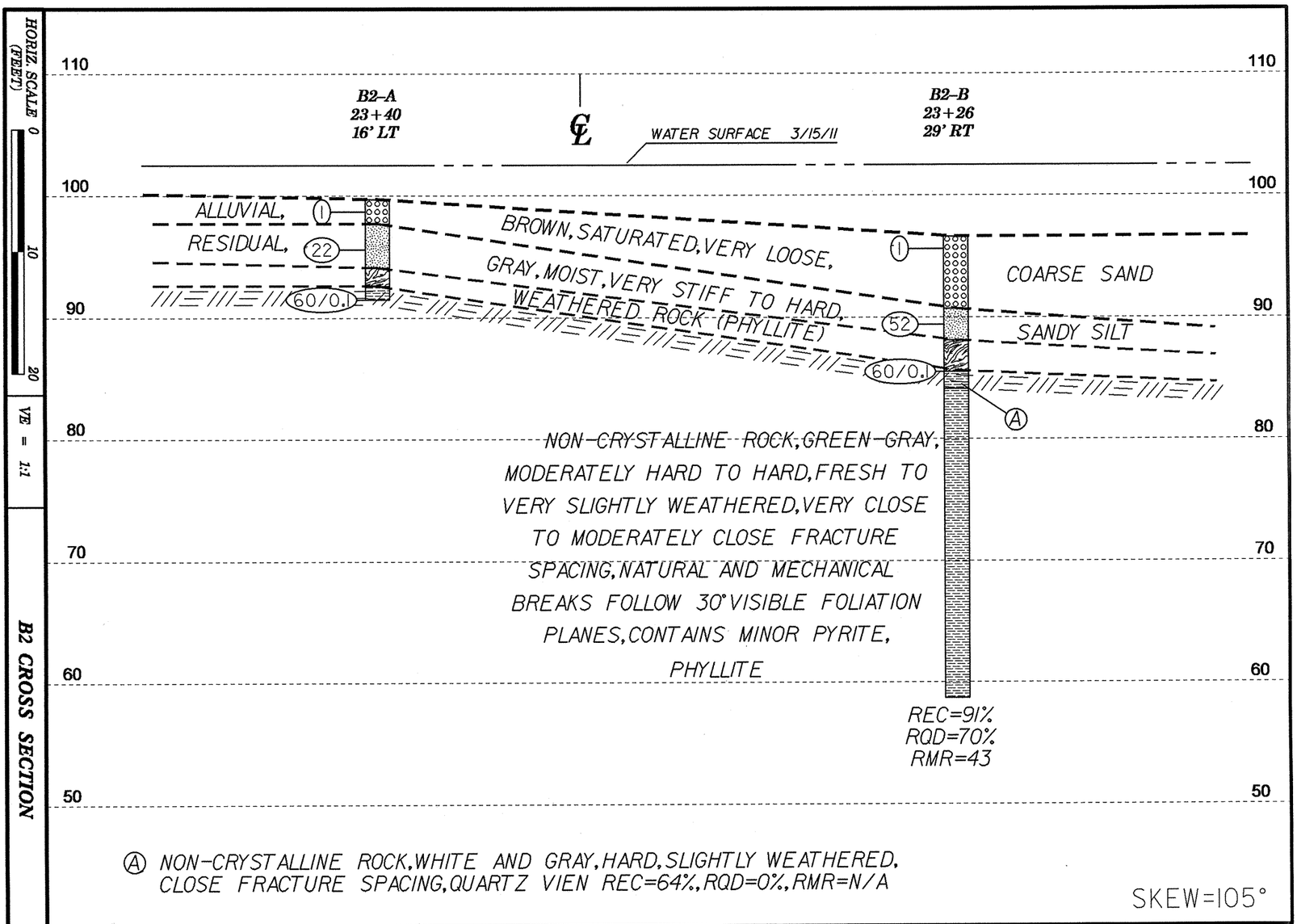
140 130 120 110 100 90 80 70 60

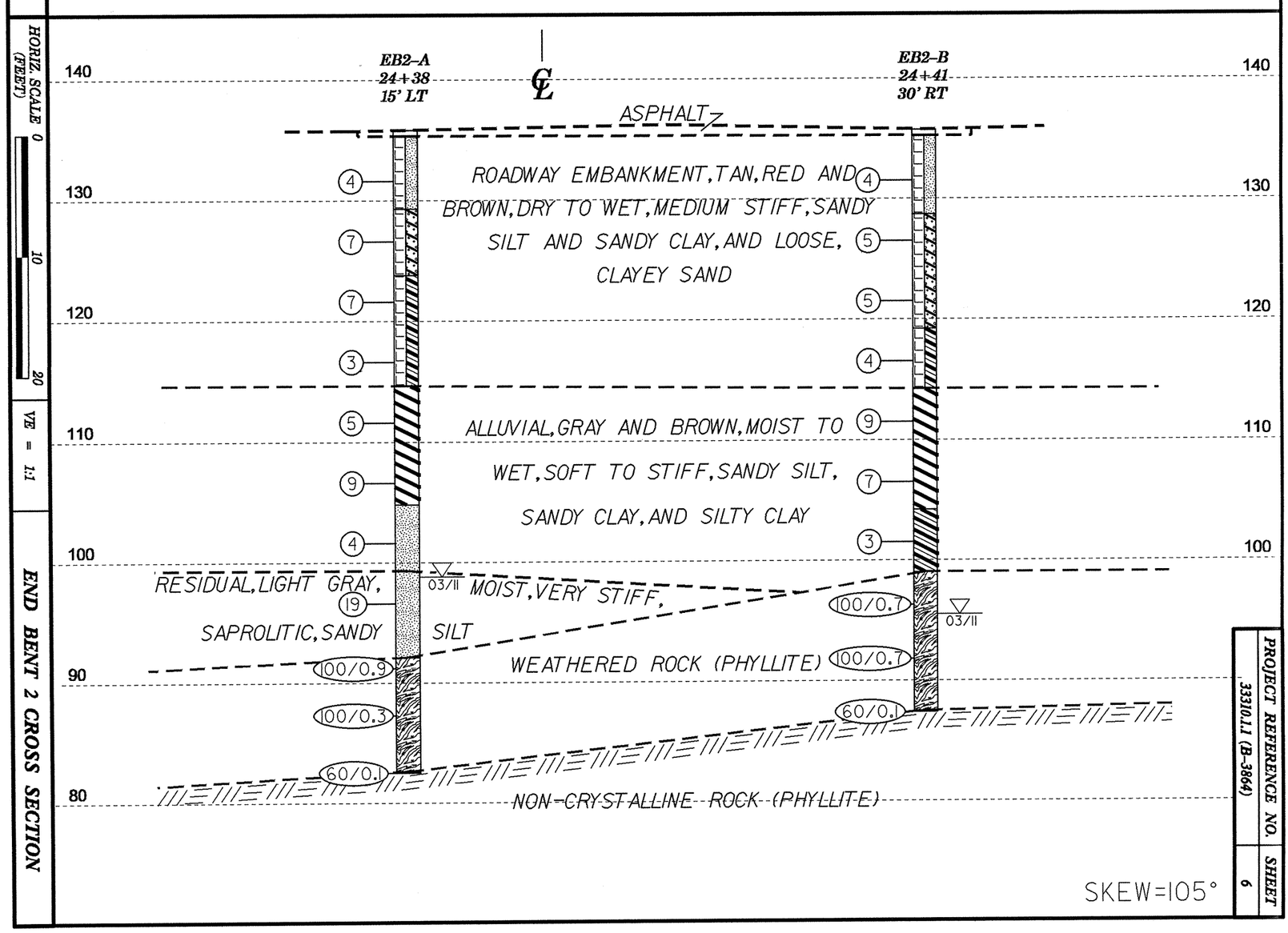
20+00 22+00 24+00 26+00





PROJECT REFERENCE NO.	SHEET
33310.1.1 (B-3864)	5





PROJECT REFERENCE NO.	SHEET
33310.1.1 (B-3864)	6

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 33310.1.1	**TIP** B-3864	**COUNTY** JOHNSTON	**GEOLOGIST** Mohs, N. D.	
SITE DESCRIPTION BRIDGE NO. 40 ON US 70 BUSINESS OVER NEUSE RIVER AT -L- STATION 22+63				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 20+80	**OFFSET** 18 ft LT	**ALIGNMENT** -L-	**0 HR.** 28.2
COLLAR ELEV. 131.5 ft	**TOTAL DEPTH** 43.3 ft	**NORTHING** 642,311	**EASTING** 2,193,310	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 00% 00/00/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 03/04/11	**COMP. DATE** 03/04/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
135										131.5 GROUND SURFACE 0.0
130	128.3	3.2	3	2	2	4		M		**ROADWAY EMBANKMENT** TAN-BROWN AND RED, CLAYEY SAND
125	123.3	8.2	2	1	1	2		M		120.0 11.5 GRAY, SANDY SILT
120	118.3	13.2	1	2	2	4		M		115.0 16.5 **ALLUVIAL** GRAY, SANDY SILT
115	113.3	18.2	1	2	1	3	SS-13	W		110.0 21.5 GRAY, SANDY CLAY
110	108.3	23.2	WOH	WOH	WOH	WOH 0		W		
105	103.3	28.2	WOH	WOH	WOH	WOH 0		W		100.0 31.5 GRAY, COARSE SILTY SAND
100	98.3	33.2	3	1	4	5		Sat.		
95	93.3	38.2	6	54	46/0.1	100/0.6				92.8 38.7 **WEATHERED ROCK** PHYLLITE
90	88.3	43.2	60/0.1			60/0.1				89.0 42.5 88.2 43.3 **NON-CRYSTALLINE ROCK** PHYLLITE Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 88.2 ft IN NON-CRYSTALLINE ROCK (PHYLLITE)

WBS 33310.1.1	**TIP** B-3864	**COUNTY** JOHNSTON	**GEOLOGIST** Czajka, C. D.	
SITE DESCRIPTION BRIDGE NO. 40 ON US 70 BUSINESS OVER NEUSE RIVER AT -L- STATION 22+63				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 20+66	**OFFSET** 44 ft RT	**ALIGNMENT** -L-	**0 HR.** 26.7
COLLAR ELEV. 130.4 ft	**TOTAL DEPTH** 43.6 ft	**NORTHING** 642,262	**EASTING** 2,193,269	**24 HR.** 25.5
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 00% 00/00/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 03/02/11	**COMP. DATE** 03/02/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
135										130.4 GROUND SURFACE 0.0
130	126.9	3.5	2	2	2	4	SS-6	M		**ROADWAY EMBANKMENT** TAN, SILTY SAND
125	121.9	8.5	2	1	2	3	SS-7	M		123.6 6.8 GRAY, SANDY SILT
120	116.9	13.5	1	3	5	8		M		113.6 16.8 **ALLUVIAL** DARK GRAY TO GRAY, SANDY CLAY, WITH TRACE ORGANICS
115	111.9	18.5	WOH	1	2	3	SS-8	M		
110	106.9	23.5	WOH	WOH	WOH	WOH 0	SS-9	M		102.4 28.0 GRAY, COARSE SILTY SAND
105	101.9	28.5	2	1	1	2	SS-10	W		
100	96.9	33.5	3	2	4	6	SS-11	W		92.9 37.5 **WEATHERED ROCK** PHYLLITE
95	91.9	38.5	100/0.3			100/0.3				86.9 43.5 86.8 43.6 **NON-CRYSTALLINE ROCK** PHYLLITE Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 86.8 ft IN NON-CRYSTALLINE ROCK (PHYLLITE)
90	86.9	43.5	60/0.1			60/0.1				

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 33310.1.1	**TIP** B-3864	**COUNTY** JOHNSTON	**GEOLOGIST** Mohs, N. D.	
SITE DESCRIPTION BRIDGE NO. 40 ON US 70 BUSINESS OVER NEUSE RIVER AT -L- STATION 22+63				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 22+08	**OFFSET** 28 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 112.7 ft	**TOTAL DEPTH** 49.6 ft	**NORTHING** 642,262	**EASTING** 2,193,429	**24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 00% 00/00/2011		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 03/07/11	**COMP. DATE** 03/07/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
115											
	112.7	0.0	1	0	1	1	S-14	M		112.7 GROUND SURFACE	0.0
110	109.7	3.0	WOH	WOH	WOH	WOH	SS-15	W		111.2 **ALLUVIAL** BROWN, SANDY SILT	1.5
105	104.7	8.0	WOH	1	1	2		Sat.		BROWN AND GRAY, SANDY CLAY	
100	99.7	13.0	1	0	1	1		Sat.			
95	94.7	18.0	6	9	12	21		M		95.1 **RESIDUAL** GRAY AND TAN, SAPROLITIC, SANDY SILT	17.6
90	89.7	23.0	25	26	24	50	SS-16	M			
85	84.7	28.0	100/0.3			100/0.3				86.2 **WEATHERED ROCK** PHYLLITE	26.5
80							RS-1			84.4 **NON-CRYSTALLINE ROCK** GREEN-GRAY, MEDIUM TO MODERATELY HARD, FRESH TO SLIGHTLY WEATHERED, CLOSE TO MODERATELY CLOSE FRACTURE SPACING, NATURAL AND MECHANICAL BREAKS FOLLOW 30° FAINTLY VISIBLE FOLIATION PLANES, CONTAINS MINOR PYRITE, PHYLLITE	28.3
75											
70											
65										63.1 Boring Terminated at Elevation 63.1 ft IN NON-CRYSTALLINE ROCK (PHYLLITE)	49.6

NCDOT BORE DOUBLE B3864_GEO_BH.GPJ NC_DOT.GDT 7/14/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 33310.1.1	**TIP** B-3864	**COUNTY** JOHNSTON	**GEOLOGIST** Mohs, N. D.	
SITE DESCRIPTION BRIDGE NO. 40 ON US 70 BUSINESS OVER NEUSE RIVER AT -L- STATION 22+63				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 22+08	**OFFSET** 28 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 112.7 ft	**TOTAL DEPTH** 49.6 ft	**NORTHING** 642,262	**EASTING** 2,193,429	**24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 00% 00/00/2011		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 03/07/11	**COMP. DATE** 03/07/11	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXWL	**TOTAL RUN** 21.3 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
84.4											Begin Coring @ 28.3 ft	
	84.4	28.3	1.3	:15/0.3 :31/1.0	(0.0) 0%	(0.0) 0%		(18.1) 85%	(15.6) 73%		84.4 **NON-CRYSTALLINE ROCK**	28.3
80	83.1	29.6	5.0	:25/1.0 :35/1.0 :33/1.0 :33/1.0 :33/1.0	(3.8) 76%	(2.9) 58%	RS-1				GREEN-GRAY, MEDIUM TO MODERATELY HARD, FRESH TO SLIGHTLY WEATHERED, CLOSE TO MODERATELY CLOSE FRACTURE SPACING, NATURAL AND MECHANICAL BREAKS FOLLOW 30° FAINTLY VISIBLE FOLIATION PLANES, CONTAINS MINOR PYRITE, PHYLLITE	
	78.1	34.6	5.0	:35/1.0 :38/1.0 :32/1.0 :35/1.0 :40/1.0	(4.7) 94%	(4.0) 80%						
75	73.1	39.6	5.0	:51/1.0 :56/1.0 :32/1.0 :50/1.0 :36/1.0	(4.8) 96%	(4.4) 88%						
70	68.1	44.6	5.0	:20/1.0 :40/1.0 :41/1.0 :39/1.0 :42/1.0	(4.8) 96%	(4.3) 86%						
65	63.1	49.6									63.1 Boring Terminated at Elevation 63.1 ft IN NON-CRYSTALLINE ROCK (PHYLLITE)	49.6

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 33310.1.1	**TIP** B-3864	**COUNTY** JOHNSTON	**GEOLOGIST** Mohs, N. D.	
SITE DESCRIPTION BRIDGE NO. 40 ON US 70 BUSINESS OVER NEUSE RIVER AT -L- STATION 22+63				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 21+90	**OFFSET** 43 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 113.1 ft	**TOTAL DEPTH** 32.0 ft	**NORTHING** 642,207	**EASTING** 2,193,381	**24 HR.** 10.0
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 00% 00/00/2011		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 03/08/11	**COMP. DATE** 03/08/11	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
115											
										113.1 GROUND SURFACE	0.0
110	109.9	3.2	1	1	1	2		M		**ALLUVIAL** BROWN AND GRAY, SANDY CLAY	
105	104.9	8.2	WOH	WOH	WOH	0		Sat.			
100	99.9	13.2	WOH	1	1	2		Sat.			
										96.3	16.8
95	94.9	18.2	4	4	4	8		M		**RESIDUAL** GRAY, SAPROLITIC, SANDY SILT	
90	89.9	23.2	9	10	15	25		M			
85	84.9	28.2	18	40	60/0.3	100/0.8				84.4	28.7
	81.2	31.9	60/0.1			60/0.1				**WEATHERED ROCK** PHYLLITE	
										81.2 81.1 **NON-CRYSTALLINE ROCK** PHYLLITE	31.9 32.0
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 81.1 ft IN NON-CRYSTALLINE ROCK (PHYLLITE)	

WBS 33310.1.1	**TIP** B-3864	**COUNTY** JOHNSTON	**GEOLOGIST** Mohs, N. D.	
SITE DESCRIPTION BRIDGE NO. 40 ON US 70 BUSINESS OVER NEUSE RIVER AT -L- STATION 22+63				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 23+40	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 99.7 ft	**TOTAL DEPTH** 8.2 ft	**NORTHING** 642,192	**EASTING** 2,193,541	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 00% 00/00/2011		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 03/08/11	**COMP. DATE** 03/08/11	**SURFACE WATER DEPTH** 4.9ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION WATER SURFACE (03/08/11)	
100											
	99.7	0.0	1	0	1	1		Sat.		99.7 GROUND SURFACE	0.0
										97.7 **ALLUVIAL** BROWN, COARSE SAND	2.0
	96.6	3.1	5	6	16			M		**RESIDUAL** GRAY, SANDY SILT	
95						22				94.1	5.6
										92.6 **WEATHERED ROCK** PHYLLITE	7.1
	91.6	8.1	60/0.1			60/0.1				91.5 **NON-CRYSTALLINE ROCK** PHYLLITE	8.2
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 91.5 ft IN NON-CRYSTALLINE ROCK (PHYLLITE)	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 33310.1.1	**TIP** B-3864	**COUNTY** JOHNSTON	**GEOLOGIST** Mohs, N. D.	
SITE DESCRIPTION BRIDGE NO. 40 ON US 70 BUSINESS OVER NEUSE RIVER AT -L- STATION 22+63				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 23+26	**OFFSET** 29 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 96.6 ft	**TOTAL DEPTH** 37.9 ft	**NORTHING** 642,158	**EASTING** 2,193,508	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 00% 00/00/2011		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 03/03/11	**COMP. DATE** 03/03/11	**SURFACE WATER DEPTH** 6.5ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										WATER SURFACE (03/03/11)	
	96.6	0.0	1	0	1	1		W		96.6 GROUND SURFACE	0.0
										ALLUVIAL BROWN, COARSE SAND	
	90.4	6.2	23	27	25	52	SS-12	M		90.7	5.9
										RESIDUAL GRAY, SAPROLITIC, SANDY SILT	
	85.6	11.0	60/0.1			60/0.1				88.1	8.5
										WEATHERED ROCK PHYLLITE	
										85.5	11.1
										NON-CRYSTALLINE ROCK WHITE AND GRAY, HARD, SLIGHTLY WEATHERED, CLOSE FRACTURE SPACING, QUARTZ VEIN	
							RS-2			84.1	12.5
										GRAY-GREEN, MODERATELY HARD TO HARD, FRESH TO VERY SLIGHTLY WEATHERED, MODERATELY CLOSELY FRACTURED, PHYLLITE	
							RS-3				
										58.7	37.9
										Boring Terminated at Elevation 58.7 ft IN NON-CRYSTALLINE ROCK (PHYLLITE)	

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 33310.1.1	**TIP** B-3864	**COUNTY** JOHNSTON	**GEOLOGIST** Mohs, N. D.	
SITE DESCRIPTION BRIDGE NO. 40 ON US 70 BUSINESS OVER NEUSE RIVER AT -L- STATION 22+63				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 23+26	**OFFSET** 29 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 96.6 ft	**TOTAL DEPTH** 37.9 ft	**NORTHING** 642,158	**EASTING** 2,193,508	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 00% 00/00/2011		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 03/03/11	**COMP. DATE** 03/03/11	**SURFACE WATER DEPTH** 6.5ft	
CORE SIZE NXWL	**TOTAL RUN** 26.8 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
85.5											Begin Coring @ 11.1 ft	
	85.5	11.1	1.8	:51/1.0 1:09/0.8	(0.9) 50%	(0.0) 0%		(0.9) 64%	(0.0) 0%		85.5 **NON-CRYSTALLINE ROCK**	11.1
	83.7	12.9	5.0	:55/1.0 :47/1.0 :45/1.0 :42/1.0 1:03/1.0	(4.5) 90%	(3.4) 68%	RS-2	(23.2) 91%	(17.7) 70%		84.1 WHITE AND GRAY, HARD, SLIGHTLY WEATHERED, CLOSE FRACTURE SPACING, QUARTZ VEIN	12.5
80	78.7	17.9	5.0	:51/1.0 :57/1.0 1:03/1.0 :59/1.0 1:03/1.0	(4.8) 96%	(4.2) 84%					GRAY-GREEN, MODERATELY HARD TO HARD, FRESH TO VERY SLIGHTLY WEATHERED, VERY CLOSE TO MODERATELY CLOSE FRACTURE SPACING, NATURAL AND MECHANICAL BREAKS FOLLOW 30° VISIBLE FOLIATION PLANES, CONTAINS MINOR PYRITE, PHYLLITE	
75	73.7	22.9	5.0	:48/1.0 :47/1.0 :40/1.0 :49/1.0 :56/1.0	(4.0) 80%	(2.2) 44%	RS-3					
70	68.7	27.9	5.0	:39/1.0 :44/1.0 :40/1.0 :45/1.0 :57/1.0	(4.7) 94%	(4.8) 96%						
65	63.7	32.9	5.0	:44/1.0 :45/1.0 :46/1.0 :50/1.0 :55/1.0	(4.3) 86%	(3.1) 62%						
60	58.7	37.9									58.7	37.9
											Boring Terminated at Elevation 58.7 ft IN NON-CRYSTALLINE ROCK (PHYLLITE)	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 33310.1.1	**TIP** B-3864	**COUNTY** JOHNSTON	**GEOLOGIST** Roberson, N.T.
SITE DESCRIPTION BRIDGE NO. 40 ON US 70 BUSINESS OVER NEUSE RIVER AT -L- STATION 22+63			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 24+38	**OFFSET** 15 ft LT	**ALIGNMENT** -L- — **0 HR.** 37.0
COLLAR ELEV. 135.8 ft	**TOTAL DEPTH** 53.3 ft	**NORTHING** 642,147	**EASTING** 2,193,628 — **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 00% 00/00/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Conley, H. R.	**START DATE** 03/09/11	**COMP. DATE** 03/09/11	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft) / DEPTH (ft)
140										
135										135.8 / 0.0 — GROUND SURFACE
										135.3 / 0.5 — **ROADWAY EMBANKMENT** ASPHALT; TAN-BROWN, SANDY SILT WITH SOME GRAVEL
	132.6	3.2	2	2	2	4		M		129.3 / 6.5 — RED-BROWN, CLAYEY SAND
130										
	127.6	8.2	4	3	4	7	SS-18	M		123.8 / 12.0 — BROWN, SANDY CLAY
125										
	122.6	13.2	3	3	4	7		M		
120										
	117.6	18.2	3	1	2	3	SS-19	W		114.6 / 21.2 — **ALLUVIAL** BROWN AND GRAY, SILTY CLAY
115										
	112.6	23.2	2	2	3	5		M		
110										
	107.6	28.2	3	4	5	9		M		104.8 / 31.0 — GRAY-BROWN, SANDY CLAY
105										
	102.6	33.2	2	2	2	4		M		99.3 / 36.5 — **RESIDUAL** LIGHT GRAY, SAPROLITIC, SANDY SILT
100										
	97.6	38.2	5	9	10	19	SS-20	M		
95										
	92.6	43.2	17	57	43/0.4	100/0.9				92.1 / 43.7 — **WEATHERED ROCK** PHYLLITE
90										
	87.6	48.2	100/0.3			100/0.3				
85										
	82.6	53.2	60/0.1			60/0.1				82.6 / 53.2 — **NON-CRYSTALLINE ROCK** PHYLLITE; Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 82.5 ft IN NON-CRYSTALLINE ROCK (PHYLLITE)

WBS 33310.1.1	**TIP** B-3864	**COUNTY** JOHNSTON	**GEOLOGIST** Czajka, C. D.
SITE DESCRIPTION BRIDGE NO. 40 ON US 70 BUSINESS OVER NEUSE RIVER AT -L- STATION 22+63			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 24+41	**OFFSET** 30 ft RT	**ALIGNMENT** -L- — **0 HR.** 40.2
COLLAR ELEV. 135.7 ft	**TOTAL DEPTH** 48.3 ft	**NORTHING** 642,106	**EASTING** 2,193,611 — **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 00% 00/00/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Conley, H. R.	**START DATE** 03/02/11	**COMP. DATE** 03/02/11	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
140										
135										135.7 / 0.0 — GROUND SURFACE
										135.2 / 0.5 — **ROADWAY EMBANKMENT** ASPHALT; TAN, SANDY SILT
	132.5	3.2	3	2	2	4	SS-1	D		
130										128.7 / 7.0 — RED-BROWN, CLAYEY SAND
	127.5	8.2	4	2	3	5	SS-2	M		
125										
	122.5	13.2	1	2	3	5		M		
120										
	117.5	18.2	2	2	2	4	SS-3	M		114.2 / 21.5 — **ALLUVIAL** GRAY, SILTY CLAY
115										
	112.5	23.2	3	4	5	9	SS-4			
110										
	107.5	28.2	3	3	4	7		M		104.2 / 31.5 — GRAY, SANDY CLAY
105										
	102.5	33.2	4	2	1	3	SS-5	W		99.0 / 36.7 — **WEATHERED ROCK** PHYLLITE
100										
	97.5	38.2	17	62	38/0.2	100/0.7				
95										
	92.5	43.2	67	33/0.2		100/0.7				
90										
	87.5	48.2	60/0.1			60/0.1				87.5 / 48.2 — **NON-CRYSTALLINE ROCK** PHYLLITE; Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 87.4 ft IN NON-CRYSTALLINE ROCK (PHYLLITE)

EB1-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-13	18 LT	20+80	18.2-19.7	A-4(0)	24	4	2.2	50.9	24.5	22.4	100	100	57	-	-

EB1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-6	44 RT	20+66	3.5-5.0	A-2-6(1)	33	13	42.7	16.1	16.8	24.4	74	48	34	-	-
SS-7	44 RT	20+66	8.5-10.0	A-4(3)	22	8	10.4	29.1	36.1	24.4	99	94	68	-	-
SS-8	44 RT	20+66	18.5-20.0	A-6(13)	36	15	0.4	19.3	39.6	40.7	100	100	89	-	-
SS-9	44 RT	20+66	23.5-25.0	A-6(7)	31	12	0.8	39.7	29.0	30.5	100	100	72	-	-
SS-10	44 RT	20+66	28.5-30.0	A-2-4(0)	22	NP	6.3	71.0	10.5	12.2	100	100	29	-	-
SS-11	44 RT	20+66	33.5-35.0	A-2-4(0)	23	NP	38.5	53.9	4.6	3.1	94	73	11	-	-

B1-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
S-14	28 LT	22+08	0.0-1.5	A-4(0)	27	NP	12.6	59.0	20.2	8.1	100	93	41	-	-
SS-15	28 LT	22+08	3.0-4.5	A-6(12)	39	16	3.3	29.5	36.7	30.5	100	98	78	-	-
SS-16	28 LT	22+08	23.0-24.5	A-4(4)	34	4	1.4	30.1	62.4	6.1	100	99	80	-	-

B2-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-12	29 RT	23+26	6.2-7.7	A-4(1)	32	2	6.1	37.8	47.9	8.1	100	98	66	-	-

EB2-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-18	15 LT	24+38	8.2-9.7	A-2-6(1)	38	22	61.2	13.5	4.9	20.3	91	50	25	-	-
SS-19	15 LT	24+38	18.2-19.7	A-6(1)	27	14	45.6	19.6	10.4	24.4	95	69	36	-	-
SS-20	15 LT	24+38	38.2-39.7	A-4(6)	37	6	1.2	27.9	64.8	6.1	100	100	82	-	-

EB2-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	30 RT	24+41	3.2-4.7	A-4(0)	16	NP	26.2	47.0	16.6	10.2	95	80	36	-	-
SS-2	30 RT	24+41	8.2-9.7	A-2-6(1)	28	16	51.5	17.3	6.8	24.4	100	67	33	-	-
SS-3	30 RT	24+41	18.2-19.7	A-6(1)	26	13	44.4	18.9	10.3	26.4	96	71	38	-	-
SS-4	30 RT	24+41	23.2-24.7	A-7-6(21)	43	20	2.0	3.7	39.4	54.9	100	99	96	-	-
SS-5	30 RT	24+41	33.2-34.7	A-6(2)	28	11	32.3	18.7	24.5	24.4	89	69	48	-	-

ROCK TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	H/D RATIO	UNIT WT lbs/ft3	Ultimate lbf	Ultimate ksi	Ultimate (corrected) ksi	Sec. Mod. @ 40% Mpsi
RS-1*	28 LT	22+08	31.6-32.4	1.915	142.6	977	.359	.357	.149
RS-2	29 RT	23+26	15.6-16.3	1.965	155.6	3530	1.295	1.292	.207
RS-3	29 RT	23+26	24.0-24.9	1.996	158.1	2490	0.913	.913	.27

*** Results for RS-1 may be incorrect due to extensiometer being damaged during testing (per Materials & Tests Unit email).**

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 33310.1.1 TIP: B-3864 COUNTY: Johnston

DESCRIPTION(1): Bridge No. 40 on US 70 Business over Neuse River at -L- Station 22+63

EXISTING BRIDGE

Information from: Field Inspection X Microfilm ____ (reel ____ pos: ____)
Other (explain) ____

Bridge No.: 40 Length: 313 Total Bents: 7 Bents in Channel: 3 Bents in Floodplain: 2
Foundation Type: Piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None

Interior Bents: Large (15'X15') area of scour on bank/West side of existing Bent 3. Bent 3 is almost completely surrounded by water.

Channel Bed: None

Channel Bank: None

EXISTING SCOUR PROTECTION

Type(3): None

Extent(4): N/A

Effectiveness(5): N/A

Obstructions(6): N/A

DESIGN INFORMATION

Channel Bed Material(7): Alluvial, coarse sand. Sample not sent to Materials and Tests Unit.

Channel Bank Material(8): Alluvial, sandy clay (A-6)

Channel Bank Cover(9): Grass and trees.

Floodplain Width(10): 200'+

Floodplain Cover(11): Grass and trees.

Stream is(12): Aggrading ____ Degrading X Static ____

Channel Migration Tendency(13): West

Observations and Other Comments: ____

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

BENTS B1	B2									
111.0	91.5									

Comparison of DSE to Hydraulics Unit theoretical scour:
The Geotechnical Engineering Unit and Hydraulics Unit agree that the DSE should be 111.0 feet at B1, and 91.5 feet at B2.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bank	Bank					
Sample No.	SS-15	SS-4					
Retained #4							
Passed #10	100	100					
Passed #40	98	99					
Passed #200	78	96					
Coarse Sand	3.3	2					
Fine Sand	29.5	3.7					
Silt	36.7	39.4					
Clay	30.5	54.9					
LL	39	43					
PI	16	20					
AASHTO	A-6(12)	A-7-6(21)					
Station	22+08	24+41					
Offset	28' LT	30' RT					
Depth	3.0-4.5	33.2-34.7					

Template Revised 02/07/06

Reported by: N.D. Mohs **Date:** 3/21/2011

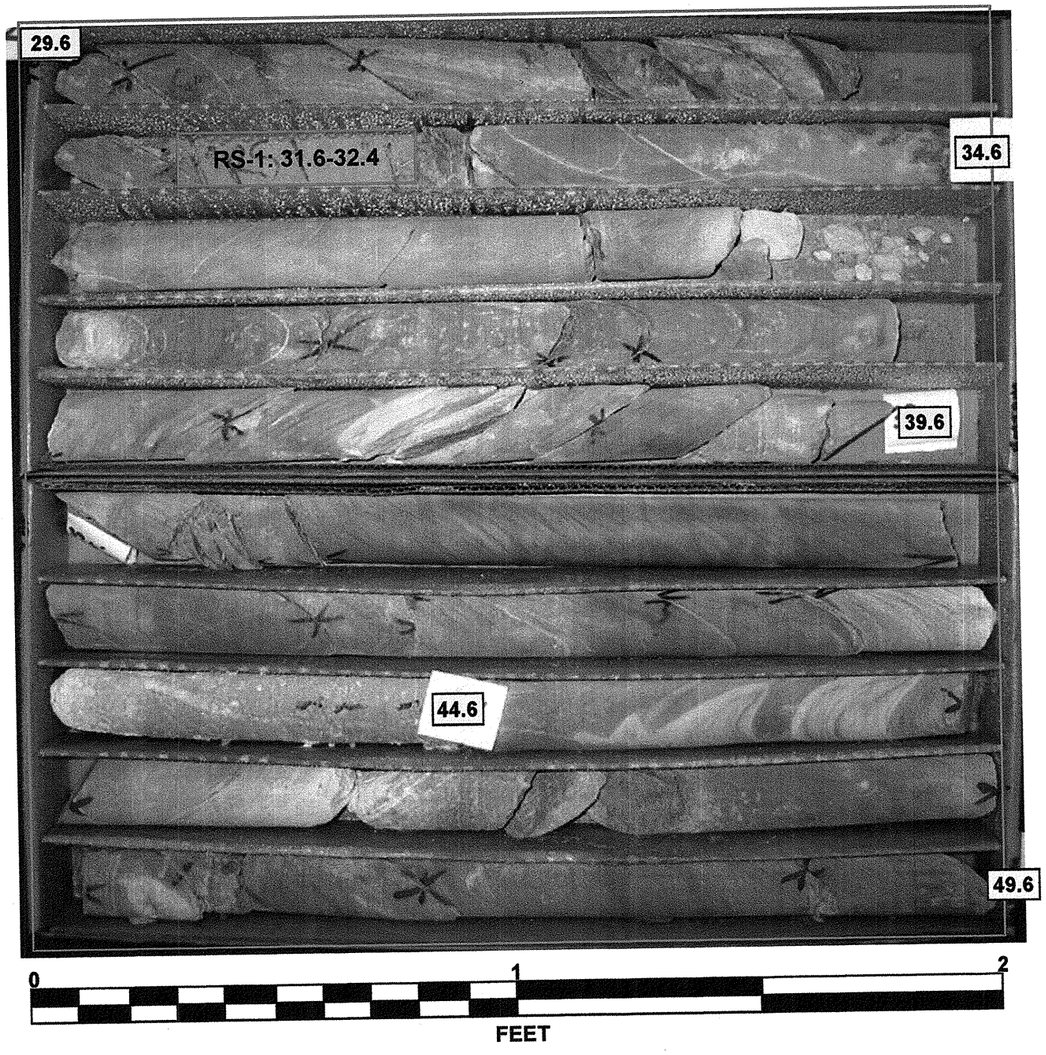
INSTRUCTIONS

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).
14 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.

CORE PHOTOGRAPHS

B1-A

BOXES 1 & 2: 29.6 - 49.6 FEET

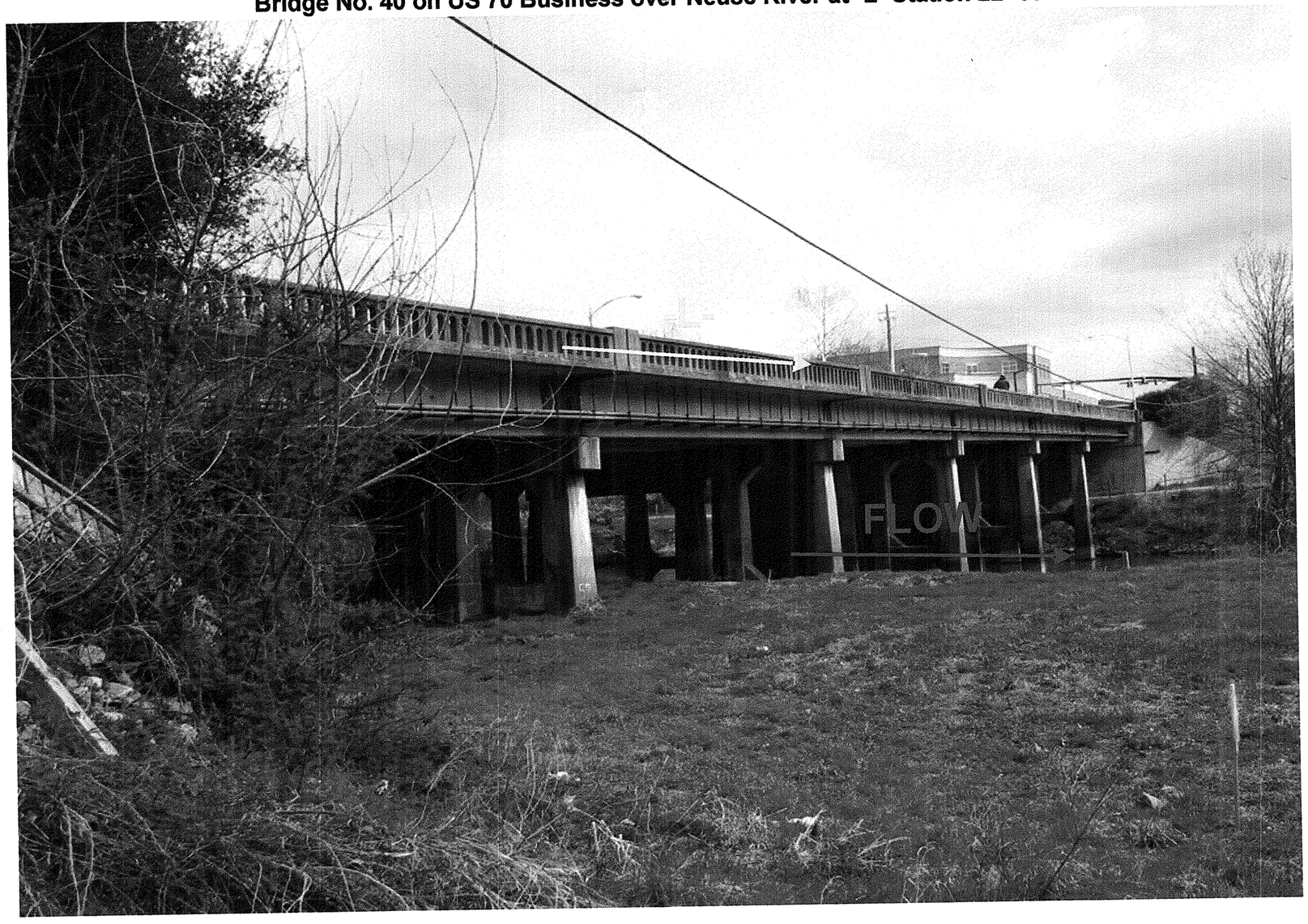


B2-B

BOXES 1, 2, & 3: 11.1 - 37.9 FEET

Site Photograph

Bridge No. 40 on US 70 Business over Neuse River at -L- Station 22+63



Looking East from EB1