STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34461.1.3 (R-2554BA)	1	15

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34461.1.3 F.A. PROJ. NHF-70 (30)

COUNTY WAYNE

PROJECT DESCRIPTION US 70 (GOLDSBORO BYPASS) FROM WEST OF SR 1300 (SALEM CHURCH ROAD) TO WEST OF SR 1714 (PARKSTOWN ROAD)

SITE DESCRIPTION STRUCTURES 1 AND 2 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS) AT -L- STA. 93+23.591

ID: R-2554BA

PROJECT: 34461.1.3

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4,5	PROFILE(S)
6,7	CROSS SECTION(S)
8-13	BORE LOG REPORT(S)
14,15	SOIL TEST RESULTS

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

TCB

TMW

S&ME

INVESTIGATED BY JL STONE

CHECKED BY DN ARGENBRIGHT

SUBMITTED BY DN ARGENBRIGHT

DATE OCTOBER 2007

NORTH CAROLINA LICENSED SEAL 2007 GEOLOGIST JOSEPH L. STONE 10-24-07

DRAWN BY: CMK, TCB, JLS

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

PROJECT REFERENCE NO.	SHEET NO.
34461.1.3 (R-2554BA)	2

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 30 CM 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 PLASTIC INDEX	6 MX		NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
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 (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<25
	SOFT	2 TO 4	25 TO 50
	MEDIUM STIFF	4 TO 8	50 TO 100
	STIFF	8 TO 15	100 TO 200
	VERY STIFF	15 TO 30	200 TO 400
	HARD	>30	>400

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))	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- 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
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

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

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

EQUIPMENT USED ON SUBJECT PROJECT

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

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [ ] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 75 mm STEEL TEETH
- [ ] TRICONE _____ mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -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 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BL-560B -L- STA. 91+63.91 (0.93m RT)

ELEVATION: 38.956 M

NOTES:
STRUCTURES 1 AND 2

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET
R-2554BA	3

SITE PLAN

METERS 0 5 10

N

93+00

93+40

TO WILSON

-L2-

EB1-A
LT. LN.

B1-A
LT. LN.

EB2-A
LT. LN.

TO RALEIGH

-L-

TO KINSTON

112° 18' 48"

EB1-B
RT. LN.

EB1 BENT LINE

B1-B
RT. LN.

90+00

B1 BENT LINE

TO GOLDSBORO

EB2-B
RT. LN.

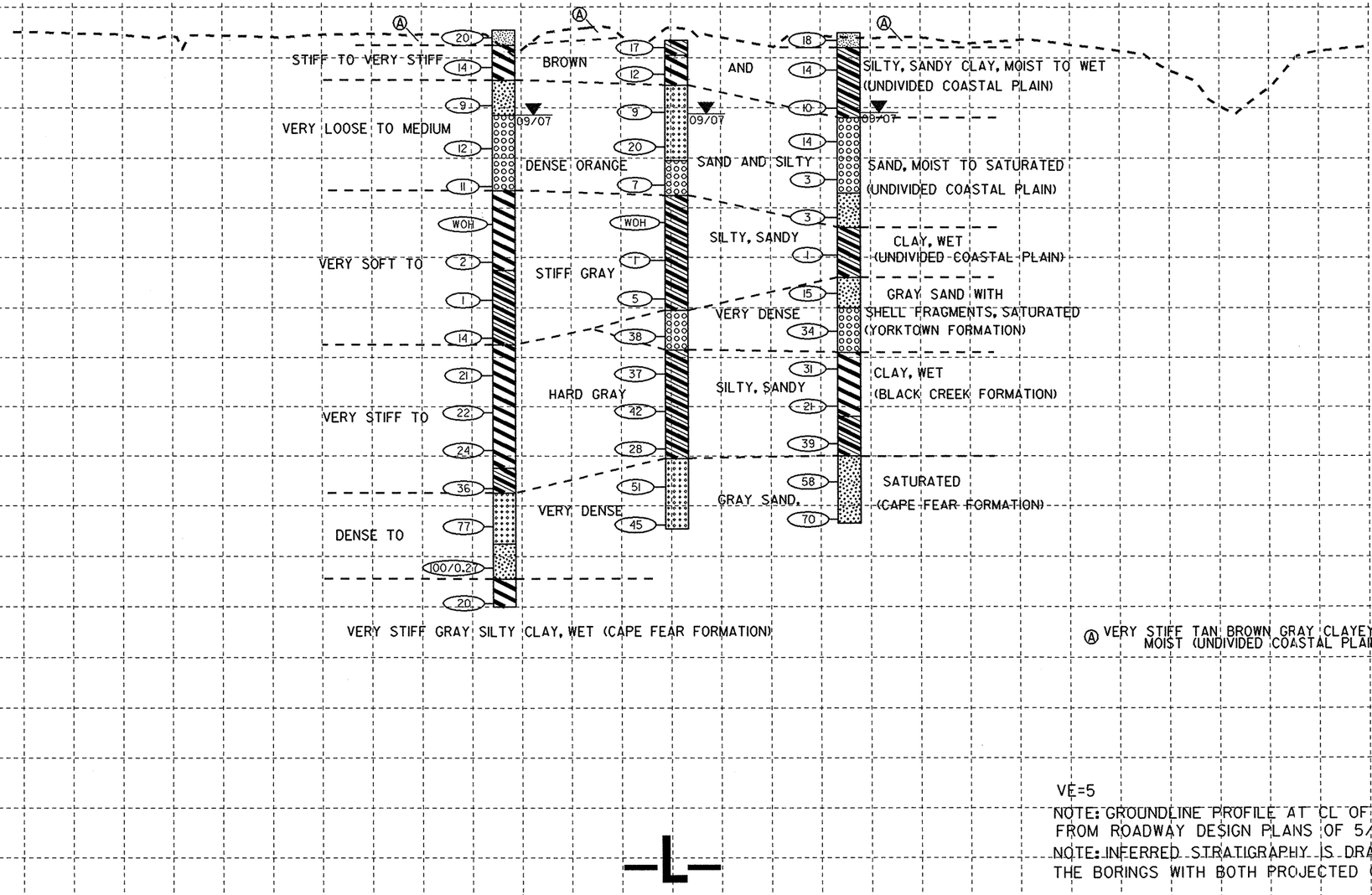
-L2LPD-

EB2 BENT LINE

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2554BA	4
CONST.REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R/W REV.	PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	

STRUCTURE 1

PROFILE THROUGH BORINGS PROJECTED ALONG -L- LEFT LANE



VE=5

NOTE: GROUNDLINE PROFILE AT CL OF -L- TAKEN FROM ROADWAY DESIGN PLANS OF 5/18/05

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

6/10/39

24-OCT-2007 12:46
e:\projects\2554ba\geotech\sheets\sub\r2554ba_geo_pf1.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2554BA	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

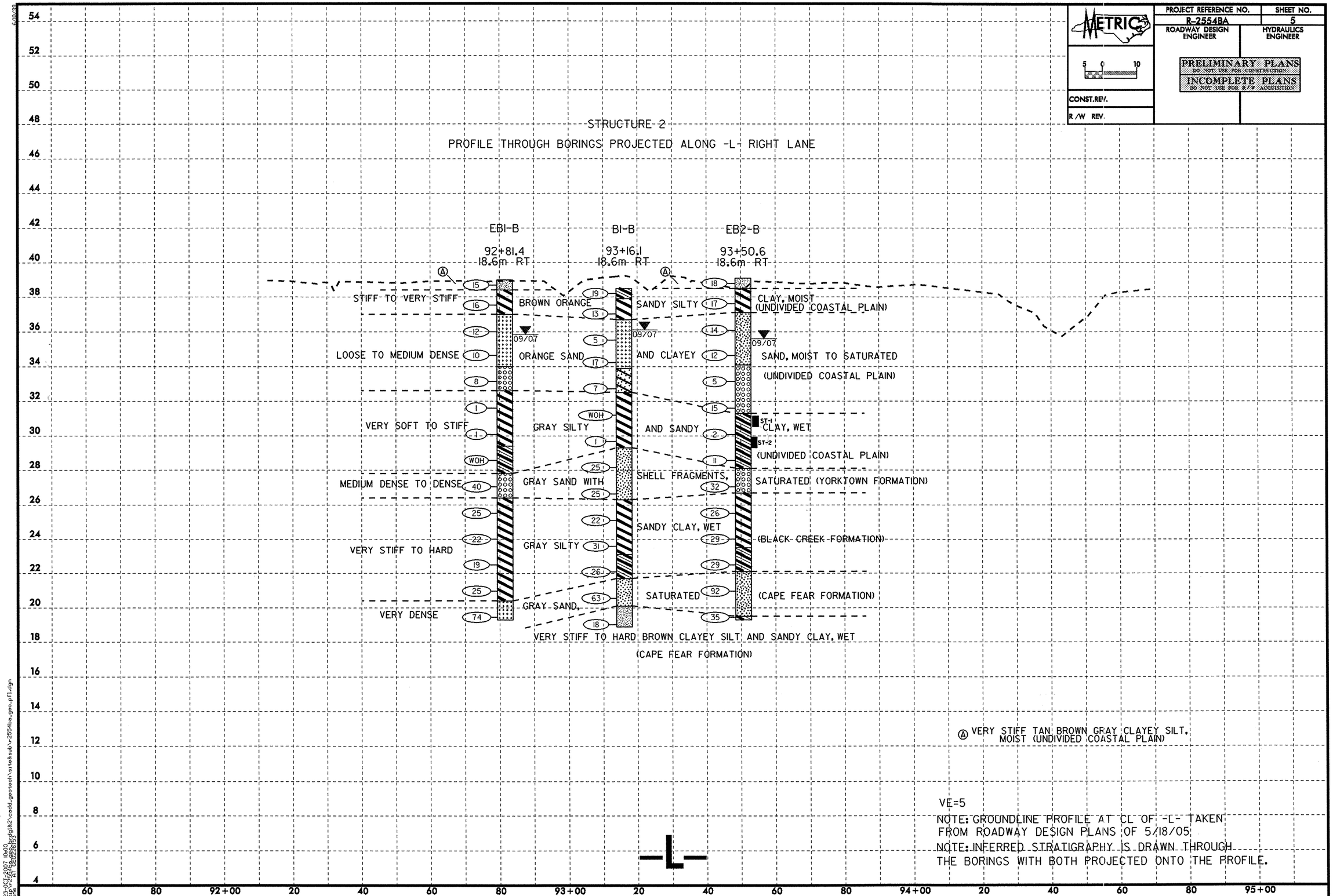
METRIC

5 0 10

CONST.REV.

R/W REV.

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

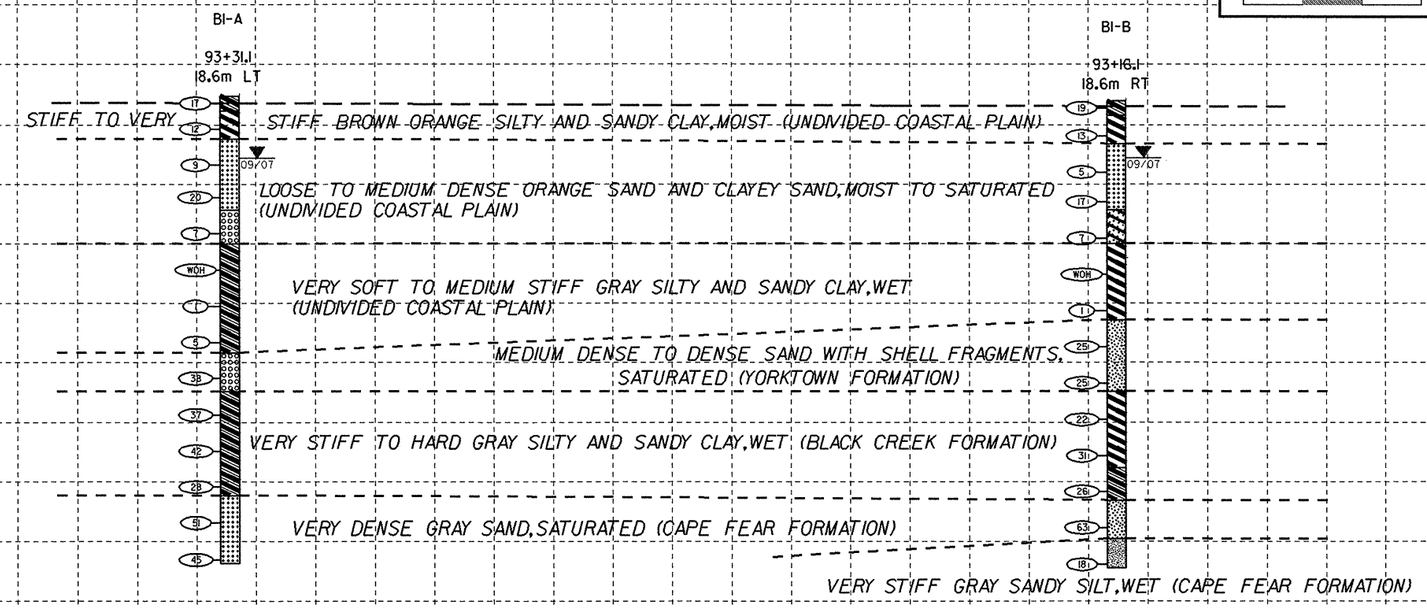


2.5 0 2.5 5

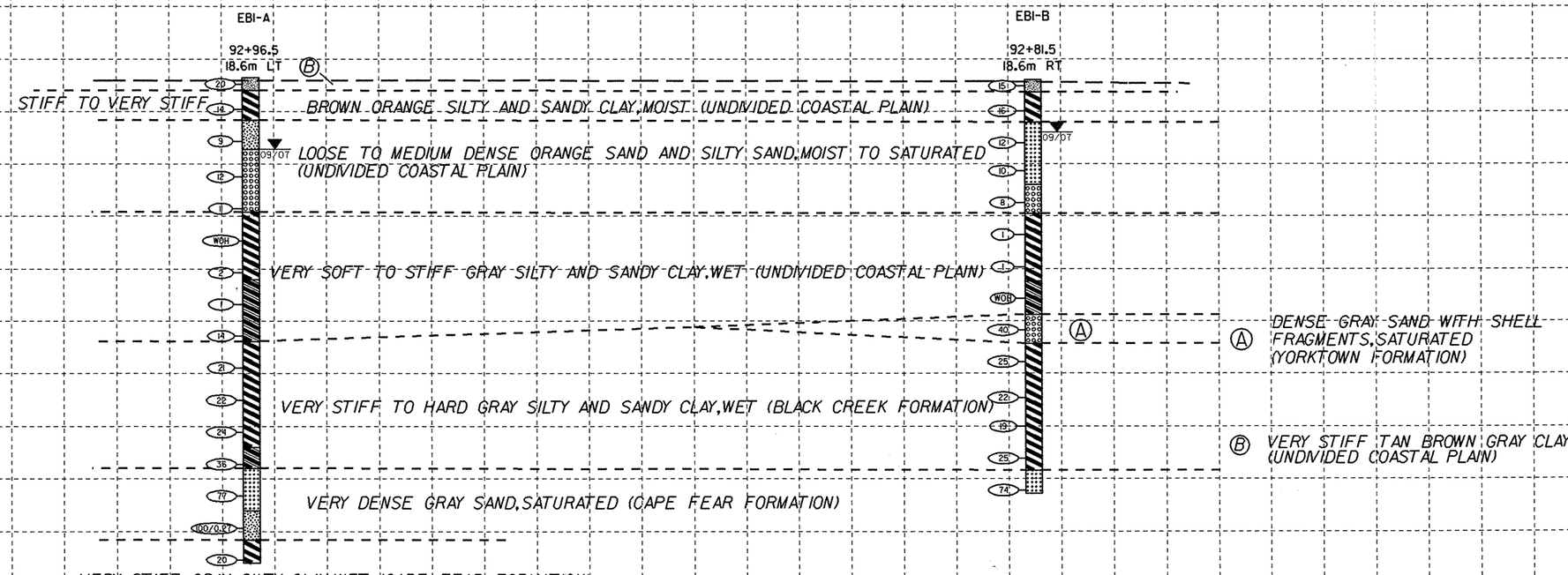
METRIC

PROJECT REFERENCE NO.	SHEET NO.
R-2544BA	6

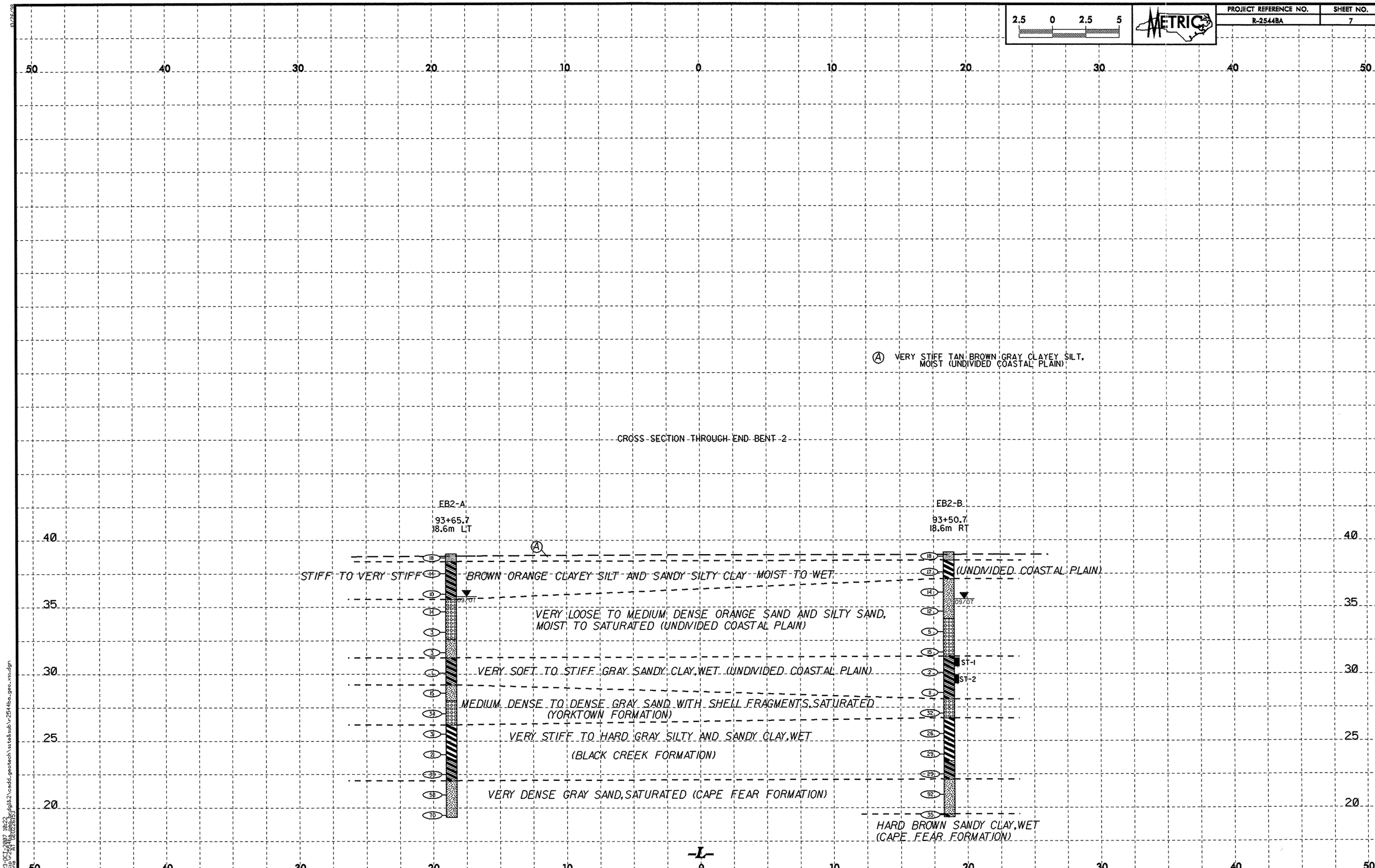
CROSS SECTION THROUGH BENT 1



CROSS SECTION THROUGH END BENT 1



24-OCT-2007 12:15
c:\tgw\tip\v2544ba_geo_gi&2\cadd_geotech\xsts&sub\v2544ba_geo_xsu.dgn
jsmith 21.0E2E2E63



2.5 0 2.5 5
METRIC
PROJECT REFERENCE NO.
R-2544BA
SHEET NO.
7
50 40 30 20 10 0 10 20 30 40 50
Ⓐ VERY STIFF TAN BROWN GRAY CLAYEY SILT, MOIST (UNDIVIDED COASTAL PLAIN)
CROSS SECTION THROUGH END BENT 2
EB2-A
93+65.7
18.6m LT
EB2-B
93+50.7
18.6m RT
STIFF TO VERY STIFF BROWN ORANGE CLAYEY SILT AND SANDY SILTY CLAY MOIST TO WET
(UNDIVIDED COASTAL PLAIN)
09/07
VERY LOOSE TO MEDIUM DENSE ORANGE SAND AND SILTY SAND, MOIST TO SATURATED (UNDIVIDED COASTAL PLAIN)
VERY SOFT TO STIFF GRAY SANDY CLAY, WET (UNDIVIDED COASTAL PLAIN)
ST-1
ST-2
MEDIUM DENSE TO DENSE GRAY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)
VERY STIFF TO HARD GRAY SILTY AND SANDY CLAY, WET (BLACK CREEK FORMATION)
VERY DENSE GRAY SAND, SATURATED (CAPE FEAR FORMATION)
HARD BROWN SANDY CLAY, WET (CAPE FEAR FORMATION)
40 35 30 25 20
-L-

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE		**GEOLOGIST** BOTTOMS, T. C.
SITE DESCRIPTION STRUCUTURE 1 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)				**GROUND WTR (m)**
BORING NO. EB1-A	**STATION** 92+96.5	**OFFSET** 18.6m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.10 m	**TOTAL DEPTH** 23.11 m	**NORTHING** 186,560.4	**EASTING** 701,133.6	**24 HR.** 3.35
DRILL MACHINE BK-51	**DRILL METHOD** MUD ROTARY		**HAMMER TYPE** AUTOMATIC	
START DATE 09/04/07	**COMP. DATE** 09/05/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (m) DEPTH (m)
	40									
39	39.10	0.00								39.10 GROUND SURFACE 0.00
			5	9	11	20	SS-11			TAN BROWN SANDY SILT, MOIST
38	37.91	1.19								38.50 0.60
			5	6	8	14	SS-12			ORANGE GRAY SILTY CLAY, MOIST
37										37.10 2.00
	36.39	2.71								ORANGE GRAY SAND, MOIST TO SATURATED
36			3	4	5	9	SS-13			
35										35.70 3.40
	34.68	4.42								
34			5	5	7	12	SS-14			
	33.16	5.94								
33			6	6	5	11	SS-15			
32										
	31.64	7.46								
31			WOH	WOH	WOH	0				
	30.12	8.98								
30			WOH	1	1	2				
29										
	28.60	10.50								
28			WOH	WOH	1	1	SS-16			
27	27.08	12.02								
			5	6	8	14				
26										
	25.56	13.54								
25			6	9	12	21	SS-17			
24	24.04	15.06								
			7	9	13	22				
23										
	22.52	16.58								
22			7	10	14	24	SS-18			
21	21.00	18.10								
			8	12	24	36	SS-19			
20										

32.70 6.40 GRAY SANDY SILTY CLAY, WET

29.50 9.60

26.50 12.60 **COASTAL PLAIN** GRAY SANDY SILTY CLAY, WET (BLACK CREEK FORMATION)

21.50 17.60

20.50 18.60 **COASTAL PLAIN** BROWN SAND, SATURATED (CAPE FEAR FORMATION)

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE		**GEOLOGIST** BOTTOMS, T. C.
SITE DESCRIPTION STRUCUTURE 1 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)				**GROUND WTR (m)**
BORING NO. EB1-A	**STATION** 92+96.5	**OFFSET** 18.6m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.10 m	**TOTAL DEPTH** 23.11 m	**NORTHING** 186,560.4	**EASTING** 701,133.6	**24 HR.** 3.35
DRILL MACHINE BK-51	**DRILL METHOD** MUD ROTARY		**HAMMER TYPE** AUTOMATIC	
START DATE 09/04/07	**COMP. DATE** 09/05/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	20					Match Line				
	19.48	19.62								
19			25	37	40	77				
18	17.96	21.14								
			21	40	60/.12		SS-20			
17						100/0.27				
	16.44	22.66								
16			5	8	12	20	SS-21			
15										
14										
13										
12										
11										
10										
9										
8										
7										
6										
5										
4										
3										
2										
1										
0										

18.50 20.60 **COASTAL PLAIN** BROWN SAND, SATURATED (CAPE FEAR FORMATION) *(continued)*

17.10 22.00 **COASTAL PLAIN** GRAY SILTY CLAY, WET (CAPE FEAR FORMATION)

15.99 23.11 Boring Terminated In Very Stiff Silty Clay at Elevation 15.99 m

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 10/23/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BOTTOMS, T. C.	
SITE DESCRIPTION STRUCTURE 2 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)				**GROUND WTR (m)**
BORING NO. EB1-B	**STATION** 92+81.5	**OFFSET** 18.6m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 38.98 m	**TOTAL DEPTH** 19.70 m	**NORTHING** 186,527.3	**EASTING** 701,110.8	**24 HR.** 2.50
DRILL MACHINE BK-51	**DRILL METHOD** MUD ROTARY		**HAMMER TYPE** AUTOMATIC	
START DATE 09/04/07	**COMP. DATE** 09/04/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
	40										
39	38.98	0.00								38.98 GROUND SURFACE	0.00
			5	8	7	15	SS-1			38.38 BROWN GRAY SANDY SILT, MOIST	0.60
38	37.80	1.18								ORANGE GRAY SILTY CLAY, MOIST	
			4	6	10	16	SS-2	25%		36.98	2.00
37	36.28	2.70								ORANGE GRAY SAND, MOIST TO SATURATED	
36			4	5	7	12	SS-3				
35	34.93	4.05									
			4	4	6	10				33.98	5.00
34	33.41	5.57									
			2	2	6	8	SS-4				
33	31.89	7.09								32.58 GRAY SILTY CLAY, WET	6.40
			WOH	WOH	1	1	SS-5	93%			
32	30.37	8.61									
			WOH	WOH	1	1					
31	28.85	10.13								29.38	9.60
			WOH	WOH	WOH	0	SS-6				
30	27.33	11.65								27.78 **COASTAL PLAIN** GRAY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)	11.20
			9	18	22	40	SS-7				
29	25.81	13.17								26.38 **COASTAL PLAIN** GRAY SILTY CLAY, WET (BLACK CREEK FORMATION)	12.60
			9	10	15	25	SS-8				
28	24.29	14.69									
			8	9	13	22					
27	22.77	16.21									
			7	7	12	19	SS-9				
26	21.25	17.73									
			7	10	15	25					
25	19.73	19.25								20.38	18.60

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BOTTOMS, T. C.	
SITE DESCRIPTION STRUCTURE 2 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)				**GROUND WTR (m)**
BORING NO. EB1-B	**STATION** 92+81.5	**OFFSET** 18.6m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 38.98 m	**TOTAL DEPTH** 19.70 m	**NORTHING** 186,527.3	**EASTING** 701,110.8	**24 HR.** 2.50
DRILL MACHINE BK-51	**DRILL METHOD** MUD ROTARY		**HAMMER TYPE** AUTOMATIC	
START DATE 09/04/07	**COMP. DATE** 09/04/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	20					Match Line				
19			32	32	42	74	SS-10			19.28 **COASTAL PLAIN** BROWN SAND, SATURATED (CAPE FEAR FORMATION) *(continued)* 19.70
18										Boring Terminated In Very Dense Sand at Elevation 19.28 m
17										
16										
15										
14										
13										
12										
11										
10										
9										
8										
7										
6										
5										
4										
3										
2										
1										
0										

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 10/23/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE		**GEOLOGIST** BOTTOMS, T. C.
SITE DESCRIPTION STRUCTURE 1 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)				**GROUND WTR (m)**
BORING NO. B1-A	**STATION** 93+31.1	**OFFSET** 18.6m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 38.73 m	**TOTAL DEPTH** 19.61 m	**NORTHING** 186,553.0	**EASTING** 701,167.3	**24 HR.** 2.94
DRILL MACHINE BK-51	**DRILL METHOD** MUD ROTARY		**HAMMER TYPE** AUTOMATIC	
START DATE 09/10/07	**COMP. DATE** 09/11/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
39	40											
	38.73	0.00								GROUND SURFACE	38.73	0.00
38			12	10	7	17	SS-54			BROWN GRAY SANDY SILTY CLAY, MOIST	38.13	0.60
	37.67	1.06										
37			3	5	7	12	SS-55					
	36.15	2.58								GRAY ORANGE SAND, MOIST TO SATURATED	36.93	1.80
36			4	4	5	9	SS-56	▼				
	34.77	3.96										
35			6	10	10	20						
	33.25	5.48								ORANGE SAND AND GRAVEL, SATURATED	33.93	4.80
34			3	5	2	7	SS-57					
	31.73	7.00								GRAY SANDY CLAY, WET	32.53	6.20
33			WOH	WOH	WOH	0						
	30.21	8.52										
32			WOH	WOH	1	1	SS-58					
	28.69	10.04										
31			WOH	1	4	5						
	27.17	11.56										
30			16	14	24	38	SS-59					
	25.65	13.08								COASTAL PLAIN GRAY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)	27.93	10.80
29			9	17	20	37	SS-60					
	24.13	14.60										
28			10	18	24	42						
	22.61	16.12								COASTAL PLAIN DARK BROWN SANDY CLAY, WET (BLACK CREEK FORMATION)	26.33	12.40
27			10	14	14	28	SS-61					
	21.09	17.64										
26			12	16	35	51	SS-62					
											21.93	16.80
25										COASTAL PLAIN GRAY SAND, SATURATED (CAPE FEAR FORMATION)		
24												
23												
22												
21												
20												

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE		**GEOLOGIST** BOTTOMS, T. C.
SITE DESCRIPTION STRUCTURE 1 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)				**GROUND WTR (m)**
BORING NO. B1-A	**STATION** 93+31.1	**OFFSET** 18.6m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 38.73 m	**TOTAL DEPTH** 19.61 m	**NORTHING** 186,553.0	**EASTING** 701,167.3	**24 HR.** 2.94
DRILL MACHINE BK-51	**DRILL METHOD** MUD ROTARY		**HAMMER TYPE** AUTOMATIC	
START DATE 09/10/07	**COMP. DATE** 09/11/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
19	20											
	19.57	19.16	6	20	25	45						
18												
17												
16												
15												
14												
13												
12												
11												
10												
9												
8												
7												
6												
5												
4												
3												
2												
1												
0												

Match Line

19.12 — Boring Terminated In Dense Sand at Elevation 19.12 m — 19.61

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BOTTOMS, T. C.	
SITE DESCRIPTION STRUCTURE 2 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)				**GROUND WTR (m)**
BORING NO. B1-B	**STATION** 93+16.1	**OFFSET** 18.6m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 38.54 m	**TOTAL DEPTH** 19.61 m	**NORTHING** 186,519.9	**EASTING** 701,144.6	**24 HR.** 2.41
DRILL MACHINE BK-51	**DRILL METHOD** MUD ROTARY		**HAMMER TYPE** AUTOMATIC	
START DATE 09/10/07	**COMP. DATE** 09/10/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
										38.54	0.00
										GROUND SURFACE	
			13	10	9	19	SS-43			BROWN GRAY SANDY SILTY CLAY, MOIST	
										37.94	0.60
			3	5	8	13	SS-44			36.74	1.80
										GRAY ORANGE SAND, MOIST TO SATURATED	
			2	2	3	5	SS-45				
			6	8	9	17				33.94	4.60
										GRAY ORANGE CLAYEY SAND, SATURATED	
			4	3	4	7	SS-46			32.34	6.20
										GRAY SILTY CLAY, WET	
			WOH	WOH	WOH	0				29.34	9.20
			WOH	WOH	1	1	SS-47			**COASTAL PLAIN** GRAY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)	
			9	12	13	25	SS-48			26.34	12.20
			13	15	10	25	SS-49			**COASTAL PLAIN** GRAY SANDY SILTY CLAY, WET (BLACK CREEK FORMATION)	
			5	10	12	22	SS-50			23.14	15.40
			9	11	20	31				21.74	16.80
			7	11	15	26	SS-51			**COASTAL PLAIN** GRAY SAND, SATURATED (CAPE FEAR FORMATION)	
			14	23	40	63	SS-52			20.14	18.40

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BOTTOMS, T. C.	
SITE DESCRIPTION STRUCTURE 2 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)				**GROUND WTR (m)**
BORING NO. B1-B	**STATION** 93+16.1	**OFFSET** 18.6m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 38.54 m	**TOTAL DEPTH** 19.61 m	**NORTHING** 186,519.9	**EASTING** 701,144.6	**24 HR.** 2.41
DRILL MACHINE BK-51	**DRILL METHOD** MUD ROTARY		**HAMMER TYPE** AUTOMATIC	
START DATE 09/10/07	**COMP. DATE** 09/10/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	19.38	19.16	6	8	10	Match Line 18	SS-53			18.93
										COASTAL PLAIN GRAY SANDY SILT, WET (CAPE FEAR FORMATION) *(continued)* 19.61
										Boring Terminated In Very Stiff Sandy Silt at Elevation 18.93 m

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BOTTOMS, T. C.	
SITE DESCRIPTION STRUCTURE 1 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)				**GROUND WTR (m)**
BORING NO. EB2-A	**STATION** 93+65.7	**OFFSET** 18.6m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 38.97 m	**TOTAL DEPTH** 19.70 m	**NORTHING** 186,545.5	**EASTING** 701,201.1	**24 HR.** 3.23
DRILL MACHINE BK-51	**DRILL METHOD** MUD ROTARY		**HAMMER TYPE** AUTOMATIC	
START DATE 09/05/07	**COMP. DATE** 09/05/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	40											
39	38.97	0.00								GROUND SURFACE	38.97	0.00
			6	8	10	18	SS-22			TAN BROWN CLAYEY SANDY SILT, MOIST	38.37	0.60
38	37.78	1.19								ORANGE GRAY SANDY CLAY, MOIST TO WET		
			5	7	7	14	SS-23					
37	36.26	2.71										
36			2	4	6	10						
											35.57	3.40
35	34.92	4.05								ORANGE GRAY SAND, SATURATED		
			4	6	8	14	SS-24					
34	33.40	5.57										
33			2	2	1	3						
											32.57	6.40
32	31.88	7.09										
			3	2	1	3	SS-25					
31	30.36	8.61										
30			WOH	WOH	1	1	SS-26					
29	28.84	10.13										
			2	6	9	15	SS-27					
28	27.32	11.65										
27			10	12	22	34	SS-28					
26	25.80	13.17										
			10	13	18	31	SS-29					
25	24.28	14.69										
24			7	9	12	21						
23	22.76	16.21										
			11	19	20	39	SS-30					
22	21.24	17.73										
21			20	25	33	58	SS-31					
20	19.72	19.25										

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BOTTOMS, T. C.	
SITE DESCRIPTION STRUCTURE 1 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)				**GROUND WTR (m)**
BORING NO. EB2-A	**STATION** 93+65.7	**OFFSET** 18.6m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 38.97 m	**TOTAL DEPTH** 19.70 m	**NORTHING** 186,545.5	**EASTING** 701,201.1	**24 HR.** 3.23
DRILL MACHINE BK-51	**DRILL METHOD** MUD ROTARY		**HAMMER TYPE** AUTOMATIC	
START DATE 09/05/07	**COMP. DATE** 09/05/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	20					Match Line						
			11	33	37	70						
19											19.27	19.70
										Boring Terminated In Very Dense Sand at Elevation 19.27 m		
18												
17												
16												
15												
14												
13												
12												
11												
10												
9												
8												
7												
6												
5												
4												
3												
2												
1												
0												

COASTAL PLAIN
GRAY SILTY SAND, SATURATED (YORKTOWN FORMATION) — 29.17 / 9.80 — 27.97 / 11.00

COASTAL PLAIN
GRAY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION) — 27.97 / 11.00 — 26.17 / 12.80

COASTAL PLAIN
GRAY SILTY SANDY CLAY, WET (BLACK CREEK FORMATION) — 26.17 / 12.80 — 23.57 / 15.40

COASTAL PLAIN
GRAY SAND, SATURATED (CAPE FEAR FORMATION) — 23.57 / 15.40 — 21.97 / 17.00

GRAY SANDY CLAY, WET — 31.17 / 7.80 — 29.17 / 9.80

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE		**GEOLOGIST** BOTTOMS, T. C.
SITE DESCRIPTION STRUCTURE 2 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)				**GROUND WTR (m)**
BORING NO. EB2-B	**STATION** 93+50.7	**OFFSET** 18.6m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.14 m	**TOTAL DEPTH** 19.80 m	**NORTHING** 186,512.4	**EASTING** 701,178.4	**24 HR.** 3.47
DRILL MACHINE BK-51	**DRILL METHOD** MUD ROTARY		**HAMMER TYPE** AUTOMATIC	
START DATE 09/07/07	**COMP. DATE** 09/07/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	40											
39	39.14	0.00	4	8	10	18	SS-32			GROUND SURFACE GRAY SANDY SILT, MOIST	39.14	0.00
38	37.95	1.19	6	7	10	17	SS-33			TAN ORANGE SILTY CLAY, MOIST	38.54	0.60
37	36.43	2.71	5	7	7	14	SS-34			GRAY ORANGE SAND, MOIST TO SATURATED	37.14	2.00
36	34.99	4.15	7	5	7	12					34.14	5.00
35	33.47	5.67	2	3	2	5	SS-35					
34	31.95	7.19	6	7	8	15	SS-36			GRAY SILTY CLAY, WET	31.34	7.80
33	30.43	8.71	WOH	WOH	2	2	SS-37					
32	28.91	10.23	2	3	8	11					28.14	11.00
31	27.39	11.75	10	16	16	32	SS-38			**COASTAL PLAIN** GRAY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)	26.74	12.40
30	25.87	13.27	6	10	16	26	SS-39			**COASTAL PLAIN** GRAY SILTY SANDY CLAY, WET (BLACK CREEK FORMATION)		
29	24.35	14.79	8	12	17	29					23.54	15.60
28	22.83	16.31	6	11	18	29	SS-40					
27	21.31	17.83	18	40	52	92	SS-41			**COASTAL PLAIN** BROWN GRAY SAND, SATURATED (CAPE FEAR FORMATION)	22.14	17.00
26	19.79	19.35										

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE		**GEOLOGIST** BOTTOMS, T. C.
SITE DESCRIPTION STRUCTURE 2 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)				**GROUND WTR (m)**
BORING NO. EB2-B	**STATION** 93+50.7	**OFFSET** 18.6m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.14 m	**TOTAL DEPTH** 19.80 m	**NORTHING** 186,512.4	**EASTING** 701,178.4	**24 HR.** 3.47
DRILL MACHINE BK-51	**DRILL METHOD** MUD ROTARY		**HAMMER TYPE** AUTOMATIC	
START DATE 09/07/07	**COMP. DATE** 09/07/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	20					Match Line				
19			21	21	14	35	SS-42			19.54 19.60 **COASTAL PLAIN** BROWN SILTY CLAY, WET (CAPE FEAR FORMATION) 19.34 19.80 Boring Terminated In Hard Silty Clay at Elevation 19.34 m Other Samples: ST-1 (7.9 - 8.5) ST-2 (9.2 - 9.8)
18										
17										
16										
15										
14										
13										
12										
11										
10										
9										
8										
7										
6										
5										
4										
3										
2										
1										
0										

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 10/23/07

R-2554BA
34461.1.3
STRUCTURES 1 AND 2 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)

HOLE #	SAMPLE #	RET 4	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
EB1-B	SS-1	-	100	97	71	5.1	35.3	43.3	16.3	18	1	A-4(0)	0.15-0.45		
RT LANE	SS-2	-	100	100	91	1.4	11.2	26.2	61.2	58	35	A-7-6(35)	1.18-1.63	24.5%	
	SS-3	-	100	74	10	64.1	26.6	1.1	8.2	20	NP	A-3(0)	2.70-3.15		
	SS-4	-	82	28	6	76.4	17.4	2.1	4.1	20	NP	A-1-b(0)	5.57-6.02		
	SS-5	-	100	95	89	6.7	6.7	47.8	38.7	60	21	A-7-5(24)	7.09-7.54	93.2%	
	SS-6	-	100	97	67	7.3	33.4	47.0	12.2	31	11	A-6(5)	10.13-10.58		
	SS-7	-	93	47	10	68.6	22.0	2.2	7.1	26	NP	A-1-b(0)	11.65-12.10		
	SS-8	-	100	98	84	3.7	19.4	48.4	28.5	48	16	A-7-5(16)	13.17-13.62		
	SS-9	-	100	98	92	2.9	8.6	37.6	51.0	49	28	A-7-6(28)	16.21-16.66		
	SS-10	-	100	67	9	79.9	12.4	1.5	6.1	21	NP	A-3(0)	19.25-19.70		
EB1-A	SS-11	-	100	98	79	3.7	25.9	50.1	20.4	20	6	A-4(2)	0.15-0.45		
LT LANE	SS-12	-	100	100	94	0.8	8.4	33.7	57.1	57	34	A-7-6(36)	1.19-1.64		
	SS-13	-	100	99	34	9.1	62.7	11.9	16.3	19	NP	A-2-4(0)	2.71-3.16		
	SS-14	-	99	43	4	88.9	8.2	0.9	2.0	23	NP	A-1-b(0)	4.42-4.87		
	SS-15	-	88	23	6	85.4	9.2	1.3	4.1	21	NP	A-1-b(0)	5.94-6.39		
	SS-16	-	100	94	57	10.6	38.9	42.3	8.2	31	12	A-6(4)	10.50-10.95		
	SS-17	-	100	99	94	1.4	7.7	39.9	51.0	53	32	A-7-6(33)	13.54-13.99		
	SS-18	-	100	98	84	5.3	16.7	49.4	28.5	41	20	A-7-6(17)	16.58-17.03		
	SS-19	-	100	98	60	5.5	45.3	16.6	32.6	26	14	A-6(5)	18.10-18.55		
	SS-20	-	98	63	16	64.0	21.2	6.6	8.2	15	NP	A-2-4(0)	21.14-21.56		
	SS-21	-	100	100	94	0.8	7.5	24.4	67.3	54	26	A-7-6(29)	22.66-23.11		
EB2-A	SS-22	-	100	98	80	3.5	26.3	45.8	24.5	22	6	A-4(2)	0.15-.0.45		
LT LANE	SS-23	-	100	99	84	1.2	22.8	37.2	38.7	35	19	A-6(15)	1.19-1.64		
	SS-24	-	88	22	4	87.8	8.6	0.6	3.1	18	NP	A-1-b(0)	4.05-4.50		
	SS-25	-	100	92	18	20.1	67.5	8.4	4.1	20	NP	A-2-4(0)	7.09-7.54		
	SS-26	-	100	98	78	3.1	30.8	47.8	18.3	33	11	A-6(8)	8.61-9.06		
	SS-27	-	97	65	30	45.9	27.3	16.5	10.3	31	9	A-2-4(0)	10.13-10.58		
	SS-28	-	82	28	6	79.1	14.7	0.0	6.2	25	NP	A-1-b(0)	11.65-12.10		
	SS-29	-	100	99	88	2.4	17.1	49.8	30.6	43	23	A-7-6(21)	13.17-13.62		
	SS-30	-	100	100	88	0.6	23.0	56.0	20.4	37	17	A-6(15)	16.21-16.66		
	SS-31	-	100	90	12	44.9	45.0	2.0	8.2	20	NP	A-2-4(0)	17.73-18.18		
EB2-B	SS-32	-	100	97	74	4.8	31.7	45.3	18.2	18	2	A-4(0)	0.30-0.45		
RT LANE	SS-33	-	100	98	83	3.0	20.4	30.1	46.5	52	33	A-7-6(28)	1.19-1.64		
	SS-34	-	100	87	14	40.1	49.1	4.7	6.1	17	NP	A-2-4(0)	2.71-3.16		
	SS-35	-	80	30	8	80.3	11.3	2.3	6.1	20	4	A-1-b(0)	5.67-6.12		
	SS-36	-	99	42	6	81.8	13.0	3.1	2.0	13	NP	A-1-b(0)	7.19-7.64		
	SS-37	-	100	96	75	7.9	24.2	45.7	22.2	36	13	A-6(9)	8.71-9.16		
	SS-38	-	93	31	6	81.8	12.7	3.4	2.0	23	NP	A-1-b(0)	11.75-12.20		
	SS-39	-	100	98	91	3.0	10.3	48.3	38.4	53	30	A-7-6(30)	13.27-13.72		
	SS-40	-	100	97	75	6.7	24.8	30.1	38.4	36	24	A-6(16)	16.31-16.76		
	SS-41	-	100	95	17	27.7	57.4	2.8	12.1	22	NP	A-2-4(0)	17.83-18.28		
	SS-42	-	100	99	83	1.2	23.8	34.5	40.4	29	13	A-6(9)	19.60-19.80		

R-2554BA
34461.1.3
STRUCTURES 1 AND 2 ON -L- (US 70 BYPASS) OVER -L2- (US 117 BYPASS)

HOLE #	SAMPLE #	RET 4	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
B1-B	SS-43	-	100	99	81	3.0	24.0	38.6	34.3	34	18	A-6(13)	0.30-0.45		
RT LANE	SS-44	-	100	99	81	1.6	26.3	27.7	44.4	48	27	A-7-6(22)	1.16-1.61		
	SS-45	-	100	75	9	56.7	34.9	1.3	7.1	17	NP	A-3(0)	2.68-3.13		
	SS-46	-	91	48	24	62.8	12.8	8.2	16.2	33	17	A-2-6(1)	5.48-5.93		
	SS-47	-	99	97	83	4.0	21.0	44.6	30.3	41	17	A-7-6(15)	8.52-8.97		
	SS-48	-	96	60	20	50.5	30.8	7.6	11.1	24	NP	A-2-4(0)	10.04-11.49		
	SS-49	-	94	84	21	18.4	61.6	11.9	8.1	32	NP	A-2-4(0)	11.56-12.01		
	SS-50	-	100	98	94	2.6	6.3	24.4	66.7	59	39	A-7-6(40)	13.08-13.53		
	SS-51	-	100	96	73	12.5	22.0	23.0	42.4	31	16	A-6(9)	16.12-16.57		
	SS-52	-	100	84	14	46.3	41.3	1.3	11.1	21	NP	A-2-4(0)	17.64-18.09		
	SS-53	-	100	99	68	1.4	39.8	28.5	30.3	23	10	A-4(4)	19.16-19.61		
B1-A	SS-54	-	100	99	83	2.8	22.4	42.4	32.3	29	12	A-6(8)	0.30-0.45		
LT LANE	SS-55	-	100	100	94	0.8	9.1	37.6	52.5	51	33	A-7-6(33)	1.06-1.51		
	SS-56	-	100	95	10	34.9	56.8	2.2	6.1	24	NP	A-3(0)	2.58-3.03		
	SS-57	-	85	26	5	83.2	11.1	1.6	4.0	22	NP	A-1-b(0)	5.48-5.93		
	SS-58	-	100	99	80	2.6	25.5	45.7	26.3	37	15	A-6(12)	8.52-8.97		
	SS-59	-	95	43	19	69.5	11.9	4.4	14.1	25	NP	A-1-b(0)	11.56-12.01		
	SS-60	-	100	98	82	3.0	24.0	46.7	26.3	38	16	A-6(13)	13.08-13.53		
	SS-61	-	100	99	86	2.8	17.2	51.7	28.3	31	11	A-6(9)	16.12-16.57		
	SS-62	-	100	95	10	36.1	54.4	1.4	8.1	18	NP	A-3(0)	17.64-18.09		

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34461.1.3(R-2554BA)	1	10

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34461.1.3 (R-2554BA) F.A. PROJ. BRSTP-25(13)

COUNTY WAYNE

PROJECT DESCRIPTION US 70 (GOLDSBORO BYPASS) FROM WEST OF SR 1300 (SALEM CHURCH ROAD) TO WEST OF SR 1714 (PARKSTOWN ROAD)

SITE DESCRIPTION BRIDGE ON -L2RPBD- OVER -L- (US 70 BYPASS) AT -L2RPBD- STATION 8+00.816

INVENTORY

ID: R-2554BA

PROJECT: 34461.1.3

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	GEOTECHNICAL REPORT
4	SITE PLAN
5	PROFILE(S)
6-8	BORE LOGS
9	SOIL TEST RESULTS
10	SITE PHOTOGRAPH

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

D.N. ARGENBRIGHT

L.W. DAIL

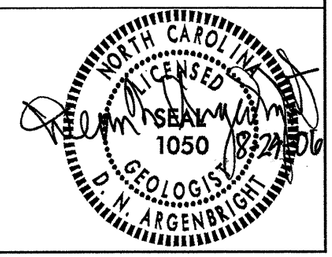
T.J. WHITE

INVESTIGATED BY D.N. ARGENBRIGHT

CHECKED BY D.N. ARGENBRIGHT

SUBMITTED BY D.N. ARGENBRIGHT

DATE AUGUST 2006



DRAWN BY: C.M. KENT

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

PROJECT REFERENCE NO.	SHEET NO.
3446I.1.3(R-2554BA)	2

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 30 CM 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	8	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 (kN/m^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	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

SAMPLE DESIGNATIONS
S - BULK SAMPLE
SS - SPLIT SPOON SAMPLE
ST - SHELBY TUBE SAMPLE
RM - RESILIENT MODULUS SAMPLE
RS - ROCK SAMPLE
RT - RECOMPACTED TRIAXIAL SAMPLE
CBR - CALIFORNIA BEARING RATIO SAMPLE

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
- MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

EQUIPMENT USED ON SUBJECT PROJECT

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

ADVANCING TOOLS:
- ☐ CLAY BITS
- ☐ 152mm CONTINUOUS FLIGHT AUGER
- ☐ 203mm HOLLOW AUGERS
- ☐ HARD FACED FINGER BITS
- ☐ TUNG.-CARBIDE INSERTS
- ☐ CASING ☐ W/ ADVANCER
- ☐ TRICONE 75 mm STEEL TEETH
- ☐ TRICONE _____ mm TUNG.-CARB.
- ☐ CORE BIT
- ☐ _____

HAMMER TYPE:
- ■ AUTOMATIC ☐ MANUAL

CORE SIZE:
- ☐ -B_____
- ☐ -N_____
- ☐ -H_____

HAND TOOLS:
- ☐ POST HOLE DIGGER
- ☐ HAND AUGER
- ☐ SOUNDING ROD
- ☐ _____
- ☐ _____

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 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BL-560B -L- STATION 91+63.9, 0.93 RT

ELEVATION: 38.956m

NOTES:

REVISED 03/07/05

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
MICHAEL F. EASLEY, GOVERNOR
P.O. BOX 25201, RALEIGH, N.C. 27611-5201
LYNDO TIPPETT, SECRETARY

August 24, 2006

STATE PROJECT: 34461.1.3 (R-2554BA)
F.A. PROJECT: NHF-70 (30)
COUNTY: Wayne
DESCRIPTION: US 70 (Goldsboro Bypass) from east of SR 1300 (Salem Church Rd.) to west of SR 1714 (Parkstown Road)

SUBJECT: Geotechnical Report - Bridge Foundation Investigation for Ramp BD over US 70 Bypass at -L2RPBD- Station 8+00.816

Site Description

The new bridge site is located at the proposed crossing of Ramp BD over US 70 Bypass in Goldsboro. The new structure will be built along the alignment of Ramp BD which is a portion of the intersection between the US 117 Bypass and the proposed US 70 Bypass. Based on the proposed design, the new structure will have 2 spans totaling 58.6 meters. The bents will have variable skews from 78° 31' 50" at End Bent 1 to 92° 49' 05" at End Bent 2.

One Standard Penetration Test (SPT) boring was made at or near each proposed bent location to provide subsurface information relative to foundation design. These borings were made with ATV mounted CME-45B drill machine and advanced by rotary drill methods using bentonite drilling fluid.

The bridge site is located in the Coastal Plain Physiographic Province and is underlain by recent upland and alluvial deposits, Pliocene marine sediments of the Yorktown Formation, and Cretaceous sediments of the Black Creek and Cape Fear Formation. Topography along the project is nearly flat with an elevation of 39± meters.

Ground water elevations range from 38.2± meters to 39.0± meters.

Soil Description

Upland surficial soils generally consist of 2± to 4± meters of soft to stiff sandy clay (A-6) and sandy clayey silt (A-4). A Shelby Tube (ST-12) was collected in the soft silt soils and submitted for consolidation testing. The cohesive soils are underlain by 4 to 5.5 meters of loose to medium dense alluvial sand (A-2-4, A-1-b). The surficial units are underlain by the formational sediments of the Yorktown, Black Creek and Cape Fear Formations. The Yorktown Formation (Pliocene) is composed of 4.5 to 6 meters of very loose to medium dense sand (A-2-4) and very soft to soft clayey sandy silt (A-4). The Cretaceous Black Creek Formation immediately underlies the Yorktown at an elevation of 26.5± meters. This unit is composed of 1.2 to 3 meters of medium dense sand (A-2-4), very stiff clayey silt (A-5) and silty clay (A-7-6) with some lignite. The Cape Fear Formation underlies the Black Creek soils from an elevation of 23.5 at End Bent 2 to 25.0 at End Bent 1. Soils in this formation consist of 3 to 4.5 meters of interlayered medium stiff to hard sandy and silty clay (A-6, A-7-6) as well as sandy and clayey silt (A-4). A very dense sand (A-3, A-2-4) and hard sandy silt (A-4) was encountered at an elevation of 20.5 meters.

Based on the proposed design, approximately 11.5 meters of embankment material will be placed on soft to stiff clayey sandy silt (A-4) at each end bent. Additional fill will be required for construction of the end bent and side slopes. Borrow meeting Coastal Plain criteria is available in nearby areas.

Notice

This Geotechnical Foundation Report is based on the Preliminary General Drawing for the bridge on Ramp BD over US 70 Bypass between existing SR 1714 and SR 1300 dated January 2006. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Prepared By:

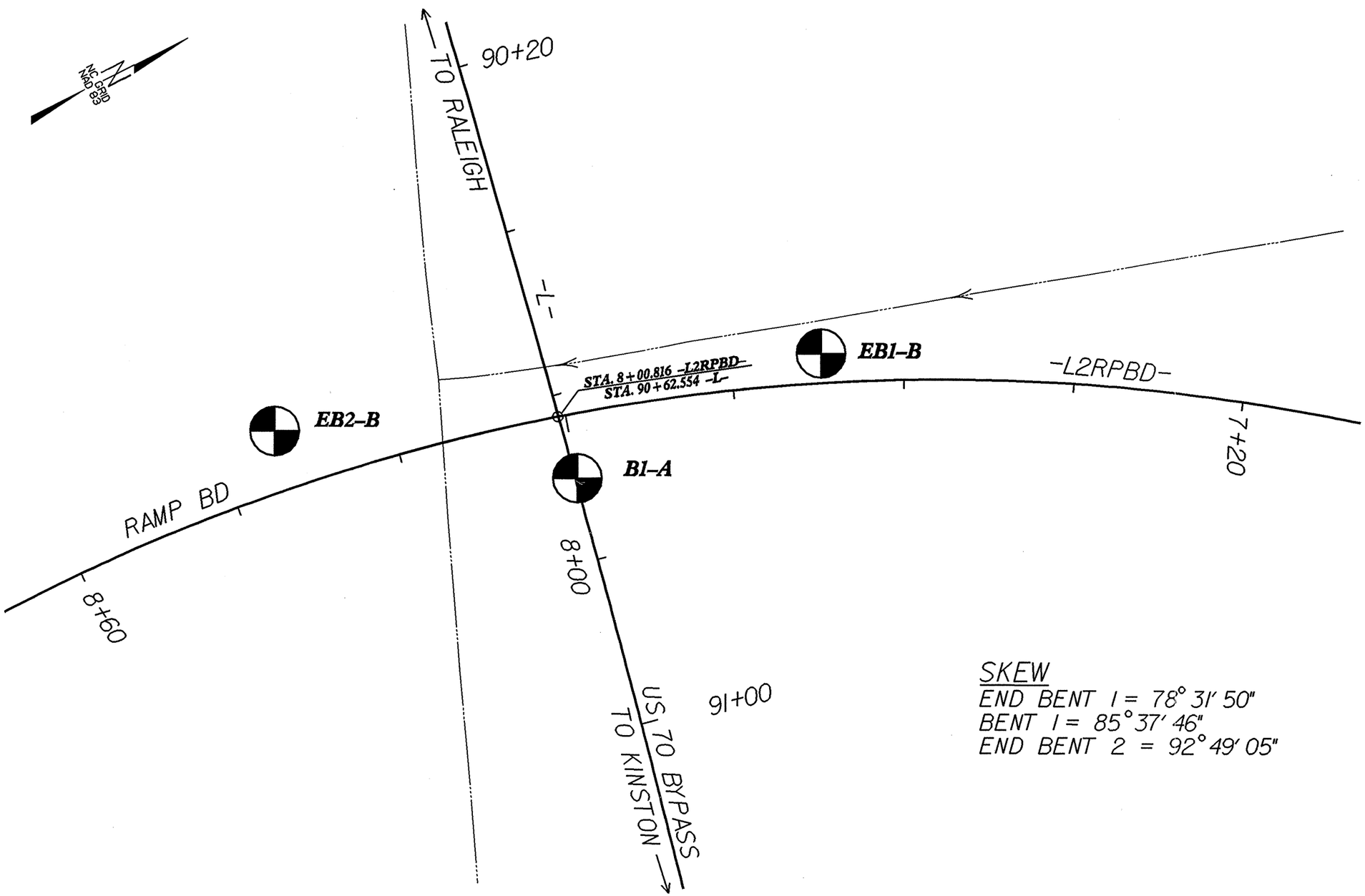
Dean N. Argenbright, L.G.
Regional Geological Engineer

PROJECT REFERENCE NO.	SHEET
34461.1.3(R-2554BA)	4

SITE PLAN

0 10 20

METERS



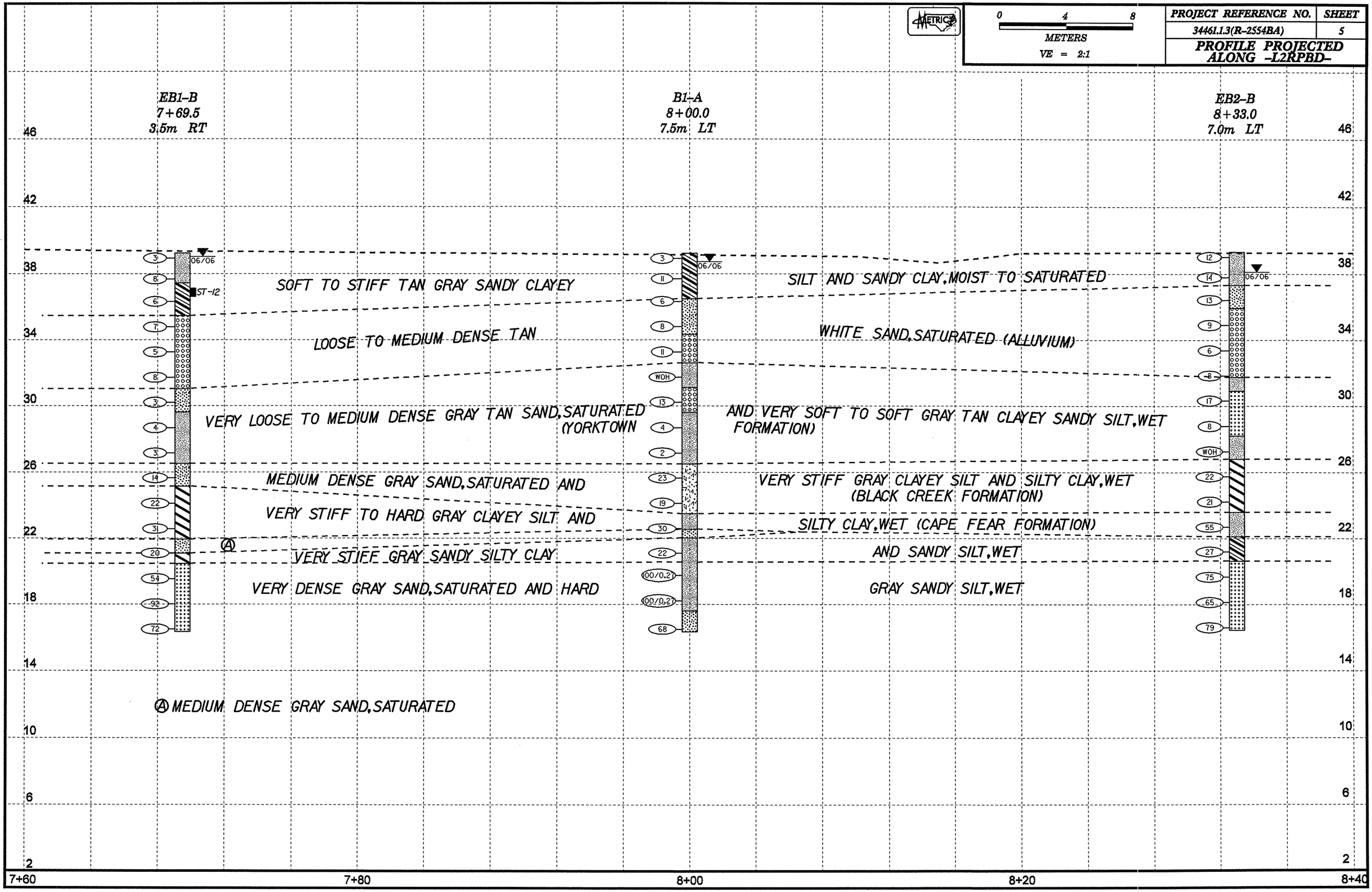
SKEW
END BENT 1 = 78° 31' 50"
BENT 1 = 85° 37' 46"
END BENT 2 = 92° 49' 05"

METRIC

0 4 8
METERS
VE = 2:1

PROJECT REFERENCE NO.	SHEET
34461.1.3(R-2554BA)	5

PROFILE PROJECTED ALONG -L2RPBD-



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	ID. R-2554BA	COUNTY WAYNE		GEOLOGIST D.N. ARGENBRIGHT
SITE DESCRIPTION BRIDGE ON -L2RPBD-(RAMP BD) OVER -L- (US 70 BYPASS)				GROUND WATER
BORING NO. EBI-B	BORING LOCATION 7+69.5	OFFSET 3.5m RT	ALIGNMENT -L2RPBD-	0 HR. N/A
COLLAR ELEV. 39.24m	NORTHING 186622.7m	EASTING 700907.8m		24 HR. 0.21m
TOTAL DEPTH 22.88m	DRILL MACHINE CME-45B	DRILL METHOD ROTARY W/MUD	HAMMER TYPE AUTOMATIC	
START DATE 6/26/06	COMPLETION DATE 6/26/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
39.24	0.00	WOH	1	2	0.30	X 3				
38.00	1.25	2	3	5	0.30	X 8	SS-1			TAN GRAY SANDY CLAYEY SILT, MOIST TO WET
	2.62	1	2	4	0.30	X 6	ST-12			TAN BROWN SANDY CLAY, WET
36.00	4.15	4	3	4	0.30	X 7	SS-2			
34.00	5.67	2	3	2	0.30	X 5				TAN WHITE SAND, SATURATED (ALLUVIUM)
32.00	7.19	4	4	4	0.30	X 8	SS-3			
	8.72	1	1	2	0.30	X 3	SS-4			TAN SAND, SATURATED (YORKTOWN FORMATION)
30.00	10.24	1	2	2	0.30	X 4	SS-5			GRAY CLAYEY SANDY SILT, WET
28.00	11.77	WOH	1	2	0.30	X 3				
26.00	13.29	2	5	9	0.30	X 14	SS-6			GRAY SAND WITH LIGNITE SATURATED (BLACK CREEK FORMATION)
	14.81	6	9	13	0.30	X 22	SS-7			GRAY SILTY CLAY, WET (CAPE FEAR FORMATION)
24.00	16.34	8	13	18	0.30	X 31				
22.00	17.86	12	9	11	0.30	X 20	SS-8			GRAY SAND, SATURATED
										GRAY SILTY CLAY, WET
20.00	19.39	17	23	31	0.30	X 54				GRAY SAND, SATURATED

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	ID. R-2554BA	COUNTY WAYNE		GEOLOGIST D.N. ARGENBRIGHT
SITE DESCRIPTION BRIDGE ON -L2RPBD-(RAMP BD) OVER -L- (US 70 BYPASS)				GROUND WATER
BORING NO. EBI-B	BORING LOCATION 7+69.5	OFFSET 3.5m RT	ALIGNMENT -L2RPBD-	0 HR. N/A
COLLAR ELEV. 39.24m	NORTHING 186622.7m	EASTING 700907.8m		24 HR. 0.21m
TOTAL DEPTH 22.88m	DRILL MACHINE CME-45B	DRILL METHOD ROTARY W/MUD	HAMMER TYPE AUTOMATIC	
START DATE 6/26/06	COMPLETION DATE 6/26/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
19.00	20.91	26	40	52	0.30	X 92	SS-9			GRAY SAND, SATURATED
17.00	22.43	18	27	45	0.30	X 72				
15.00						BORING TERMINATED AT ELEVATION 16.36m IN VERY DENSE SAND				
13.00										
11.00										
9.00										
7.00										
5.00										
3.00										
1.00										
-1.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** D.N. ARGENBRIGHT
SITE DESCRIPTION BRIDGE ON -L2RPBD-(RAMP BD) OVER -L- (US 70 BYPASS)			**GROUND WATER**
BORING NO. BI-A	**BORING LOCATION** 8+00.0	**OFFSET** 7.5m LT	**ALIGNMENT** -L2RPBD-	**0 HR.** N/A
COLLAR ELEV. 39.22m	**NORTHING** 186590.5m	**EASTING** 700908.3		**24 HR.** 0.50m
TOTAL DEPTH 22.85m	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC	
START DATE 6/27/06	**COMPLETION DATE** 6/27/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
39.22	0.00	1	1	2	0.30	3				
								▼		GRAY SANDY SILTY CLAY, MOIST TO WET
38.00	1.22	3	5	6	0.30	11	SS-10	11%		
	2.59	1	2	4	0.30	6	SS-11			TAN SAND, SATURATED (ALLUVIUM)
36.00										
	4.11	4	3	5	0.30	8				
34.00	5.64	1	7	4	0.30	11	SS-12			
32.00	7.16	WOH	WOH	WOH	0.30	0	SS-13	27%		TAN SANDY SILT, WET (YORKTOWN FORMATION)
	8.69	4	7	6	0.30	13	SS-14			TAN SAND, SATURATED
30.00	10.21	1	2	2	0.30	4	SS-15	25%		GRAY SANDY SILT, WET
28.00	11.73	WOH	WOH	2	0.30	0				
26.00	13.26	4	10	13	0.30	23	SS-16	14%		GRAY CLAYEY SILT, WET (BLACK CREEK FORMATION)
	14.78	5	8	11	0.30	19				
24.00	16.31	6	11	19	0.30	30	SS-17			GRAY CLAYEY SILT, WET (CAPE FEAR FORMATION)
22.00										GRAY SAND, SATURATED
	17.83	6	10	12	0.30	22				GRAY SANDY SILT, WET
20.00	19.35	37	63		0.27	100±	SS-18			

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** D.N. ARGENBRIGHT
SITE DESCRIPTION BRIDGE ON -L2RPBD-(RAMP BD) OVER -L- (US 70 BYPASS)			**GROUND WATER**
BORING NO. BI-A	**BORING LOCATION** 8+00.0	**OFFSET** 7.5m LT	**ALIGNMENT** -L2RPBD-	**0 HR.** N/A
COLLAR ELEV. 39.22m	**NORTHING** 186590.5m	**EASTING** 700908.3		**24 HR.** 0.50m
TOTAL DEPTH 22.85m	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC	
START DATE 6/27/06	**COMPLETION DATE** 6/27/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
19.00	20.88	27	53	47	0.27	100+				GRAY SANDY SILT, WET
17.00	22.40	28	29	39	0.30	68	SS-19			GRAY SAND, SATURATED
15.00						BORING TERMINATED AT ELEVATION 16.37m IN VERY DENSE SAND				
13.00										
11.00										
9.00										
7.00										
5.00										
3.00										
1.00										
-1.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** D.N. ARGENBRIGHT
SITE DESCRIPTION BRIDGE ON -L2RPBD-(RAMP BD) OVER -L- (US 70 BYPASS)			**GROUND WATER**
BORING NO. EB2-B	**BORING LOCATION** 8+33.0	**OFFSET** 7.0m RT	**ALIGNMENT** -L2RPBD- — **0 HR.** N/A
COLLAR ELEV. 39.32m	**NORTHING** 186561.1m	**EASTING** 700887.6m	**24 HR.** 1.20m
TOTAL DEPTH 22.85m	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC
START DATE 6/28/06	**COMPLETION DATE** 6/29/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
39.32	0.00	1	7	5	0.30	X 12				TAN GRAY SANDY SILT, MOIST TO WET
38.00	1.22	3	5	9	0.30	X 14	SS-20	▼		
	2.59	4	6	7	0.30	X 13	SS-21			
36.00	4.11	4	4	5	0.30	X 9				TAN SAND, SATURATED (ALLUVIUM)
34.00	5.64	3	4	2	0.30	X 6	SS-22			
32.00	7.16	3	4	4	0.30	X 8				
	8.69	3	7	10	0.30	X 17	SS-23			TAN SANDY SILT, WET (YORKTOWN FORMATION)
30.00	10.21	3	4	4	0.30	X 8				TAN SAND, SATURATED
28.00	11.73	WOH	WOH	WOH	0.30	X 0	SS-24			TAN SANDY SILT, WET
26.00	13.26	5	8	14	0.30	X 22	SS-25			GRAY SILTY CLAY, WET (BLACK CREEK FORMATION)
	14.78	6	10	11	0.30	X 21				
24.00	16.31	16	20	35	0.30	X 55	SS-26			GRAY CLAYEY SANDY SILT, WET (CAPE FEAR FORMATION)
22.00	17.83	8	11	16	0.30	X 27	SS-27			GRAY SANDY CLAY, WET
20.00	19.35	32	38	37	0.30	X 75	SS-28			GRAY SAND, SATURATED
19.00	20.88	20	28	37	0.30	X 65				GRAY SAND, SATURATED
17.00	22.40	23	35	44	0.30	X 79				
15.00										BORING TERMINATED AT ELEVATION 16.47m IN VERY DENSE SAND
13.00										
11.00										
9.00										
7.00										
5.00										
3.00										
1.00										
-1.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** D.N. ARGENBRIGHT
SITE DESCRIPTION BRIDGE ON -L2RPBD-(RAMP BD) OVER -L- (US 70 BYPASS)			**GROUND WATER**
BORING NO. EB2-B	**BORING LOCATION** 8+33.0	**OFFSET** 7.0m RT	**ALIGNMENT** -L2RPBD- — **0 HR.** N/A
COLLAR ELEV. 39.32m	**NORTHING** 186561.1m	**EASTING** 700887.6m	**24 HR.** 1.20m
TOTAL DEPTH 22.85m	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC
START DATE 6/28/06	**COMPLETION DATE** 6/29/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

R-2554BA
34461.1.3
BRIDGE ON -L2RPBD- (RAMP BD) OVER -L- (US 70 BYPASS)

HOLE NO.	SAMPLE NO.	2.0 mm	425 um	75 um	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
EB1-B	SS-1	100	89	58	19.0	28.1	16.0	36.9	32	2	A-4(0)	1.25-1.70		
	ST-12	100	95	60	12.7	33.9	21.0	32.3	35	18	A-6(8)	2.14-2.62		
	SS-2	100	41	6	86.0	8.8	0.8	4.4	24	NP	A-1-b(0)	4.15-4.60		
	SS-3	98	50	8	79.2	13.6	0.8	6.4	20	NP	A-1-b(0)	7.19-7.64		
	SS-4	96	90	29	21.8	51.3	10.0	16.8	20	NP	A-2-4(0)	8.72-9.17		
	SS-5	100	99	45	3.2	60.7	11.6	24.4	24	NP	A-4(0)	10.24-10.69		
	SS-6	92	89	18	9.2	73.3	8.6	8.8	19	NP	A-2-4(0)	13.29-13.74		
	SS-7	100	98	92	3.4	7.0	31.1	58.5	48	28	A-7-6(28)	14.81-15.26		
	SS-8	100	85	30	36.1	39.5	17.6	6.8	17	NP	A-2-4(0)	17.86-18.16		
	SS-9	100	77	9	57.5	35.5	0.0	7.0	15	NP	A-3(0)	20.91-21.36		
B1-A	SS-10	100	98	69	6.0	31.1	56.1	6.8	35	15	A-6(9)	1.22-1.67	11.1	
	SS-11	100	76	17	48.9	35.9	10.4	4.8	16	NP	A-2-4(0)	2.74-3.04		
	SS-12	100	44	9	78.2	14.0	1.0	6.8	16	NP	A-1-b(0)	5.64-6.09		
	SS-13	100	99	84	1.8	24.4	66.9	6.8	31	5	A-4(4)	7.16-7.61	27.4	
	SS-14	100	47	8	77.0	15.4	4.8	2.8	16	NP	A-1-b(0)	8.69-9.14		
	SS-15	100	99	48	3.8	55.8	30.7	9.7	23	NP	A-4(0)	10.21-10.66	24.7	
	SS-16	100	98	89	3.4	10.3	47.3	39.0	53	3	A-5(9)	13.26-13.71	14.4	
	SS-17	100	99	76	1.2	39.0	29.9	29.9	29	6	A-4(4)	16.31-16.76		
	SS-18	100	80	52	48.9	42.6	0.8	7.7	22	NP	A-4(0)	19.35-19.62		
	SS-19	99	89	33	45.3	23.8	11.1	19.8	19	NP	A-2-4(0)	22.40-22.85		
EB2-B	SS-20	100	87	44	54.7	23.2	5.5	16.6	20	NP	A-4(0)	1.22-1.67		
	SS-21	100	90	22	35.2	43.2	5.9	15.8	28	1	A-2-4(0)	2.59-3.04		
	SS-22	92	30	10	80.6	10.1	3.6	5.7	20	NP	A-1-b(0)	5.64-6.09		
	SS-23	100	68	9	74.3	17.8	2.2	5.7	16	NP	A-3(0)	8.69-9.14		
	SS-24	100	92	38	26.5	41.6	22.2	9.7	20	NP	A-4(0)	11.73-12.18		
	SS-25	100	95	78	8.9	18.6	60.8	11.7	44	19	A-7-6(15)	13.26-13.71		
	SS-26	100	99	52	3.0	63.8	1.2	31.9	17	NP	A-4(0)	16.31-16.76		
	SS-27	100	99	72	2.4	41.6	22.0	33.9	30	13	A-6(7)	17.83-18.28		
	SS-28	92	54	8	66.9	26.1	1.4	5.7	13	NP	A-3(0)	19.35-19.80		

34461.1.3 (R-2554BA)
Bridge On -L2RPBD- (Ramp BD) Over -L- (US 70 Bypass)
Wayne Co.

Looking South Toward End Bent 2

PROJECT: 34461.1.3 ID: R-2554BA

CONTENTS:

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	GEOTECHNICAL REPORT
4	SITE PLAN
5	PROFILE
6-8	BORELOGS
9	SOIL TEST RESULTS
10	SITE PHOTOGRAPH

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34461.1.3 I.D. NO. R-2554BA

F.A. PROJECT NHF-70 (30)

COUNTY WAYNE

PROJECT DESCRIPTION US 70 (GOLDSBORO BYPASS) FROM WEST OF SR 1300 (SALEM CHURCH ROAD) TO WEST OF SR 1714 (PARKSTOWN ROAD)

SITE DESCRIPTION BRIDGE ON -L2RPBD- (RAMP BD) OVER -L2- (US 117 BYP) AT STATION 11+09.326

METRIC	STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
	N.C.	34461.1.3 (R-2554BA)	1	10
	STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
			P.E.	
			CONST.	

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS 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.

INVESTIGATED BY D. N. ARGENBRIGHT PERSONNEL JLS

CHECKED BY D. N. ARGENBRIGHT TJW

SUBMITTED BY D. N. ARGENBRIGHT WNC

DATE AUGUST 2006 LWD

DRAWN BY: C.M. KENT

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 LICENSED SEAL 1050 GEOLOGIST D. N. ARGENBRIGHT

8-28-06

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-2554BA	3446U.3	2	10

METRIC

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL 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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND 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)				A-1, A-2 A-3	A-4, A-5 A-6, A-7	ORGANIC MATERIALS
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7 (A-7-5, A-7-6)			
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7							
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		N.P.	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

P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 ≥ L.L. - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<25
	SOFT	2 TO 4	25 TO 50
	MEDIUM STIFF	4 TO 8	50 TO 100
	STIFF	8 TO 15	100 TO 200
	VERY STIFF	15 TO 30	200 TO 400
	HARD	>30	>400

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	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)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- 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, YEL-BRN, 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 ARE 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 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 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 SEEPAGE

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP/DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

SAMPLE DESIGNATIONS

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

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
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- ☐ MOBILE B-___
- ☐ BK-51
- ☐ CME-45A
- ☐ CME-550
- ☐ PORTABLE HOIST
- ☒ OTHER CME-45B
- ☐ OTHER_____

ADVANCING TOOLS:
- ☐ CLAY BITS
- ☐ 152 mm CONTINUOUS FLIGHT AUGER
- ☐ 203 mm HOLLOW AUGERS
- ☐ HARD FACED FINGER BITS
- ☐ TUNG.-CARBIDE INSERTS
- ☒ CASING ☐ W/ ADVANCER
- ☒ TRICONE 75 mm STEEL TEETH
- ☐ TRICONE _____ mm TUNG.-CARB.
- ☐ CORE BIT
- ☐ OTHER _____

HAMMER TYPE:
- ☒ AUTOMATIC ☐ MANUAL

CORE SIZE:
- ☐ -B_____
- ☐ -N_____
- ☐ -H_____

HAND TOOLS:
- ☐ POST HOLE DIGGER
- ☐ HAND AUGER
- ☐ SOUNDING ROD
- ☐ VANE SHEAR TEST
- ☐ OTHER _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN 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 2.5 cm PER 50 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 FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.
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 2.5 cm. 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 ROCKS 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 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
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 GEOLOGISTS 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 6 mm DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 WHICH 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 IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL WHICH 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, WHICH 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BL-5603 -L- STA. 91+63.9 0.93 RT

ELEVATION: 38.956

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

LYNDO TIPPETT
SECRETARY

August 23, 2006

STATE PROJECT:	34461.1.3 (R-2554BA)
F.A. PROJECT:	NHF-70 (30)
COUNTY:	Wayne
DESCRIPTION:	US 70 (Goldsboro Bypass) from east of SR 1300 (Salem Church Rd.) to west of SR 1714 (Parkstown Road)
SUBJECT:	Geotechnical Report - Bridge Foundation Investigation for Ramp BD over US 117 Bypass at -L2RPBD- Station 11+09.326

Site Description

The new bridge site is located at the proposed crossing of Ramp BD over US 117 Bypass in Goldsboro. The new structure will be built along the alignment of Ramp BD which is a portion of the intersection between the US 117 Bypass and the proposed US 70 Bypass. Based on the proposed design, the new structure will have 2 spans totaling 69 meters. The bents will have variable skews from 83° 51' 51" at End Bent 1 to 102° 31' 35" at End Bent 2.

One Standard Penetration Test (SPT) boring was made at or near each proposed bent location to provide subsurface information relative to foundation design. These borings were made with ATV mounted CME-45B drill machine and advanced by rotary drill methods using bentonite drilling fluid.

The bridge site is located in the Coastal Plain Physiographic Province and is underlain by recent upland and alluvial deposits, Pliocene marine sediments of the Yorktown Formation, and Cretaceous deltaic/alluvial sediments of the Cape Fear Formation. Topography along the project is nearly flat to gently sloping with elevations ranging from 36± meters to 39± meters.

Ground water elevations range from 36.0± meters to 35.7± meters.

Soil Description

Upland surficial soils generally consist of 2± to 3.5± meters of medium stiff to stiff silty sandy clay (A-6, A-7-6) and clayey silt (A-4). These soils are underlain by 3 to 4 meters of loose to medium dense alluvial sand (A-3, A-1-b). These surficial units are underlain by the formational sediments of the Yorktown and Cape Fear Formations. The Yorktown Formation (Pliocene) is composed of 6± meters of very loose to very dense sand (A-2-4, A-3, A-1-b) with shell fragments. A very soft to soft sandy silt (A-4) layer, 4.5± meters thick, was encountered at End Bent 1. The Cretaceous Cape Fear Formation immediately underlies the Yorktown in this area. This contact lies an elevation of approximately 26± meters. This unit is composed of interlayered medium stiff to hard sandy and silty clay (A-6, A-7-6) as well as sandy and clayey silt (A-4, A-5). A 2.5± meter thick layer of dense sand was encountered in the Cape Fear Formation in EB1-A at an elevation of 21.5 meters.

Based on the proposed design, at End Bent 1 approximately 9 meters of embankment material will be placed on medium stiff to stiff silt (A-4). At End Bent 2, approximately 7 meters of embankment material will be placed on stiff sandy silt (A-4). Additional fill will be required for construction of the end bent and side slopes. Borrow meeting Coastal Plain criteria is available in nearby areas.

Notice

This Geotechnical Foundation Report is based on the Preliminary General Drawing for Bridge on Ramp BD over US 117 Bypass between existing SR 1714 and SR 1300 dated January 2006. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Prepared By:

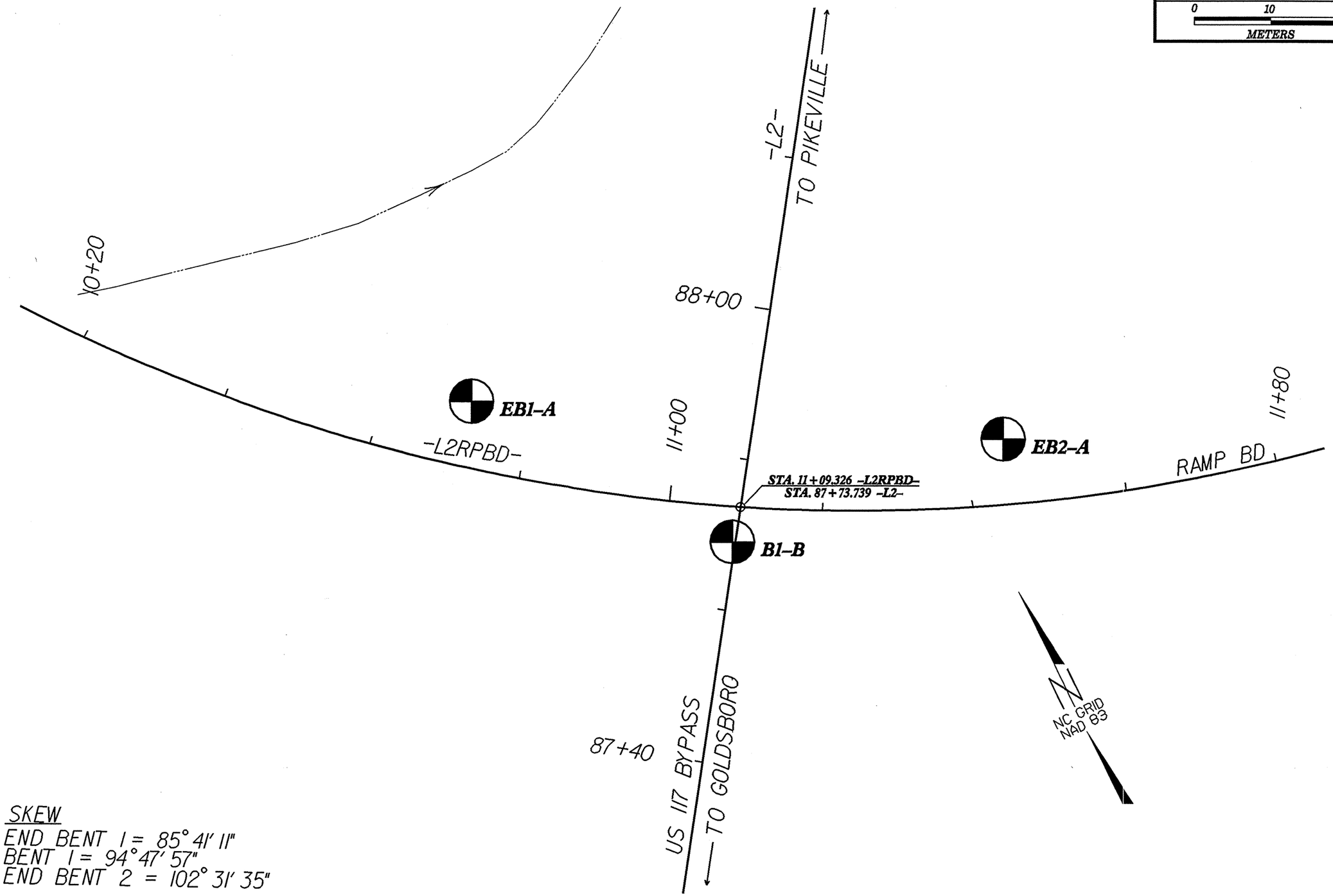
Dean N. Argenbright, L.G.
Regional Geological Engineer

PROJECT REFERENCE NO.	SHEET
34461.1.3(R-2554BA)	4

SITE PLAN

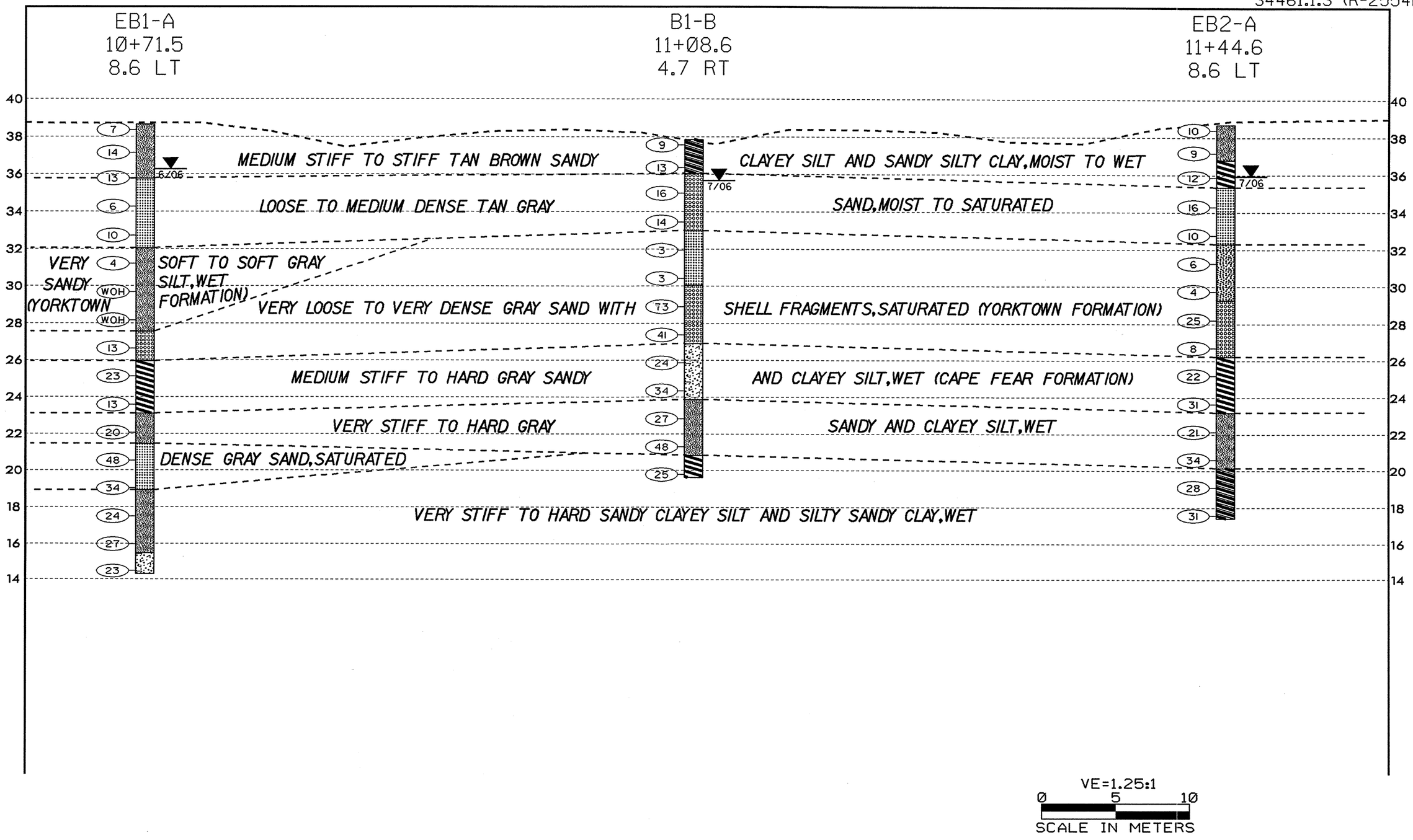
0 10 20

METERS



SKEW
END BENT 1 = 85° 41' 11"
BENT 1 = 94° 47' 57"
END BENT 2 = 102° 31' 35"

PROFILE THROUGH BORINGS PROJECTED ALONG -L2RPBD-



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	ID. R-2554BA	COUNTY WAYNE	GEOLOGIST D. N. ARGENBRIGHT
SITE DESCRIPTION BRIDGE ON -L2RPBD- (RAMP BD) OVER -L2- (US 117 BYPASS)			GROUND WATER
BORING NO. EBI-A	BORING LOCATION 10+71.50	OFFSET 8.60 LT	ALIGNMENT -L2RPBD-
COLLAR ELEV. 38.66	NORTHING 186367	EASTING 700970	24 HR. 2.40m
TOTAL DEPTH 24.37	DRILL MACHINE CME-45B	DRILL METHOD ROTARY W/MUD	HAMMER TYPE AUTOMATIC
START DATE 6/29/06	COMPLETION DATE 6/30/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
38.66										
	0.00	1	1	6	0.3	7	SS-1			TAN BROWN SANDY AND CLAYEY SILT, MOIST TO WET
38.00	1.22	4	6	8	0.3	14	SS-2			
36.00	2.59	3	4	9	0.3	13		▼		
	4.11	3	3	3	0.3	6	SS-3			TAN SAND, SATURATED (ALLUVIUM)
34.00	5.64	4	4	6	0.3	10				
32.00	7.16	1	2	2	0.3	4	SS-4			GRAY SANDY SILT, WET (YORKTOWN FORMATION)
30.00	8.69	WOH	WOH	WOH	0.3	0				
	10.21	WOH	WOH	1	0.3	0	SS-5			
28.00	11.73	13	8	5	0.3	13	SS-6			GRAY SAND WITH SHELL FRAGMENTS, SATURATED
26.00	13.26	6	10	13	0.3	23	SS-7			GRAY SILTY CLAY, WET (CAPE FEAR FORMATION)
24.00	14.78	4	6	7	0.3	13				
	16.31	5	8	12	0.3	20	SS-8			GRAY SANDY CLAYEY SILT, WET
22.00	17.83	15	21	27	0.3	48	SS-9			GRAY SAND, SATURATED
20.00	19.35	13	16	18	0.3	34				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	ID. R-2554BA	COUNTY WAYNE	GEOLOGIST D. N. ARGENBRIGHT
SITE DESCRIPTION BRIDGE ON -L2RPBD- (RAMP BD) OVER -L2- (US 117 BYPASS)			GROUND WATER
BORING NO. EBI-A	BORING LOCATION 10+71.50	OFFSET 8.60 LT	ALIGNMENT -L2RPBD-
COLLAR ELEV. 38.66	NORTHING 186367	EASTING 700970	24 HR. 2.40m
TOTAL DEPTH 24.37	DRILL MACHINE CME-45B	DRILL METHOD ROTARY W/MUD	HAMMER TYPE AUTOMATIC
START DATE 6/29/06	COMPLETION DATE 6/30/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
19.00										
	20.88	7	10	14	0.3	24	SS-10			GRAY SANDY AND CLAYEY SILT, WET
17.00	22.4	7	12	15	0.3	27				
15.00	23.92	8	10	13	0.3	23	SS-11			
13.00						BORING TERMINATED AT ELEVATION 14.29m IN VERY STIFF CLAYEY SILT				
11.00										
9.00										
7.00										
5.00										
3.00										
1.00										
-1.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** J. L. STONE
SITE DESCRIPTION BRIDGE ON -L2RPBD- (RAMP BD) OVER -L2- (US 117 BYPASS)			**GROUND WATER**
BORING NO. BI-B	**BORING LOCATION** 11+08.6	**OFFSET** 4.7 RT	**ALIGNMENT** -L2RPBD- — **0 HR.** N.M.
COLLAR ELEV. 37.86	**NORTHING** 186334	**EASTING** 700990	**24 HR.** 2.20m
TOTAL DEPTH 18.24	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC
START DATE 7/10/06	**COMPLETION DATE** 7/10/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
37.86	0.00	2	3	6	0.3	9	SS-20			TAN SILTY SANDY CLAY, MOIST
	1.22	3	5	8	0.3	13				
36.00	2.59	6	7	9	0.3	16	SS-21	▼		GRAY SAND, SATURATED (ALLUVIUM)
34.00	4.11	3	6	8	0.3	14				
32.00	5.63	1	2	1	0.3	3	SS-22			
	7.15	1	1	2	0.3	3				GRAY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)
30.00	8.67	26	36	37	0.3	73	SS-23			
28.00	10.19	15	21	20	0.3	41				
26.00	11.71	8	10	14	0.3	24	SS-24	14%		GRAY CLAYEY AND SANDY SILT, WET (CAPE FEAR FORMATION)
24.00	13.23	4	14	20	0.3	34				
	14.75	11	13	14	0.3	27	SS-25			
22.00	16.27	7	15	33	0.3	48				
20.00	17.79	11	11	14	0.3	25	SS-26			GRAY SILTY CLAY, WET
18.00						BORING TERMINATED AT ELEVATION 19.62m IN VERY STIFF SILTY CLAY.				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** J. L. STONE
SITE DESCRIPTION BRIDGE ON -L2RPBD- (RAMP BD) OVER -L2- (US 117 BYPASS)			**GROUND WATER**
BORING NO. EB2-A	**BORING LOCATION** 11+44.6	**OFFSET** 8.6 LT	**ALIGNMENT** -L2RPBD-
COLLAR ELEV. 38.77	**NORTHING** 186327	**EASTING** 701027	**24 HR.** 2.77m
TOTAL DEPTH 21.28	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC
START DATE 7/6/06	**COMPLETION DATE** 7/6/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
38.77										
	0.00	WOH	4	6	0.3	10	SS-12			TAN BROWN CLAYEY SANDY SILT, MOIST
38.00	1.22	2	4	5	0.3	9				
36.00	2.59	2	5	7	0.3	12	SS-13	▼		TAN SILTY CLAY, MOIST TO WET
	4.11	3	8	8	0.3	16	SS-14			GRAY SAND, SATURATED (ALLUVIUM)
34.00	5.63	6	5	5	0.3	10				
32.00	7.15	3	3	3	0.3	6	SS-15			GRAY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)
30.00	8.67	1	2	2	0.3	4				
	10.19	3	12	13	0.3	25	SS-16			
28.00	11.71	2	4	4	0.3	8				
26.00	13.23	5	10	12	0.3	22	SS-17			GRAY SILTY CLAY, WET (CAPE FEAR FORMATION)
24.00	14.75	5	12	19	0.3	31				
	16.27	6	9	12	0.3	21	SS-18			GRAY SANDY SILT, WET
22.00	17.79	6	12	22	0.3	34				
20.00	19.31	6	12	16	0.3	28	SS-19			GRAY SANDY CLAY, WET

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** J. L. STONE
SITE DESCRIPTION BRIDGE ON -L2RPBD- (RAMP BD) OVER -L2- (US 117 BYPASS)			**GROUND WATER**
BORING NO. EB2-A	**BORING LOCATION** 11+44.6	**OFFSET** 8.6 LT	**ALIGNMENT** -L2RPBD-
COLLAR ELEV. 38.77	**NORTHING** 186327	**EASTING** 701027	**24 HR.** 2.77m
TOTAL DEPTH 21.28	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC
START DATE 7/6/06	**COMPLETION DATE** 7/6/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

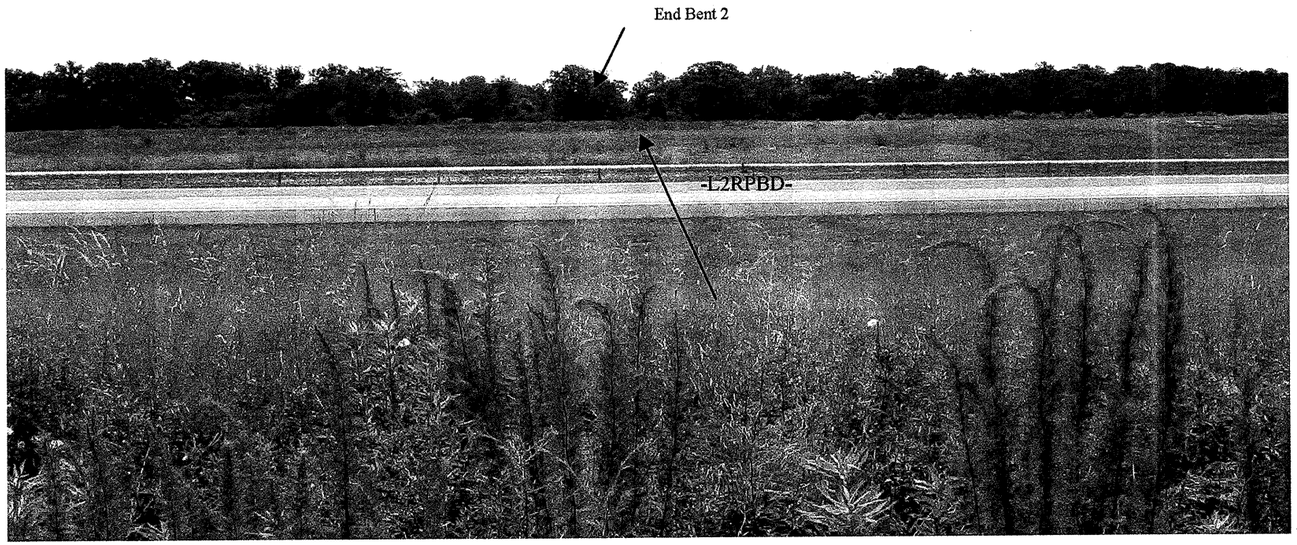
ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
19.00	20.83	9	14	17	0.3	31				GRAY SANDY CLAY, WET
17.00										BORING TERMINATED AT ELEVATION 17.49M IN HARD SANDY CLAY.
15.00										
13.00										
11.00										
9.00										
7.00										
5.00										
3.00										
1.00										
-1.00										

R-2554BA
34461.1.3
BRIDGE ON -L2RPBD- (RAMP BD) OVER -L2- (US 117 BYPASS)

HOLE NO.	SAMPLE NO.	2.0 mm	425 um	75 um	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
EB1-A	SS-1	100	97	60	8.8	43.3	28.6	19.3	16	NP	A-4(0)	0.30-0.45		
	SS-2	100	98	75	4.8	26.9	31.0	37.3	39	5	A-4(5)	1.22-1.67		
	SS-3	100	67	9	61.8	29.7	5.3	3.2	25	NP	A-3(0)	4.11-4.56		
	SS-4	100	85	39	29.7	37.9	19.2	13.2	26	NP	A-4(0)	7.16-7.61		
	SS-5	100	84	39	21.1	45.5	20.2	13.2	28	NP	A-4(0)	10.21-10.66		
	SS-6	85	35	9	74.0	17.5	7.3	1.2	33	NP	A-1-b(0)	11.73-12.18		
	SS-7	100	97	89	6.2	12.6	29.8	51.4	47	16	A-7-5(17)	13.26-13.71		
	SS-8	100	99	79	2.8	22.3	31.6	43.3	30	7	A-4(5)	16.31-16.76		
	SS-9	100	91	10	48.1	43.1	1.5	7.2	19	NP	A-3(0)	17.83-18.28		
	SS-10	100	98	69	5.2	34.5	19.0	41.3	33	7	A-4(4)	20.88-21.33		
	SS-11	100	99	92	1.6	10.0	21.0	67.4	50	5	A-5(10)	23.92-24.37		
EB2-A	SS-12	100	98	72	4.4	34.5	39.8	21.3	18	4	A-4(0)	0.30-0.45		
	SS-13	100	99	89	1.0	17.5	30.2	51.4	48	17	A-7-5(18)	2.59-3.04		
	SS-14	100	71	6	77.3	17.7	3.0	2.0	24	NP	A-3(0)	4.11-4.56		
	SS-15	100	82	23	42.9	42.1	12.7	2.4	28	NP	A-2-4(0)	7.15-7.60		
	SS-16	83	30	7	78.7	14.5	2.4	4.4	26	NP	A-1-b(0)	10.19-10.64		
	SS-17	100	98	94	2.6	6.2	40.4	50.7	49	16	A-7-5(19)	13.23-13.68		
	SS-18	100	98	38	3.0	67.4	11.1	18.5	33	4	A-4(0)	16.27-16.72		
	SS-19	100	98	63	4.0	45.5	34.0	16.5	32	11	A-6(5)	19.31-19.76		
B1-B	SS-20	100	97	73	6.4	27.0	30.0	36.6	36	19	A-6(12)	0.30-0.45		
	SS-21	100	49	9	80.3	12.3	1.0	6.4	19	NP	A-1-b(0)	2.59-3.04		
	SS-22	91	60	9	64.2	28.0	5.4	2.4	24	NP	A-3(0)	5.63-6.08		
	SS-23	83	42	5	66.6	28.6	4.4	0.4	19	NP	A-1-b(0)	8.67-9.12		
	SS-24	100	98	89	3.2	12.7	45.5	38.6	49	8	A-5(12)	11.71-12.16	14.4%	
	SS-25	100	82	39	28.4	44.3	14.9	12.5	17	NP	A-4(0)	14.75-15.20		
	SS-26	100	94	80	10.6	12.6	26.2	50.6	46	27	A-7-6(21)	17.79-18.24		

34461.1.3 (R-2554BA)
Bridge On -L2RPBD- (Ramp BD) Over -L2- (US 117 Bypass)
Wayne Co.

Looking Southeast Toward End Bent 2



PROJECT: 34461.1.3 ID: R-2554BA

CONTENTS:

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	STRUCTURE INVENTORY REPORT
4	SITE PLAN
5	PROFILE
6-7	BORE LOGS
8	SOIL TEST RESULTS
9	SITE PHOTOGRAPH

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34461.1.3 I.D. NO. R-2554BA

F.A. PROJECT NHF-70(30)

COUNTY WAYNE

PROJECT DESCRIPTION US 70 (GOLDSBORO BYPASS) FROM EAST OF SR 1300 (SALEM CHRUCH RD.) TO EAST OF SR 1556 (WAYNE MEMORIAL DR.)

SITE DESCRIPTION BRIDGE ON RAMP DB OVER US 117 BYPASS AT -L2RPDB- STATION 5+63.595

METRIC	STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
	N.C.	R-2554BA	1	9
	STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
	34461.1.3	NHF-70(30)	P.E.	
			CONST.	

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS 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.

INVESTIGATED BY J L STONE PERSONNEL MMH

CHECKED BY D N ARGENBRIGHT MBO

SUBMITTED BY D N ARGENBRIGHT ELD

DATE JULY 2006 WNC

TJW

DRAWN BY: C M KENT

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 LICENSED SEAL 2007 GEOLOGIST JOSEPH L. STONE

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-2554BA	3446.1.1.3	2	9

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL 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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND 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 PLASTIC INDEX	6 MX		N.P.	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
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

P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^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	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	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
PLASTIC RANGE (PI): LL — LIQUID LIMIT		
	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- 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, YEL-BRN, 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 ARE 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 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 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 SEEPAGE

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP/DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT PMT VST — TEST BORING
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

SAMPLE DESIGNATIONS
S- BULK SAMPLE
SS- SPLIT SPOON SAMPLE
ST- SHELBY TUBE SAMPLE
RS- ROCK SAMPLE
RT- RECOMPACTED TRIAXIAL SAMPLE
CBR - CBR SAMPLE

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
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

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

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152 mm CONTINUOUS FLIGHT AUGER
- [ ] 203 mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [x] CASING [ ] W/ ADVANCER
- [x] TRICONE 75mm mm STEEL TEETH
- [ ] TRICONE _____ mm TUNG.-CARB.
- [ ] CORE BIT
- [x] OTHER DRAG BIT

HAMMER TYPE:
- [x] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN 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 2.5 cm PER 50 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 YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.
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 2.5 cm. 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 ROCKS 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 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
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 GEOLOGISTS 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 6 mm DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 WHICH 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 IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL WHICH 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, WHICH 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BL-5603 -L- STATION 91+63.9 (0.93RT)

ELEVATION: 38.956

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

LYNDO TIPPETT
SECRETARY

July, 2006

STATE PROJECT: 34461.1.3 (R-2554BA)
F.A. PROJECT: NHF-70 (30)
COUNTY: Wayne
DESCRIPTION: US 70 (Goldsboro Bypass) from east of SR 1300 (Salem Church Rd.) to east of SR 1556 (Wayne Memorial Dr.)

SUBJECT: Geotechnical Report - Bridge Foundation Investigation for Ramp DB over US 117 Bypass at Sta. -L2RPDB-5+63.595

Site Description

The new bridge site is located at the proposed crossing of Ramp DB over US 117 Bypass in Goldsboro. The new structure will be built along the alignment of Ramp DB which is a portion of the intersection between the US 117 Bypass and the proposed US 70 Bypass. Based on the proposed design, the new structure will have 2 spans totaling 110 meters. The bents will have a skew of 90 degrees.

One Standard Penetration Test (SPT) boring was made at or near each proposed bent location to provide subsurface information relative to foundation design. These borings were made with ATV mounted CME-45C and CME-45B drill machines and advanced by rotary drill methods using bentonite drilling fluid.

The bridge site is located in the Coastal Plain Physiographic Province and is underlain by recent upland and alluvial deposits, Pleistocence marine sediments of the Yorktown Formation, and Cretaceous deltaic/alluvial sediments of the Black Creek and Cape Fear Formations. Topography along the project is nearly flat to gently sloping with elevations ranging from 36± meters to 39± meters.

Ground water elevations range from 35.4± meters to 36.0± meters.

Soil Description

Upland surficial soils generally consist of 1± to 3± meters of medium stiff to stiff silty clay and clayey silt (A-7-5, A-4). These soils are underlain by 4± meters of loose to medium dense alluvial sand, silty sand, and gravel (A-3, A-2-4, and A-1-b). These surficial units are underlain by the formational sediments of Yorktown, Black Creek, and Cape Fear Formations. The Yorktown Formation (Pleistocene) is composed of 3± to 6± meters of very loose to very dense sand, (A-3) silty sand, (A-2-4), and clayey sand (A-2-6), along with 3± meters of soft clayey silt and sandy clay (A-4, A-6). The Cretaceous Black Creek Formation immediately underlies the Yorktown in this area. This contact lies an elevation of approximately 26± meters. It is composed of 2± to 4± meters of medium dense to very dense sand and silty sand (A-3, A-2-4) with interbedded lignite and laminated clay. Finally the Cretaceous Cape Fear Formation is found beneath the Black Creek. This unit is composed of 3± to 5± meters of very stiff to hard silty clay (A-7-6) and sandy clay (A-6), with 1± meter of very dense silty sand.

Based on the proposed design, at End Bent 1 approximately 6 ± meters of embankment material will be placed on stiff silty clay (A-7-5). At End Bent 2, approximately 8 meters of embankment material will be placed on medium stiff clayey silt (A-4). Additional fill will be required for construction of the end bent and side slopes. Borrow meeting Coastal Plain criteria is available in nearby areas.

This Geotechnical Foundation Report is based on the Preliminary General Drawing for Bridge on Ramp DB over US 117 Bypass between existing US 117 and SR 1300 (Salem Church Road), dated April 2006. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Prepared By:

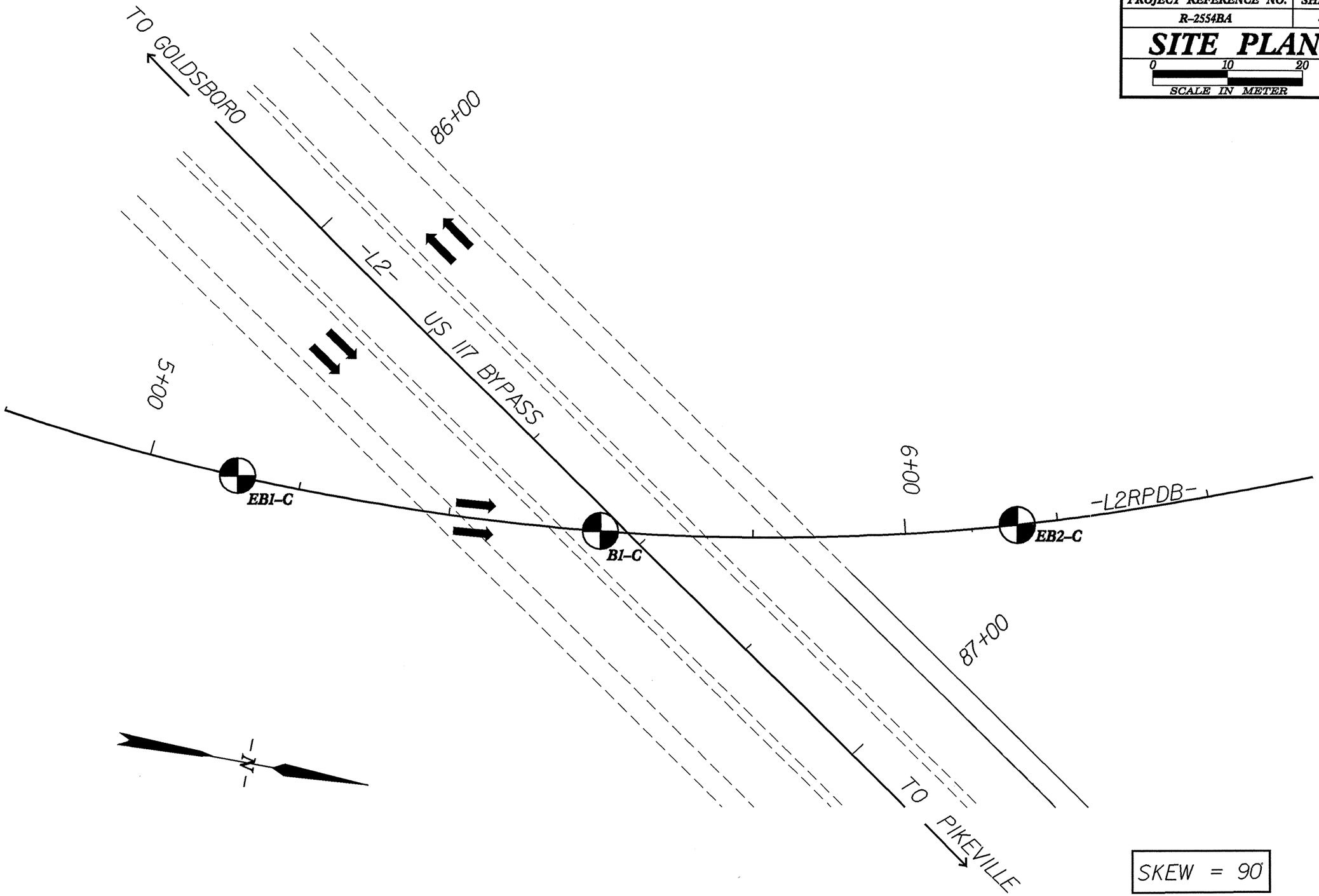
Joseph L Stone, L.G.
Engineering Geologist II

PROJECT REFERENCE NO.	SHEET
R-2554BA	4

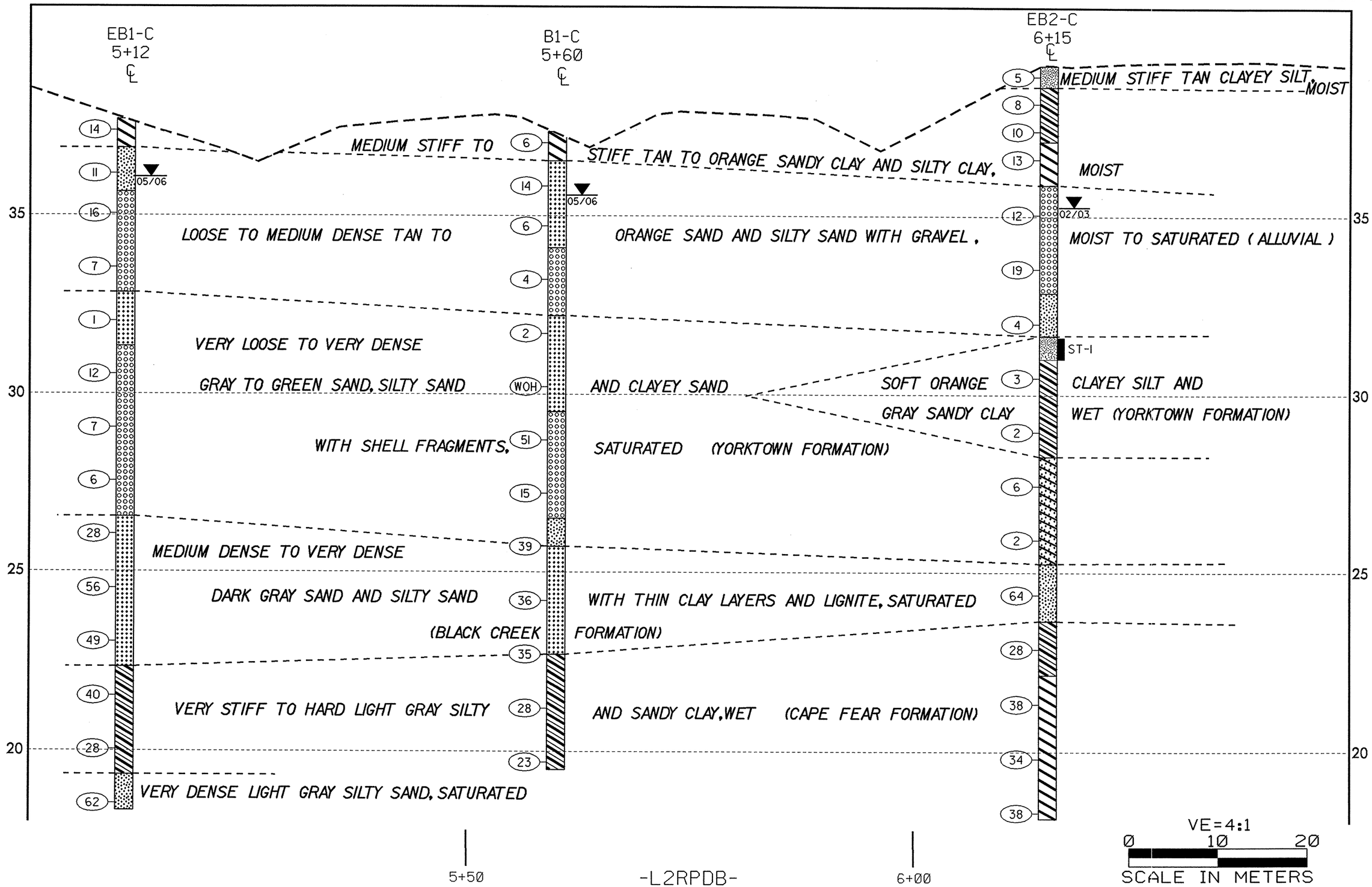
SITE PLAN

0 10 20

SCALE IN METER



PROFILES THROUGH BORINGS PROJECTED ALONG -L2RPDB-



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	ID. R-2554BA	COUNTY WAYNE		GEOLOGIST J. L. STONE
SITE DESCRIPTION BRIDGE ON -L2RPDB- (RAMP DB) OVER -L2- (US 117 BYPASS)				GROUND WATER
BORING NO. EBI-C	BORING LOCATION 5+12.00	OFFSET ℄	ALIGNMENT -L2RPDB-	0 HR. N.M.
COLLAR ELEV. 37.64	NORTHING 186183.7	EASTING 700946.9		24 HR. 1.6
TOTAL DEPTH 19.49	DRILL MACHINE CME-45C	DRILL METHOD ROTARY W/MUD	HAMMER TYPE AUTOMATIC	
START DATE 05/30/06	COMPLETION DATE 05/31/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
37.00	0.00	2	6	8	0.3	14	SS-1	13%		TAN ORANGE SILTY CLAY, MOIST.
	1.22	2	4	7	0.3	11	SS-2			TAN ORANGE SILTY SAND, SAND, WITH GRAVEL, SATURATED.
35.00	2.32	4	7	9	0.3	16	SS-3			
	3.84	3	3	4	0.3	7				
33.00	5.36	1	0	1	0.3	1	SS-4			GRAY GREEN SAND WITH SHELL FRAGMENTS AND PHOSPHATE, SATURATED. (YORKTOWN FORMATION)
31.00	6.88	3	6	6	0.3	12				
29.00	8.40	1	3	4	0.3	7	SS-5			
	9.92	1	2	4	0.3	6				
27.00	11.44	2	9	19	0.3	28	SS-6			DARK GRAY MICACEOUS SAND WITH THIN CLAY AND LIGNITE, SATURATED. (BLACK CREEK FORMATION)
25.00	12.96	11	22	34	0.3	56				
23.00	14.48	11	18	31	0.3	49				
	16.00	10	17	23	0.3	40	SS-7	10%		LIGHT GRAY SANDY CLAY, WET. (CAPE FEAR FORMATION)
21.00	17.52	7	12	16	0.3	28				
19.00	19.04	10	19	43	0.3	62	SS-8			LIGHT GRAY SILTY SAND, SATURATED.
17.00						BORING TERMINATED AT ELEVATION -18.15- METERS IN VERY DENSE SILTY SAND				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	ID. R-2554BA	COUNTY WAYNE		GEOLOGIST J. L. STONE
SITE DESCRIPTION BRIDGE ON -L2RPDB- (RAMP DB) OVER -L2- (US 117 BYPASS)				GROUND WATER
BORING NO. BI-C	BORING LOCATION 5+60.00	OFFSET ℄	ALIGNMENT -L2RPDB-	0 HR. N.M.
COLLAR ELEV. 37.30	NORTHING 186227.8	EASTING 700944.7		24 HR. 1.6
TOTAL DEPTH 17.97	DRILL MACHINE CME-45C/45B	DRILL METHOD ROTARY W/MUD	HAMMER TYPE AUTOMATIC	
START DATE 06/01/06	COMPLETION DATE 06/02/06	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
37.00	0.00	2	3	3	0.3	6				TAN ORANGE SILTY CLAY, WET.
	1.22	3	7	7	0.3	14	SS-9			TAN ORANGE SAND WITH GRAVEL, SATURATED.
35.00	2.32	1	3	3	0.3	6				
	3.84	1	3	1	0.3	4	SS-10			
33.00	5.36	1	1	1	0.3	2				GRAY GREEN SAND, SILTY SAND WITH SHELL FRAGMENTS, SATURATED. (YORKTOWN FORMATION)
31.00	6.88	WOH	WOH	WOH	0.3	0				
29.00	8.40	13	20	31	0.3	51	SS-11			
	9.92	3	4	11	0.3	15				
27.00	11.44	47	14	25	0.3	39	SS-12			
25.00	12.96	5	14	22	0.3	36	SS-13			DARK GRAY SAND WITH THIN CLAY LAYERS AND LIGNITE, SATURATED. (BLACK CREEK FORMATION)
23.00	14.48	17	19	16	0.3	35				
	16.00	8	11	17	0.3	28				LIGHT GRAY SANDY CLAY, WET. (CAPE FEAR FORMATION)
21.00	17.52	7	9	14	0.3	23				
19.00						BORING TERMINATED AT ELEVATION -19.33- METERS IN VERY STIFF SANDY CLAY				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	ID. R-2554BA	COUNTY WAYNE	GEOLOGIST M.M. HAGER
SITE DESCRIPTION BRIDGE ON -L2RPDB- (RAMP DB) OVER -L2- (US 117 BYPASS)			GROUND WATER
BORING NO. EB2-C	BORING LOCATION 6+15.00	OFFSET ℄	ALIGNMENT -L2RPDB-
COLLAR ELEV. 39.15	NORTHING 186282.1	EASTING 700932.7	0 HR. N.M.
TOTAL DEPTH 21.01	DRILL MACHINE CME-45C	DRILL METHOD ROTARY W/MUD	HAMMER TYPE AUTOMATIC
START DATE 02/06/03	COMPLETION DATE 02/06/03	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
39.00	0.00	1	3	2	0.3	5	SS-201			TAN CLAYEY SILT, MOIST.
	0.76	2	3	5	0.3	8	SS-202			
38.00	1.52	3	5	5	0.3	10				TAN TO YELLOW SANDY AND SILTY CLAY, MOIST.
	2.29	3	5	8	0.3	13	SS-203			
36.00	3.81	4	4	8	0.3	12	SS-204	▼		TAN SAND AND SILTY SAND, SATURATED.
34.00	5.33	6	8	11	0.3	19				
32.00	6.86	1	2	2	0.3	4	SS-205			
							ST-1			ORANGE CLAYEY SILT, WET. (YORKTOWN FORMATION)
	8.38	1	1	2	0.3	3	SS-206			
30.00	9.90	1	1	1	0.3	2	SS-207			GRAY SANDY CLAY, WET.
28.00	11.42	1	1	5	0.3	6				GRAY CLAYEY SAND, SATURATED.
26.00	12.94	1	1	1	0.3	2	SS-208			
	14.47	24	36	28	0.3	64	SS-209			DARK GRAY SILTY SAND, SATURATED. (BLACK CREEK FORMATION)
24.00	15.99	7	12	16	0.3	28	SS-210			
22.00	17.52	9	14	24	0.3	38	SS-211	23%		GRAY SANDY AND SILTY CLAY, WET. (CAPE FEAR FORMATION)
20.00	19.04	8	14	20	0.3	34				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

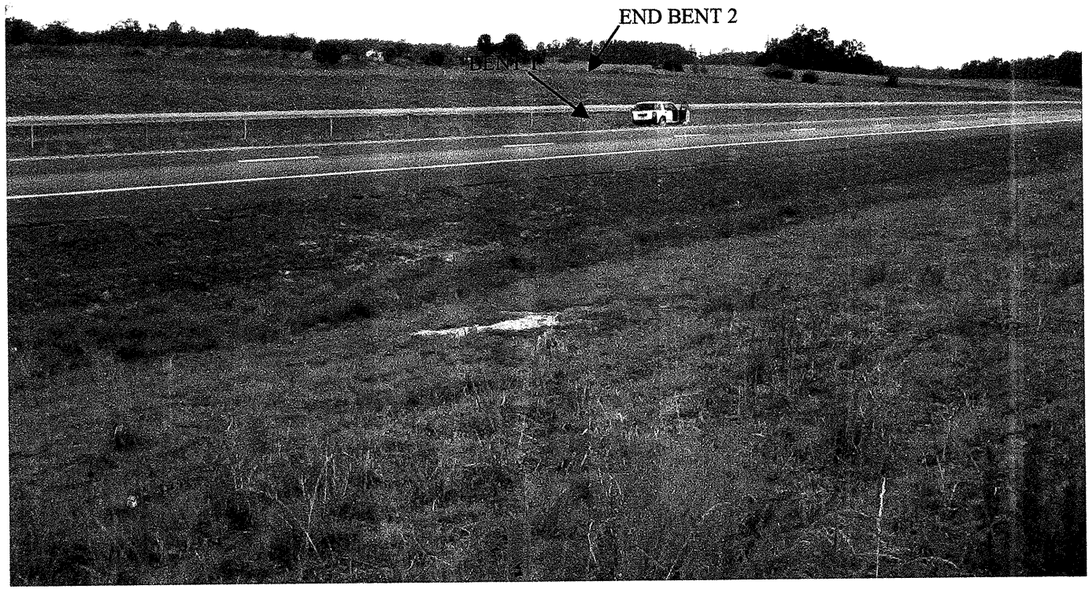
PROJECT NO. 34461.1.3	ID. R-2554BA	COUNTY WAYNE	GEOLOGIST M.M. HAGER
SITE DESCRIPTION BRIDGE ON -L2RPDB- (RAMP DB) OVER -L2- (US 117 BYPASS)			GROUND WATER
BORING NO. EB2-C	BORING LOCATION 6+15.00	OFFSET ℄	ALIGNMENT -L2RPDB-
COLLAR ELEV. 39.15	NORTHING 186282.1	EASTING 700932.7	0 HR. N.M.
TOTAL DEPTH 21.01	DRILL MACHINE CME-45C	DRILL METHOD ROTARY W/MUD	HAMMER TYPE AUTOMATIC
START DATE 02/06/03	COMPLETION DATE 02/06/03	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
	20.56	11	15	23	0.3	38	SS-212			
17.00										BORING TERMINATED AT ELEVATION 18.14 METERS IN VERY STIFF SILTY CLAY
15.00										
13.00										
11.00										
9.00										
7.00										
5.00										
3.00										
1.00										
-1.00										

R-2554BA
BRIDGE ON RAMP DB OVER US 117 BYPASS

HOLE #	SAMPLE #	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
EB1-C	SS-1	100	100	77	0.4	33.5	31.4	34.7	42	12	A-7-5(10)	0.30-0.45	12.5%	
	SS-2	100	85	12	61.7	28.2	5.9	4.3	20	NP	A-2-4(0)	1.22-1.67		
	SS-3	40	9	3	84.6	8.1	7.1	0.2	NOT ENOUGH SAMPLE			2.30-2.75		
	SS-4	78	67	10	22.7	64.7	10.3	2.2	33	NP	A-3(0)	5.36-5.81		
	SS-5	75	41	12	62.3	27.0	6.5	4.3	23	NP	A-1-b(0)	8.40-8.85		
	SS-6	93	85	9	55.6	36.9	5.9	1.6	20	NP	A-3(0)	11.44-11.89		
	SS-7	100	89	68	16.6	20.9	26.4	36.1	35	21	A-6(12)	16.00-16.45	9.6%	
	SS-8	93	89	15	10.5	75.3	8.5	5.7	18	NP	A-2-4(0)	19.04-19.49		
B1-C	SS-9	100	74	10	69.6	20.7	4.1	5.7	21	NP	A-3(0)	1.22-1.67		
	SS-10	84	31	3	85.8	11.2	1.4	1.6	17	NP	A-1-b(0)	3.84-4.29		
	SS-11	77	33	4	69.4	26.6	2.4	1.6	24	NP	A-1-b(0)	8.40-8.85		
	SS-12	98	92	14	12.8	73.2	8.3	5.7	22	NP	A-2-4(0)	9.92-10.37		
	SS-13	NOT	ENOUGH	SAMPLE										
EB2-C	SS-201	100	97	77	6.0	26.8	35.0	32.2	23	10	A-4(5)	0.30-0.45		
	SS-202	100	98	80	4.0	24.5	35.2	36.2	29	14	A-6(9)	0.76-1.21		
	SS-203	100	98	85	3.8	19.1	26.8	50.3	54	35	A-7-6(31)	2.29-2.74		
	SS-204	98	44	6	81.3	13.1	1.6	4.0	20	NP	A-1-b(0)	3.81-4.26		
	SS-205	83	49	20	56.3	22.1	11.5	10.1	25	10	A-2-4(0)	6.86-7.31		
	SS-206	100	94	59	11.1	40.8	36.0	12.1	34	16	A-6(7)	8.38-8.83		
	SS-207	100	95	56	9.1	42.0	34.0	14.1	34	13	A-6(5)	9.90-10.35		
	SS-208	92	58	24	49.3	26.4	16.3	8.0	35	15	A-2-6(0)	12.94-13.39		
	SS-209	98	79	16	55.9	30.6	3.4	10.1	20	NP	A-2-4(0)	14.47-14.92		
	SS-210	100	99	70	2.4	47.7	19.7	30.2	31	14	A-6(8)	15.99-16.44		
	SS-211	100	98	93	3.0	7.2	35.4	54.3	59	36	A-7-6(37)	17.52-17.97	23.0%	
	SS-212	100	99	74	2.0	34.6	39.2	24.1	41	20	A-7-6(14)	20.56-21.01		
	ST-1	100	82	37	33.9	37.8	24.2	4.0	27	7	A-4(0)	7.53-8.13		

34461.1.3 (R-2554BA)
Bridge On -L2RPDB- (Ramp DB) Over -L2- (US 117 Bypass)
Wayne Co.



Looking North Toward End Bent 2

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34461.1.3	1	36

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34461.1.3 F.A. PROJ. NHF-70 (30)

COUNTY WAYNE

PROJECT DESCRIPTION US 70 (GOLDSBORO BYP) FROM SR 1300 (SALEM CHURCH RD) TO EAST OF SR 1556 (WAYNE MEMORIAL DR)

SITE DESCRIPTION STRUCTURES 6 & 7: DUAL BRIDGES ON -L- (US 70) OVER CSX RAILROAD (-Y1-)

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3 - 5	GEOTECHNICAL REPORT
6	SITE VICINITY MAP
STRUCTURE 10 (LT LANE)	
7	BORING LOCATION PLAN
8	PROFILE
9 - 12	CROSS SECTIONS
13 - 16	BORE LOGS
17	SOIL TEST RESULTS
18 - 21	SITE PHOTOGRAPH(S)
STRUCTURE 11 (RT LANE)	
22	BORING LOCATION PLAN
23	PROFILE
24 - 27	CROSS SECTIONS
28 - 31	BORE LOGS
32	SOIL TEST RESULTS
33 - 36	SITE PHOTOGRAPH(S)

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.

FOR LETTING

PERSONNEL

P. ZHANG

G. LANG

B. SAWASKA

INVESTIGATED BY C. BRUINSMA

CHECKED BY M. ROBERTSON

SUBMITTED BY TIERRA INC.

DATE 8-14-2007

NORTH CAROLINA LICENSED SEAL 241 GEOLOGIST MARGARET AIRD ROBERTSON 8-14-07

DRAWN BY: P. ZHANG

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.

ID: R-2554BA

PROJECT: 34461.1.3

PROJECT REFERENCE NO.	SHEET NO.
34461.1.3	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 30 CM 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 PLASTIC INDEX	6 MX		NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
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 (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<25
	SOFT	2 TO 4	25 TO 50
	MEDIUM STIFF	4 TO 8	50 TO 100
	STIFF	8 TO 15	100 TO 200
	VERY STIFF	15 TO 30	200 TO 400
	HARD	>30	>400

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)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT		
	- 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
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
- SOUNDING ROD
- SPT CPT, DPT DMT, VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

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

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B-40
- [ ] BK-51
- [X] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [ ] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [X] TRICONE 76 mm STEEL TEETH
- [ ] TRICONE _____ mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [ ] AUTOMATIC
- [X] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -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 3 CM 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 30 CM 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 FELOSPARS 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 FELOSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: TBM -BL- 556B, STA. 10+15.204, 4.189 m RT -Y1-

ELEVATION: 38.922 M

NOTES:

August 14, 2007

N.C. Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699-1589

Attn: Mr. Njoroge W. Wainaina, P.E.

Ref: Geotechnical Structure Subsurface Investigation Report

State Project No.:	34461.1.3
TIP No.:	R-2554BA
County:	Wayne County
Description:	US 70 (Goldsboro Bypass) from SR 1300 (Salem ChurchRd) to East of SR 1556 (Wayne Memorial Dr) Structures 6 and 7: Dual Bridges on -L- over –CSX-
Tierra, Inc. Proj. No.:	6211-07-027

Dear Mr. Wainaina,

As authorized, Tierra, Inc. has completed the geotechnical subsurface investigation for the proposed new dual structures (6 & 7) located along the future US 70 Goldsboro Bypass in Wayne County, North Carolina. The purpose of this report is to present subsurface conditions and general notes to the designer for consideration during design of the planned structures. Field and laboratory test results, site and boring location plans, and profile/cross sections depicting subsurface conditions may be found in the appendix of this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices. No other warranty expressed or implied is made. Tierra, Inc. appreciates this opportunity to provide you with geotechnical engineering services for this project. If you have any questions regarding this report, please contact our office.

Sincerely,
TIERRA, INC.

Christina Bruinsma KP

Christina M. Bruinsma, L.G.
Project Geologist

Margaret A. Robertson, L.G.
Principal Engineering Geologist

2736 Rowland Road • Raleigh, North Carolina 27615
Phone 919.871.0800 • Fax 919.871.0803

1.0 PROJECT DESCRIPTION

Based on information obtained from the North Carolina Department of Transportation (NCDOT) plans dated March 2006 and December 2006, dual three span, 4-bent structures are proposed along the future US 70 Bypass. These structures are designated Structure 6 (Left Lane) and Structure 7 (Right Lane). Proposed structures will be approximately 54.8 meters in length for Structure 6, and 56.7 meters in length for Structure 7 based on Preliminary General Drawings. The width of each bridge is approximately 15.8 meters wide. The dual structures are at a new location and will span over the existing CSX Railroad. The proposed skew angle for all bents is 78 to 80 degrees, tangential to curve.

2.0 SITE DESCRIPTION AND GEOLOGY

The project site is located approximately 250 meters south of Belfast Road, along the proposed alignment for US 70 Bypass. The CSX Rail Line parallels existing NC 117 Bypass and NC 117 Business. This site is located in a rural to residential/commercial area in Belfast, North Carolina in Wayne County. Topographically, the site is generally flat with some drainage swales parallel and adjacent to the existing railroad tracks.

The project site is located in the Coastal Plain Physiographic Province of North Carolina, north of Goldsboro, North Carolina. According to ***The Geology of the Carolinas*** (1991), the site is located within the Yorktown Formation and Black Creek Group (Kb).

Undifferentiated post Miocene Age deposits were encountered at higher elevations across the site, resting unconformably on Yorktown Formation sediments. These soils consist of materials ranging from cross bedded sands and clays to materials of deltaic/fluvial origin.

The Yorktown Formation consists of Miocene Age, clayey and silty sands with occasional shell fragments. This formation is approximately 7 meters in thickness across the site, and lies unconformably on the Tar Heel Formation.

The Tar Heel Formation (lower member of Black Creek Group) consists of Cretaceous Age interbedded sands, clayey sands and dark gray clays. Material is periodically glauconitic depending on facies. Pyrite/marcasite cemented sand occurs in zones and non-continuous layers throughout the formation. Some molded limestone exists in upper portions of the formation, in isolated areas south of Goldsboro. No molded limestone was encountered at this site. Deposits are typically deltaic in nature.

3.0 FIELD EVALUATION PROCEDURE

Subsurface conditions were evaluated for both proposed structures by soil test borings. A total of (8) soil test borings (4 borings per structure) were drilled near proposed bent centerlines. Some of these borings were offset up to 3 meters due to railroad right of way access and utilities. Soil test borings were drilled utilizing a track-mounted CME 45 rig and truck-mounted CME 45 rig with a manual hammer. Borings were drilled using a 7.6 (cm) tricone bit with mud rotary methods. Standard penetration tests were performed at regular intervals, in accordance with American Association of State Highway Transportation Officials (AASHTO T-206-03), and North Carolina Department of Transportation (NCDOT) latest Geotechnical Guidelines and Procedures Manual.

Groundwater measurements were recorded within each borehole utilizing a weighted 30-meter tape from a survey reference location at the top of each boring. Readings were recorded immediately after boring termination and after a 24-hour waiting period. In the case of artesian conditions, flow rate and head measurements were taken at the time of drilling.

4.0 LABORATORY TESTING

Representative split-barrel sampler samples were selected from soil test borings to verify visual field classification and determine soil index properties. Twenty-two split-barrel samples were analyzed in our laboratory for Atterberg limits and grain size with hydrometer analysis. Two Shelby tube samples were obtained in the field and tested by a NCDOT approved laboratory for consolidation analysis. All testing was performed in accordance with the following American Society for Testing and Materials (ASTM), NCDOT Modified and/or AASHTO procedures:

- AASHTO T-88-00 (As Modified) "Particle Size Analysis of Soil"
- AASHTO T-89-02 (As Modified) "Determining the Liquid Limits of Soil"
- AASHTO T-90-00 "Determining the Plastic Limit and Plasticity of Soils"
- AASHTO T-265-93 (2000) "Laboratory Determination of Moisture Content of Soils"
- ASTM D 1140-00 (2006) "Amount of Material in Soils Finer than the #200 Sieve"
- ASTM D 2435-04 "Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading"

5.0 SUBSURFACE AND GROUNDWATER CONDITIONS

5.1 Structure 6 (Left Lane)

End Bents

Soils beneath End Bent 1 and 2 consist of Coastal Plain material. Three strata zones were encountered beneath the bent line.

Stratum 1 consists of 4.8 to 6.3 meters of undifferentiated post-Miocene deposits. Soils in this zone consist of medium stiff to stiff sandy clay (A-6, A-7-6) medium dense sands, and silty sands (A-1-b, A-2-4).

Stratum 2 was encountered between elevations 33.56 and 32.66 meters (MSL), and consists of 7.4 to 8.2 meters of very loose to loose clayey silty sands (A-2-4) and medium stiff sandy silty clay and silt with very little shell fragments (A-4, A-7-5) of the Yorktown Formation.

Stratum 3 was encountered between elevations 25.36 and 25.26 meters (MSL) and is classified as part of the Tar Heel Formation (Black Creek Group). Soils in this strata consist of gray over consolidated, occasionally highly plastic, hard sandy silts and clays (A-4, A-6, A-7-6) interbedded with dense to very dense, occasionally organic sands and silty sands (A-3, A-2-4). Cemented sands were encountered in isolated lenses within the Tar Heel Formation beneath end bent 1 and end bent 2.

Static groundwater was measured 1.40 to 1.54 meters below existing ground surface, between elevations 37.42 and 36.96 meters (MSL).

Interior Bents

Soils beneath Bent 1 and 2 consist of Coastal Plain material. Three strata zones were encountered beneath the bent line.

Stratum 1 consists of 4.9 to 6.7 meters of undifferentiated post-Miocene deposits. Soils in this zone consist of medium stiff to stiff sandy clay (A-6) medium dense sands, and clayey and silty sands (A-1-b, A-2-4, A-2-6).

Stratum 2 was encountered between the elevations of 33.47 and 31.86 meters (MSL), and consists of 6.7 to 7.7 meters of very loose to loose clayey silty sands (A-2-4) and medium stiff sandy silty clay with traces of shell fragments (A-7-6) of the Yorktown Formation.

Stratum 3 was encountered between the elevations of 25.77 and 25.19 meters (MSL) and is classified as part of the Tar Heel Formation (Black Creek Group). Soils in this strata consist of gray, over consolidated, occasionally highly plastic, hard sandy clays and silts (A-4, A-6, A-7-6) interbedded with dense to very dense, occasionally organic, sands and silty sands (A-3, A-2-4). Cemented sands were encountered in isolated lenses beneath bent 2 within the Tar Heel Formation.

Static groundwater was measured 1.40 meters below existing ground surface, between elevations 37.16 and 36.97 meters (MSL).

5.2 Structure 7 (Right Lane)

End Bents

Soils beneath End Bent 1 and 2 consist of Coastal Plain material. Three strata zones were encountered beneath the bent line.

Stratum 1 consists of 6.2 to 6.3 meters of undifferentiated post-Miocene deposits. Soils in this zone consist of medium stiff to stiff sandy clay (A-6, A-7-6) medium dense sands, and clayey sands (A-1-b, A-2-6).

Stratum 2 was encountered between elevations 32.77 and 32.56 meters (MSL), and consists of 7.5 to 7.7 meters of very loose to loose clayey silty sands (A-2-4) and medium stiff sandy silty clay and silt with very little shell fragments (A-4, A-7-5) of the Yorktown Formation.

Stratum 3 was encountered between elevations 25.12 and 25.03 meters (MSL) and is part of the Tar Heel Formation (Black Creek Group). Soils in this strata consist of gray over consolidated, occasionally highly plastic, hard sandy clays and silts (A-4, A-6, A-7-5) interbedded with dense to very dense, occasionally organic sands and silty sands (A-3, A-2-4). Cemented sands were encountered in isolated lenses within the Tar Heel Formation beneath end bent 2.

Static groundwater was measured 1.40 to 1.50 meters below existing ground surface, between elevations 37.52 and 37.33 meters (MSL).

Interior Bents

Soils beneath Bent 1 and 2 consist of Coastal Plain material. Three strata zones were encountered beneath the bent line.

Stratum 1 consists of 6.4 meters of undifferentiated post-Miocene deposits. Soils in this zone consist of medium stiff to stiff sandy clay (A-6, A-7-5) medium dense sands, and clayey and silty sands (A-1-b, A-2-4, A-2-6).

Stratum 2 was encountered at elevation 32.20 meters (MSL), and consists of 6.9 to 7.0 meters of very loose to loose clayey silty sands (A-2-4) and medium stiff sandy clayey silt with very little shell fragments (A-4) of the Yorktown Formation.

Stratum 3 was encountered between elevations 25.26 and 25.18 meters (MSL) and is part of the Tar Heel Formation (Black Creek Group). Soils in this strata consist of gray over consolidated, occasionally highly plastic, hard sandy silts and clays (A-4, A-6, A-7-5) interbedded with dense to very dense sands and silty sands (A-3, A-2-4). No cemented sand layers were encountered.

Static groundwater was measured 1.20 to 1.42 meters below existing ground surface, between elevations 37.39 and 37.18 meters (MSL).

6.0 NOTES TO DESIGNER

Based on our field exploration the following conditions may impact design and construction of the proposed structure. Therefore the designer should be aware of the following subsurface conditions:

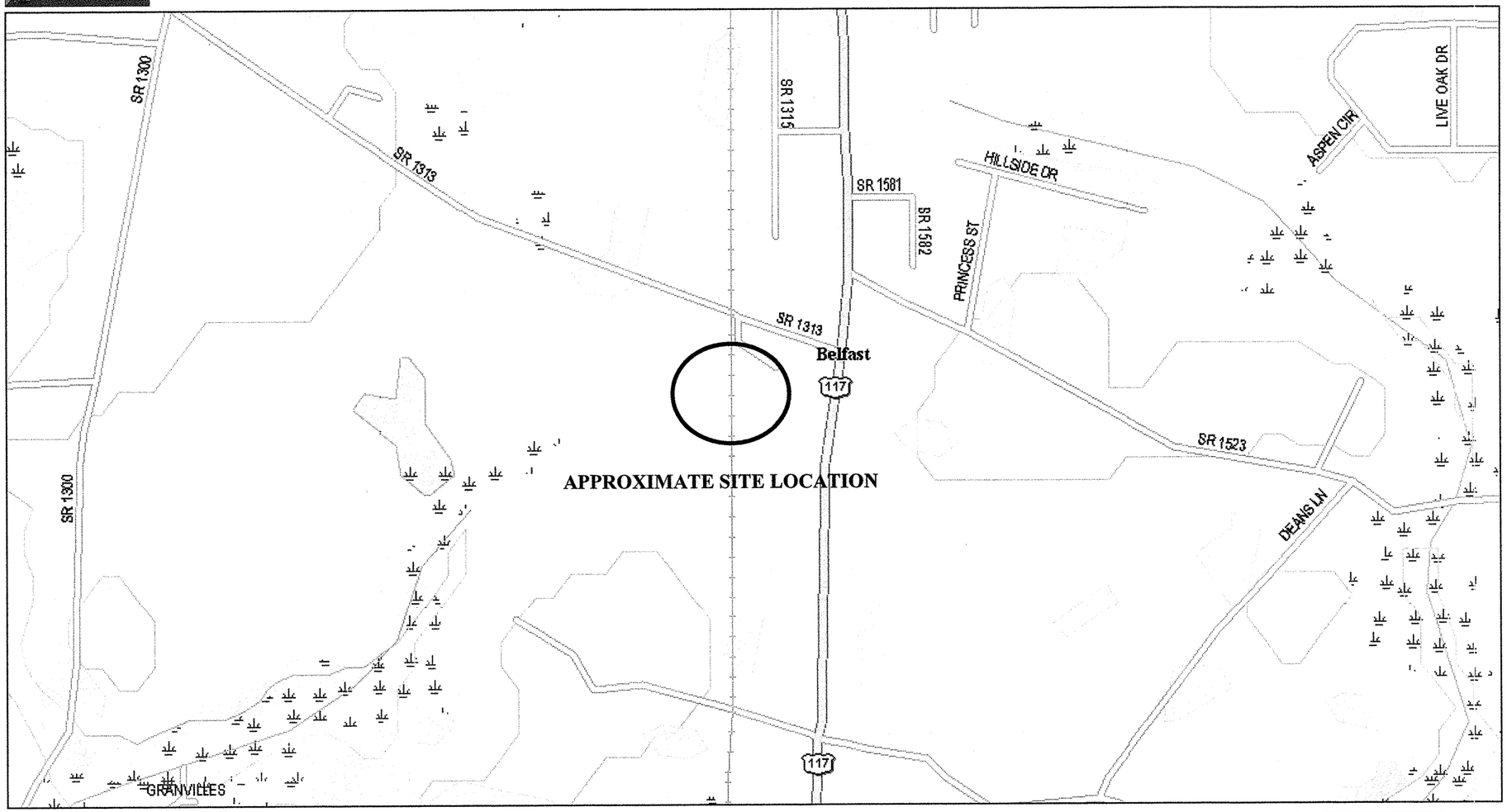
- Soft, highly plastic clay exists beneath Structure 6, B1-A between elevations 33.47 and 31.87 meters (MSL).
- Very dense sands were encountered beneath the entire site between elevations 23.09 and 15.53 meters (MSL). These sands are interlayered with hard clays.
- Tar Heel Formation sands and clays contain occasional small lenses of cemented sands in LL EB1, LL EB2, RL EB2. These layers exist throughout the site.
- Static groundwater was measured at shallow depths beneath Structure 6 and 7 between 1.20 and 1.54 meters below existing ground surface.

7.0 CLOSURE

Notes to the designer and evaluations provided by Tierra, Inc. are based on the Roadway Design Plans dated March 1, 2006, and Preliminary Design Drawings dated December 11, 2006, provided by NCDOT. Modifications to our report may be required if there are changes to the design or location of the proposed structure. Notes to the designer in this report are based on data obtained from soil borings. The nature and extent of variations between borings may not become evident until construction.

DELORME

Topo USA® 5.0



Data use subject to license.

© 2004 DeLorme. Topo USA® 5.0.

www.delorme.com

MN (9.2° W)

0 100 200 300 400 500 m

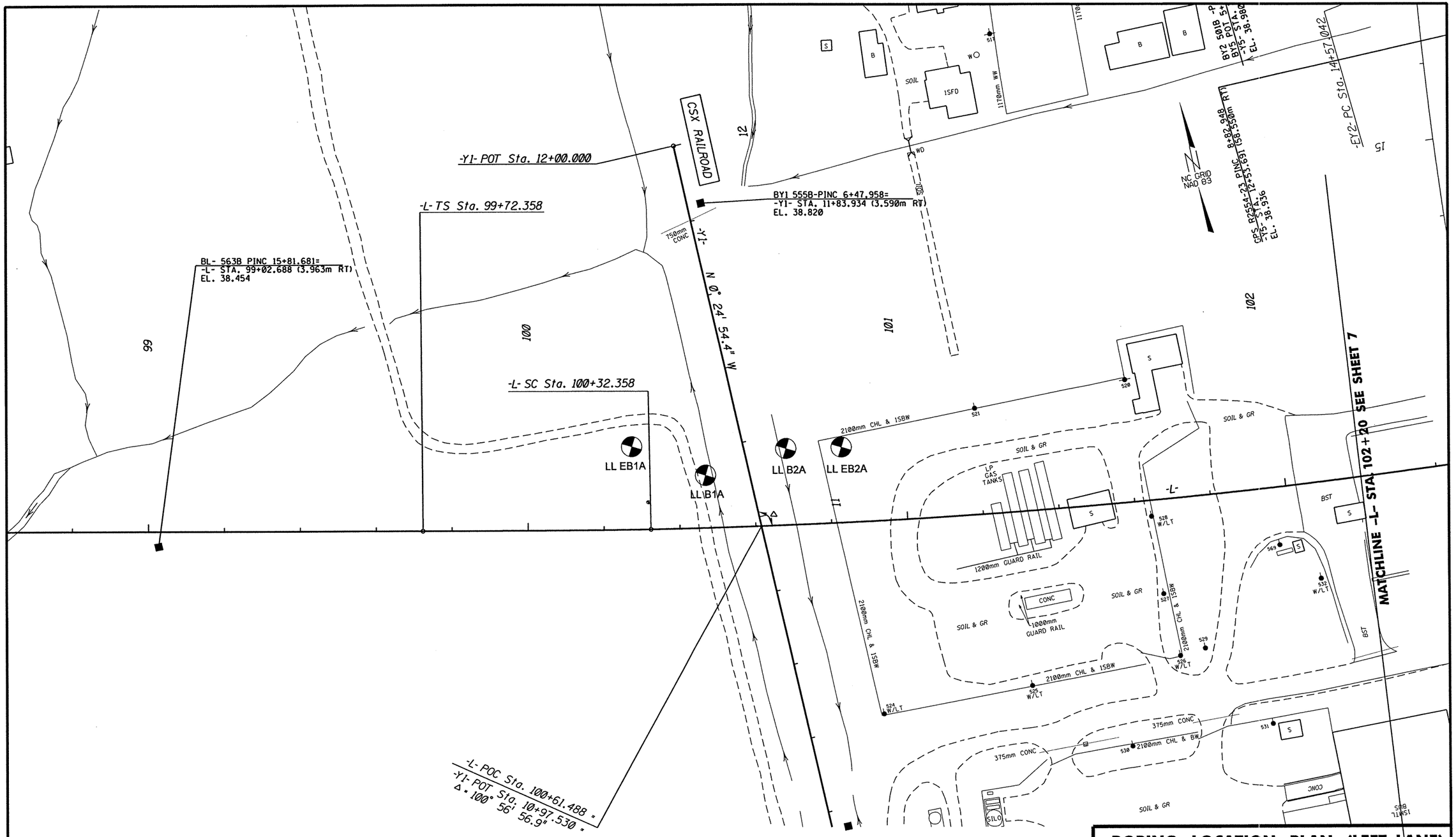
Data Zoom 14-0

SITE VICINITY MAP

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA GEOTECHNICAL • MATERIALS ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803



NOTES:

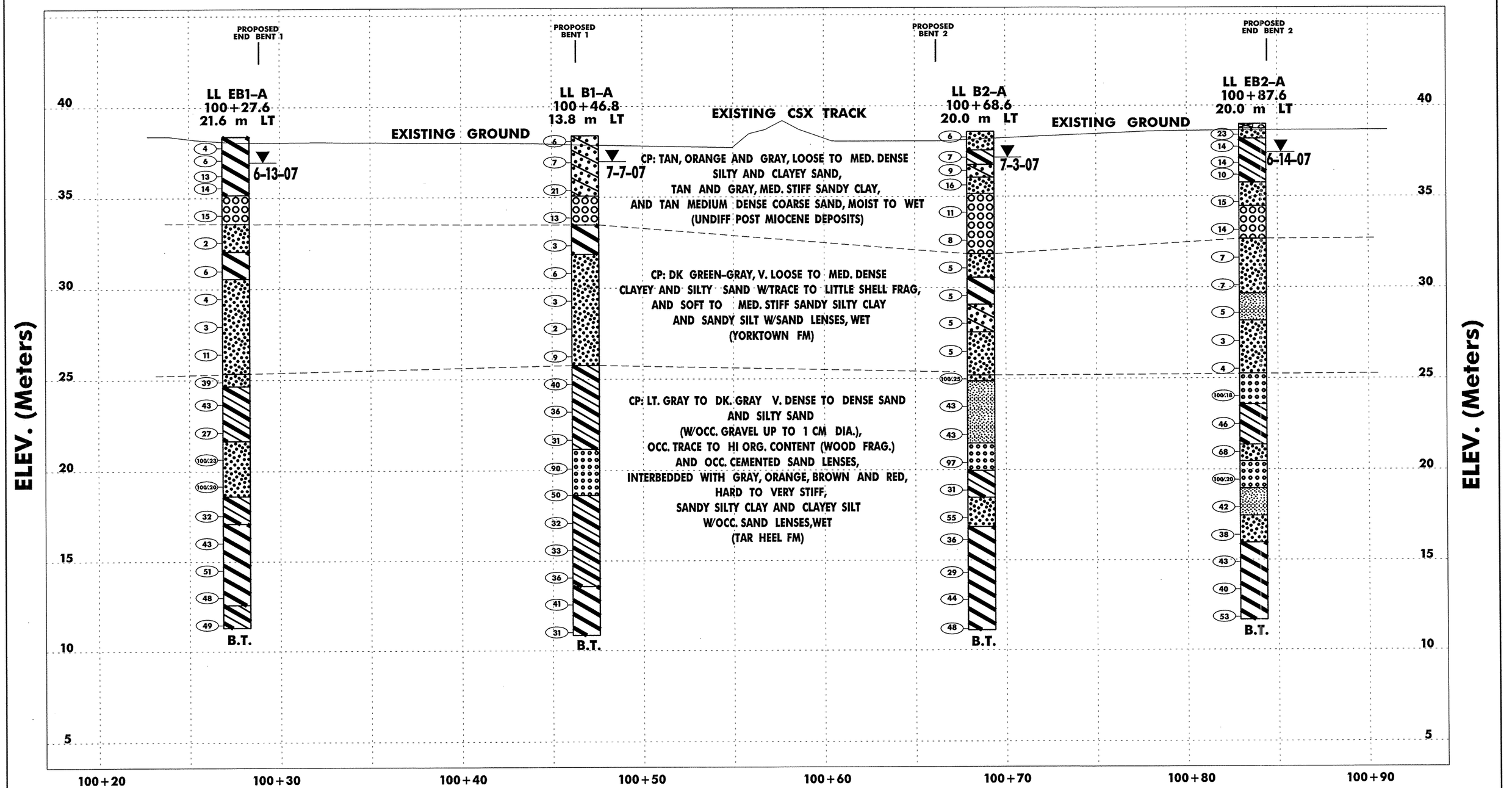
BENCH MARK: BL 556B PINC 17+77.540
-Y1- STA 10+15.204, 4.18 m RT ELEV 38.92 m MSL
PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED FROM NCDOT, DATED APRIL, 2007
PROPOSED BRIDGE SKEW: 78 TO 80 DEGREES

0 10 20 40
METER

BORING LOCATION PLAN (LEFT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX RAILROAD
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 3446 1.1.3

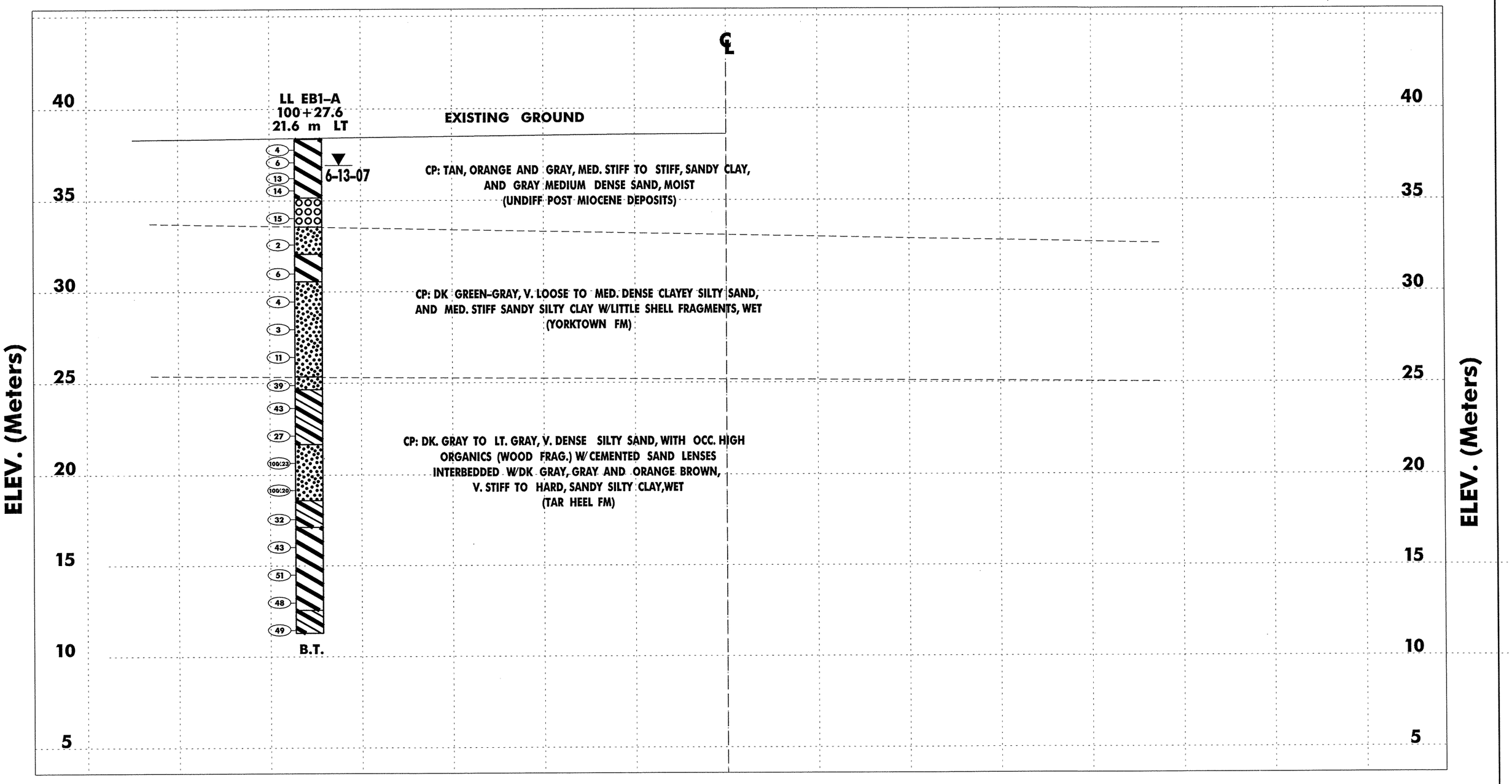
TIERRA
GEOTECHNICAL - MATERIALS ENGINEERING
TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803



STRUCTURE 6 PROFILE (LT LANE)
20m LT OF CENTERLINE

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0500
FAX (919) 871-0503

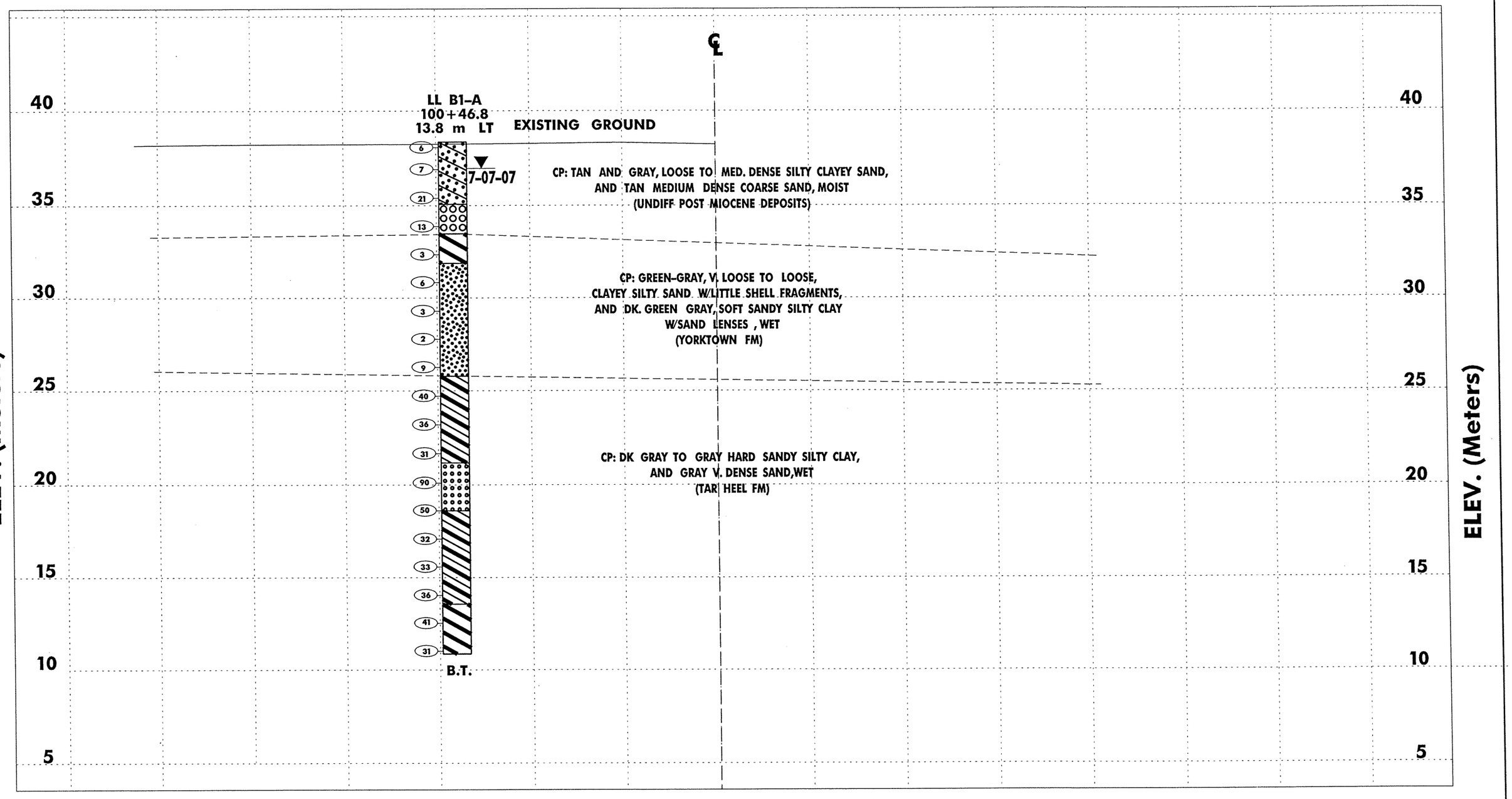


0 5 10M

CROSS SECTION END BENT 1
STRUCTURE 6 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL - MATERIALS ENGINEERING
TIERRA, INC.
2726 NOWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0444
FAX (919) 871-0403

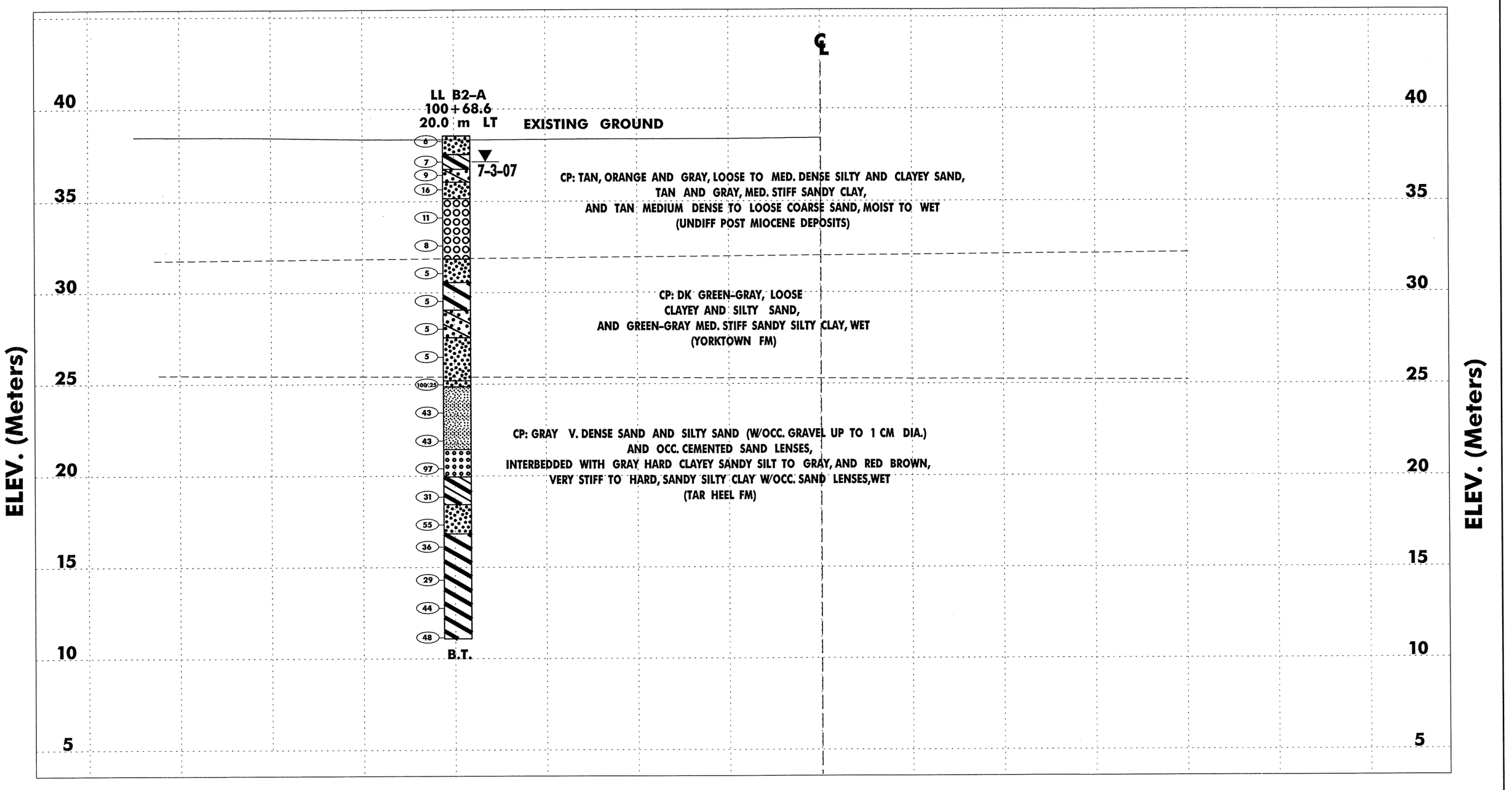


0 5 10M

CROSS SECTION BENT 1
STRUCTURE 6 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
9724 ROLAND RD.
RALEIGH, NC 27615
PHONE: (919) 871-8668
FAX: (919) 871-8663



0 5 10M

CROSS SECTION BENT 2
STRUCTURE 6 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE: (919) 871-9090
FAX: (919) 871-9093

LL EB2-A
100+87.6
20.0 m LT

EXISTING GROUND

23
14
14
10
6-14-07

CP: TAN, ORANGE AND WHITE, MED. DENSE CLAYEY SILTY SAND
TAN AND GRAY, STIFF SILTY SANDY CLAY,
AND WHITE MEDIUM DENSE SILTY COARSE SAND, MOIST TO WET
(UNDIFF POST MIOCENE DEPOSITS)

15
14
7
7
5
3
4

CP: GREEN-GRAY, V. LOOSE TO LOOSE,
CLAYEY SILTY SAND W/CLAY LENSES,
AND GREEN GRAY MED. STIFF SANDY CLAYEY SILT
W/SAND LENSES, WET
(YORKTOWN FM)

100/18
46
68
100/20
42
38
43
40
53

CP: GRAY V. DENSE SAND AND SILTY SAND (W/OCC. TRACE ORGANIC MATERIAL),
INTERBEDDED WITH GRAY AND RED BROWN HARD SANDY SILTY CLAY
AND CLAYEY SILT,WET
(TAR HEEL FM)

B.T.

ELEV. (Meters)

40 35 30 25 20 15 10 5

0 5 10M

CROSS SECTION END BENT 2
STRUCTURE 6 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
2726 ROWLAND RD.
RALEIGH, NC 27615
PHONE: (919) 871-0999
FAX: (919) 871-0965

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.	
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX				**GROUND WTR (m)**
BORING NO. LL EB1-A	**STATION** 100+27.6	**OFFSET** 21.6m LT	**ALIGNMENT** -L-	**0 HR.** 1.77
COLLAR ELEV. 38.36 m	**TOTAL DEPTH** 27.06 m	**NORTHING** 186,405.8	**EASTING** 701,847.8	**24 HR.** 1.40
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 06/11/07	**COMP. DATE** 06/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
39											
38.06	0.30								GROUND SURFACE	38.36	0.00
37.38	0.98	3	2	2	4		M		**COASTAL PLAIN** TAN, ORANGE AND GRAY, MED. STIFF TO STIFF, SANDY CLAY (A-7-6) MOTTLED (UNDIFF. POST MIOCENE DEPOSITS)		
36.53	1.83	2	3	3	6	SS-1	20%				
35.86	2.50	4	5	8	13		M				
34.34	4.02	4	5	9	14		M			35.16	3.20
32.81	5.55	5	7	8	15		M		**COASTAL PLAIN** GRAY, MED. DENSE, SAND (A-1-b)		
31.29	7.07	1	1	1	2		W			33.56	4.80
29.76	8.60	3	3	3	6	SS-2	61%		**COASTAL PLAIN** GREEN GRAY, V. LOOSE, CLAYEY SILTY SAND (A-2-4) (YORKTOWN FORMATION)		
28.24	10.12	1	2	2	4		W			32.06	6.30
26.72	11.64	1	2	1	3		W		**COASTAL PLAIN** DARK GREEN GRAY, MED. STIFF, SANDY SILTY CLAY (A-7-5)		
25.19	13.17	5	5	6	11		W			30.56	7.80
23.94	14.42	27	20	19	39		W		**COASTAL PLAIN** DARK GRAY, LOOSE TO V. LOOSE TO MED. DENSE, CLAYEY SILTY SAND (A-2-4) WITH LITTLE SHELL FRAGMENTS		
22.42	15.94	12	18	25	43	SS-3	W				
20.89	17.47	14	13	14	27		W				
19.37	18.99	51	49/.08		100/.23	SS-4	W			25.36	13.00
		65	35/.05		100/.20		W		**COASTAL PLAIN** DARK GRAY, DENSE, SILTY SAND (A-2-4) WITH HIGH ORGANICS (WOOD FRAG.) AND CEMENTED SAND (TARHEEL FORMATION)	24.66	13.70
									COASTAL PLAIN GRAY, HARD TO V. STIFF, SANDY CLAY (A-6)		
										21.66	16.70
									COASTAL PLAIN LIGHT GRAY, V. DENSE, SILTY SAND (A-2-4)		

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.	
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX				**GROUND WTR (m)**
BORING NO. LL EB1-A	**STATION** 100+27.6	**OFFSET** 21.6m LT	**ALIGNMENT** -L-	**0 HR.** 1.77
COLLAR ELEV. 38.36 m	**TOTAL DEPTH** 27.06 m	**NORTHING** 186,405.8	**EASTING** 701,847.8	**24 HR.** 1.40
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 06/11/07	**COMP. DATE** 06/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
19					Match Line				
17.85	20.51	9	14	18	32		W		**COASTAL PLAIN** GRAY, HARD, SILTY SANDY CLAY (A-6)
16.32	22.04	11	18	25	43	SS-5	W		
14.80	23.56	15	23	28	51		W		
13.27	25.09	13	21	27	48		W		**COASTAL PLAIN** DARK GRAY, HARD SANDY SILTY CLAY (A-7-6)
11.75	26.61	15	21	28	49		W		**COASTAL PLAIN** GRAY, AND ORANGE BROWN, HARD, SILTY SANDY CLAY (A-6) MOTTLED
									Boring Terminated at Elevation 11.30 m IN CP: CLAY (TARHEEL FORMATION)

18.61 — 19.75

17.11 — 21.25

12.56 — 25.80

11.30 — 27.06

HARD LAYERS
13.17-13.22M
13.62-13.70M

ST-1 7.01-7.71 M
ST-2 7.71-8.37 M
MUD DENSITY = 0.98 gcc

NCDOT BORE DOUBLE 07-027.GPJ NC_DOT.GDT 8/12/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX			**GROUND WTR (m)**
BORING NO. LL B1-A	**STATION** 100+46.8	**OFFSET** 13.8m LT	**ALIGNMENT** -L-
COLLAR ELEV. 38.37 m	**TOTAL DEPTH** 27.52 m	**NORTHING** 186,394.3	**EASTING** 701,865.2
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 07/06/07	**COMP. DATE** 07/06/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

0 HR. 1.83 **24 HR.** 1.40

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
39									
38.37	0.00								38.37 GROUND SURFACE 0.00
37.21	1.16	5	3	3	6		M		**COASTAL PLAIN** TAN AND GRAY, LOOSE TO MED. DENSE, SILTY CLAYEY SAND (A-2-6) (UNDIFF. POST MIOCENE DEPOSITS)
35.69	2.68	2	2	5	7		M		
34.16	4.21	3	7	14	21		M		35.07 3.30 **COASTAL PLAIN** TAN, MED. DENSE, COARSE SAND (A-1-b)
32.64	5.73	8	7	6	13		M		33.47 4.90 **COASTAL PLAIN** DARK GREEN GRAY, SOFT, SANDY SILTY CLAY (A-7-6) WITH SAND LENSES (YORKTOWN FORMATION)
31.12	7.25	1	2	1	3		W		31.87 6.50 **COASTAL PLAIN** GREEN GRAY, LOOSE TO V. LOOSE, SILTY SAND (A-2-4) WITH TRACE SHELL FRAG.
29.59	8.78	2	3	3	6		W		
28.07	10.30	1	1	2	3		W		
26.55	11.82	1	1	1	2		W		
25.02	13.35	5	5	4	9		W		25.77 12.60 **COASTAL PLAIN** DARK GRAY TO GRAY, HARD, SILTY SANDY CLAY (A-6) (TARHEEL FORMATION)
23.50	14.87	6	18	22	40		W		
21.97	16.40	10	16	20	36	SS-6	18%		
20.45	17.92	9	16	15	31		M		21.17 17.20 **COASTAL PLAIN** GRAY, V. DENSE, SAND (A-3)
18.92	19.45	30	38	52	90		W		
		34	26	24					

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX			**GROUND WTR (m)**
BORING NO. LL B1-A	**STATION** 100+46.8	**OFFSET** 13.8m LT	**ALIGNMENT** -L-
COLLAR ELEV. 38.37 m	**TOTAL DEPTH** 27.52 m	**NORTHING** 186,394.3	**EASTING** 701,865.2
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 07/06/07	**COMP. DATE** 07/06/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

0 HR. 1.83 **24 HR.** 1.40

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
19					Match Line		M		18.62 **COASTAL PLAIN** GRAY, HARD, SANDY CLAY (A-6) 19.75
17.40	20.97	9	14	18	32		M		
15.88	22.49	9	14	19	33		M		
14.35	24.02	10	15	21	36		M		13.57 24.80 **COASTAL PLAIN** DARK GRAY, HARD, SANDY SILTY CLAY (A-7-5)
12.83	25.54	12	18	23	41		M		
11.30	27.07	12	15	16	31		M		10.85 27.52 Boring Terminated at Elevation 10.85 m IN CP: CLAY (TARHEEL FORMATION) MUD DENSITY = 0.97 gcc NOTE: MOVED RIGHT ALONG BENTLINE DUE TO TREE BRANCHES

NCDOT BORE DOUBLE 07-027.GPJ NC_DOT.GDT 8/12/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX			**GROUND WTR (m)**
BORING NO. LL B2-A	**STATION** 100+68.6	**OFFSET** 20.0m LT	**ALIGNMENT** -L-
COLLAR ELEV. 38.56 m	**TOTAL DEPTH** 27.46 m	**NORTHING** 186,396.5	**EASTING** 701,887.4
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 07/02/07	**COMP. DATE** 07/02/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

0 HR. 1.68 **24 HR.** 1.40

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
39									
38.56	0.00								38.56 / 0.00 GROUND SURFACE
37.46	1.10	2	3	3	6		M		**COASTAL PLAIN** TAN, LOOSE, CLAYEY SILTY SAND (A-2-4) (UNDIFF. POST-MIOCENE DEP.) — 37.56 / 1.00
36.73	1.83	3	3	4	7				**COASTAL PLAIN** TAN AND GRAY, MED. STIFF, SANDY CLAY (A-6) — 36.76 / 1.80
35.94	2.62	4	4	5	9		W		**COASTAL PLAIN** TAN, LOOSE, SILTY CLAYEY SAND (A-2-6) — 36.06 / 2.50
34.42	4.14	6	8	8	16		W		**COASTAL PLAIN** TAN, MED. DENSE, CLAYEY SILTY COARSE SAND (A-2-4) — 35.16 / 3.40
32.89	5.67	3	6	5	11		W		**COASTAL PLAIN** TAN, ORANGE AND GRAY, MED. DENSE TO LOOSE, COARSE SAND (A-1-b)
31.37	7.19	3	5	3	8		W		
29.84	8.72	3	2	3	5		W		
28.32	10.24	2	2	3	5	SS-7	42%		
26.79	11.77	2	2	3	5		W		
25.27	13.29	2	1	4	5		W		
23.75	14.81	40	60/.1		100/.25		W		31.86 / 6.70 **COASTAL PLAIN** DARK GRAY, LOOSE, SILTY SAND (A-2-4) (YORKTOWN FORMATION) — 30.56 / 8.00 **COASTAL PLAIN** GREEN AND GRAY, MED. STIFF, SANDY SILTY CLAY (A-7-6) — 29.06 / 9.50 **COASTAL PLAIN** GREEN AND GRAY, LOOSE, SILTY CLAYEY SAND (A-2-6) — 27.56 / 11.00 **COASTAL PLAIN** GREEN AND GRAY, LOOSE, CLAYEY SILTY SAND (A-2-4) — 25.19 / 13.37 **COASTAL PLAIN** GRAY, V. DENSE, SILTY SAND (A-2-4) WITH GRAVEL (UP TO 1CM DIA) AND CEMENTED SANDS (TARHEEL FORMATION) — 24.86 / 13.70
22.22	16.34	16	19	24	43		W		**COASTAL PLAIN** GRAY, HARD, CLAYEY SANDY SILT (A-4)
20.70	17.86	10	22	21	43		W		21.46 / 17.10 **COASTAL PLAIN** GRAY, V. DENSE, SAND (A-3)
19.17	19.39	48	47	50	97		W		19.96 / 18.60 **COASTAL PLAIN** GRAY, HARD, SILTY SANDY CLAY (A-6)
		9	12	19	31		W		

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX			**GROUND WTR (m)**
BORING NO. LL B2-A	**STATION** 100+68.6	**OFFSET** 20.0m LT	**ALIGNMENT** -L-
COLLAR ELEV. 38.56 m	**TOTAL DEPTH** 27.46 m	**NORTHING** 186,396.5	**EASTING** 701,887.4
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 07/02/07	**COMP. DATE** 07/02/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

0 HR. 1.68 **24 HR.** 1.40

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
19					Match Line				
17.65	20.91	11	25	30	55		W		18.46 / 20.10 **COASTAL PLAIN** GRAY, V. DENSE, SLIGHTLY SILTY SAND (A-2-4)
16.13	22.43	11	16	20	36		W		16.86 / 21.70 **COASTAL PLAIN** GRAY AND RED BROWN, HARD TO V. STIFF TO HARD, SANDY SILTY CLAY (A-7-5) WITH SAND LENSES
14.60	23.96	9	12	17	29		W		
13.08	25.48	16	20	24	44		W		
11.55	27.01	14	20	28	48		W		11.10 / 27.46 Boring Terminated at Elevation 11.10 m IN CP: CLAY (TARHEEL FORMATION)

MUD DENSITY = 0.99 gcc

NCDOT BORE DOUBLE 07-027.GPJ NC_DOT.GDT 8/12/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX			**GROUND WTR (m)**
BORING NO. LL EB2-A	**STATION** 100+87.6	**OFFSET** 20.0m LT	**ALIGNMENT** -L-
COLLAR ELEV. 38.96 m	**TOTAL DEPTH** 27.30 m	**NORTHING** 186,393.7	**EASTING** 701,901.6
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 06/13/07	**COMP. DATE** 06/13/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

0 HR. 2.04 | **24 HR.** 1.54

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
39									
38.66	0.30								GROUND SURFACE (38.96 / 0.26) GRAY GRAVEL WITH SAND (A-1-a)
38.02	0.94	7	10	13	23		M		**COASTAL PLAIN** (38.16 / 0.80) TAN, MED. DENSE, CLAYEY SILTY SAND (A-2-4) (UNDIFF. POST MIOCENE DEP.)
37.13	1.83	6	7	7	14	SS-8	20%		**COASTAL PLAIN** TAN AND GRAY, STIFF, SILTY SANDY CLAY (A-6)
36.49	2.47	4	7	7	14		M		
34.97	3.99	1	5	5	10		W		(35.76 / 3.20) **COASTAL PLAIN** WHITE, MED. DENSE, SILTY COARSE SAND (A-2-4)
33.44	5.52	8	8	7	15		W		(34.46 / 4.50) **COASTAL PLAIN** WHITE AND ORANGE, MED. DENSE, SAND (A-1-b)
31.92	7.04	5	5	9	14		W		(32.66 / 6.30) **COASTAL PLAIN** GREEN GRAY, LOOSE, CLAYEY SILTY SAND (A-2-4) (YORKTOWN FORMATION)
30.40	8.56	2	3	4	7		W		
28.87	10.09	2	3	4	7		W		(29.66 / 9.30) **COASTAL PLAIN** GREEN GRAY, MED. STIFF, SANDY CLAYEY SILT (A-4) WITH SAND LENSES
27.35	11.61	2	2	3	5	SS-9	W		(28.16 / 10.80) **COASTAL PLAIN** GREEN GRAY, V. LOOSE TO LOOSE, CLAYEY SILTY SAND (A-2-4) WITH CLAY LENSES
25.82	13.14	2	2	1	3		W		
24.30	14.66	2	2	2	4		W		(25.26 / 13.70) **COASTAL PLAIN** GRAY, V. DENSE, SAND (A-3) WITH TRACE ORG. MATERIAL (TARHEEL FORMATION)
22.78	16.18	17	73	27/.03	100/.18		W		(23.56 / 15.40) **COASTAL PLAIN** GRAY, HARD SILTY SANDY CLAY (A-6)
21.25	17.71	21	19	27	46		W		
19.73	19.23	13	26	42	68		W		(21.36 / 17.60) **COASTAL PLAIN** GRAY, V. DENSE, SILTY SAND (A-2-4) (20.46 / 18.50) **COASTAL PLAIN** GRAY, V. DENSE, SAND (A-3)
		57	43/.05		100/.20		W		(18.96 / 20.00)

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX			**GROUND WTR (m)**
BORING NO. LL EB2-A	**STATION** 100+87.6	**OFFSET** 20.0m LT	**ALIGNMENT** -L-
COLLAR ELEV. 38.96 m	**TOTAL DEPTH** 27.30 m	**NORTHING** 186,393.7	**EASTING** 701,901.6
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 06/13/07	**COMP. DATE** 06/13/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

0 HR. 2.04 | **24 HR.** 1.54

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
19					Match Line				
18.20	20.76	11	20	22	42	SS-10	18% W		(17.46 / 21.50) **COASTAL PLAIN** GRAY, HARD, CLAYEY SANDY SILT (A-4) *(continued)*
16.68	22.28	19	22	16	38		W		(15.96 / 23.00) **COASTAL PLAIN** GRAY, DENSE, SILTY SAND (A-2-4)
15.16	23.80	8	19	24	43		W		**COASTAL PLAIN** GRAY AND RED-BROWN, HARD, SANDY SILTY CLAY (A-7-6) MOTTLED
13.63	25.33	10	17	23	40	SS-11	25% W		
12.11	26.85	18	25	28	53		W		(11.66 / 27.30) Boring Terminated at Elevation 11.66 m IN CP: CLAY (TARHELL FORMATION) HARD LAYERS 18.33-18.48M MUD DENSITY = 1.00 gcc

NCDOT BORE DOUBLE 07-027.GPJ NC_DOT.GDT 8/12/07

TIERRA, INC. 2736 ROWLAND ROAD, RALEIGH, NORTH CAROLINA 27615

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

US 70 (GOLDSBORO BYPASS) - STRUCTURE 6 (LEFT LANE)
ON -L- OVER -CSX-
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA
WAYNE COUNTY

TIERRA, INC. PROJECT NO: 6211-07-027

BORING #		SAMPLE #	TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED						
STATION #	OFFSET (METER)	DEPTH (METER)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY	LL	PI	%
LL EB1-A		SS-1	99	86	65	19	19	21	41	42	20	19.5
A-7-6												
100+27.58	21.56 m lt	0.98-1.43										
LL EB1-A		SS-2	100	99	89	1	14	49	36	45	15	60.5
A-7-5												
100+27.58	21.56 m lt	7.07-7.52										
LL EB1-A		SS-3	86	79	57	12	23	25	40	35	21	21.7
A-6												
100+27.58	21.56 m lt	13.17-13.62										
LL EB1-A		SS-4	100	99	28	2	70	18	10	21	NP	-
A-2-4												
100+27.58	21.56 m lt	17.47-17.92										
LL EB1-A		SS-5	100	98	91	2	11	21	66	47	23	21.7
A-7-6												
100+27.58	21.56 m lt	22.04-22.49										
LL B1-A		SS-6	100	98	76	5	21	47	27	28	17	17.8
A-6												
100+46.84	13.76 m lt	14.87-15.32										
LL B2-A		SS-7	100	99	69	8	27	38	27	66	51	42.4
A-7-6												
100+68.62	20.0 m lt	8.72-12.17										
LL EB2-A		SS-8	100	89	58	22	25	21	32	31	14	19.5
A-6												
100+87.63	19.98 m lt	0.98-1.43										
LL EB2-A		SS-9	100	99	66	11	25	41	23	31	8	-
A-4												
100+87.63	19.98 m lt	10.09-10.54										
LL EB2-A		SS-10	100	99	58	2	51	29	18	25	10	17.9
A-4												
100+87.63	19.98 m lt	20.76-21.21										
LL EB2-A		SS-11	100	99	89	3	11	20	66	54	31	24.8
A-7-6												
100+87.63	19.98 m lt	25.33-25.78										
LL EB1-A		ST-2	100	100	87	1	12	-	-	55	41	44.1
A-7-6 (37)												
100+27.58	21.56 m lt	8.0-8.2										

STRUCTURE 6 (LEFT LANE) CENTERLINE LOOKING UPSTATION STATION 100+00.

STRUCTURE 6 (LEFT LANE) PROFILE NEAR -L- LOOKING FROM EB2 DOWNSTATION.

SITE PHOTOGRAPHS
STRUCTURE 6 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7 ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

STRUCTURE 6 (LEFT LANE) END BENT 1 LOOKING LEFT TO RIGHT

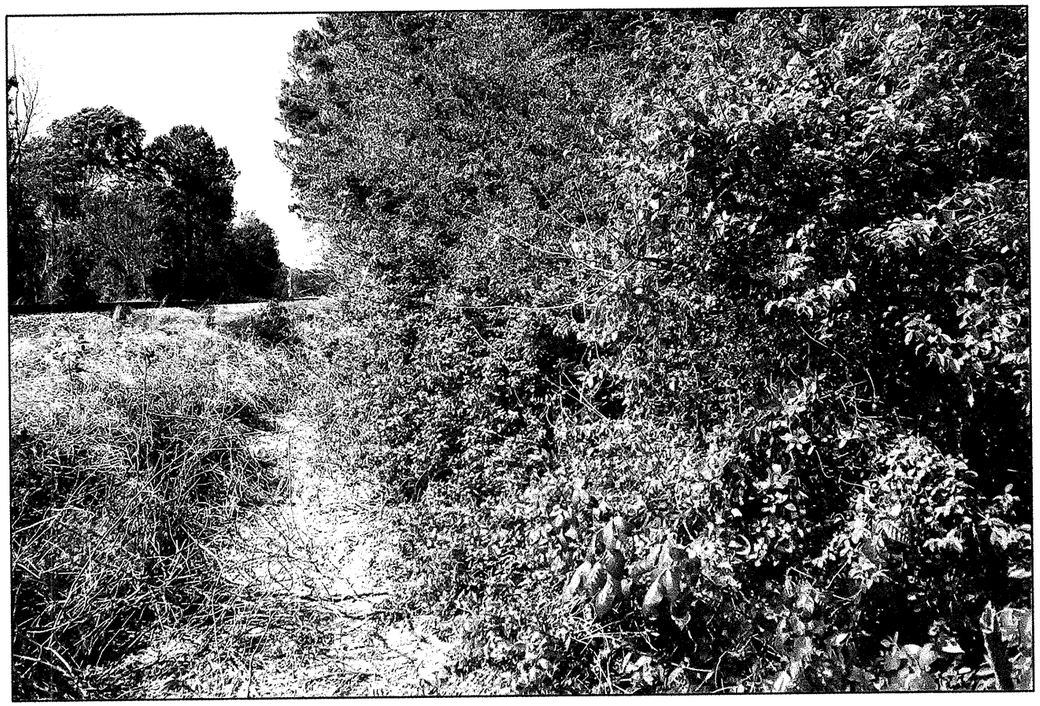
STRUCTURE 6 (LEFT LANE) BENT 1 LOOKING LEFT TO RIGHT

SITE PHOTOGRAPHS
STRUCTURE 6 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7 ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803



STRUCTURE 6 (LEFT LANE) BENT 2 LOOKING RIGHT TO LEFT

STRUCTURE 6 (LEFT LANE) END BENT 2 VICINITY LOOKING RIGHT TO LEFT

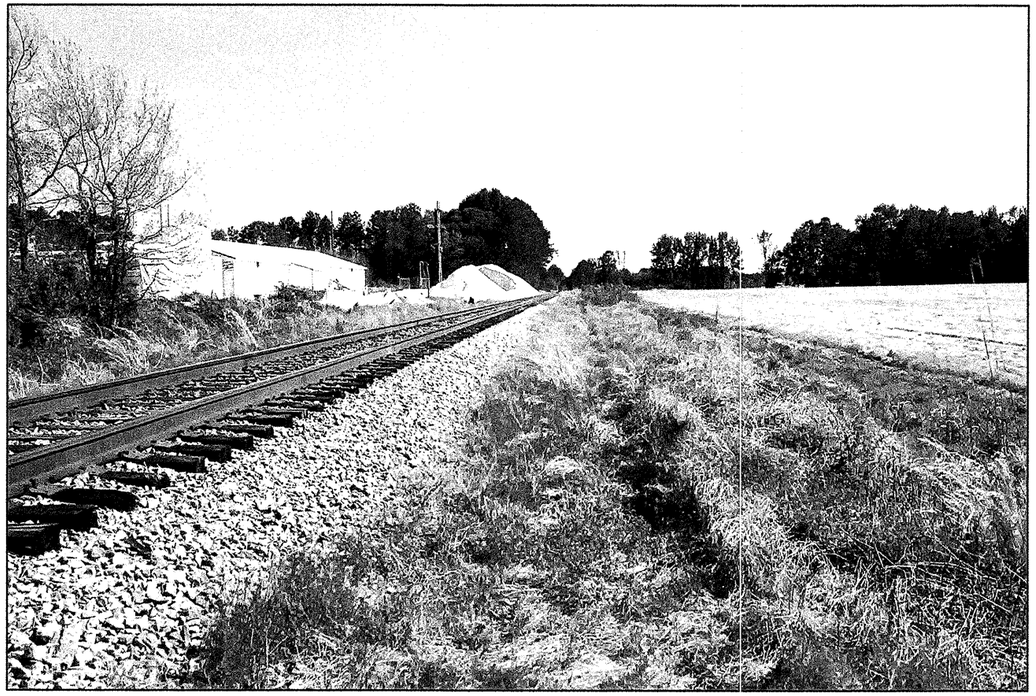
SITE PHOTOGRAPHS
STRUCTURE 6 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

CSX TRACKLINE LOOKING NORTH FROM CENTERLINE –L-



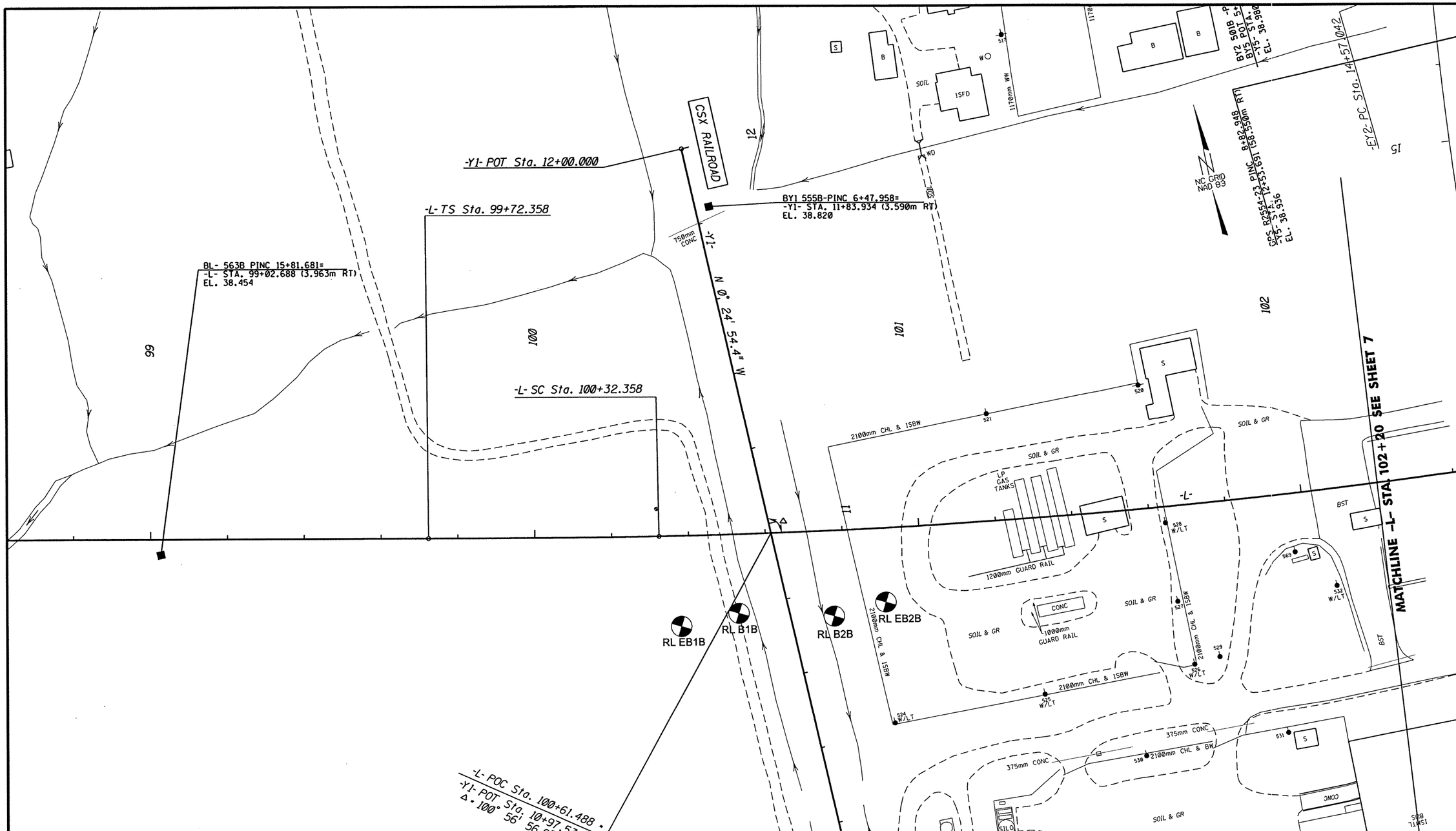
CSX TRACK LINE LOOKING SOUTH FROM CENTERLINE –L-

SITE PHOTOGRAPHS
STRUCTURE 6 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803



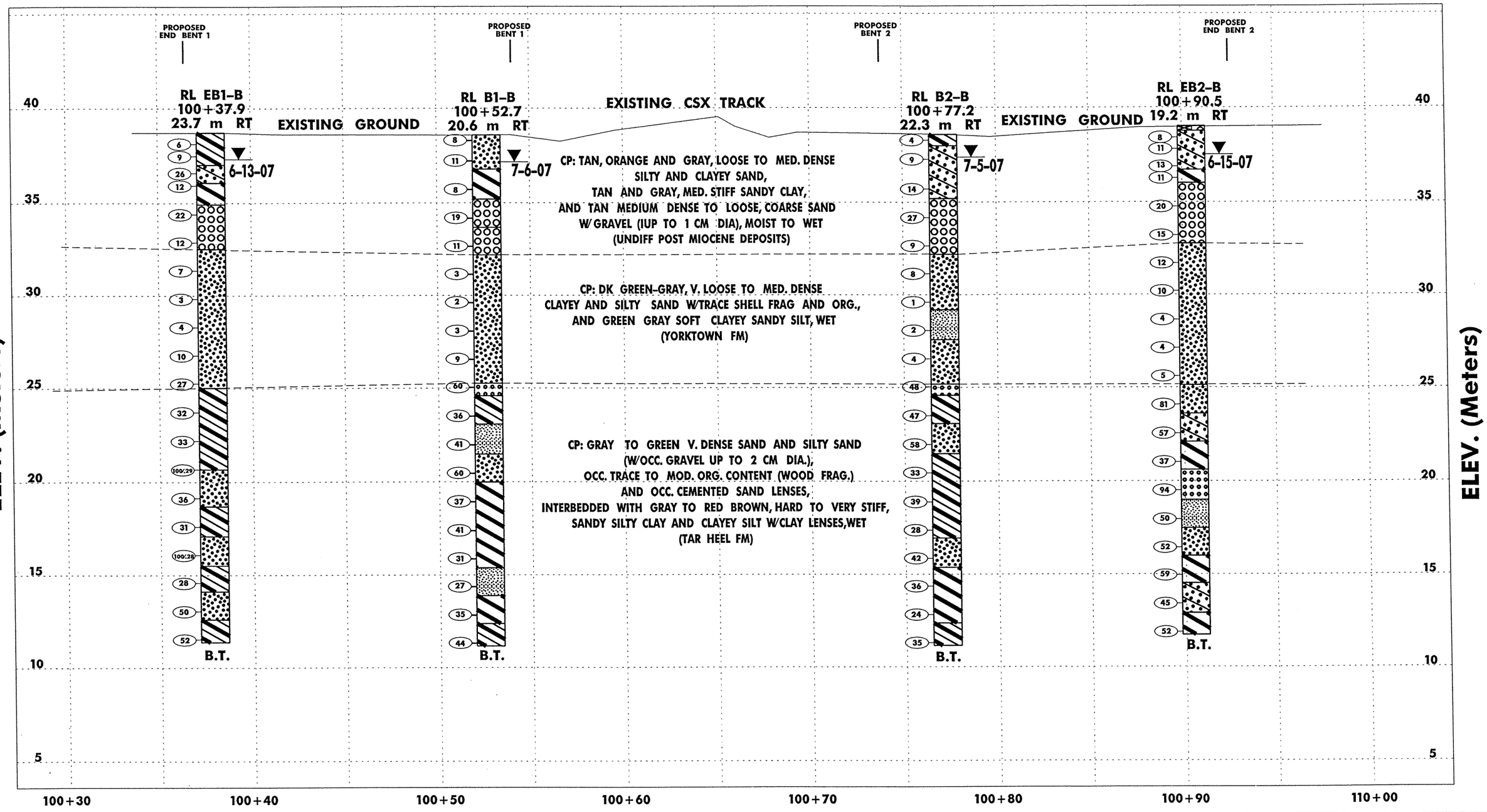
NOTES:

BENCH MARK: BL 556B PINC 17+77.540
-Y1- STA 10+15.204, 4.18 m RT ELEV 38.92 m MSL
PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED FROM NCDOT, DATED APRIL, 2007
PROPOSED BRIDGE SKEW: 78 TO 80 DEGREES

BORING LOCATION PLAN (RIGHT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX RAILROAD
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

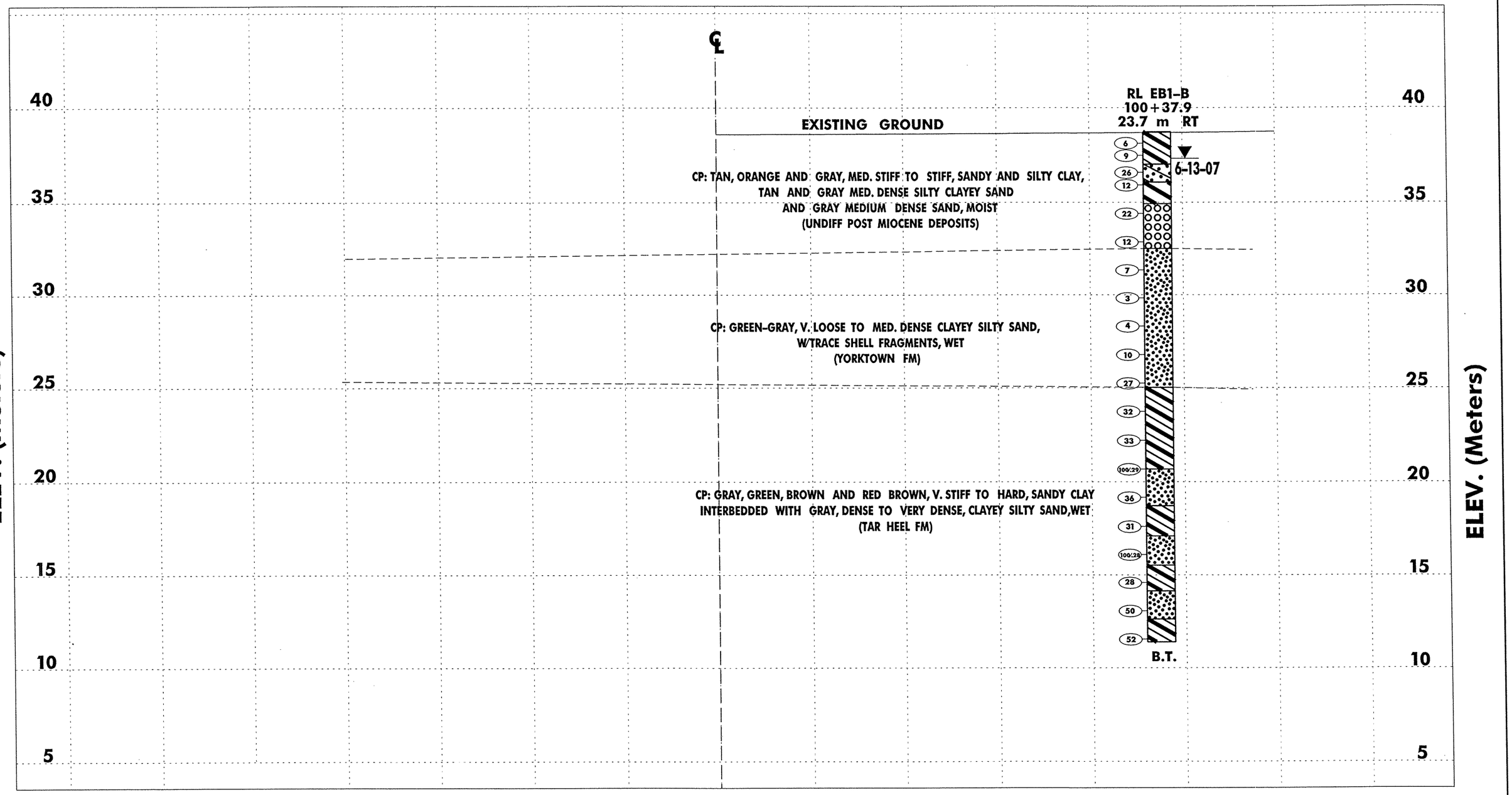
TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803



STRUCTURE 7 PROFILE (RT LANE)
20m RT OF CENTERLINE

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL · MATERIALS ENGINEERING
TIERRA, INC.
2136 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-8000
FAX (919) 871-8003

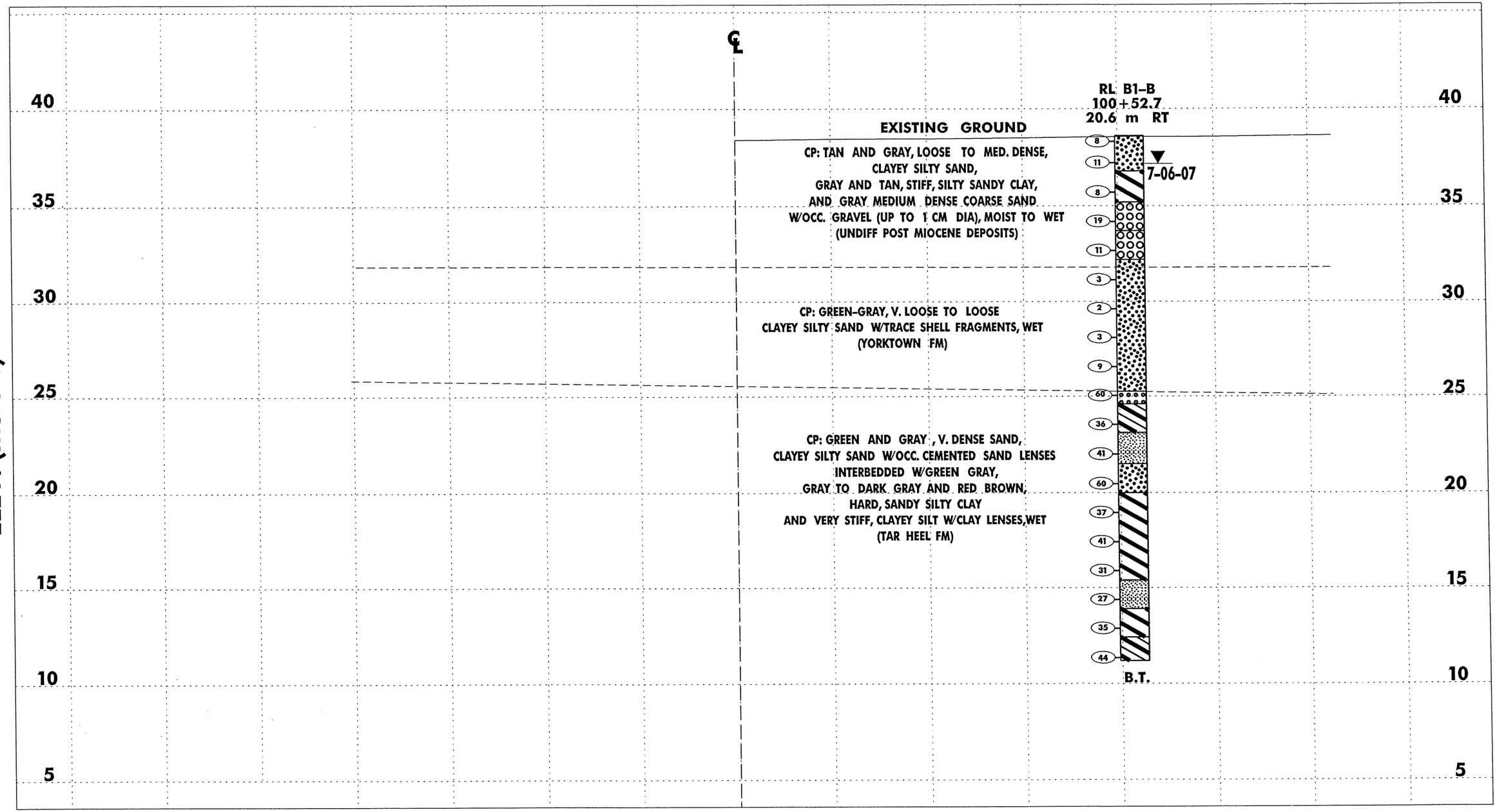


0 5 10M

CROSS SECTION END BENT 1
STRUCTURE 7 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

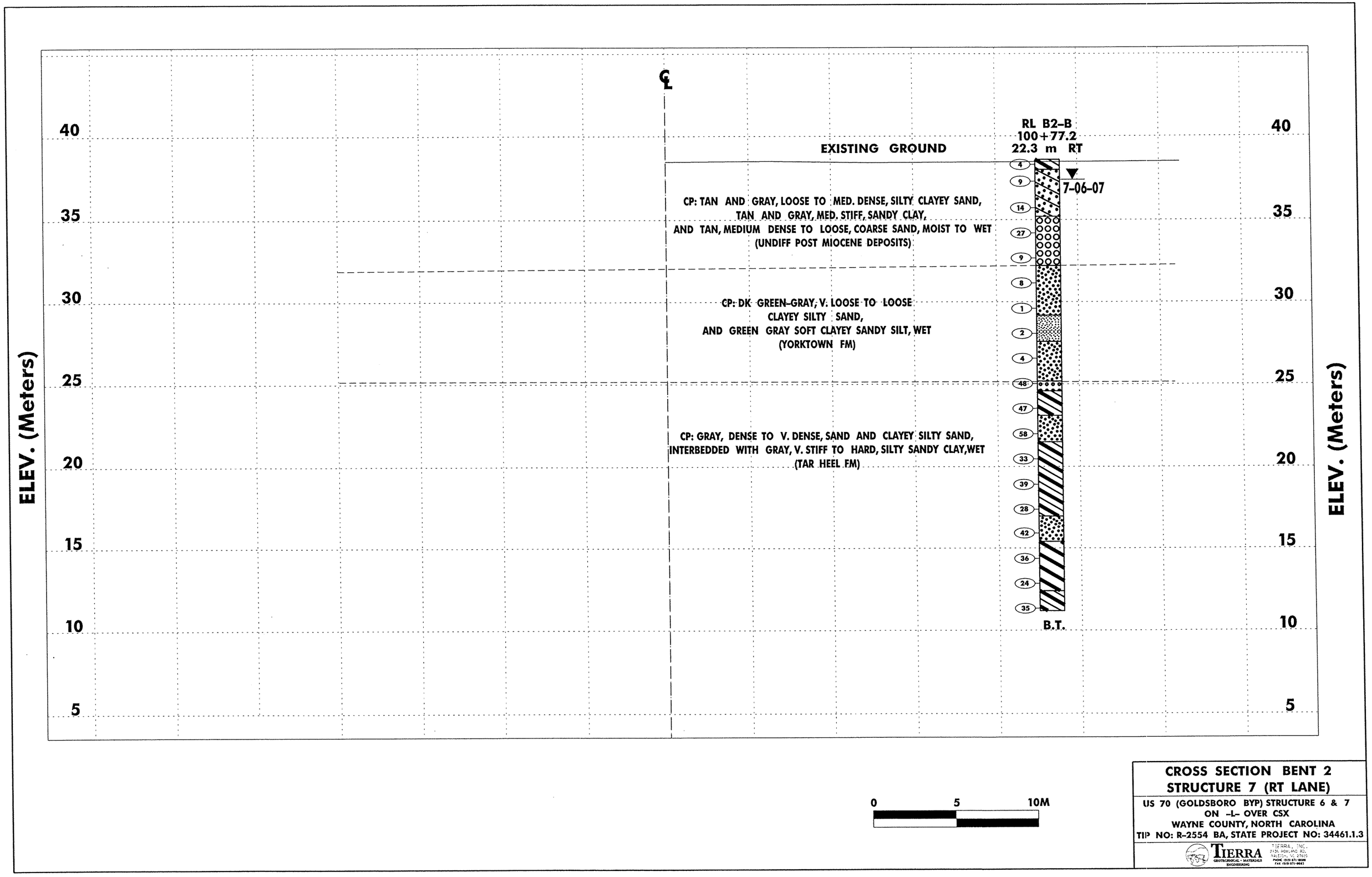
TIERRA
GEOTECHNICAL - MATERIALS ENGINEERING
TIERRA, INC.
2736 ROLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-9044
FAX (919) 871-9043



CROSS SECTION BENT 1
STRUCTURE 7 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

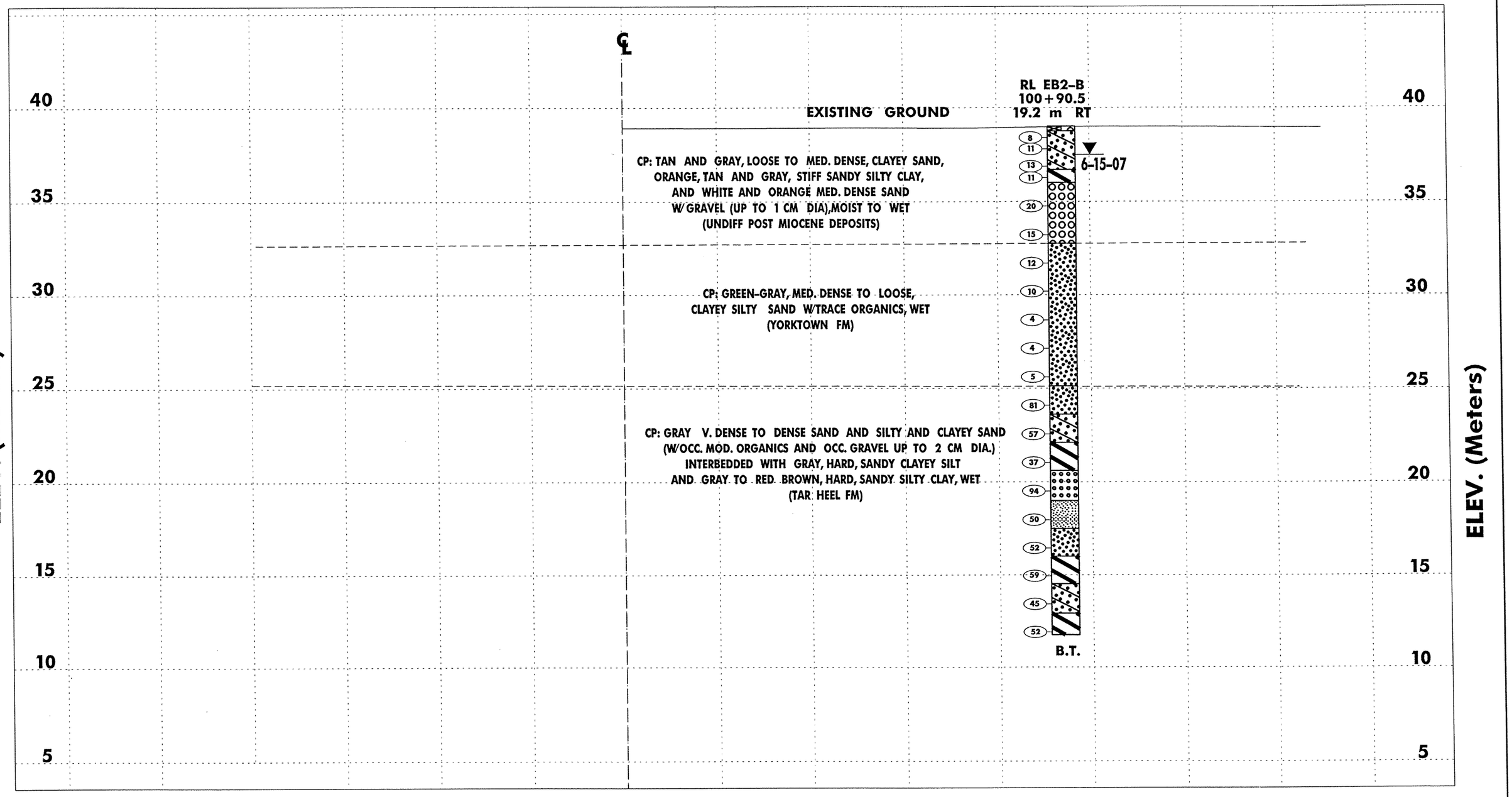
TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
2726 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-8004
FAX (919) 871-8003



CROSS SECTION BENT 2
STRUCTURE 7 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803



0 5 10M

CROSS SECTION END BENT 2
STRUCTURE 7 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL - MATERIALS ENGINEERING
TIERRA, INC.
3701 ROLING RD.
RALEIGH, NC 27615
PHONE (919) 871-8880
FAX (919) 871-8885

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.	
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX				**GROUND WTR (m)**
BORING NO. RL EB1-B	**STATION** 100+37.9	**OFFSET** 23.7m RT	**ALIGNMENT** -L-	**0 HR.** 2.01
COLLAR ELEV. 38.73 m	**TOTAL DEPTH** 27.33 m	**NORTHING** 186,359.4	**EASTING** 701,848.6	**24 HR.** 1.40
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 06/12/07	**COMP. DATE** 06/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
39											
38.43	0.30								GROUND SURFACE	38.73	0.00
37.75	0.98	2	3	3	6		M		**COASTAL PLAIN** GRAY AND TAN, MED. STIFF TO STIFF, SILTY SANDY CLAY (A-6) MOTTLED (UNDIFF. POST MIOCENE DEPOSITS)		
36.90	1.83	3	4	5	9						
36.23	2.50	9	11	15	26		M		**COASTAL PLAIN** TAN AND GRAY, MED. DENSE, SILTY CLAYEY SAND (A-2-6)	37.03	1.70
34.71	4.02	6	7	5	12	SS-12	20% M		**COASTAL PLAIN** ORANGE AND GRAY, STIFF, SANDY SILTY CLAY (A-7-6)	36.08	2.65
33.18	5.55	8	11	11	22		M		**COASTAL PLAIN** GRAY, MED. DENSE, SAND (A-1-b)	34.93	3.80
31.66	7.07	5	6	6	12	SS-13	W				
30.13	8.60	3	3	4	7		W		**COASTAL PLAIN** GREEN GRAY, LOOSE TO V. LOOSE TO MED. DENSE, CLAYEY SILTY SAND (A-2-4) WITH TRACE SHELL FRAGMENTS (YORKTOWN FORMATION)	32.53	6.20
28.61	10.12	1	2	1	3		W				
27.09	11.64	2	1	3	4	SS-14	W				
25.56	13.17	3	5	5	10		W				
24.04	14.69	5	4	23	27		W				
22.51	16.22	11	13	19	32		W				
20.99	17.74	10	15	18	33		W				
19.47	19.26	12	34	66/.14	100/.29		W				
		7	20	16	36		W				
										25.03	13.70
									COASTAL PLAIN GRAY BROWN, HARD, SILTY SANDY CLAY (A-6) (TARHEEL FORMATION)		
										20.69	18.04
									COASTAL PLAIN GRAY, V. DENSE TO DENSE, CLAYEY SILTY SAND (A-2-4)		
										18.73	20.00

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.	
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX				**GROUND WTR (m)**
BORING NO. RL EB1-B	**STATION** 100+37.9	**OFFSET** 23.7m RT	**ALIGNMENT** -L-	**0 HR.** 2.01
COLLAR ELEV. 38.73 m	**TOTAL DEPTH** 27.33 m	**NORTHING** 186,359.4	**EASTING** 701,848.6	**24 HR.** 1.40
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 06/12/07	**COMP. DATE** 06/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
19					Match Line				
17.94	20.79	8	15	16	31	SS-15	17% W		**COASTAL PLAIN** GRAY, HARD, SANDY SILTY CLAY (A-6) *(continued)*
16.42	22.31	43	50/.13		100/.28		W		**COASTAL PLAIN** GRAY, V. DENSE, SILTY SAND (A-2-4)
14.89	23.84	10	12	16	28		W		**COASTAL PLAIN** GRAY AND GREEN, V. STIFF, SANDY SILTY CLAY (A-6)
13.37	25.36	11	30	20	50	SS-16	W		**COASTAL PLAIN** GRAY, DENSE, CLAYEY SILTY SAND (A-2-4)
11.85	26.88	13	21	31	52		W		**COASTAL PLAIN** GRAY AND RED BROWN, HARD, SANDY SILTY CLAY (A-6) MOTTLED
									Boring Terminated at Elevation 11.40 m IN CP: CLAY (TARHEEL FORMATION)
									MUD DENSITY = 0.97 gcc

ELEV. (m)	DEPTH (m)
17.13	21.60
15.53	23.20
14.13	24.60
12.63	26.10
11.40	27.33

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE		**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX				**GROUND WTR (m)**
BORING NO. RL B1-B	**STATION** 100+52.7	**OFFSET** 20.6m RT	**ALIGNMENT** -L-	**0 HR.** 1.89
COLLAR ELEV. 38.60 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 186,359.6	**EASTING** 701,864.0	**24 HR.** 1.42
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 07/05/07	**COMP. DATE** 07/05/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
39											
38.60	0.00								GROUND SURFACE	38.60	0.00
		6	4	4	8		M		**COASTAL PLAIN** TAN AND GRAY, LOOSE, CLAYEY SILTY SAND (A-2-4)		
37.53	1.07									36.80	1.80
		3	4	7	11				**COASTAL PLAIN** GRAY AND TAN , STIFF, SILTY SANDY CLAY (A-7-5)		
36.01	2.59						W			35.20	3.40
		3	3	5	8				**COASTAL PLAIN** GRAY, MED. DENSE, COARSE SAND (A-1-a) WITH GRAVEL (UP TO 1 CM DIA.)		
34.49	4.11									33.70	4.90
		10	9	10	19		W		**COASTAL PLAIN** GRAY, MED. DENSE, SAND (A-1-b)		
32.96	5.64									32.20	6.40
		3	3	8	11		W		**COASTAL PLAIN** GREEN GRAY, V. LOOSE TO LOOSE, CLAYEY SILTY SAND (A-2-4) WITH TRACE SHELL FRAG. (YORKTOWN FORMATION)		
31.44	7.16										
		2	1	2	3		W				
29.91	8.69										
		1	1	1	2		W				
28.39	10.21										
		1	1	2	3		W				
26.87	11.73										
		3	4	5	9		W				
25.34	13.26									25.26	13.34
		5	25	35	60		W		**COASTAL PLAIN** GRAY AND GREEN, V. DENSE, SAND (A-3) WITH CEMENTED SAND LENSES (TARHEEL FORMATION)	24.60	14.00
23.82	14.78								**COASTAL PLAIN** GREEN AND GRAY, HARD SILTY SANDY CLAY (A-6)	23.10	15.50
		13	15	21	36		W		**COASTAL PLAIN** GRAY, HARD, CLAYEY SANDY SILT (A-4)	21.50	17.10
22.29	16.31								**COASTAL PLAIN** GRAY, V. DENSE, CLAYEY SILTY SAND (A-2-4)	20.00	18.60
		10	14	27	41		W		**COASTAL PLAIN** DARK GRAY, HARD, SANDY SILTY CLAY (A-7-5)		
20.77	17.83										
		14	26	34	60	SS-17	W				
19.26	19.34										
		11	15	22	37		W				

NCDOT BORE DOUBLE 07-027.GPJ NC_DOT.GDT 8/12/07

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE		**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX				**GROUND WTR (m)**
BORING NO. RL B1-B	**STATION** 100+52.7	**OFFSET** 20.6m RT	**ALIGNMENT** -L-	**0 HR.** 1.89
COLLAR ELEV. 38.60 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 186,359.6	**EASTING** 701,864.0	**24 HR.** 1.42
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 07/05/07	**COMP. DATE** 07/05/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
19					Match Line				
17.72	20.88	12	18	23	41		W		**COASTAL PLAIN** DARK GRAY, HARD, SANDY SILTY CLAY (A-7-5) *(continued)*
16.20	22.40	13	13	18	31		M		
14.67	23.93	6	12	15	27		M		**COASTAL PLAIN** GRAY, V. STIFF, SANDY CLAYEY SILT (A-4) WITH CLAY LENSES
13.15	25.45	12	16	19	35		M		**COASTAL PLAIN** DARK GRAY AND BROWN, HARD, SANDY SILTY CLAY (A-7-5) MOTTLED
11.63	26.97	16	21	23	44		M		**COASTAL PLAIN** GRAY AND RED BROWN, HARD, SILTY SANDY CLAY (A-6)
									Boring Terminated at Elevation 11.18 m IN CP: CLAY (TARHEEL FORMATION)

MUD DENSITY = 1.01 gcc

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX			**GROUND WTR (m)**
BORING NO. RL B2-B	**STATION** 100+77.2	**OFFSET** 22.3m RT	**ALIGNMENT** -L-	**0 HR.** 2.22
COLLAR ELEV. 38.59 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 186,351.5	**EASTING** 701,888.7	**24 HR.** 1.20
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 07/03/07	**COMP. DATE** 07/03/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
39									
38.59	0.00								ELEV. (m) 38.59 GROUND SURFACE — DEPTH (m) 0.00
		3	2	2	4		M		**COASTAL PLAIN** TAN AND GRAY, MED. STIFF, SANDY CLAY (A-6) (UNDIFF. POST-MIOCENE DEP.) 37.99 — 0.60
37.52	1.07								
		3	4	5	9		M		**COASTAL PLAIN** GRAY AND TAN, LOOSE TO MED. DENSE, SILTY CLAYEY SAND (A-2-6)
36.00	2.59								
		8	6	8	14		W		
34.48	4.11								
		16	16	11	27	SS-18	W		35.19 — 3.40
32.95	5.64								**COASTAL PLAIN** TAN, MED. DENSE TO LOOSE, COARSE SAND (A-1-b)
		4	4	5	9		W		
31.43	7.16								32.19 — 6.40
		4	4	4	8		W		**COASTAL PLAIN** DARK GRAY, LOOSE TO V. LOOSE, SILTY SAND (A-2-4) (YORKTOWN FORMATION)
29.90	8.69								
		WOH	WOH	1	1		W		
28.38	10.21								
		2	1	1	2		W		29.19 — 9.40
26.86	11.73								**COASTAL PLAIN** GREEN GRAY, SOFT, CLAYEY SANDY SILT (A-4)
		2	2	2	4		W		27.59 — 11.00
25.33	13.26								**COASTAL PLAIN** GREEN GRAY, LOOSE, CLAYEY SILTY SAND (A-2-4)
		2	18	30	48		W		
23.81	14.78								25.18 — 13.41
		15	22	25	47		W		**COASTAL PLAIN** GRAY, DENSE, SLI. SILTY SAND (A-3) (TARHEEL FORMATION) 24.59 — 14.00
22.28	16.31								**COASTAL PLAIN** GRAY, HARD, SILTY SANDY CLAY (A-6)
		16	27	31	58		W		23.09 — 15.50
20.76	17.83								**COASTAL PLAIN** GRAY, V. DENSE, CLAYEY SILTY SAND (A-2-4)
		8	13	20	33		W		21.49 — 17.10
19.25	19.34								**COASTAL PLAIN** GRAY, HARD TO V. STIFF, SANDY CLAY (A-6)
		10	17	22	39		W		

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX			**GROUND WTR (m)**
BORING NO. RL B2-B	**STATION** 100+77.2	**OFFSET** 22.3m RT	**ALIGNMENT** -L-	**0 HR.** 2.22
COLLAR ELEV. 38.59 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 186,351.5	**EASTING** 701,888.7	**24 HR.** 1.20
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 07/03/07	**COMP. DATE** 07/03/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
19					Match Line				
17.71	20.88	8	12	16	28		W		**COASTAL PLAIN** GRAY, HARD TO V. STIFF, SANDY CLAY (A-6) *(continued)*
16.19	22.40	26	20	22	42		W		15.99 — 21.60
14.66	23.93	10	15	21	36		W		**COASTAL PLAIN** GRAY, DENSE, SILTY SAND (A-2-4)
13.14	25.45	8	10	14	24		W		15.39 — 23.20
11.62	26.97	13	17	18	35		W		**COASTAL PLAIN** GRAY, HARD, SILTY SANDY CLAY (A-6)
									12.39 — 26.20
									COASTAL PLAIN GRAY, HARD, SILTY SANDY CLAY (A-6)
									11.17 — 27.42
									Boring Terminated at Elevation 11.17 m IN CP: CLAY (TARHEEL FORMATION)
									ROOTMAT = 0.10 M
									MUD DENSITY = 1.00 gcc
									NOTE: MOVED HOLE UPSTATION DUE TO BURIED LINES, MOVED TO RIGHT DUE TO TREE BRANCHES.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX			**GROUND WTR (m)**
BORING NO. RL EB2-B	**STATION** 100+90.5	**OFFSET** 19.2m RT	**ALIGNMENT** -L-
COLLAR ELEV. 39.02 m	**TOTAL DEPTH** 27.27 m	**NORTHING** 186,354.1	**EASTING** 701,902.0
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 06/14/07	**COMP. DATE** 06/14/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

0 HR. 1.74 **24 HR.** 1.50

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
40									
39.02	0.00								GROUND SURFACE
38.77	0.25								**ARTIFICIAL FILL** GRAY GRAVEL (A-1-a)
38.72	0.30	7	5	3	8		M		**COASTAL PLAIN** TAN AND GRAY, LOOSE TO MED. DENSE, CLAYEY SAND (A-2-6) (UNDIFF POST MIOCENE DEP.)
38.11	0.91	3	4	7	11		M		
37.19	1.83	7	6	7	13		M		
36.72	2.30								
36.58	2.44	4	5	6	11	SS-19	25%		**COASTAL PLAIN** GRAY, ORANGE AND TAN, STIFF, SANDY SILTY CLAY (A-7-6)
36.02	3.00								
35.06	3.96	7	11	9	20		W		**COASTAL PLAIN** ORANGE AND WHITE, MED. DENSE, SAND (A-1-b) TO TAN W/ GRAVEL (UP TO 1 CM DIA)
33.53	5.49	7	6	9	15		W		
32.01	7.01	4	5	7	12	SS-20	W		
30.49	8.53	3	4	6	10		W		
28.96	10.06	1	2	2	4		W		
27.44	11.58	1	2	2	4		W		
25.91	13.11	2	2	3	5	SS-21	W		
25.12	13.90								**COASTAL PLAIN** GREEN GRAY, MED. DENSE TO LOOSE, CLAYEY SILTY SAND (A-2-4) WITH TRACE ORG. (YORKTOWN FORMATION)
24.39	14.63	26	35	46	81		W		
23.62	15.40								**COASTAL PLAIN** DARK GRAY, V. DENSE, SILTY SAND (A-2-4) WITH OCC. GRAVEL UP TO 2 CM DIAMETER AND MOD. ORG. (TARHEEL FORMATION)
22.87	16.15	15	30	27	57		W		
22.12	16.90								**COASTAL PLAIN** GRAY, V. DENSE, SILTY CLAYEY SAND (A-2-6)
21.34	17.68	10	16	21	37	SS-22	19%		
20.62	18.40								**COASTAL PLAIN** GRAY, HARD, SANDY SILTY CLAY (A-7-6)
19.82	19.20								**COASTAL PLAIN** GRAY, V. DENSE, SAND (A-3)

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 BYPASS STRUCTURE 6 & 7 ON -L- OVER CSX			**GROUND WTR (m)**
BORING NO. RL EB2-B	**STATION** 100+90.5	**OFFSET** 19.2m RT	**ALIGNMENT** -L-
COLLAR ELEV. 39.02 m	**TOTAL DEPTH** 27.27 m	**NORTHING** 186,354.1	**EASTING** 701,902.0
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 06/14/07	**COMP. DATE** 06/14/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

0 HR. 1.74 **24 HR.** 1.50

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
20					Match Line				
19.02	20.00	14	55	39	94		W		**COASTAL PLAIN** GRAY, V. DENSE, SAND (A-3) *(continued)*
18.29	20.73	12	21	29	50		W		**COASTAL PLAIN** GRAY, HARD, SANDY CLAYEY SILT (A-4)
17.52	21.50								
16.77	22.25	22	23	29	52		W		**COASTAL PLAIN** GRAY, V. DENSE, CLAYEY SILTY SAND (A-2-4)
16.02	23.00								
15.25	23.77	18	28	31	59		W		**COASTAL PLAIN** GRAY, HARD, SANDY SILTY CLAY (A-7-5)
14.52	24.50								
13.72	25.30	17	20	25	45		W		**COASTAL PLAIN** GRAY, DENSE, CLAYEY SAND (A-2-6)
12.92	26.10								
12.20	26.82	19	25	27	52		W		**COASTAL PLAIN** GRAY AND RED BROWN, HARD, SANDY SILTY CLAY (A-7-5) MOTTLED
11.75	27.27								Boring Terminated at Elevation 11.75 m IN CP: CLAY (TARHEEL FORMATION)

HARD LAYER AT 21.50-21.52M

MUD DENSITY = 1.01 gcc

NCDOT BORE DOUBLE 07-027.GPJ NC_DOT.GDT 8/12/07

TIERRA, INC. 2736 ROWLAND ROAD, RALEIGH, NORTH CAROLINA 27615

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

US 70 (GOLDSBORO BYPASS) - STRUCTURE 7 (RIGHT LANE)
ON -L- OVER -CSX-
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA
WAYNE COUNTY

TIERRA, INC. PROJECT NO: 6211-07-027

BORING #		SAMPLE #	TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED						
STATION #	OFFSET (METER)	DEPTH (METER)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY	LL	PI	%
RL EB1-B		SS-12	100	87	66	19	19	10	52	50	26	-
A-7-6												
100+37.86	23.68 m rt	2.50-2.95										
RL EB1-B		SS-13	98	46	5	89	5	1	5	21	NP	-
A-1-b												
100+37.86	23.68 m rt	5.55-6.00										
RL EB1-B		SS-14	100	95	28	19	54	6	21	28	NP	-
A-2-4												
100+37.86	23.68 m rt	10.12-10.57										
RL EB1-B		SS-15	100	99	84	3	21	26	50	33	14	17.1
A-6												
100+37.86	23.68 m rt	20.79-21.24										
RL EB1-B		SS-16	100	96	21	10	74	0	16	27	NP	-
A-2-4												
100+37.86	23.68 m rt	25.36-25.81										
RL B1-B		SS-17	100	93	26	21	54	11	14	21	5	-
A-2-4												
100+52.68	20.58 m rt	19.34-19.79										
RL B2-B		SS-18	79	30	6	82	11	1	6	20	NP	-
A-1-b												
100+77.17	22.31 m rt	4.11-4.56										
RL EB2-B		SS-19	100	97	78	7	20	24	49	45	22	25.1
A-7-6												
100+90.53	19.22 m rt	2.44-2.89										
RL EB2-B		SS-20	100	100	29	10	63	7	20	24	NP	-
A-2-4												
100+90.53	19.22 m rt	7.01-7.46										
RL EB2-B		SS-21	97	89	18	21	67	0	12	25	NP	-
A-2-4												
100+90.53	19.22 m rt	13.11-13.56										
RL EB2-B		SS-22	100	97	83	7	14	20	59	44	24	19.1
A-7-6												
100+90.53	19.22 m rt	17.68-18.13										

STRUCTURE 7 (RIGHT LANE) CENTERLINE LOOKING UPSTATION STATION 100+00.

STRUCTURE 7 (RIGHT LANE) END BENT 1 LOOKING LEFT TO RIGHT.

SITE PHOTOGRAPHS
STRUCTURE 7 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7 ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

STRUCTURE 7 (RIGHT LANE) BENT 1 LOOKING LEFT TO RIGHT

STRUCTURE 7 (RIGHT LANE) BENT 2 LOOKING FROM CSX TRACK CENTERLINE TOWARDS BENT 2

SITE PHOTOGRAPHS
STRUCTURE 7 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7 ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL + MATERIALS ENGINEERING
TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

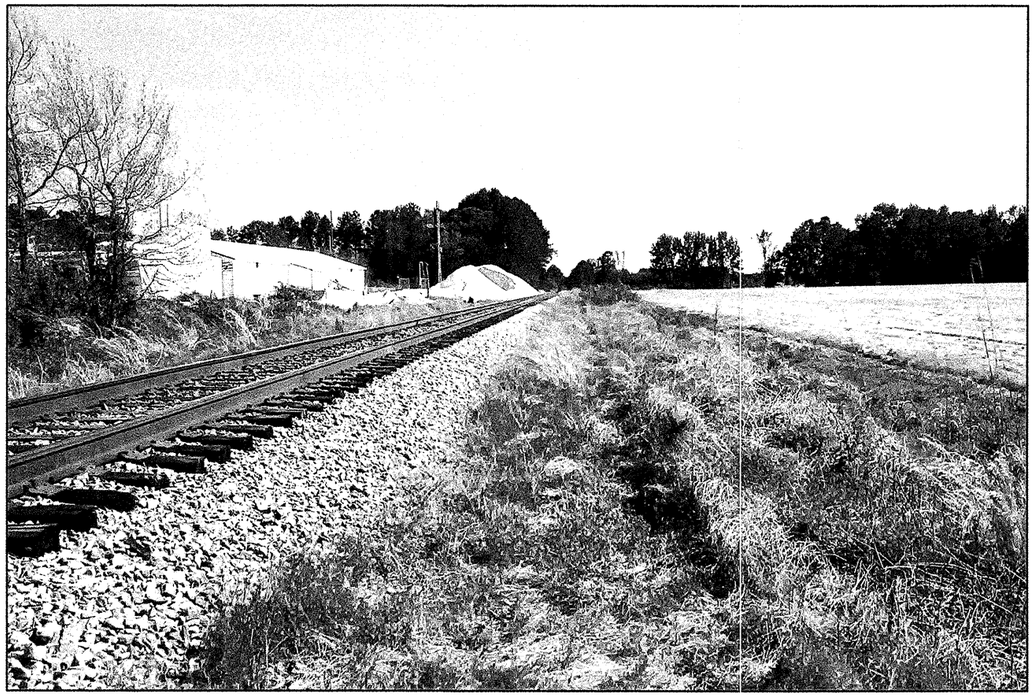
STRUCTURE 7 (RIGHT LANE) END BENT 2 LOOKING LEFT TO RIGHT FROM STRUCTURE 6 (LEFT LANE)

SITE PHOTOGRAPHS
STRUCTURE 7 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

CSX TRACKLINE LOOKING NORTH FROM CENTERLINE –L-



CSX TRACK LINE LOOKING SOUTH FROM CENTERLINE –L-

SITE PHOTOGRAPHS
STRUCTURE 7 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 6 & 7
ON -L- OVER CSX
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS
ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

PROJECT: 34461.1.3

ID: R-2554BA

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34461.1.3 (R-2554BA)	1	14

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34461.1.3 F.A. PROJ. NHF-70 (30)

COUNTY WAYNE

PROJECT DESCRIPTION US 70 (GOLDSBORO BYPASS) FROM WEST OF SR 1300 (SALEM CHURCH ROAD) TO WEST OF SR 1714 (PARKSTOWN ROAD)

SITE DESCRIPTION STRUCTURES 8 AND 9 ON -L- (US 70 BYPASS) OVER -Y2- (US 117) AT -L- STA. 103+80.709

REVISED

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4,5	PROFILE(S)
6,7	CROSS SECTION(S)
8-12	BORE LOG REPORT(S)
13,14	SOIL TEST RESULTS

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

TCB

TMW

S&ME

INVESTIGATED BY JL STONE

CHECKED BY DN ARGENBRIGHT

SUBMITTED BY DN ARGENBRIGHT

DATE JANUARY 2008

NORTH CAROLINA LICENSED SEAL 2007 GEOLOGIST JOSEPH L. STONE

2-1-08

DRAWN BY: CMK, TCB, JLS

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.
34461.1.3 (R-2554BA)	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 30 CM 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	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	
CLASS.	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 (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<25
	SOFT	2 TO 4	25 TO 50
	MEDIUM STIFF	4 TO 8	50 TO 100
	STIFF	8 TO 15	100 TO 200
	VERY STIFF	15 TO 30	200 TO 400
	HARD	>30	>400

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)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- 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
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

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

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

EQUIPMENT USED ON SUBJECT PROJECT

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

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [ ] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 75 mm STEEL TEETH
- [ ] TRICONE _____ mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -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 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BY2-502B
-L- STA. 102+50.697 36.15 RT
ELEVATION: 39.09 M

NOTES:

STRUCTURES 3 AND 9

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET
R-2554BA	3

SITE PLAN

METERS
0 5 10

103+40

104+00

EB1–A
LEFT LANE

EB2–A
LEFT LANE

TO WILSON, NC

-L-

79° 07' 32"

N

EB1–B
RIGHT LANE

EB2–B
RIGHT LANE

EB1 BENT LINE

EB2 BENT LINE

-Y2-

TO GOLDSBORO, NC

PROJECT REFERENCE NO.	SHEET NO.
R-2554BA	4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

METRIC

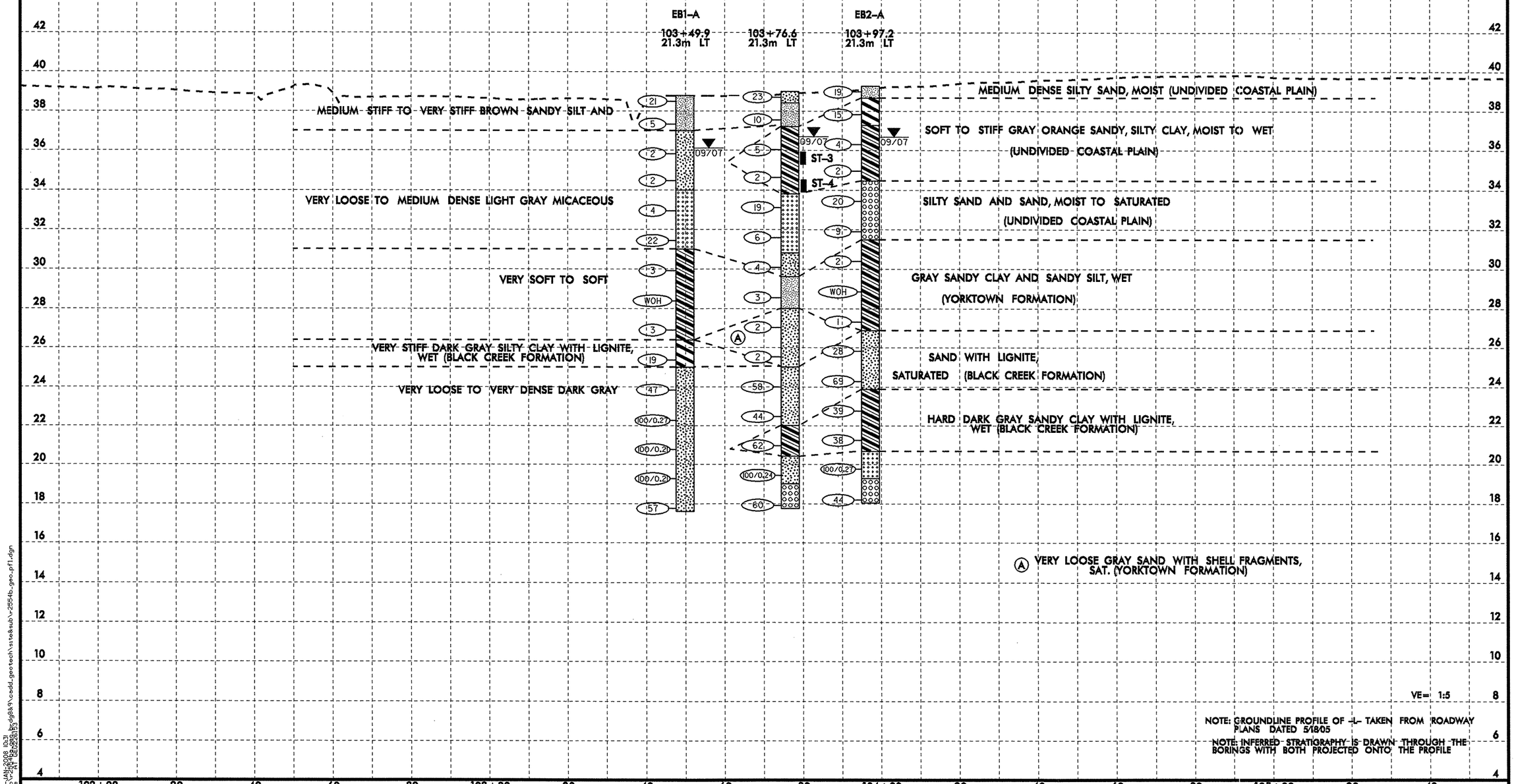
0 10 20
METERS

CONST.REV.

R/W REV.

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

STRUCTURE 8
PROFILE THROUGH BORING PROJECTED ALONG -L- LEFT LANE



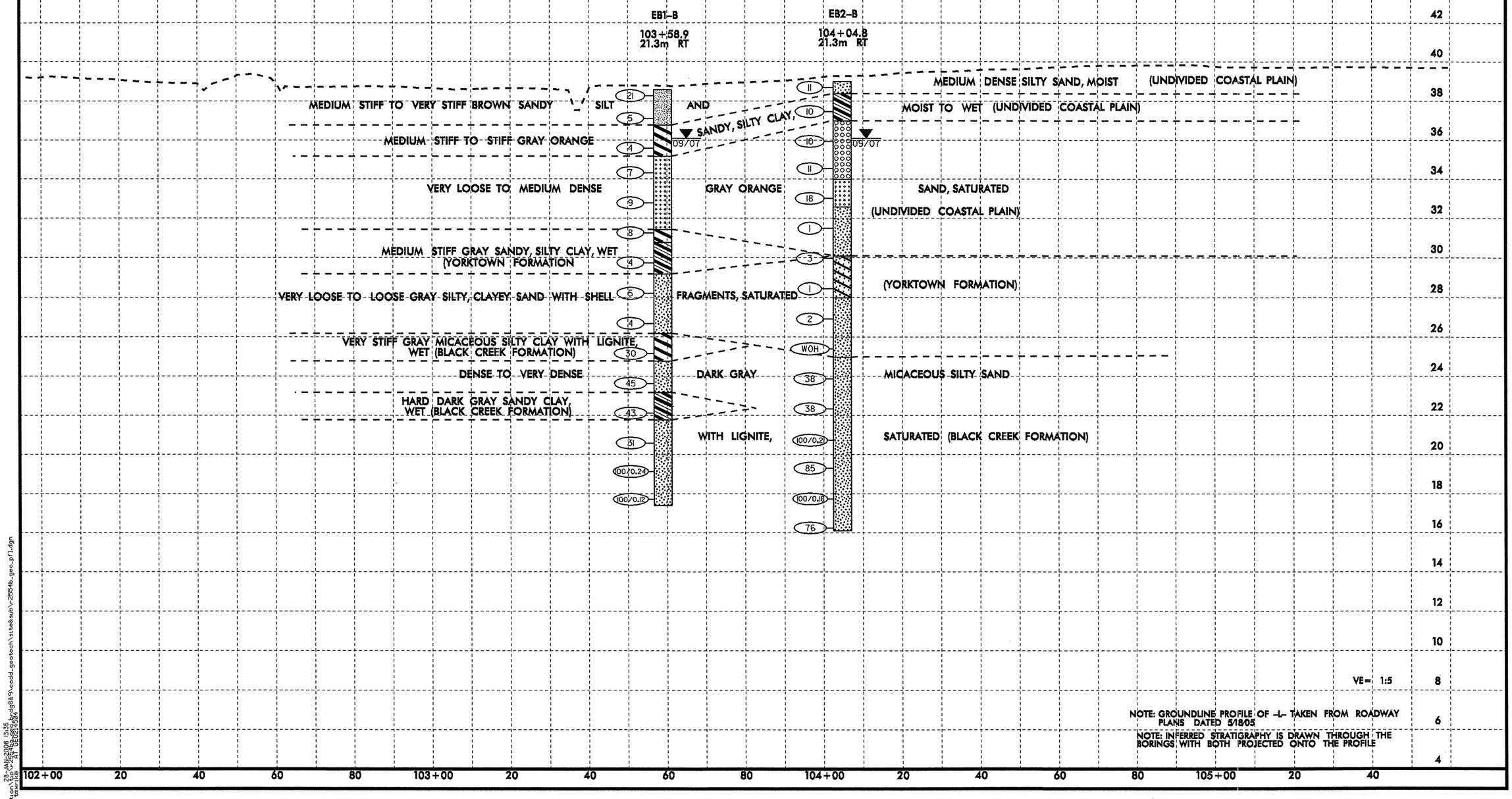
NOTE: GROUNDLINE PROFILE OF -L- TAKEN FROM ROADWAY PLANS DATED 5/18/05

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

6/10/99
31-JAN-2008 10:31
jstone AT GEO2-26153
jstone\tip\r2554bb_geo_bridg8&9\cadd_geotech\site&sub\r2554b_geo_pfl.dgn

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	R-2554BA	5
0 10 20 METERS	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST.REV.	PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
R/W REV.	INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	

STRUCTURE 9
PROFILE THROUGH BORINGS PROJECTED ALONG -L- RIGHT LANE



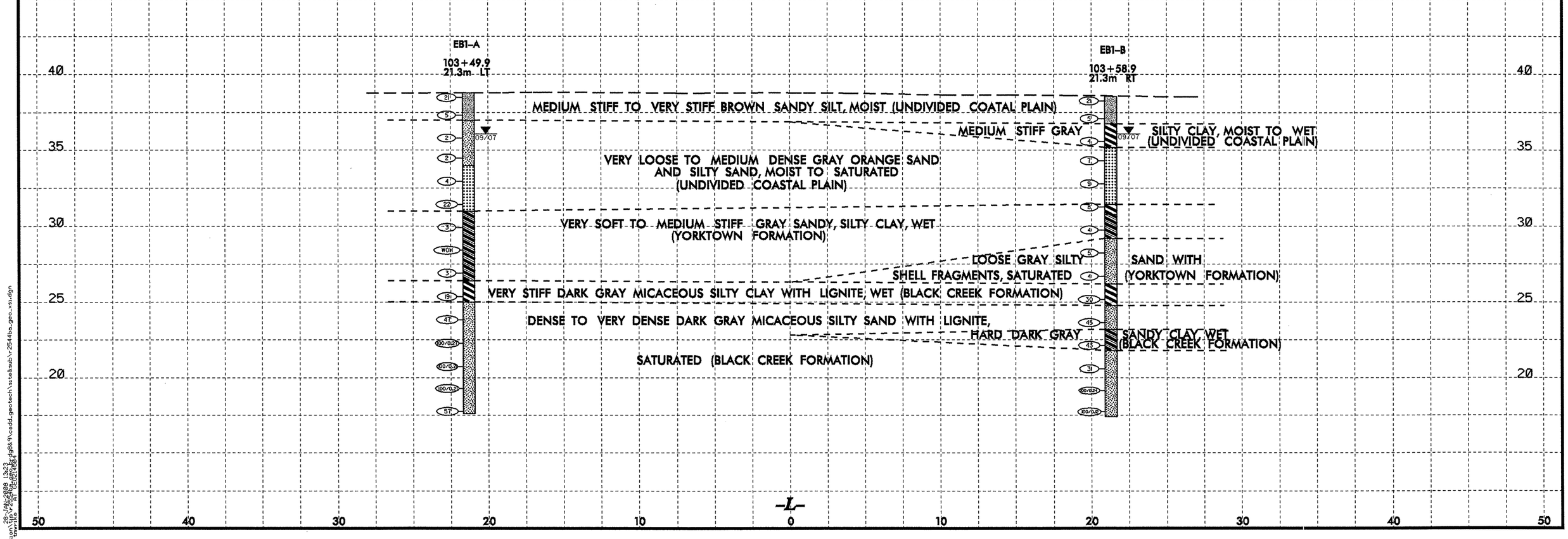
VE= 1:5

NOTE: GROUNDLINE PROFILE OF -L- TAKEN FROM ROADWAY PLANS DATED 5/1805

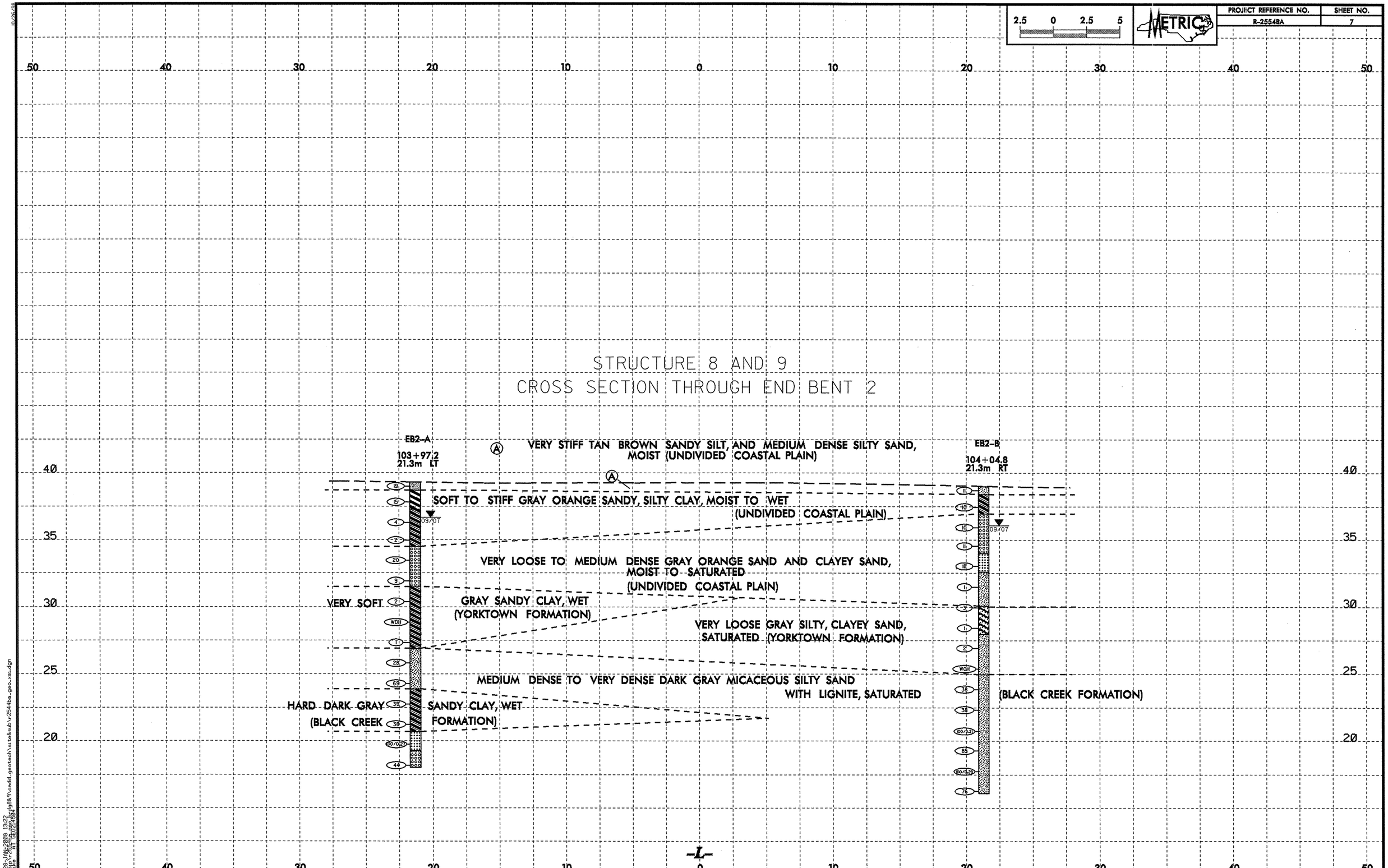
NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

6/10/08
26-JUN-2008 13:35
tion:\25548\Roadway\geo&h\cadd-geotech\site&sub\r-2554b_geo_pf1.dgn
tion:\25548\Roadway\geo&h\cadd-geotech\site&sub\r-2554b_geo_pf1.dgn

STRUCTURE 8 AND 9
CROSS SECTION THROUGH END BENT 1



PROJECT REFERENCE NO.	SHEET NO.
R-2554BA	7



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 8 ON -L- (US 70 BYPASS) OVER -Y2- (US 117)			**GROUND WTR (m)**
BORING NO. EB1-A	**STATION** 103+49.9	**OFFSET** 21.3m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 38.73 m	**TOTAL DEPTH** 21.19 m	**NORTHING** 186,370.5	**EASTING** 702,163.3	**24 HR.** 2.65
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 09/11/07	**COMP. DATE** 09/11/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m) / DEPTH (m)
39	38.73	0.00	5	10	11	21	SS-63			38.73 / 0.00 GROUND SURFACE BROWN SANDY SILT, MOIST
38	37.57	1.16	2	2	3	5	SS-64			36.93 / 1.80 LIGHT GRAY MICACEOUS SILTY SAND, MOIST TO SATURATED
37	36.05	2.68	1	1	1	2	SS-65	▼		
36	34.71	4.02	1	1	1	2				
35	33.19	5.54	1	2	2	4	SS-66			33.93 / 4.80 GRAY SAND, SATURATED
34	31.67	7.06	4	10	12	22	SS-67			
33	30.15	8.58	1	1	2	3	SS-68	44%		30.93 / 7.80 COASTAL PLAIN GRAY SANDY CLAY, WET (YORKTOWN FORMATION)
32	28.63	10.10	WOH	WOH	WOH	0				
31	27.13	11.60	1	2	1	3				26.33 / 12.40 COASTAL PLAIN DARK GRAY MICACEOUS SILTY CLAY WITH LIGNITITE, WET (BLACK CREEK FORMATION)
30	25.59	13.14	6	7	12	19	SS-69			
29	24.07	14.66	16	25	22	47	SS-70			24.93 / 13.80 COASTAL PLAIN DARK GRAY MICACEOUS SILTY SAND WITH LIGNITE, SATURATED (BLACK CREEK FORMATION)
28	22.55	16.18	22	42	58/.12	100/0.27				
27	21.03	17.70	50	88	12/.06	100/0.21	SS-71			
26	19.51	19.22	25	47	53/.06	100/0.21				

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 8 ON -L- (US 70 BYPASS) OVER -Y2- (US 117)			**GROUND WTR (m)**
BORING NO. EB1-A	**STATION** 103+49.9	**OFFSET** 21.3m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 38.73 m	**TOTAL DEPTH** 21.19 m	**NORTHING** 186,370.5	**EASTING** 702,163.3	**24 HR.** 2.65
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 09/11/07	**COMP. DATE** 09/11/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
19						Match Line				
18	17.99	20.74	16	27	30	57	SS-72			**COASTAL PLAIN** DARK GRAY MICACEOUS SILTY SAND WITH LIGNITE, SATURATED (BLACK CREEK FORMATION) *(continued)*
17										17.54 / 21.19 Boring Terminated at Elevation 17.54 m IN VERY DENSE SILTY SAND
16										
15										
14										
13										
12										
11										
10										
9										
8										
7										
6										
5										
4										
3										
2										
1										
0										
-1										

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 01/28/08

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.	
SITE DESCRIPTION STRUCTURE 9 ON -L- (US 70 BYPASS) OVER -Y2- (US 117)				**GROUND WTR (m)**
BORING NO. EB1-B	**STATION** 103+58.9	**OFFSET** 21.3m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 38.59 m	**TOTAL DEPTH** 20.85 m	**NORTHING** 186,327.9	**EASTING** 702,172.3	**24 HR.** 2.65
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 09/13/07	**COMP. DATE** 09/14/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m) / DEPTH (m)
39	38.59	0.00	5	11	10	21	SS-122			38.59 GROUND SURFACE 0.00 BROWN SANDY SILT, MOIST
38	37.43	1.16	2	2	3	5	SS-123			36.79 GRAY SANDY CLAY, MOIST TO WET 1.80
37	35.91	2.68	1	2	2	4	SS-124	▼		35.19 GRAY ORANGE SAND, SATURATED 3.40
36	34.63	3.96	2	3	4	7	SS-125			
35	33.10	5.49	3	4	5	9	SS-126			31.44 **COASTAL PLAIN** 7.15 GRAY SANDY SILTY CLAY, WET (YORKTOWN FORMATION)
34	31.58	7.01	3	4	4	8	SS-127			30.79 7.80
33	30.06	8.53	1	2	2	4	SS-128			29.19 **COASTAL PLAIN** 9.40 GRAY SILTY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)
32	28.53	10.06	1	2	3	5	SS-129			
31	27.01	11.58	2	2	2	4	SS-130			26.19 **COASTAL PLAIN** 12.40 GRAY MICACEOUS SILTY CLAY WITH LIGNITE, WET (BLACK CREEK FORMATION)
30	25.48	13.11	7	12	18	30	SS-131			24.79 **COASTAL PLAIN** 13.80 GRAY MICACEOUS SILTY SAND WITH LIGNITE, SATURATED (BLACK CREEK FORMATION)
29	23.96	14.63	9	13	32	45	SS-132			23.19 **COASTAL PLAIN** 15.40 DARK GRAY SANDY CLAY, WET (BLACK CREEK FORMATION)
28	22.44	16.15	13	19	24	43	SS-133			21.79 **COASTAL PLAIN** 16.80 GRAY SILTY SAND, SATURATED (BLACK CREEK FORMATION)
27	20.91	17.68	12	15	16	31				
26	19.39	19.20	70	100/.09		100/0.24				

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.	
SITE DESCRIPTION STRUCTURE 9 ON -L- (US 70 BYPASS) OVER -Y2- (US 117)				**GROUND WTR (m)**
BORING NO. EB1-B	**STATION** 103+58.9	**OFFSET** 21.3m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 38.59 m	**TOTAL DEPTH** 20.85 m	**NORTHING** 186,327.9	**EASTING** 702,172.3	**24 HR.** 2.65
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 09/13/07	**COMP. DATE** 09/14/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
19						Match Line				
18	17.86	20.73		100/.12		100/0.12				**COASTAL PLAIN** GRAY SILTY SAND, SATURATED (BLACK CREEK FORMATION) *(continued)* 17.74 20.85 Boring Terminated at Elevation 17.74 m IN VERY DENSE SILTY SAND
17										
16										
15										
14										
13										
12										
11										
10										
9										
8										
7										
6										
5										
4										
3										
2										
1										
0										
-1										

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 01/28/08

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 8 ON -L- (US 70 BYPASS) OVER -Y2- (US 117)			**GROUND WTR (m)**
BORING NO.	**STATION** 103+76.6	**OFFSET** 21.3m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.02 m	**TOTAL DEPTH** 21.25 m	**NORTHING** N/A	**EASTING** N/A	**24 HR.** 2.32
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 09/11/07	**COMP. DATE** 09/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
40											
39	39.02	0.00								39.02 GROUND SURFACE	0.00
38	37.86	1.16	6	14	9	23	SS-73			BROWN SILTY SAND, MOIST	
37	36.34	2.68	6	5	5	10	SS-74			38.42 ORANGE SANDY SILT, MOIST	0.60
36	34.94	4.08	1	2	3	5	SS-75			37.22 GRAY ORANGE SANDY CLAY, MOIST TO WET	1.80
35	33.42	5.60	WOH	1	1	2	SS-76	31%			
34	31.90	7.12	10	10	9	19	SS-77			33.82 GRAY SAND AND SILTY SAND, SATURATED	5.20
33	30.38	8.64	5	3	3	6	SS-78			30.82	8.20
32	28.86	10.16	3	2	2	4	SS-79			29.62 COASTAL PLAIN GRAY SANDY SILT WITH SHELL FRAGMENTS, WET (YORKTOWN FORMATION)	9.40
31	27.34	11.68	1	1	2	3	SS-80			28.02 COASTAL PLAIN GRAY SAND WITH SHELL FRAGMENTS, SAT. (YORKTOWN FORMATION)	11.00
30	25.82	13.20	WOH	1	1	2	SS-81			25.02 COASTAL PLAIN GRAY SILTY SAND WITH LIGNITE, SAT. (BLACK CREEK FORMATION)	14.00
29	24.30	14.72	WOH	WOH	2	2	SS-82			22.02 COASTAL PLAIN DARK GRAY SANDY CLAY WITH LIGNITE, WET (BLACK CREEK FORMATION)	17.00
28	22.78	16.24	18	30	28	58	SS-83			20.42	18.60
27	21.26	17.76	13	16	28	44					
26	19.74	19.28	15	24	38	62					

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 8 ON -L- (US 70 BYPASS) OVER -Y2- (US 117)			**GROUND WTR (m)**
BORING NO.	**STATION** 103+76.6	**OFFSET** 21.3m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.02 m	**TOTAL DEPTH** 21.25 m	**NORTHING** N/A	**EASTING** N/A	**24 HR.** 2.32
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 09/11/07	**COMP. DATE** 09/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
20						Match Line				
19			55	100/.09		100/0.24	SS-84			COASTAL PLAIN
18	18.22	20.80	22	27	33	60	SS-85			19.02 GRAY SAND WITH LIGNITE, SATURATED (BLACK CREEK FORMATION) *(continued)* 20.00
17										17.77 Boring Terminated at Elevation 17.77 m IN VERY DENSE SAND 21.25
16										Other Samples: ST-3 (3.1 - 3.7) ST-4 (4.5 - 5.1)
15										
14										
13										
12										
11										
10										
9										
8										
7										
6										
5										
4										
3										
2										
1										
0										

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 01/29/08

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 8 ON US -L- (US 70 BYPASS) OVER -Y2- (US 117)			**GROUND WTR (m)**
BORING NO. EB2-A	**STATION** 103+97.2	**OFFSET** 21.3m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.22 m	**TOTAL DEPTH** 21.24 m	**NORTHING** 186,370.0	**EASTING** 702,210.6	**24 HR.** 2.56
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 09/12/07	**COMP. DATE** 09/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
40											
39	39.22	0.00	6	9	10	19	SS-86			39.22 GROUND SURFACE	0.00
38	38.06	1.16								BROWN SANDY SILT. MOIST	
			7	7	8	15	SS-87			38.62 GRAY ORANGE SANDY SILTY CLAY, MOIST TO SATURATED	0.60
37	36.54	2.68								37.22	2.00
36			2	2	2	4	SS-88				
35	35.20	4.02	WOH	WOH	2	2					
34	33.67	5.55								34.42 GRAY SAND, SATURATED	4.80
			7	9	11	20	SS-89				
33	32.15	7.07									
32			2	4	5	9				31.42 COASTAL PLAIN GRAY SANDY CLAY, WET (YORKTOWN FORMATION)	7.80
31	30.62	8.60									
30			1	1	1	2					
29	29.10	10.12	WOH	WOH	WOH	0	SS-90				
28	27.58	11.64	WOH	WOH	1	1					
27										26.82 COASTAL PLAIN DARK GRAY MICACEOUS SILTY SAND WITH LIGNITE, SAT (BLACK CREEK FORMATION)	12.40
26	26.05	13.17	5	13	15	28	SS-91				
25	24.53	14.69									
24			24	34	35	69	SS-92				
23	23.00	16.22								23.82 COASTAL PLAIN DARK GRAY SANDY CLAY, WET (BLACK CREEK FORMATION)	15.40
22			9	16	23	39	SS-93				
21	21.48	17.74	11	15	23	38					
20	19.96	19.26	53	100/.12		100/0.27	SS-94			20.62 COASTAL PLAIN GRAY SAND, SATURATED (BLACK CREEK FORMATION)	18.60

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 8 ON US -L- (US 70 BYPASS) OVER -Y2- (US 117)			**GROUND WTR (m)**
BORING NO. EB2-A	**STATION** 103+97.2	**OFFSET** 21.3m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.22 m	**TOTAL DEPTH** 21.24 m	**NORTHING** 186,370.0	**EASTING** 702,210.6	**24 HR.** 2.56
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 09/12/07	**COMP. DATE** 09/12/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
20						Match Line				
19										19.22 20.00
18	18.43	20.79	16	19	25	44	SS-95			17.98 21.24 Boring Terminated at Elevation 17.98 m IN DENSE SAND
17										
16										
15										
14										
13										
12										
11										
10										
9										
8										
7										
6										
5										
4										
3										
2										
1										
0										

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 01/28/08

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE		**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 9 ON -L- (US 70 BYPASS) OVER -Y2- (US 117)				**GROUND WTR (m)**
BORING NO. EB2-B	**STATION** 104+04.8	**OFFSET** 21.3m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.05 m	**TOTAL DEPTH** 22.88 m	**NORTHING** 186,327.4	**EASTING** 702,218.1	**24 HR.** 2.93
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 09/13/07	**COMP. DATE** 09/13/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
	39.05	0.00								GROUND SURFACE	39.05	0.00
			3	5	6	11	SS-96			BROWN SILTY SAND, MOIST	38.45	0.60
	37.83	1.22								ORANGE SANDY CLAY, MOIST		
			3	3	7	10	SS-97				37.05	2.00
	36.31	2.74								GRAY ORANGE SAND, MOIST TO SATURATED		
			4	6	4	10	SS-98					
	34.90	4.15										
			3	4	7	11					34.05	5.00
	33.38	5.67										
			4	8	10	18	SS-99				32.65	6.40
	31.86	7.19										
			WOH	WOH	1	1	SS-100					
	30.33	8.72										
			1	2	1	3	SS-101				30.15	8.90
										COASTAL PLAIN GRAY ORANGE SAND AND CLAYEY SAND, SATURATED (YORKTOWN FORMATION)		
	28.81	10.24										
			WOH	WOH	1	1	SS-102				28.05	11.00
	27.28	11.77										
			1	1	1	2	SS-103					
	25.76	13.29										
			WOH	WOH	WOH	0					25.05	14.00
	24.24	14.81								COASTAL PLAIN DARK GRAY MICACEOUS SILTY SAND WITH LIGNITE, SATURATED (BLACK CREEK FORMATION)		
			11	14	24	38	SS-104					
	22.71	16.34										
			13	14	24	38	SS-105					
	21.19	17.86										
			22	52	48/.06	100/0.21	SS-106					
	19.66	19.39										

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE		**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 9 ON -L- (US 70 BYPASS) OVER -Y2- (US 117)				**GROUND WTR (m)**
BORING NO. EB2-B	**STATION** 104+04.8	**OFFSET** 21.3m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.05 m	**TOTAL DEPTH** 22.88 m	**NORTHING** 186,327.4	**EASTING** 702,218.1	**24 HR.** 2.93
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 09/13/07	**COMP. DATE** 09/13/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
						Match Line						
			24	30	55	85						
	18.14	20.91										
			26	60	40/.03	100/0.18	SS-107					
	16.62	22.43										
			22	30	46	76						
										COASTAL PLAIN DARK GRAY MICACEOUS SILTY SAND WITH LIGNITE, SATURATED (BLACK CREEK FORMATION) *(continued)*		
											16.17	22.88
										Boring Terminated at Elevation 16.17 m IN VERY DENSE SILTY SAND		

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 01/28/08

STRUCTURES 8 AND 9 ON -L- (US 70 BYPASS) OVER -Y2- (US 117)

HOLE #	SAMPLE #	RET 4	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
EB1-A	SS-63	-	100	83	42	27.9	36.4	27.7	8.1	15	NP	A-4(0)	0.30-0.45		
LT.LN.	SS-64	-	100	85	45	24.4	36.8	18.6	20.2	23	9	A-4(1)	1.16-1.61		
	SS-65	-	100	94	21	16.5	65.8	6.7	11.1	25	NP	A-2-4(0)	2.68-3.13		
	SS-66	-	95	51	7	58.4	35.5	1.1	5.1	24	NP	A-3(0)	5.54-5.99		
	SS-67	-	99	73	7	66.3	27.8	1.9	4.0	23	NP	A-3(0)	7.06-7.51		
	SS-68	-	99	97	57	6.3	42.6	28.9	22.2	33	13	A-6(5)	8.58-9.03	44.1%	
	SS-69	-	97	92	50	9.9	45.1	24.8	20.2	42	11	A-7-5(4)	13.14-13.59		
	SS-70	-	100	100	26	0.5	80.5	13.9	5.1	28	NP	A-2-4(0)	14.66-15.11		
	SS-71	-	99	96	14	6.0	82.9	8.1	3.0	17	NP	A-2-4(0)	17.70-18.06		
	SS-72	-	100	100	18	0.7	86.8	8.5	4.0	29	NP	A-2-4(0)	20.74-21.19		
	SS-73	-	100	80	35	32.9	40.0	19.0	8.1	15	NP	A-2-4(0)	0.15-0.45		
	SS-74	-	100	75	38	36.4	30.7	12.7	20.2	22	8	A-4(0)	1.16-1.61		
	SS-75	-	100	95	73	10.3	24.4	30.9	34.3	34	16	A-6(10)	2.68-3.13		
	SS-76	-	100	99	94	1.8	8.9	54.9	34.3	31	13	A-6(12)	4.08-4.53	31.2%	
	SS-77	-	100	75	10	64.5	27.4	2.0	6.1	15	NP	A-3(0)	5.60-6.05		
	SS-78	-	100	96	33	27.1	43.0	11.7	18.2	26	7	A-2-4(0)	8.69-9.09		
	SS-79	-	100	98	43	25.9	34.1	25.9	14.1	29	7	A-4(0)	10.16-10.61		
	SS-80	-	100	94	14	15.7	71.2	8.1	5.1	26	NP	A-2-4(0)	11.68-12.13		
	SS-81	-	100	90	15	54.1	33.4	7.4	5.1	22	NP	A-2-4(0)	14.71-15.16		
	SS-82	-	100	74	16	62.4	23.3	7.2	7.1	19	NP	A-2-4(0)	16.24-16.69		
	SS-83	-	100	96	80	7.5	21.2	32.9	38.4	35	15	A-6(11)	17.76-18.21		
	SS-84	-	100	92	15	28.5	61.0	6.5	4.0	13	NP	A-2-4(0)	19.28-19.52		
	SS-85	-	98	27	10	79.5	12.4	4.0	4.0	22	2	A-1-b(0)	20.80-21.25		
EB2-A	SS-86	-	100	86	44	24.2	38.4	19.2	18.2	21	7	A-4(0)	0.30-0.45		
LT.LN.	SS-87	-	100	80	51	31.3	22.4	11.9	34.3	48	28	A-7-6(10)	1.16-1.61		
	SS-88	-	100	95	51	17.4	36.8	15.6	30.3	33	17	A-6(5)	2.68-3.13		
	SS-89	-	99	47	7	78.3	16.4	1.2	4.1	20	NP	A-1-b(0)	5.55-6.00		
	SS-90	-	100	92	52	18.9	32.9	27.9	20.3	36	12	A-6(4)	10.12-10.57		
	SS-91	-	88	76	15	24.6	61.1	6.2	8.1	30	NP	A-2-4(0)	13.17-13.62		
	SS-92	-	99	97	18	9.2	78.3	8.4	4.1	22	NP	A-2-4(0)	14.69-15.14		
	SS-93	-	100	97	81	5.3	22.5	29.5	42.6	38	20	A-6(15)	16.22-16.67		
	SS-94	-	100	77	7	55.6	38.4	4.0	2.0	22	NP	A-3(0)	19.26-19.53		
	SS-95	-	99	35	7	87.3	6.2	2.4	4.1	25	NP	A-1-b(0)	20.79-21.24		
EB2-B	SS-96	-	100	87	34	25.6	47.1	13.1	14.2	15	NP	A-2-4(0)	0.30-0.45		
RT.LN.	SS-97	-	100	92	43	17.5	45.7	8.4	28.4	32	17	A-6(3)	1.22-1.67		
	SS-98	-	92	37	9	75.2	15.6	0.0	9.1	21	NP	A-1-b(0)	2.74-3.19		
	SS-99	-	96	53	7	67.1	26.6	1.2	5.1	22	NP	A-3(0)	5.67-6.12		
	SS-100		99	83	16	57.4	27.0	2.4	13.2	21	NP	A-2-4(0)	7.19-7.64		
	SS-101	-	97	76	30	50.6	19.1	6.0	24.4	39	19	A-2-6(1)	8.90-9.17		
	SS-102	-	97	57	23	60.8	17.4	12.7	9.1	31	14	A-2-6(0)	10.24-10.69		
	SS-103	-	100	92	16	19.0	65.8	7.1	8.1	28	NP	A-2-4(0)	11.17-11.62		
	SS-104	-	99	64	15	61.6	25.4	7.9	5.1	23	NP	A-2-4(0)	14.81-15.26		
	SS-105	-	100	99	17	0.4	89.3	6.2	4.1	30	NP	A-2-4(0)	16.34-16.79		
	SS-106	-	100	95	30	12.4	63.5	8.9	15.2	24	3	A-2-4(0)	17.86-18.22		
	SS-107	-	100	99	22	10.8	69.9	7.1	12.2	21	NP	A-2-4(0)	20.91-21.24		

STRUCTURES 8 AND 9 ON -L- (US 70 BYPASS) OVER -Y2- (US 117)

EB1-B	SS-122	-	100	90	52	17.5	39.0	25.3	18.3	16	2	A-4(0)	0.30-0.45
RT.LN.	SS-123	-	100	74	45	33.9	28.0	29.9	8.1	21	6	A-4(0)	1.16-1.61
	SS-124	-	100	99	85	1.4	28.0	32.0	38.6	42	19	A-7-6(17)	2.68-3.13
	SS-125	-	100	84	7	59.7	34.3	2.9	3.0	13	NP	A-3(0)	3.96-4.41
	SS-126	-	100	96	71	9.6	25.8	34.1	30.5	49	23	A-7-6(16)	7.15-7.46
	SS-127	-	100	98	70	5.9	29.3	42.5	22.4	40	13	A-6(9)	8.53-8.98
	SS-128	-	93	83	30	28.3	40.2	17.3	14.2	26	9	A-2-4(0)	10.06-10.51
	SS-129	-	97	91	14	14.9	71.2	5.7	8.1	21	NP	A-2-4(0)	11.58-12.03
	SS-130	-	100	95	60	7.5	36.8	27.2	28.5	43	17	A-7-6(9)	13.11-13.56
	SS-131	-	99	97	34	11.7	57.3	13.7	17.3	28	7	A-2-4(0)	14.63-15.08
	SS-132	-	100	99	91	3.0	11.4	49.0	36.6	40	16	A-6(16)	16.15-16.60
	SS-133	-	100	97	28	17.7	58.2	5.8	18.3	23	5	A-2-4(0)	17.68-18.13

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34461.1.3	1	39

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34461.1.3 F.A. PROJ. NHF-70 (30)

COUNTY WAYNE

PROJECT DESCRIPTION US 70 (GOLDSBORO BYP) FROM SR 1300 (SALEM CHURCH RD) TO EAST OF SR 1556 (WAYNE MEMORIAL DR)

SITE DESCRIPTION STRUCTURES 10 & 11: DUAL BRIDGES ON -L- (US 70) OVER HOWELL BRANCH

ID: R-2554BA

PROJECT: 34461.1.3

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3 - 6	GEOTECHNICAL REPORT
7	SITE VICINITY MAP
STRUCTURE 10 (LT LANE)	
8	BORING LOCATION PLAN
9	PROFILE
10 - 13	CROSS SECTIONS
14 - 15	BORE LOGS
16	SOIL TEST RESULTS
17 - 20	SCOUR REPORT
21 - 24	SITE PHOTOGRAPH(S)
STRUCTURE 11 (RT LANE)	
25	BORING LOCATION PLAN
26	PROFILE
27 - 30	CROSS SECTIONS
31 - 32	BORE LOGS
33	SOIL TEST RESULTS
34 - 35	SCOUR REPORT
36 - 39	SITE PHOTOGRAPH(S)

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

P. ZHANG

G. LANG

INVESTIGATED BY C. BRUINSMA

CHECKED BY M. ROBERTSON

SUBMITTED BY TIERRA INC.

DATE 6-5-2007

NORTH CAROLINA LICENSED SEAL 2031 GEOLOGIST CHRISTINA MICHELLE BRUINSMA

6-5-07

For Letting

DRAWN BY: P. ZHANG

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

PROJECT REFERENCE NO.	SHEET NO.
34461.1.3	2

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 30 CM 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 (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<25
	SOFT	2 TO 4	25 TO 50
	MEDIUM STIFF	4 TO 8	50 TO 100
	STIFF	8 TO 15	100 TO 200
	VERY STIFF	15 TO 30	200 TO 400
	HARD	>30	>400

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)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL - PLASTIC LIMIT		
OM - OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL - SHRINKAGE LIMIT		
	- 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
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
- SOUNDING ROD
- SPT CPT, DPT DMT, VST PMT - TEST BORING
- AUGER BORING
- CORE BORING
- MW - MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF - SPT REFUSAL

SAMPLE DESIGNATIONS

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

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B-40
- [ ] BK-51
- [X] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [ ] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [X] TRICONE 76 mm STEEL TEETH
- [ ] TRICONE _____ mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [ ] AUTOMATIC
- [X] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -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 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: TBM -BL- 569B, STA. 31+84.201 -BL-, 114+29.67 -L-

ELEVATION: 36.786 M

NOTES:

ART. - ARTESIAN
H - ART. HEAD

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING

June 5, 2007

N.C. Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699-1589

Attn: Mr. Njoroge W. Wainaina, P.E.

Ref: Geotechnical Structure Subsurface Investigation Report

State Project No.:	34461.1.3
TIP No.:	R-2554BA
County:	Wayne County
Description:	US 70 (Goldsboro Bypass) from SR 1300 (Salem ChurchRd) to East of SR 1556 (Wayne Memorial Dr) Structures 10 and 11: Dual Bridges on -L- over Howell Branch
Tierra, Inc. Proj. No.:	6211-07-014

Dear Mr. Wainaina,

As authorized, Tierra, Inc. has completed the geotechnical subsurface investigation for the proposed new dual structures (10 & 11) located along the future US 70 Goldsboro Bypass in Wayne County, North Carolina. The purpose of this report is to present subsurface conditions and general notes to the designer for consideration during design of the planned structures. Field and laboratory test results, site and boring location plans, and profile/cross sections depicting subsurface conditions may be found in the appendix of this report.

Our professional services for this project have been performed in accordance with generally accepted engineering practices. No other warranty expressed or implied is made. Tierra, Inc. appreciates this opportunity to provide you with geotechnical engineering services for this project. If you have any questions regarding this report, please contact our office.

Sincerely,
TIERRA, INC.

Christina M. Bruinsma, L.G.
Project Geologist

Margaret A. Robertson, L.G.
Principal Engineering Geologist

2736 Rowland Road • Raleigh, North Carolina 27615
Phone 919.871.0800 • Fax 919.871.0803

1.0 PROJECT DESCRIPTION

Based on information obtained from the North Carolina Department of Transportation (NCDOT) Bridge Survey & Hydraulic Design Report dated March 1, 2006, dual three span, 4-bent structures are proposed along the future US 70 Bypass. These structures are designated Structure 10 (Left Lane) and Structure 11 (Right Lane). Both proposed structures will be 110 meters long and 12.4 meters wide. The dual structures are at a new location and will span over Howell Branch. The proposed skew angle for all bents is 90 degrees.

2.0 SITE DESCRIPTION AND GEOLOGY

The project site is located approximately 140 meters north of Tommy's Road, along the proposed alignment for the US 70 Bypass in a rural to residential area in Belfast, North Carolina in Wayne County. Howell Branch flows generally south-southeast into Stoney Creek. Stoney Creek flows directly into the Neuse River, approximately 10 km to the south.

Topographically, the site is generally flat along the end bents for structure 10 and 11, then steeply descends into the floodplain of Howell Branch. The relief across the site is approximately 5 meters. Howell Branch (main channel) was approximately 3 meters wide and 1.0 meter deep during our investigation. The existing floodplain is approximately 75 meters wide. Floodplain cover consists of brush, grasses, and young trees. Deadfall is abundant throughout the floodplain.

The project site is located in the Coastal Plain Physiographic Province of North Carolina, north of Goldsboro, North Carolina. According to ***The Geology of the Carolinas*** (1991), the site is located within the Yorktown Formation and Black Creek Group (Kb).

The Yorktown Formation consists of Miocene Age, clayey and silty sands with occasional shell fragments and phosphate deposits. This formation at the site is approximately 3 meters in thickness, and lies unconformably on the Tar Heel Formation.

The Tar Heel Formation (lower member of Black Creek Group) consists of Cretaceous Age interbedded sands, clayey sands and dark gray clays. Material is periodically glauconitic depending on facies. Pyrite/marcasite cemented sand occurs in zones and non-continuous layers throughout the formation. Lignite is also common. Some molded limestone can be found in upper portions of the formation, in isolated pockets south of Goldsboro. No molded limestone was encountered at this site. Deposits are typically deltaic in nature.

Undifferentiated post Miocene age deposits were encountered at higher elevations across the site (along end bents for both structures), resting unconformably on Yorktown Formation sediments. These soils consist of materials ranging from cross bedded sands to miscellaneous deltaic/fluvial deposits.

3.0 FIELD EVALUATION PROCEDURE

Subsurface conditions were evaluated for both proposed structures by soil test borings. A total of (8) soil test borings (4 borings per structure) were drilled near proposed bent centerlines. Some of these borings were offset due to accessibility issues. Soil test borings were drilled utilizing a track-mounted CME 45 rig and truck-mounted B-40 rig with a manual hammer. Borings were drilled using a 7.6 (cm) tricone bit with mud rotary methods. Standard penetration tests were performed at regular intervals, in accordance with American Association of State Highway Transportation Officials (AASHTO T-206-03), and North Carolina Department of Transportation (NCDOT) latest Geotechnical Guidelines and Procedures Manual.

In addition to our subsurface investigation, a visual scour evaluation was performed along the channel and banks of Howell Branch to determine scour impact for foundation design purposes. The field scour report was electronically submitted May 18, 2007.

Groundwater measurements were recorded within each borehole utilizing a weighted 30-meter tape from a survey reference location at the top of each boring. Readings were recorded immediately after boring termination and after a 24-hour waiting period. In the case of artesian conditions, flow rate and head measurements were taken at the time of drilling.

4.0 LABORATORY TESTING

Representative split-barrel sampler samples were selected from soil test borings to verify visual field classification and determine soil index properties. Thirty-one split-barrel samples were analyzed in our laboratory for Atterberg limits and grain size with hydrometer analysis. Six (6) samples were tested for organic content. Seven alluvial samples were analyzed for grain size determination to assist the NCDOT in theoretical scour elevations. Three Shelby tube samples were obtained in the field and delivered to NCDOT for further consolidation and scour analysis. All testing was performed in accordance with the following American Society for Testing and Materials (ASTM), NCDOT Modified and/or AASHTO procedures:

- AASHTO T-88-00 (As Modified) "Particle Size Analysis of Soil"
- AASHTO T-89-02 (As Modified) "Determining the Liquid Limits of Soil"
- AASHTO T-90-00 "Determining the Plastic Limit and Plasticity of Soils"
- AASHTO T-265-93 (2000) "Laboratory Determination of Moisture Content of Soils"
- ASTM D 1140-00 (2006) "Amount of Material in Soils Finer than the #200 Sieve"
- AASHTO T-267-86 (2004) "Determination of Organic Content in Soils by Loss on Ignition"

5.0 SUBSURFACE AND GROUNDWATER CONDITIONS

5.1 Structure 10 (Left Lane)

End Bent 1

Soils beneath End Bent 1 consist of Coastal Plain material. Three strata zones were encountered across the bent line.

Stratum 1 consists of 9.30 meters of undifferentiated post-Miocene deposits. Soils in this zone consist of very loose to medium dense sands, and silty and clayey sands (A-1-b, A-2-4, and A-2-6).

Stratum 2 was encountered at an elevation of 27.67 meters (MSL), and consists of 1.85 meters of very loose to loose clayey silty sands of the Yorktown Formation (A-2-4) with occasional phosphate nodules, shell and wood fragments.

Stratum 3 was encountered at an elevation of 24.17 meters (MSL) and is classified as part of the Tar Heel Formation (Black Creek Group). Soils in this strata consist of moderately to highly organic (up to14.7% organics), very dense sands and silty sands with occasional lignite interbedded with dark gray over consolidated, highly plastic, very stiff silty clay (A-7-5). Cemented sands were encountered in isolated lenses within Tar Heel Formation sand deposits. Cementations were typically pyrite/marcasite in nature.

Static groundwater was measured 2.10 meters below existing ground surface, at an elevation of 37.87 meters (MSL).

Interior Bents

Soils beneath Bent 1 and 2 consist of alluvium and Coastal Plain material. Alluvial deposits are approximately 1.00 to 1.50 meters of very loose silty sand and very soft sandy silty with organics (5.7% to 8.4%). Beneath the organic horizon, alluvial soils consist of 3.30 to 4.10 meters of very loose to loose sand and silty sand (A-1-b, A-2-4) and soft sandy silt (A-4). Alluvium deposits directly overlie Coastal Plain soils of the Yorktown Formation at elevations between 28.20 and 27.99 meters (MSL).

Coastal Plain material below alluvium consists of two types of strata. Stratum 1 consists of loose clayey silty sands (A-2-4) of the Yorktown Formation. These soils are typically 3.10 to 3.77 meters thick. Stratum 2 was encountered at elevations between 25.10 and 24.22 meters (MSL) and is part of the Tar Heel Formation (Black Creek Group). Soils in this strata consists of moderately to highly organic (ranging from 13.7 to 17.1% organics), very dense sands and silty sands with lignite, interbedded with dark and light gray very stiff to hard silty and sandy clay (A-7-5, A-7-6, A-6). Cemented sands were encountered in isolated lenses within Tar Heel Formation soils. Cementations were typically pyrite/marcasite in nature.

Artesian groundwater conditions were encountered beneath Bent 1 and Bent 2. Artesian flow at Bent 1 became evident only after boring termination. Flow rates were approximately 2.3 liters per minute, and the head measurement was 0.30 meters. Bent 2 artesian flows occurred between depths of 8.69 and 14.84 meters, with a flow rate of 19 liters per minute. A head measurement at boring termination was 1.8 meters.

End Bent 2

Soils beneath End Bent 2 consist of Coastal Plain material. Three strata were encountered along the bent line.

Stratum 1 consists of 6.5 meters of undifferentiated post-Miocene deposits. Soils in this zone consist of very loose to medium dense silty sands (A-2-4) and soft silty clay (A-7-6).

Stratum 2 was encountered at an elevation of 28.59 meters (MSL), and consists of 3.00 meters of very loose to loose clayey silty sands of the Yorktown Formation (A-2-4).

Stratum 3 was encountered at an elevation of 25.59 meters (MSL) and is part of the Tar Heel Formation (Black Creek Group). Soils in this strata consist of very dense to dense sands, clayey and silty sands (A-2-4, A-2-6) with trace to highly organic (up to14.5% organics), and occasional lignite. Cemented sands were encountered in isolated lenses within Tar Heel Formation sand deposits. Cementations were typically pyrite/marcasite in nature.

Artesian groundwater conditions were encountered 24 hours after boring termination. Flow rate was relatively low, and 1 week after boring termination, water levels were approximately 0.05 meters below the ground surface.

5.2 Structure 11 (Right Lane)

End Bent 1

Soils beneath End Bent 1 consist of Coastal Plain material. Three strata zones were encountered across the bent line.

Stratum 1 consists of 9.80 meters of undifferentiated post-Miocene deposits. Soils in this zone consist of very loose to medium dense sands, and silty and clayey sands (A-3, A-1-a, A-1-b, A-2-4, and A-2-6).

Stratum 2 was encountered at an elevation of 27.52 meters (MSL), and consists of 3.50 meters of loose clayey silty sands of the Yorktown Formation (A-2-4).

Stratum 3 was encountered at an elevation of 25.67 meters (MSL) and is classified as part of the Tar Heel Formation (Black Creek Group). Soils in this strata consist of moderately to highly organic (up to 14.7% organics), very dense sands and silty sands with occasional lignite interbedded with dark gray over consolidated, highly plastic, very stiff silty clay (A-7-5, A-7-6). Cemented sands were encountered in isolated lenses within Tar Heel Formation sand deposits. Cementations were typically pyrite/marcasite in nature.

Static groundwater was measured 3.72 meters below existing ground surface, at an elevation of 33.60 meters (MSL).

Interior Bents

Soils beneath Bent 1 and 2 consist of alluvium and Coastal Plain material. Alluvial deposits are approximately 1.00 to 1.60 meters of very soft sandy silt with approximately 5.7% to 8.4% organics. Beneath the organic horizon, alluvial soils consist of 3.28 to 4.10 meters of very loose to loose sand, silty and clayey sand (A-3, A-1-b, A-2-4, A-2-6) and very soft silty clay (A-7-6). Alluvium deposits directly overlie Coastal Plain soils of the Yorktown Formation at elevations between 27.93 and 27.76 meters (MSL).

Coastal Plain material below the alluvium consists of 2 strata types. Stratum 1 consists of very loose to loose clayey silty sands (A-2-4) of the Yorktown Formation. These soils are typically 3.00 to 3.02 meters thick.

Stratum 2 was encountered at elevations between 24.93 and 24.74 meters (MSL) and is part of the Tar Heel Formation (Black Creek Group). Soils in this strata consist of moderately to highly organic (ranging from 13.7 to 17.1% organics), very dense sands, silty and clayey sands with lignite, interbedded with dark and light gray very stiff to hard silty and sandy clay (A-7-5, A-7-6, A-6). Cemented sands were encountered in isolated lenses within Tar Heel Formation soils. Cementations were typically pyrite/marcasite in nature.

Artesian groundwater conditions were encountered beneath Bent 1 and Bent 2. Artesian flow at Bent 1 became evident only after boring termination. Flow rates were similar to conditions encountered at Structure 10 Bent 1. Bent 2 artesian flows occurred between depths of 8.69 and 22.40 meters, with a flow rate of 19 and 30 liters per minute. A head measurement at boring termination was 1.6 meters.

End Bent 2

Soils beneath End Bent 2 consist of Coastal Plain material. Three (3) strata types were encountered along the bent line.

Stratum 1 consists of 7.0 meters of undifferentiated post-Miocene deposits. Soils in this zone consist of very loose to medium dense sand and silty sand (A-1-b, A-2-4) and medium stiff to stiff silty sandy clay (A-6).

Stratum 2 was encountered at an elevation of 28.26 meters (MSL), and consists of 2.60 meters of very loose clayey silty sands of the Yorktown Formation (A-2-4).

Stratum 3 was encountered at an elevation of 25.66 meters (MSL) and is part of the Tar Heel Formation (Black Creek Group). Soils in this stratum consist of very dense to medium dense sands, clayey and silty sands (A-2-4, A-2-6). These sands are moderately to highly organic (up to14.5% organics), and interbedded with very stiff to hard silty clay and sandy silt (A-6, A-4). Occasional lignite and phosphate nodules were noted. Cemented sands were encountered in isolated lenses within Tar Heel Formation sand deposits. Cementations were typically pyrite/marcasite in nature.

No artesian groundwater conditions were observed. However, static ground water was measured at a depth of only 0.07 meters below existing ground surface, at an elevation of 35.19 meters (MSL).

6.0 NOTES TO DESIGNER

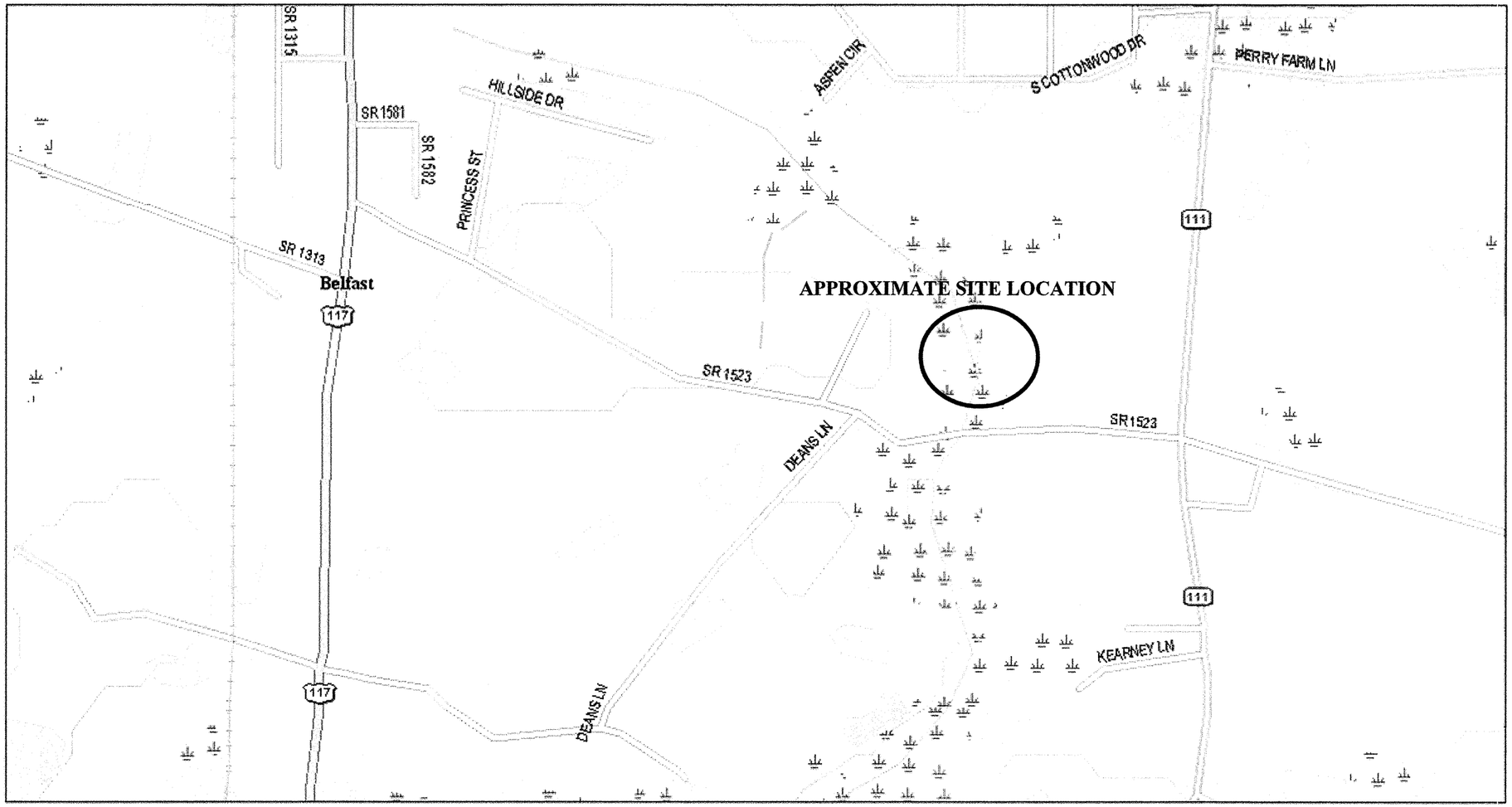
Based on our field exploration the following conditions may impact design and construction of the proposed structure. Therefore the designer should be aware of the following subsurface conditions:

- Soft, highly plastic clay exists beneath Structure 10, EB2-A from elevation 31.99 to 27.79 meters (MSL)
- Soft, highly plastic clay exists beneath Structure 11, B1-B from elevation 32.03 to 29.98 meters (MSL).
- Very dense sands were encountered beneath the entire site at elevations 25.59 to 24.22 meters (MSL). These sands contain small lenses of cemented sands; typically cementaceous material is pyrite/marcasite in composition.
- Approximately 1 to 1.6 meters of very soft/very loose sands and silts with organics exists along the Howell Branch floodplain from station 114+48 to 115+15.
- Artesian groundwater conditions exist beneath both interior bents of Structure 10 and 11. Bent 1 flow rate is approximately 2.3 liters per minute, with a head pressure of .30 meters. Bent 2 flow rates range from 19 to 30 liters per minute, with a head pressure of 1.6 to 1.8 meters. The elevation of the water bearing aquifer occurs between 25.59 and 12.19 meters (MSL) across all 4 interior bents.
- Artesian groundwater conditions along Structure 10 end bent 2 was encountered 24 hours after boring termination. Flow rate was relatively low, and 1 week after boring termination, water levels were approximately 0.05 meters below the ground surface.
- Static groundwater was measured across Structure 10 and 11 end bent 1 between 2.10 and 2.72 meters below existing ground surface, between an elevation of 37.87 and 33.6 meters (MSL).
- Static groundwater along Structure 11, end bent 2 was measured 3.72 meters below existing ground surface, at an elevation of 33.60 meters (MSL).

7.0 CLOSURE

Notes to the designer and evaluations provided by Tierra, Inc. are based on the Hydraulic Design Report dated March 1, 2006, provided by NCDOT. Modifications to our report may be required if there are changes to the design or location of the proposed structure. Notes to the designer in this report are based on data obtained from soil borings. The nature and extent of variations between borings may not become evident until construction.

US 70 (Goldsboro Bypass) – Structure 10 & 11 over Howell Branch *Wayne County, NC*



Data use subject to license.

© 2004 DeLorme. Topo USA® 5.0.

www.delorme.com

MN (9.2° W)

0 100 200 300 400 500 m

Data Zoom 14-0

SITE VICINITY MAP

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

NC GRID NAD 83

-T1- 103 PINC 5+77.965=
-L- STA. 114+27.108 (59.987m LT)
ELEV.= 33.131
NAIL SET

-T1-104 PINC 6+10.417=
-L- STA. 114+42.770 (31.565, LT)
ELEV.=33.226
NAIL SET

BL- 569B PINC 31+84.201=
-L- STA. 114+29.666 (0.937m LT)
EL. 36.786

LL EB-1A

LL B1-A

BL POT 32+07.513
-T1-105 PINC 6+42.852=
-L- STA. 114+52.977 (0.779m LT)
ELEV.=33.367
NAIL SET

LL B2-A

BL- 570B PINC 32+62.972=
-L- STA. 115+08.434 (0.408m LT)
EL. 33.203

LL EB2-A

BL- 571B PINC 33+44.122=
-L- STA. 115+89.581 (0.428m RT)
EL. 37.656

HOWELL BRANCH

113 114 115 116

-L- N 85° 15' 20.0" E

-L- TS Sta. 116+34.304

BEG. WW FENCE

-T1-106 PINC 6+81.459=
-L- STA. 114+49.465 (37.671m RT)
ELEV.= 33.092
NAIL SET

-T1- 107 PINC 7+30.605=
-L- STA. 114+32.632 (83.834m RT)
ELEV.= 34.999
NAIL SET

ORCHARD

POND

DEANS CEMETERY

-SR5- PT Sta. 20+05.544

BY4- 508B PINC 15+95.311=
-SR5- STA. 20.31.770 (4.681m RT)
EL. 35.108

-SR5- PC Sta. 20+55.017

-SR5- PT Sta. 21+15.247

S 75° 20' 33.6" E

-SR5- PC Sta. 22+77.138

S 87° 24' 09.9" E

SR 1571 TOMMY'S RD

BEGIN CONSTRUCTION
-SR5- POC Sta. 20+60.000

-T1- 108 POT 8+11.687=
-L- STA. 114+09.242 (161.469m RT)
ELEV.= 34.071
NAIL SET

END CONSTRUCTION
-SR5- POT Sta. 22+45.000

BY4 509B PINC 18+15.292=
-L- STA. 115+19.717
(167.727m RT)
EL. 36.978

Cox Semi-Circle

0 10 20 40
METER

NOTES:

BENCH MARK: TBM -BL- 569B, STA. 31+84.201 -BL-, 114+29.67 -L-, ELEVATION 36.786

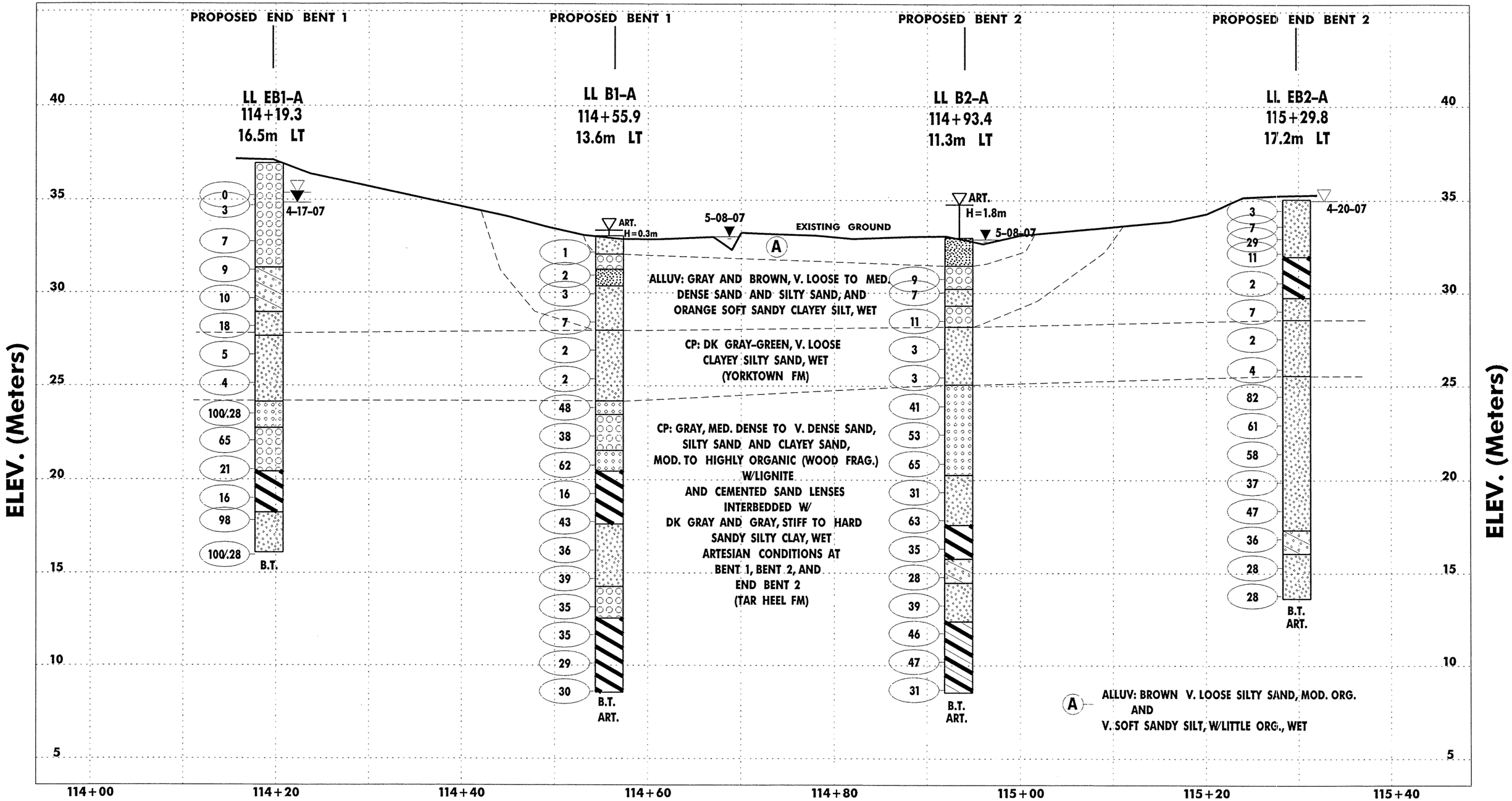
PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED FROM NCDOT, DATED APRIL, 2007

PROPOSED BRIDGE SKEW: 90°

BORING LOCATION PLAN
STRUCTURE 10 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 3446 1.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

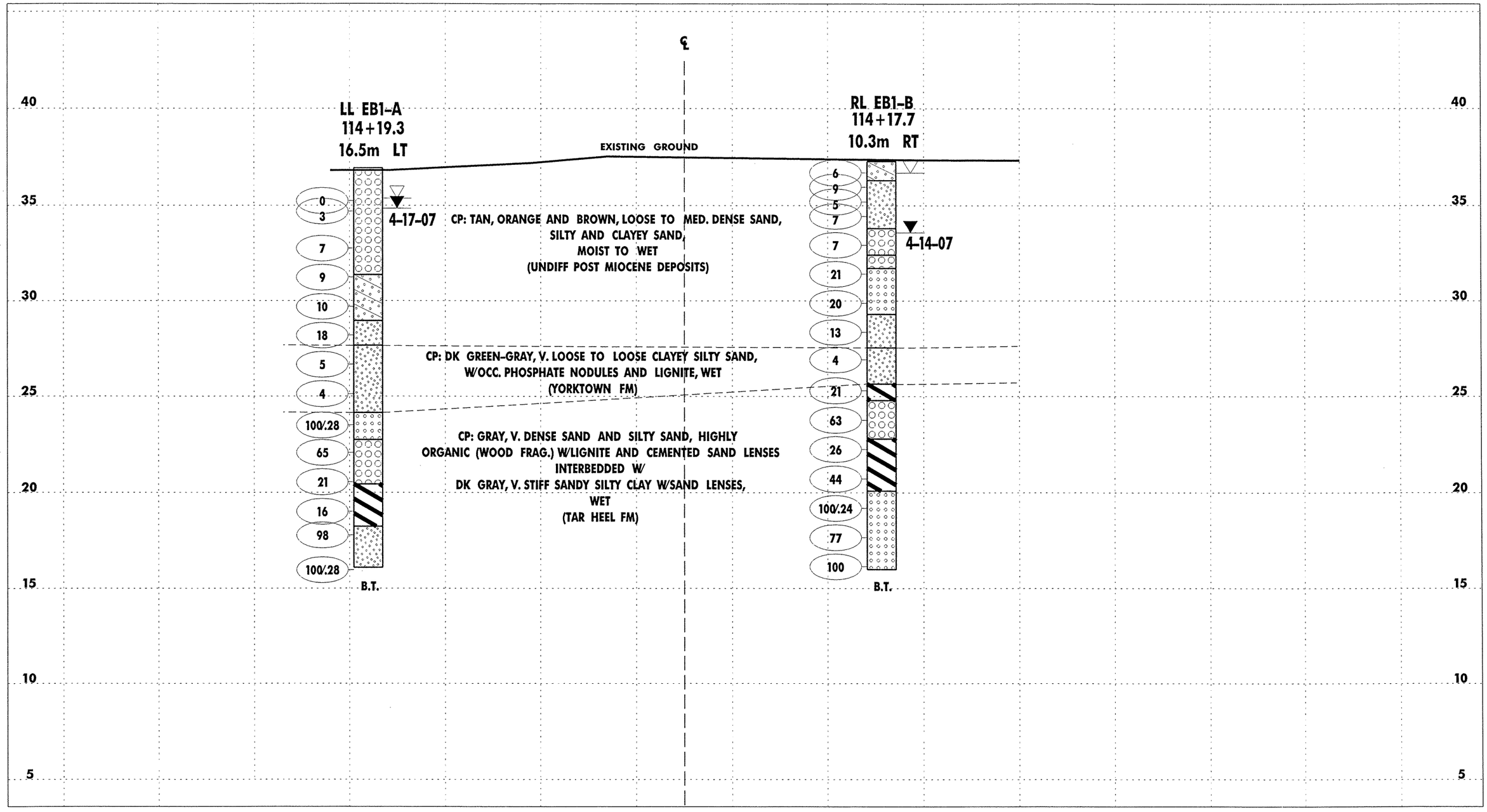


NOTE: ART. - ARTESIAN.

PROFILE 14M LT OF -L- STRUCTURE 10 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

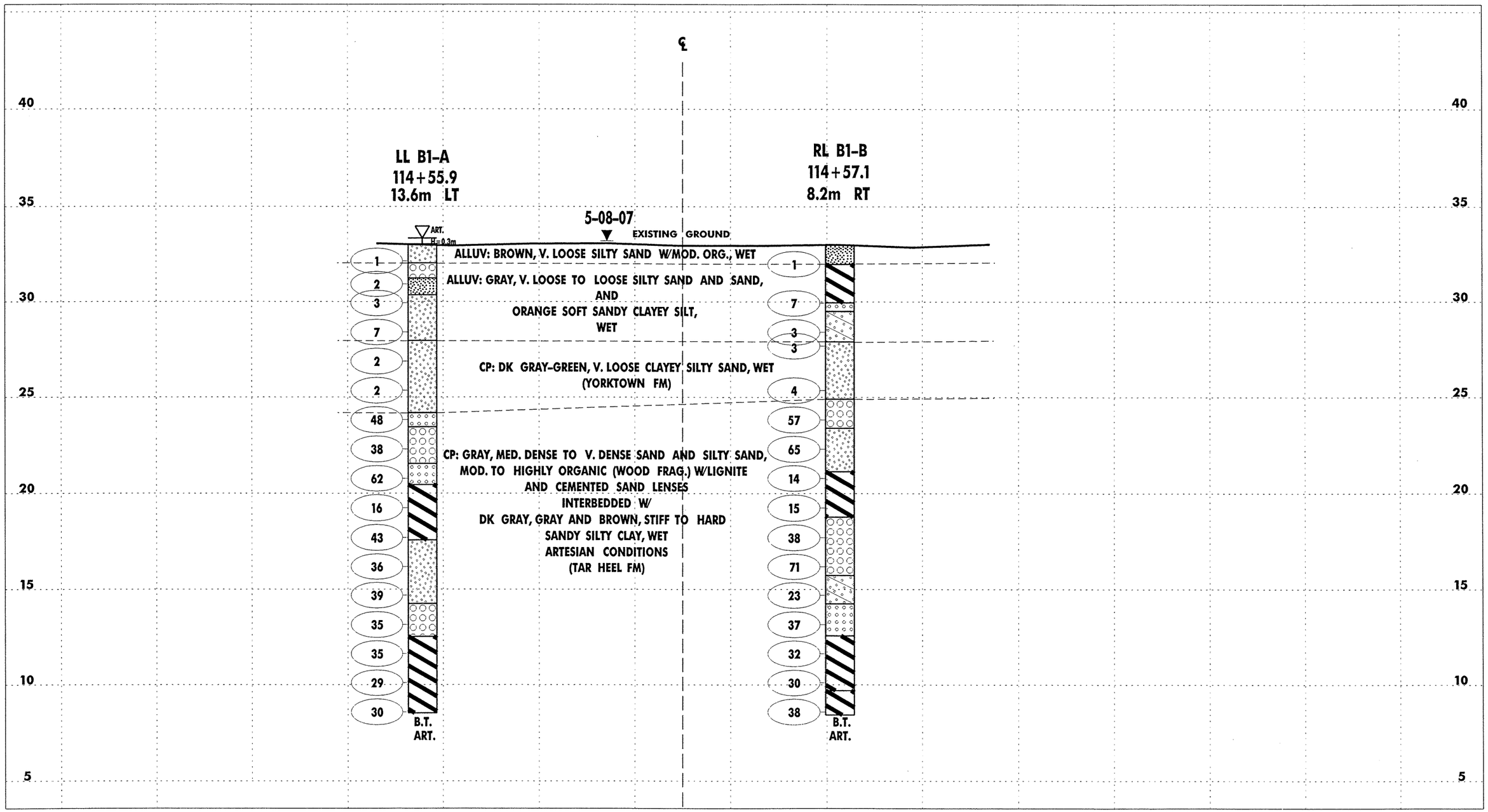
TIERRA



CROSS SECTION END BENT 1
STRUCTURE 10 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL · MATERIALS ENGINEERING
TIERRA, INC.
2776 AGALIAC RD.
RALEIGH, NC 27615
PHONE (919) 871-8000
FAX (919) 871-8003

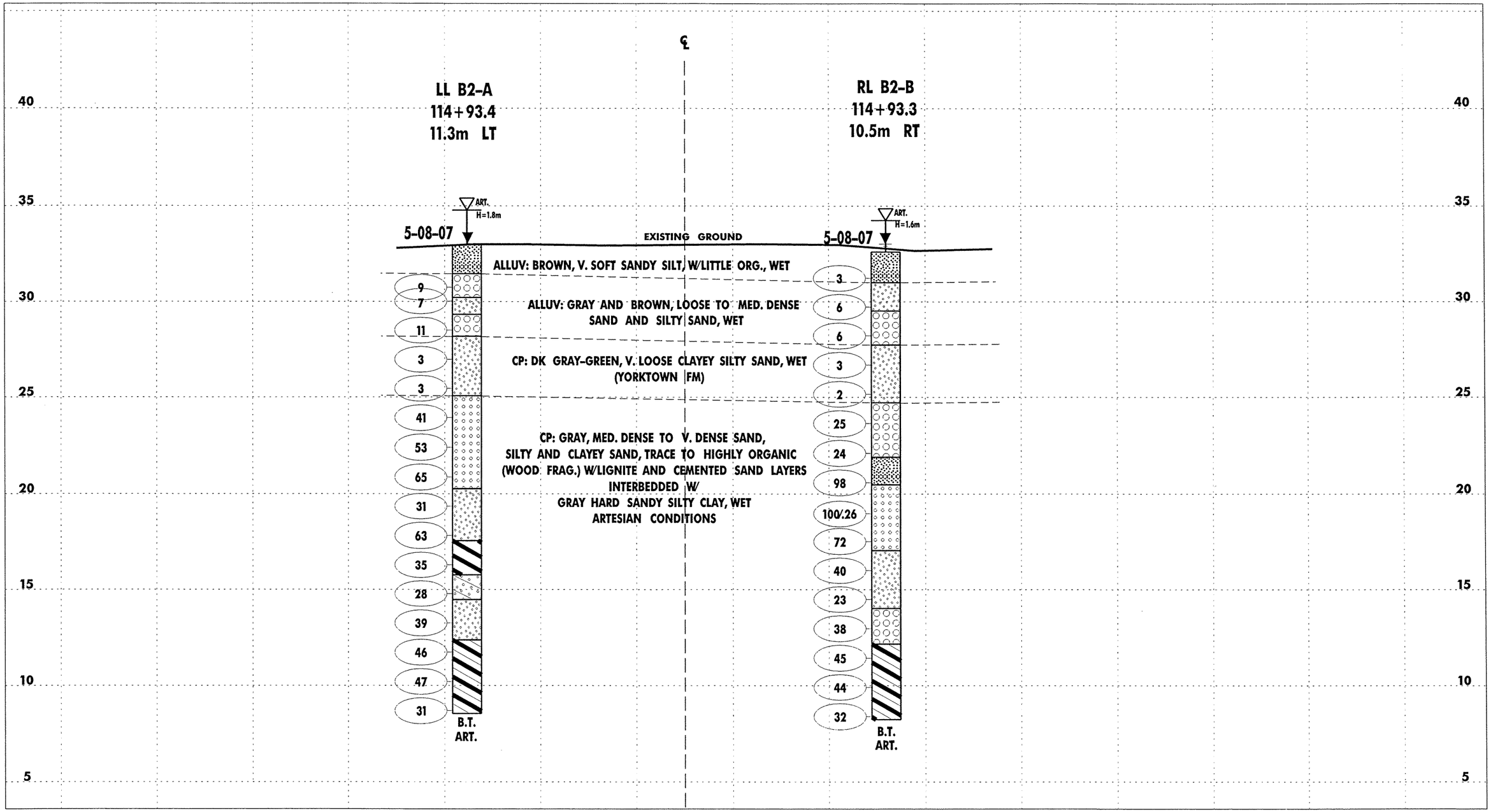


NOTE: ART. - ARTESIAN.

CROSS SECTION BENT 1
STRUCTURE 10 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA GEOTECHNICAL · MATERIALS ENGINEERING
TIERRA, INC.

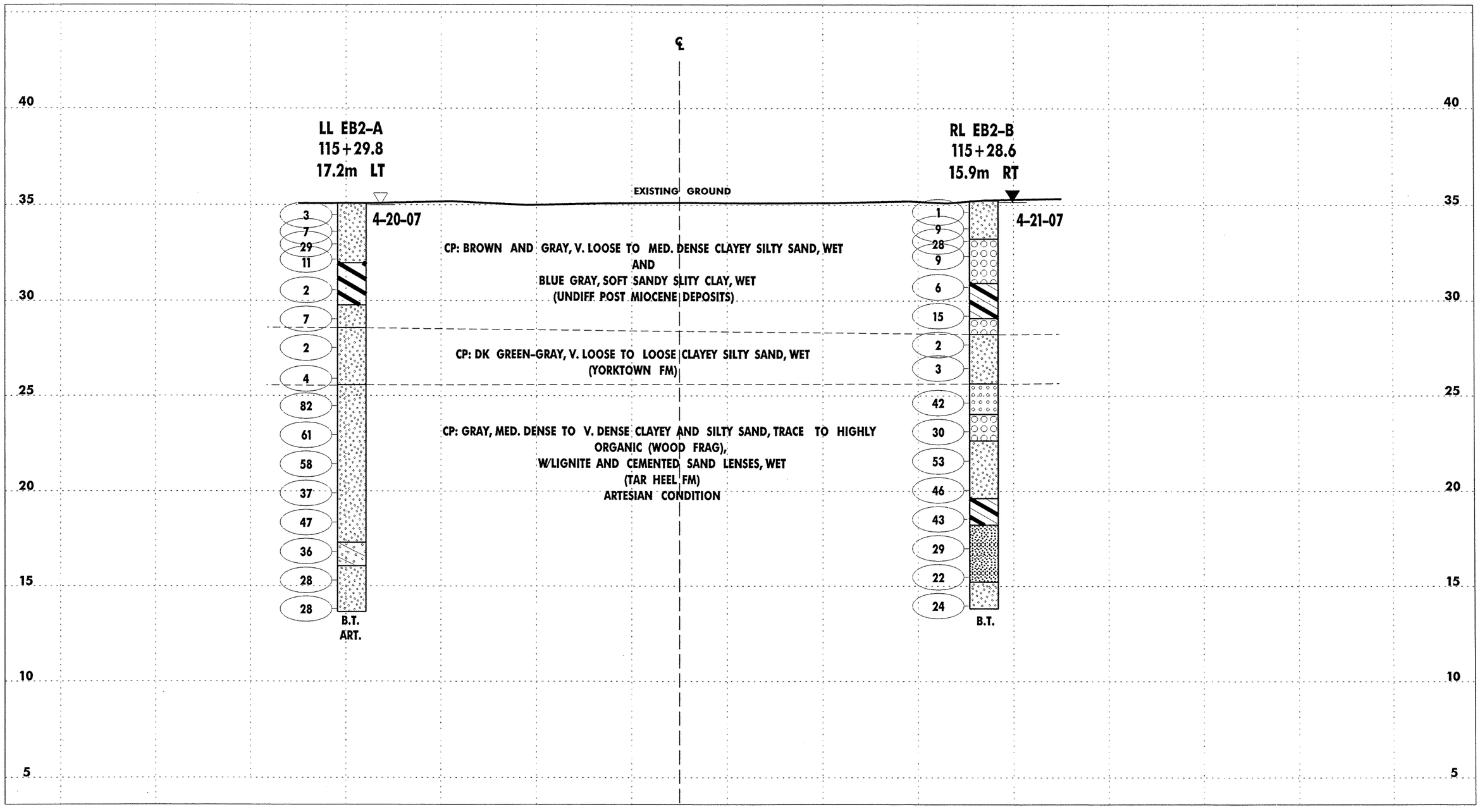


NOTE: ART. - ARTESIAN.

CROSS SECTION BENT 2
STRUCTURE 10 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.



NOTE: ART. - ARTESIAN.

CROSS SECTION END BENT 2
STRUCTURE 10 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL · MATERIALS ENGINEERING

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 (GOLDSBORO BYPASS) STRUCTURE 10 & 11 ON -L- OVER HOWELL BRANCH			**GROUND WTR (m)**
BORING NO. LL EB1-A	**STATION** 114+19.3	**OFFSET** 16.5m LT	**ALIGNMENT** -L-	**0 HR.** 1.58
COLLAR ELEV. 36.97 m	**TOTAL DEPTH** 20.85 m	**NORTHING** 186,444.8	**EASTING** 703,228.1	**24 HR.** 2.10
DRILL MACHINE B-40	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 04/16/07	**COMP. DATE** 04/16/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m) / DEPTH (m)
37									36.97 GROUND SURFACE 0.00
35.57	1.40						W		**COASTAL PLAIN** TAN, V. LOOSE TO LOOSE, SAND (A-1-b) (UNDIFFERENTIATED POST MIOCENE DEPOSITS) RODS DROPPED FROM 0.3 TO 1.0M
35.02	1.95	WOH	WOH	WOH	0		W		
33.07	3.90	2	1	2	3		W		
31.54	5.43	4	3	4	7		W		
30.02	6.95	3	3	6	9		W		31.37 5.60 **COASTAL PLAIN** ORANGE AND TAN, LOOSE TO MED. DENSE, CLAYEY SAND (A-2-6)
28.50	8.47	3	3	7	10		W		28.97 8.00 **COASTAL PLAIN** ORANGE AND BROWN, MED. DENSE, SILTY SAND (A-2-4)
26.97	10.00	5	10	8	18		W		27.67 9.30 **COASTAL PLAIN** DARK GREEN, GRAY , LOOSE, CLAYEY SILTY SAND (A-2-4) TRACE SHELL FRAG., LIGNITE AND PHOSPHATE NODULES (YORKTOWN FORMATION)
25.45	11.52	3	2	3	5		W		
23.92	13.05	2	2	2	4		W		24.17 12.80 **COASTAL PLAIN** GRAY, V. DENSE, SAND (A-3), HI. ORG. WITH LIGNITE (TARHEEL FORMATION) (ORGANIC CONTENT14.7%) *
22.40	14.57	20	35	65/.13	100/.28	SS-1	W		22.77 14.20 **COASTAL PLAIN** GRAY, V. DENSE SAND (A-1-b)
20.88	16.09	18	32	33	65		W		20.47 16.50 **COASTAL PLAIN** DARK GRAY, V. STIFF, SILTY CLAY (A-7-5)
19.35	17.62	10	8	13	21		W		
17.83	19.14	6	7	9	16		W		18.27 18.70 **COASTAL PLAIN** LIGHT GRAY, V. DENSE, SILTY SAND (A-2-4) WITH CEMENTED SAND LENSES
16.30	20.67	7	30	68	98		W		16.12 20.85 Boring Terminated at Elevation 16.12 m IN CP: SAND (TARHEEL FORMATION)
		50	50/.13		100/.28	SS-2	W		MUD DENSITY =0.97 GPCC

* ORGANICS CONSIST OF WOOD FRAGMENTS

NCDOT BORE SINGLE 07-014.GPJ NC_DOT.GDT 6/7/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 (GOLDSBORO BYPASS) STRUCTURE 10 & 11 ON -L- OVER HOWELL BRANCH			**GROUND WTR (m)**
BORING NO. LL B1-A	**STATION** 114+55.9	**OFFSET** 13.6m LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 33.09 m	**TOTAL DEPTH** 24.52 m	**NORTHING** 186,444.8	**EASTING** 703,264.8	**24 HR.** N/A
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/01/07	**COMP. DATE** 05/02/07	**SURFACE WATER DEPTH** 0.21m	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m) / DEPTH (m)
34									WATER SURFACE (05/01/07)
32.49	0.60								33.09 GROUND SURFACE 0.00
31.27	1.82	1	1	WOH	1	SS-3	W		32.09 1.00 **ALLUVIAL** BROWN, V. LOOSE, SILTY SAND (A-2-4) MOD. ORG.
30.26	2.83	1	1	1	2	SS-4	32%		31.29 1.80 **ALLUVIAL** LIGHT GRAY, V. LOOSE, SAND (A-1-b)
28.73	4.36	1	1	2	3	SS-5	W		30.39 2.70 **ALLUVIAL** ORANGE AND GRAY, V. SOFT, SANDY CLAYEY SILT (A-4)
27.21	5.88	5	5	2	7		W		27.99 5.10 **ALLUVIAL** ORANGE, GRAY AND BROWN, V. LOOSE TO LOOSE, SAND (A-2-4)
25.68	7.41	1	1	1	2		W		**COASTAL PLAIN** DARK GRAY AND GREEN, V. LOOSE, CLAYEY SILTY (A-2-4) (YORKTOWN FORMATION)
24.16	8.93	1	1	1	2	SS-6	W		24.22 8.87
22.64	10.45	16	17	31	48		W		23.49 9.60 **COASTAL PLAIN** GRAY, DENSE, SAND (A-3), MOD. TO HI. ORG. (TARHEEL FORMATION) *
21.11	11.98	15	20	18	38		W		21.59 11.50 **COASTAL PLAIN** GRAY, DENSE, SAND (A-1-b) WITH MOD. TO HI. ORG. *
19.59	13.50	20	23	39	62	SS-7	W		20.49 12.60 **COASTAL PLAIN** GRAY, V. DENSE, SAND (A-3) HI. ORG. WITH LIGNITE (ORGANIC CONTENT 13.7%) *
18.06	15.03	6	7	9	16	SS-8	42%		**COASTAL PLAIN** DARK GRAY, V. STIFF TO HARD, SANDY SILTY CLAY (A-7-5) WITH SAND AND CEMENTED SAND LENSES
16.54	16.55	5	23	20	43		W		17.64 15.45 **COASTAL PLAIN** GRAY TO LIGHT GRAY, DENSE, CLAYEY SILTY SAND (A-2-4), MOD. ORG. *
15.02	18.07	9	15	21	36	SS-9	W		
13.49	19.60	19	16	23	39		W		14.29 18.80 **COASTAL PLAIN** LIGHT GRAY, DENSE, SAND (A-1-b)
11.97	21.12	11	17	18	35		W		12.57 20.52 **COASTAL PLAIN** LIGHT GRAY, HARD TO V. STIFF, SANDY SILTY CLAY (A-7-5)
10.44	22.65	11	16	19	35		W		
8.92	24.17	10	13	16	29		W		
		12	14	16	30		W		8.57 24.52 Boring Terminated at Elevation 8.57 m IN CP: CLAY (TARHEEL FORMATION)

MUD DENSITY = 0.97 GPCC
ARTESIAN CONDITION AT TERMINATION
FLOW RATE =2.3 LPM, H = 0.30 M

* ORGANICS CONSIST OF WOOD FRAGMENTS

Other Samples:
ST-1 (1.8 - 2.4)

NCDOT BORE SINGLE 07-014.GPJ NC_DOT.GDT 6/7/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 (GOLDSBORO BYPASS) STRUCTURE 10 & 11 ON -L- OVER HOWELL BRANCH			**GROUND WTR (m)**
BORING NO. LL B2-A	**STATION** 114+93.4	**OFFSET** 11.3m LT	**ALIGNMENT** -L- **0 HR.** N/A
COLLAR ELEV. 33.00 m	**TOTAL DEPTH** 24.44 m	**NORTHING** 186,445.7	**EASTING** 703,302.3 **24 HR.** N/A
DRILL MACHINE B-40	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 04/24/07	**COMP. DATE** 04/25/07	**SURFACE WATER DEPTH** 0.02m	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
33									WATER SURFACE (04/24/07) GROUND SURFACE	
									33.00 **ALLUVIAL** BROWN, V. SOFT, SANDY SILT (A-4) WITH LITTLE ORG.	0.00
31.08	1.92								31.50	1.50
30.35	2.65	3	5	4	9	SS-10	W		**ALLUVIAL** TAN, LOOSE, SAND (A-1-b)	
		3	3	4	7	SS-11	W		30.25	2.75
28.82	4.18								**ALLUVIAL** TAN, LOOSE, SILTY SAND (A-2-4)	
		4	5	6	11	SS-12	W		29.35	3.65
27.30	5.70								**ALLUVIAL** GRAY AND GREEN, MED. DENSE, SAND (A-1-b)	
		1	2	1	3		W		28.20	4.80
25.78	7.22								**COASTAL PLAIN** GREEN AND GRAY, V. LOOSE, CLAYEY SILTY SAND (A-2-4) (YORKTOWN FORMATION)	
		1	1	2	3		W		25.10	7.90
24.25	8.75								**COASTAL PLAIN** GRAY AND BROWN, DENSE, SAND (A-3), MOD. TO HI. ORG. (TAR HEEL FORMATION) *	
		13	18	23	41		W			
22.73	10.27									
		16	29	24	53		W			
21.20	11.80									
		20	32	33	65		W			
19.68	13.32								20.30	12.70
		6	8	23	31		W		**COASTAL PLAIN** GRAY, DENSE TO V. DENSE, SILTY SAND (A-2-4) WITH TRACE ORGANICS *	
18.16	14.84									
		28	32	31	63	SS-13	W			
16.63	16.37								17.60	15.40
		12	12	23	35	SS-14	18%		**COASTAL PLAIN** LIGHT GRAY, HARD, SILTY SANDY CLAY (A-7-6)	
15.11	17.89								15.80	17.20
		13	13	15	28		W		**COASTAL PLAIN** LIGHT GRAY, MED. DENSE CLAYEY SAND (A-2-6)	
13.58	19.42								14.50	18.50
		17	16	23	39		W		**COASTAL PLAIN** LIGHT GRAY, DENSE, CLAYEY SILTY SAND (A-2-4)	
12.06	20.94								12.40	20.60
		15	18	28	46		W		**COASTAL PLAIN** LIGHT GRAY, HARD SILTY SANDY CLAY (A-6)	
10.54	22.46									
		15	17	30	47	SS-15	15%			
9.01	23.99									
		12	13	18	31		W		8.56	24.44
									Boring Terminated at Elevation 8.56 m IN CP:CLAY (TARHEEL FORMATION)	

ARTESIAN CONDITIONS ENCOUNTERED AT 14.50M
FLOW RATE = 19 LPM, H = 1.80M
MUD DENSITY = 1.00 GPCC
NOTE: MOVED 3M DUE TO TREE DEBRIS (COULD NOT MOVE)

* ORGANICS CONSIST OF WOOD FRAGMENTS

NCDOT BORE SINGLE 07-014.GPJ NC_DOT.GDT 6/5/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 (GOLDSBORO BYPASS) STRUCTURE 10 & 11 ON -L- OVER HOWELL BRANCH			**GROUND WTR (m)**
BORING NO. LL EB2-A	**STATION** 115+29.8	**OFFSET** 17.2m LT	**ALIGNMENT** -L- **0 HR.** 0.07
COLLAR ELEV. 35.09 m	**TOTAL DEPTH** 21.42 m	**NORTHING** 186,454.6	**EASTING** 703,338.1 **24 HR.** N/A
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual
START DATE 04/19/07	**COMP. DATE** 04/19/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
36										
34.79	0.30								35.09 GROUND SURFACE	0.00
		3	2	1	3	SS-16	M		**COASTAL PLAIN** BROWN, V. LOOSE, SILTY SAND WITH CLAY LENSES (A-2-4) (UNDIFFERENTIATED POST MIOCENE DEPOSITS)	
33.93	1.16						W			
33.26	1.83	1	1	6	7		W			
		12	18	11	29		W			
32.47	2.62									
		2	3	8	11		W			
30.88	4.21									
		1	1	1	2	SS-17	72%			
29.36	5.73								29.79	5.30
		2	2	5	7		W		**COASTAL PLAIN** DARK GRAY, LOOSE, SILTY COARSE SAND (A-2-4)	
27.84	7.25								28.59	6.50
		1	1	1	2		W		**COASTAL PLAIN** DARK GREEN AND GRAY, V. LOOSE, CLAYEY SILTY SAND (A-2-4) (YORKTOWN FORMATION)	
26.31	8.78									
		3	2	2	4	SS-18	W			
24.79	10.30								25.59	9.50
		12	34	48	82		W		**COASTAL PLAIN** LIGHT GRAY, V. DENSE TO DENSE, SILTY SAND (A-2-4), TRACE ORGANICS TO HI. ORG. (TARHEEL FORMATION) (ORGANIC CONTENT UP TO 14.5%) *	
23.26	11.83									
		12	20	41	61	SS-19	W			
21.74	13.35									
		10	20	38	58	SS-20	W			
20.22	14.87									
		10	17	20	37		W			
18.69	16.40									
		13	20	27	47		W			
17.17	17.92									
		17	17	19	36		W			
15.64	19.45									
		13	15	13	28		W			
14.12	20.97									
		17	13	15	28		W		17.34	17.75
									COASTAL PLAIN GRAY, DENSE, CLAYEY SAND (A-2-6) WITH CLAY LENSES AND TRACE ORGANICS *	
									16.09	19.00
									COASTAL PLAIN LIGHT GRAY, MED. DENSE, CLAYEY SILTY SAND (A-2-4) WITH CLAY LENSES	
									13.67	21.42
									Boring Terminated at Elevation 13.67 m IN CP: SAND (TARHEEL FORMATION)	

ROOTMAT 0.07 M
ARTESIAN CONDITIONS OBSERVED AFTER 24 HR (LOW FLOW-NOT MEASURED)
MUD DENSITY = 0.96 GPCC

* ORGANICS CONSIST OF WOOD FRAGMENTS

Other Samples:
ST-2 (4.0 - 4.8)
ST-3 (4.8 - 5.5)

NCDOT BORE SINGLE 07-014.GPJ NC_DOT.GDT 6/5/07

TIERRA, INC. 2736 ROWLAND ROAD, RALEIGH, NORTH CAROLINA 27615

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

US 70 (GOLDSBORO BYPASS) - STRUCTURE 10 (LEFT LANE)
ON -L- OVER HOWELL BRANCH
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA

WAYNE COUNTY

TIERRA, INC. PROJECT NO: 6211-07-014

BORING #		SAMPLE #	TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC	OC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED							
STATION #	OFFSET (METER)	DEPTH (METER)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY	LL	PI	%	%
LL EB1-A		SS-1	-	-	-	-	-	-	-	-	-	-	14.7
N/A													
114+19.3	16.5 M LT	13.05-13.50											
LL EB1-A		SS-2	89	86	10	23	68	2	7	19	NP	-	-
A-2-4													
114+19.3	16.5 M LT	19.14-19.59											
LL B1-A		SS-3	96	52	19	62	21	7	10	20	NP	-	-
A-2-4													
114+55.9	13.6 M LT	0.60-1.15											
LL B1-A		SS-4	100	93	62	13	36	23	28	28	10	32.0	-
A-4													
114+55.9	13.6 M LT	1.82-2.27											
LL B1-A		SS-5	100	95	33	13	64	6	17	20	NP	-	-
A-2-4													
114+55.9	13.6 M LT	2.83-3.28											
LL B1-A		SS-6	92	86	17	19	63	1	17	28	NP	-	-
A-2-4													
114+55.9	13.6 M LT	7.41-7.86											
LL B1-A		SS-7	-	-	-	-	-	-	-	-	-	-	13.7
N/A													
114+55.9	13.6 M LT	11.98-12.3											
LL B1-A		SS-8	100	99	97	1	3	19	77	99	64	41.7	-
A-7-5													
114+55.9	13.6 M LT	13.50-13.95											
LL B1-A		SS-9	95	56	32	52	18	14	16	22	NP	-	-
A-2-4													
114+55.9	13.6 M LT	16.55-17.00											
LL B2-A		SS-10	98	45	3	78	19	2	1	15	NP	-	-
A-1-b													
114+93.4	11.3 M LT	1.92-2.37											

TIERRA, INC. 2736 ROWLAND ROAD, RALEIGH, NORTH CAROLINA 27615

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

US 70 (GOLDSBORO BYPASS) - STRUCTURE 10 (LEFT LANE)
ON -L- OVER HOWELL BRANCH
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA

WAYNE COUNTY

TIERRA, INC. PROJECT NO: 6211-07-014

BORING #		SAMPLE #	TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC	OC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED							
STATION #	OFFSET (METER)	DEPTH (METER)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY	LL	PI	%	%
LL B2-A		SS-11	90	74	7	55	38	1	6	17	NP	-	-
A-2-4													
114+93.4	11.3 M LT	2.65-3.10											
LL B2-A		SS-12	89	34	4	-	-	-	-	-	NP	-	-
A-1-a													
114+93.4	11.3 M LT	4.18-4.63											
LL B2-A		SS-13	100	62	11	77	13	1	9	19	NP	-	-
A-2-4													
114+93.4	11.3 M LT	14.84-15.29											
LL B2-A		SS-14	100	97	66	7	27	10	56	54	37	18.2	-
A-7-6													
114+93.4	11.3 M LT	16.37-16.82											
LL B2-A		SS-15	80	76	64	9	15	27	49	40	25	14.5	-
A-6													
114+93.4	11.3 M LT	22.46-22.91											
LL EB2-A		SS-16	98	86	35	30	39	13	18	17	4	-	-
A-2-4													
115+29.8	17.2 M LT	1.16-1.61											
LL EB2-A		SS-17	100	100	95	1	6	24	69	84	56	71.9	-
A-7-6													
115+29.8	17.2 M LT	4.21-4.66											
LL EB2-A		SS-18	92	86	23	17	60	2	21	28	NP	-	-
A-2-4													
115+29.8	17.2 M LT	8.78-9.23											
LL EB2-A		SS-19	-	-	-	-	-	-	-	-	-	-	14.5
N/A													
115+29.8	17.2 M LT	11.83-12.28											
LL EB2-A		SS-20	93	81	10	38	54	1	7	17	NP	-	-
A-2-4													
115+29.8	17.2 M LT	13.35-13.80											

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34461.1.3 TIP: R-2554BA COUNTY: WAYNE

DESCRIPTION(1): US 70 (GOLDSBORO BYPASS) - STRUCTURE 10 (LEFT LANE) ON -L- OVER HOWELL BRANCH

EXISTING BRIDGE

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

Bridge No.: N/A Length: N/A Total Bents: N/A Bents in Channel: N/A Bents in Floodplain: N/A
Foundation Type: NEW LOCATION

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: N/A

Interior Bents: N/A

Channel Bed: NONE EVIDENT

Channel Bank: NONE EVIDENT

EXISTING SCOUR PROTECTION

Type(3): N/A

Extent(4): N/A

Effectiveness(5): N/A

Obstructions(6): HIGH AMOUNT OF DEADFALL (MEDIUM TO LARGE TREES), BEAVER DAMS

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.

DESIGN INFORMATION

Channel Bed Material(7): MEDIUM TO COARSE SANDS

Channel Bank Material(8): SAND AND MUCK

Channel Bank Cover(9): GRASS AND SHRUBS ADJACENT TO ACTUAL CHANNEL

Floodplain Width(10): APPROX. 75 METERS

Floodplain Cover(11): GRASS, SHRUBS, OCCASIONAL TREES (YOUNG TO MODERATE IN AGE)

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

Channel Migration Tendency(13): TO THE WEST

Observations and Other Comments: CHANNEL IS ONLY 3 METERS WIDE, WETLAND IS 75 METERS WIDE
WATER IS PONDED THROUGHOUT WETLAND AREA.

Reported by: _____ **Date:** 5/8/2007
TIERRA, INC.

DESIGN SCOUR ELEVATIONS(14) Feet ____ Meters X

	BENTS										
	Bent 1	Bent 2									
100-year DSE	31.64	31.37									
500-year DSE	31.47	31.2									

Comparison of DSE to Hydraulics Unit theoretical scour:
The Geotechnical Engineering Unit agrees that the DSE is equal to the calculated theoretical scour elevation.

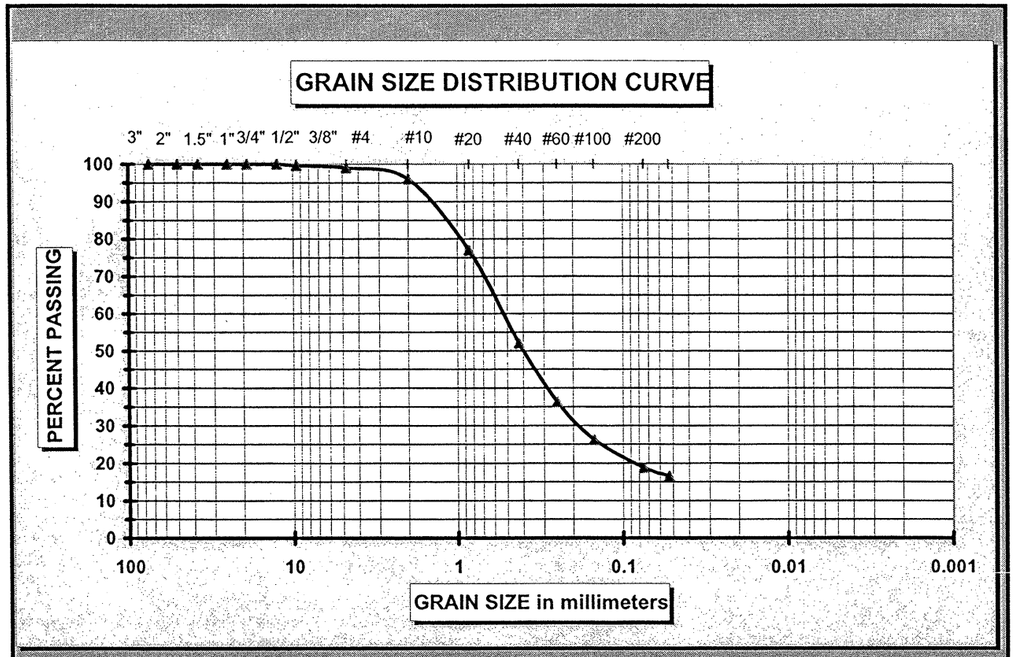
DSE determined by: _____ **Date:** 5/29/2007

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	BANK	BANK	BANK	BANK	BANK	CHANNEL	
Sample No.	SS-3	SS-4	SS-5	SS-10	SS-11	SS-12	
Retained #4	0.9	0	0	0	4.4	1.6	
Passed #10	96	99.8	99.9	98.2	89.9	89	
Passed #40	52.1	93.1	95.3	44.7	73.5	34.1	
Passed #200	18.8	62.1	32.6	3.1	7.1	3.9	
Coarse Sand	62	13	13	78	55	88	
Fine Sand	21	36	64	19	38	8	
Silt	7	23	6	2	1	-	
Clay	10	28	17	1	6	-	
LL	20	28	20	15	17	-	
PI	NP	10	NP	NP	NP	NP	
AASHTO	A-2-4	A-4	A-2-4	A-1-b	A-2-4	A-1-b	
Station	114+55.9	114+55.9	114+55.9	114+93.4	114+93.4	114+93.4	
Offset	13.6 M LT	13.6 M LT	13.6 M LT	11.3 M LT	11.3 M LT	11.3 M LT	
Depth	0.60-1.05	1.82-2.27	2.83-3.28	1.92-2.36	2.65-3.9	4.18-4.62	

TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NORTH CAROLINA 27615

US 70 (GOLDSBORO BYPASS) - STRUCTURE 11 (RIGHT LANE)
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA



AASHTO M-145 Classification of Soil for Engineering Purposes					
Gravel	< 3" and > #10		Coarse Sand	< #10 and > #60	Cu = D60 / D10
			Fine Sand	< #60 and > #200	Cc = (D30)^2 / (D10 x D60)

BORING #: LL B1-A SAMPLE #: SS-3 DEPTH: 0.60 - 1.05

BROWN SILTY SAND (A-2-4) W/ MOD. ORG.

% PASSING #200 SIEVE: 19%

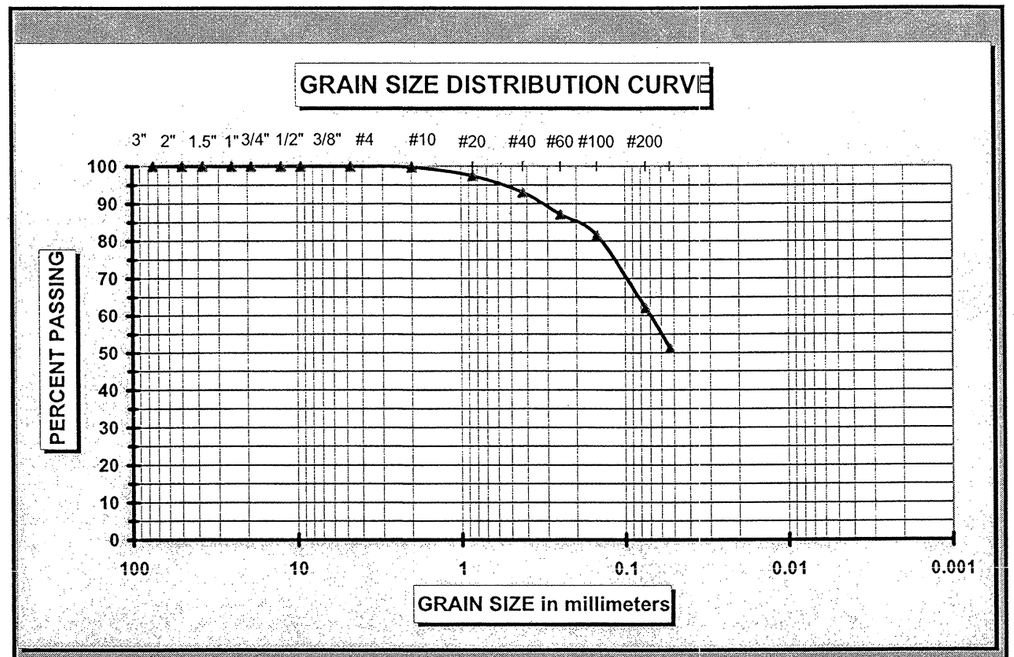
NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	20
PLASTIC LIMIT	-
PLASTIC INDEX	NP

TIERRA, INC. PROJECT #: 6211-07-014

TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NORTH CAROLINA 27615

US 70 (GOLDSBORO BYPASS) - STRUCTURE 11 (RIGHT LANE)
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA



AASHTO M-145 Classification of Soil for Engineering Purposes					
Gravel	< 3" and > #10		Coarse Sand	< #10 and > #60	Cu = D60 / D10
			Fine Sand	< #60 and > #200	Cc = (D30)^2 / (D10 x D60)

BORING #: LL B1-A SAMPLE #: SS-4 DEPTH: 1.82-2.27

ORANGE AND GRAY SANDY CLAYEY SILT (A-4)

% PASSING #200 SIEVE: 62%

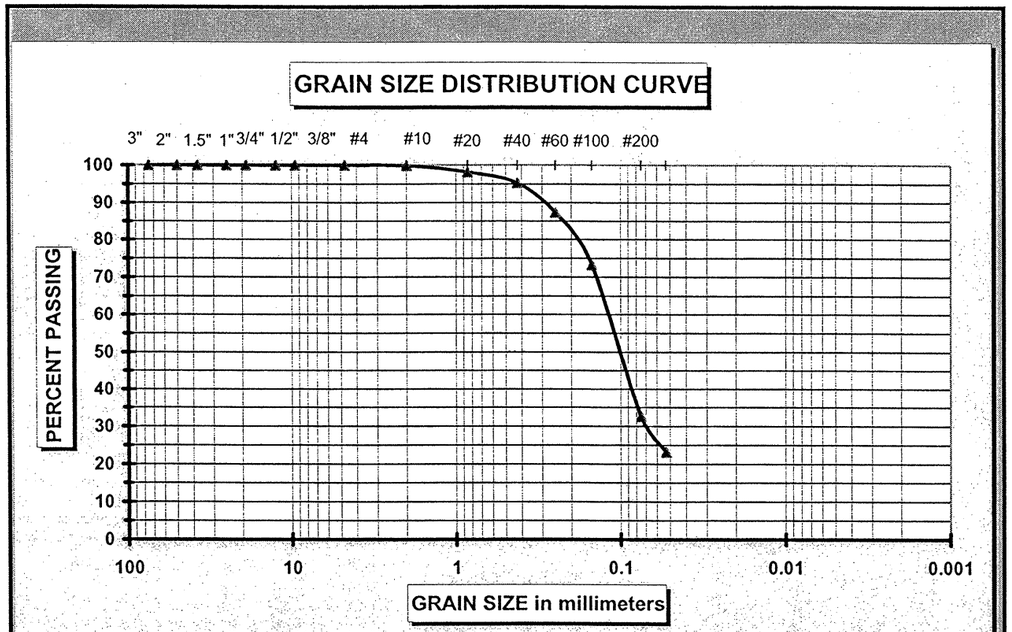
NATURAL MOISTURE CONTENT = 32.0%

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	28
PLASTIC LIMIT	18
PLASTIC INDEX	10

TIERRA, INC. PROJECT #: 6211-07-014

TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NORTH CAROLINA 27615

US 70 (GOLDSBORO BYPASS) - STRUCTURE 11 (RIGHT LANE)
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA



AASHTO M-145 Classification of Soil for Engineering Purposes					
Gravel	< 3" and > #10		Coarse Sand	< #10 and > #60	Cu = D60 / D10
			Fine Sand	< #60 and > #200	Cc = (D30)^2 / (D10 x D60)

BORING #: LL B1-A SAMPLE #: SS-5 DEPTH: 2.83 - 3.28

ORANGE GRAY CLAYEY SILTY SAND W/ CLAY LENSES

% PASSING #200 SIEVE: 33%

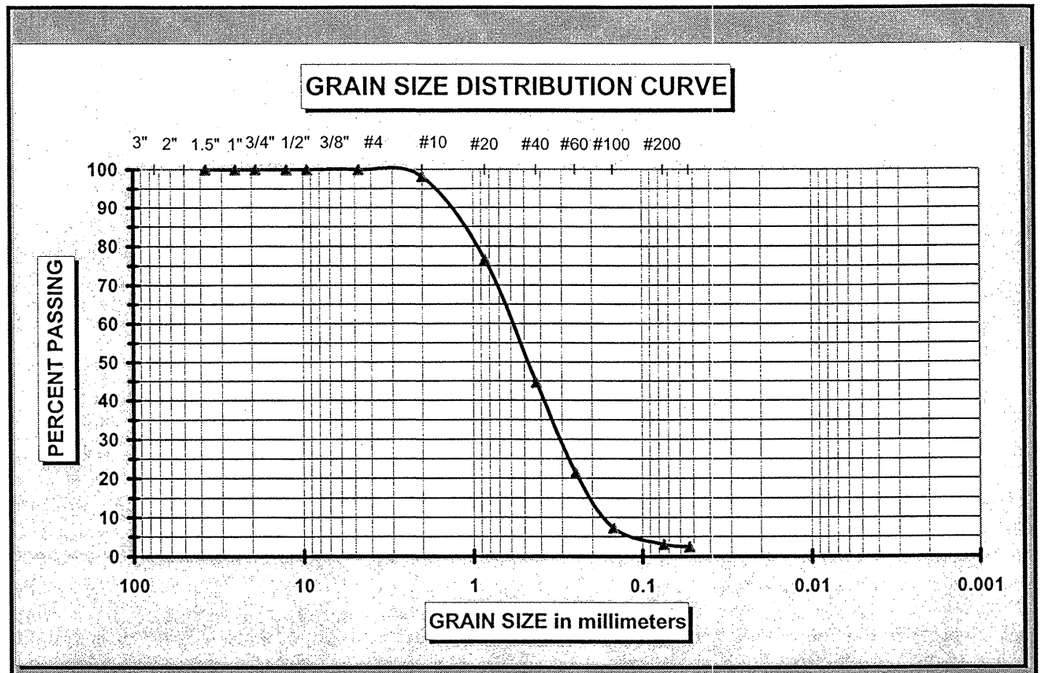
NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	20
PLASTIC LIMIT	-
PLASTIC INDEX	NP

TIERRA, INC. PROJECT #: 6211-07-014

TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NORTH CAROLINA 27615

US 70 (GOLDSBORO BYPASS) - STRUCTURE 11 (RIGHT LANE)
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA



AASHTO M-145 Classification of Soil for Engineering Purposes					
Gravel	< 3" and > #10		Coarse Sand	< #10 and > #60	Cu = D60 / D10
			Fine Sand	< #60 and > #200	Cc = (D30)^2 / (D10 x D60)

BORING #: LL B2-A SAMPLE #: SS-10 DEPTH: 1.92 - 2.37

TAN SAND (A-1-b)

% PASSING #200 SIEVE: 3%

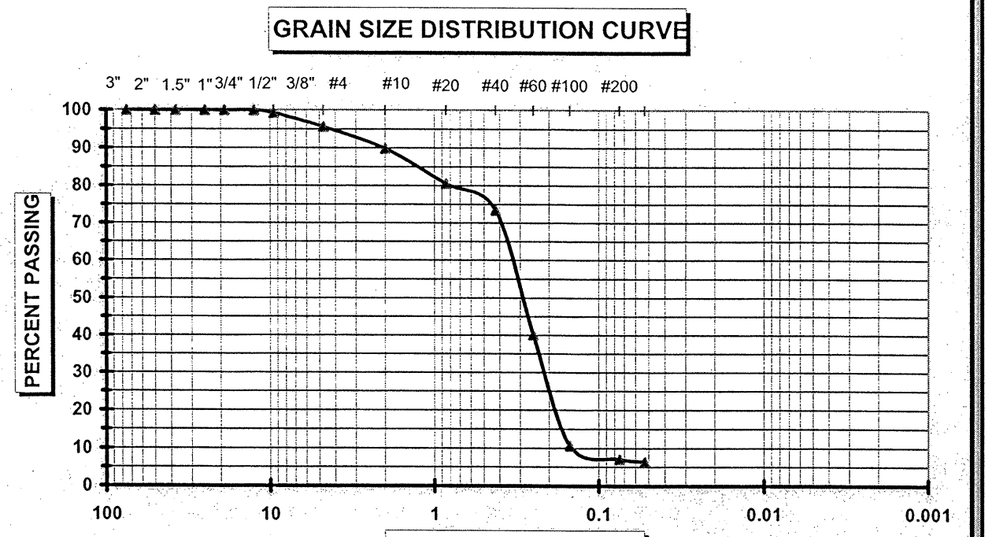
NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	15
PLASTIC LIMIT	-
PLASTIC INDEX	NP

TIERRA, INC. PROJECT #: 6211-07-014

TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NORTH CAROLINA 27615

US 70 (GOLDSBORO BYPASS) - STRUCTURE 11 (RIGHT LANE)
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA



AASHTO M-145 Classification of Soil for Engineering Purposes					
Gravel	< 3" and > #10		Coarse Sand	< #10 and > #60	Cu = D60 / D10
			Fine Sand	< #60 and > #200	Cc = (D30)^2 / (D10 x D60)

BORING #: LL B2-A SAMPLE #: SS-11 DEPTH: 2.65 - 3.10

TAN SILTY SAND (A-2-4)

% PASSING #200 SIEVE: 7%

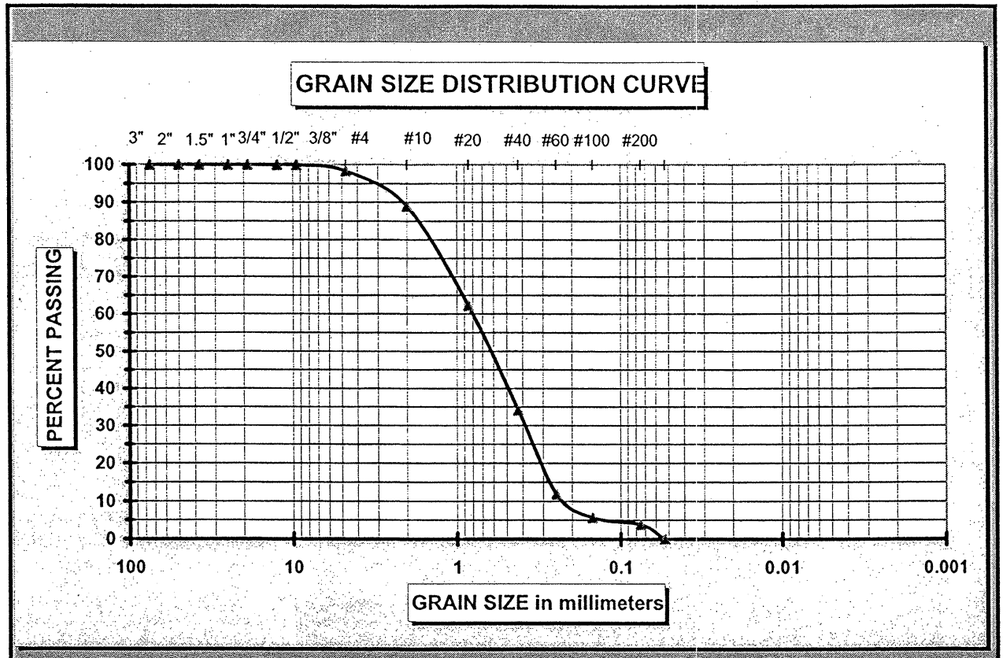
NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	17
PLASTIC LIMIT	0
PLASTIC INDEX	NP

TIERRA, INC. PROJECT #: 6211-07-014

TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NORTH CAROLINA 27615

US 70 (GOLDSBORO BYPASS) - STRUCTURE 11 (RIGHT LANE)
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA



AASHTO M-145 Classification of Soil for Engineering Purposes					
Gravel	< 3" and > #10		Coarse Sand	< #10 and > #60	Cu = D60 / D10
			Fine Sand	< #60 and > #200	Cc = (D30)^2 / (D10 x D60)

BORING #: LL B2-A SAMPLE #: SS-12 DEPTH: 4.18 - 4.63

GRAY AND GREEN SAND (A-1-b)

% PASSING #200 SIEVE: 4%

NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	-
PLASTIC LIMIT	-
PLASTIC INDEX	NP

TIERRA, INC. PROJECT #: 6211-07-014

STRUCTURE 10 (LEFT LANE) PROFILE LOOKING DOWNSTATION FROM END BENT 2.

STRUCTURE 10 (LEFT LANE) PROFILE NEAR -L- LOOKING FROM EB1 UPSTATION.

SITE PHOTOGRAPHS
STRUCTURE 10 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL + MATERIALS ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

STRUCTURE 10 (LEFT LANE) END BENT 1, LOOKING LEFT TO RIGHT.

STRUCTURE 10 (LEFT LANE) BENT 1 , LOOKING LEFT TO RIGHT.

SITE PHOTOGRAPHS
STRUCTURE 10 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL + MATERIALS ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

STRUCTURE 10 (LEFT LANE) BENT 2, LOOKING RIGHT TO LEFT.

STRUCTURE 10 (LEFT LANE) END BENT 2, LOOKING LEFT TO RIGHT.

SITE PHOTOGRAPHS
STRUCTURE 10 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

HOWELL BRANCH, LOOKING UPSTREAM FROM –L-.

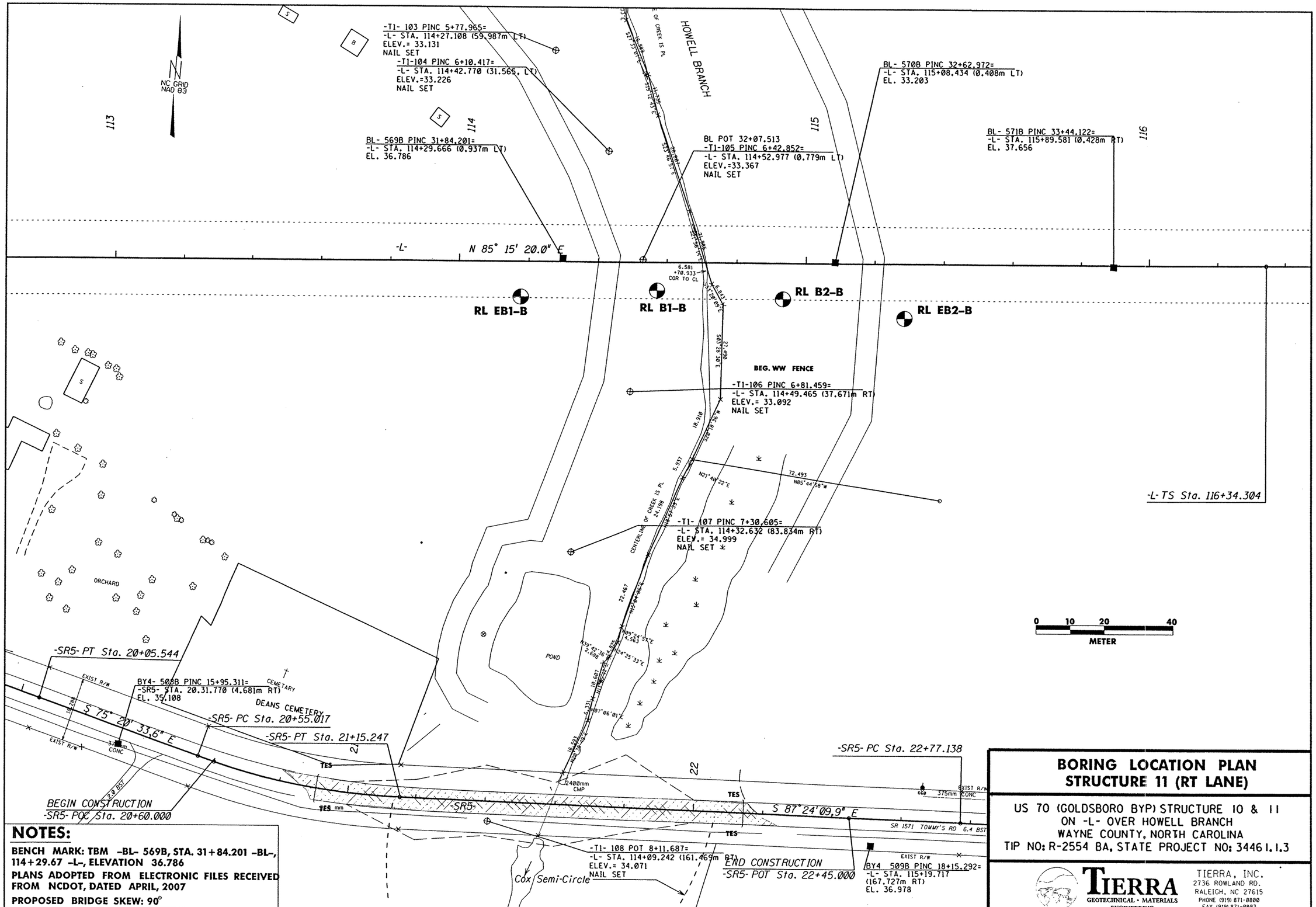
HOWELL BRANCH, LOOKING DOWNSTREAM FROM –L-.

SITE PHOTOGRAPHS
STRUCTURE 10 (LT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL + MATERIALS ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803



NOTES:

BENCH MARK: TBM -BL- 569B, STA. 31+84.201 -BL-, 114+29.67 -L-, ELEVATION 36.786

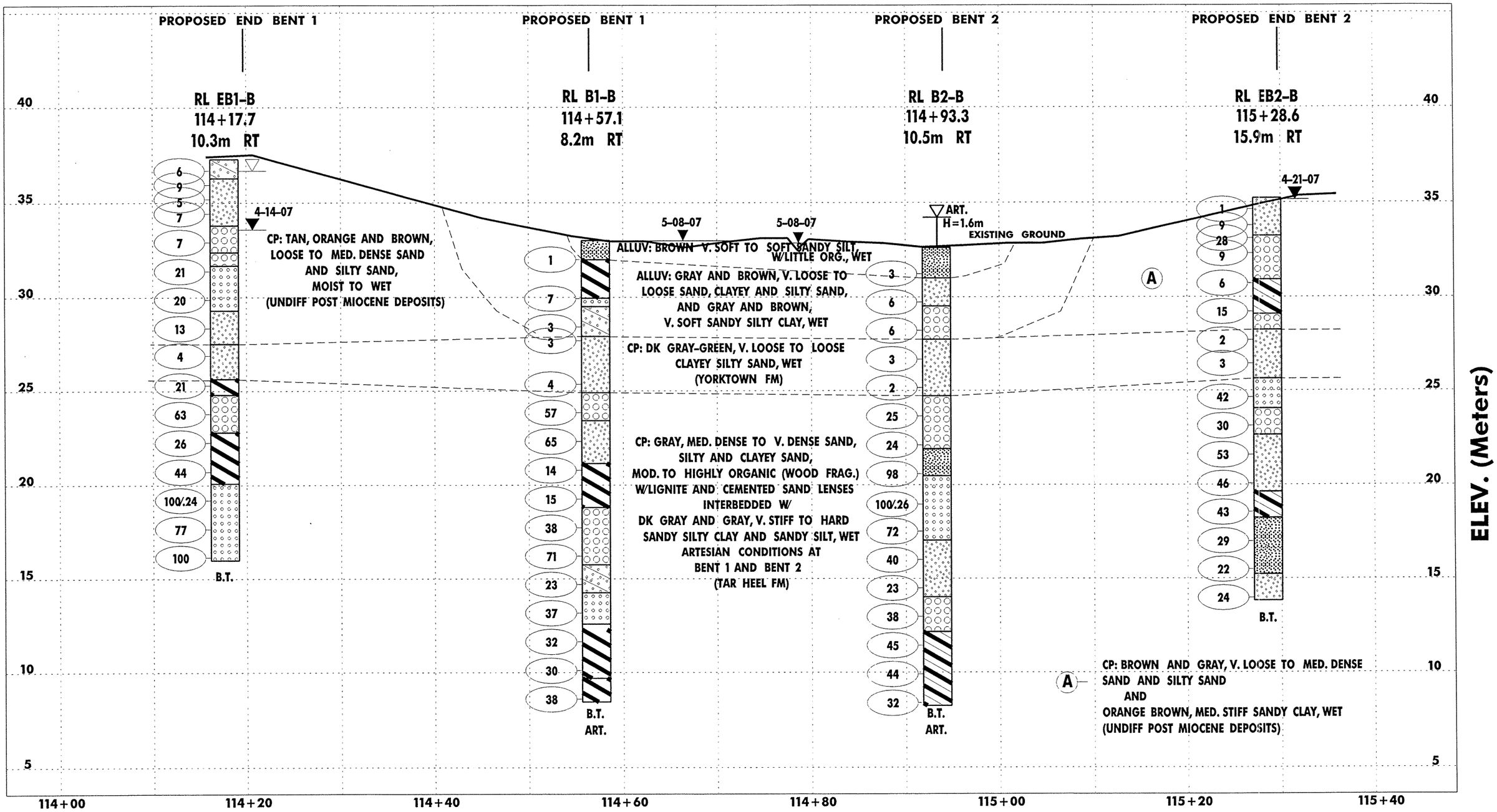
PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED FROM NCDOT, DATED APRIL, 2007

PROPOSED BRIDGE SKEW: 90°

BORING LOCATION PLAN
STRUCTURE 11 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

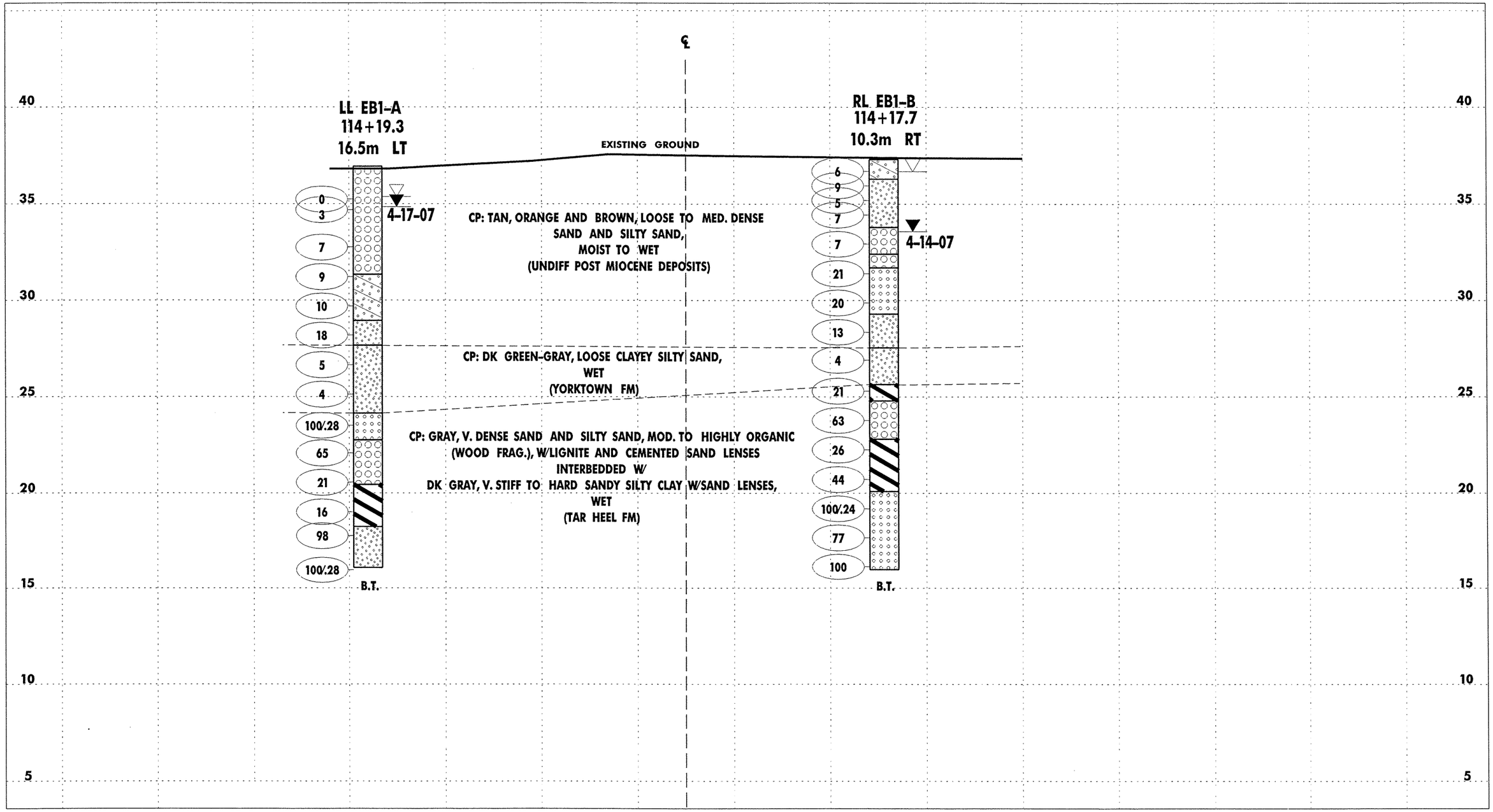


NOTE: ART. - ARTESIAN.

PROFILE 14M RT OF -L-
STRUCTURE 11 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

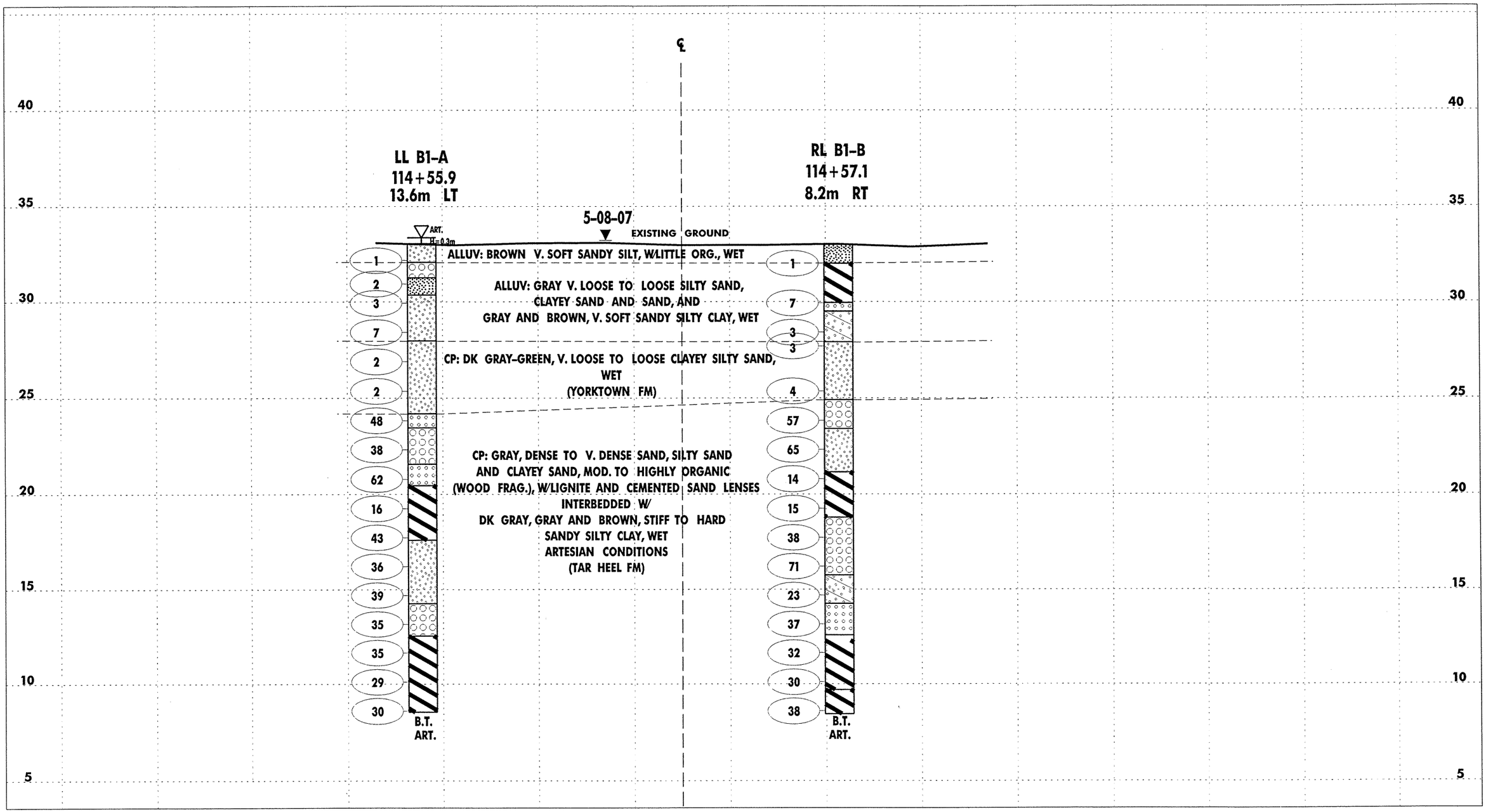
TIERRA
GEOTECHNICAL - MATERIALS ENGINEERING
TIERRA, INC.



CROSS SECTION END BENT 1
STRUCTURE 11 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
PHONE (919) 871-8686
FAX (919) 871-8683



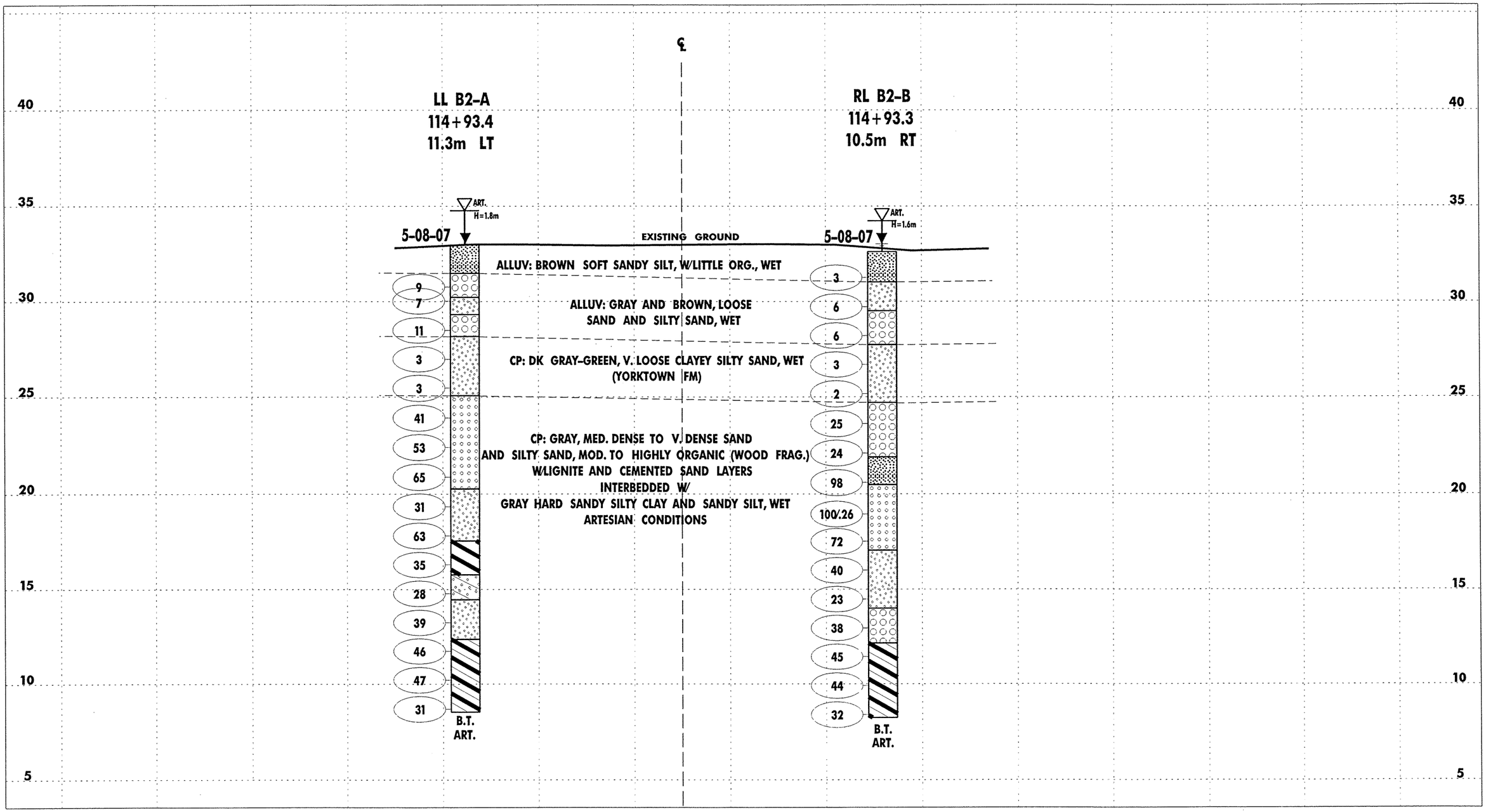
NOTE: ART. – ARTESIAN.

0 5 10M

CROSS SECTION BENT 1
STRUCTURE 11 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON –L– OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
RALEIGH, N.C. 27615
PHONE (919) 871-0666
FAX (919) 871-0883



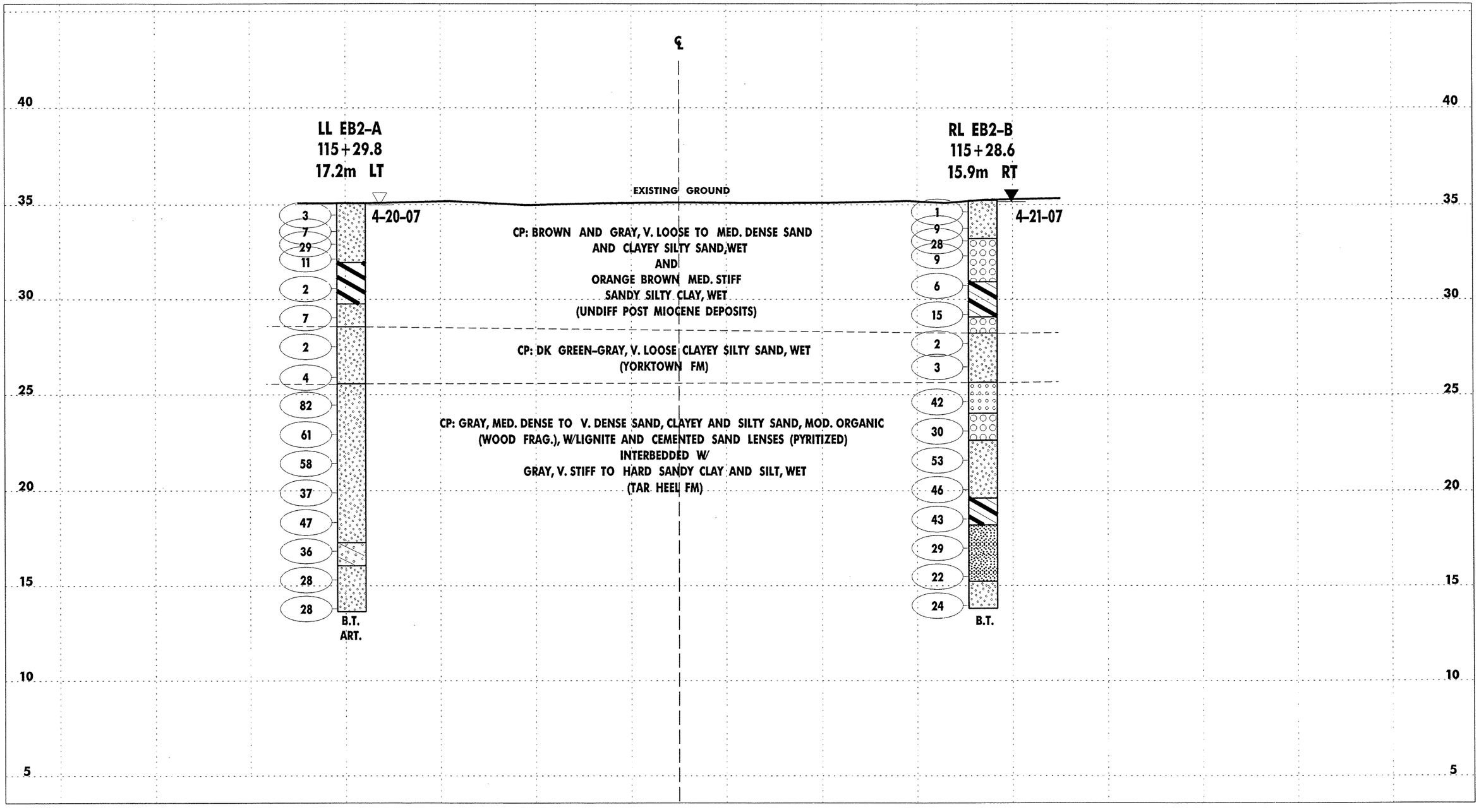
NOTE: ART. - ARTESIAN.

0 5 10M

CROSS SECTION BENT 2
STRUCTURE 11 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL - MATERIALS ENGINEERING
TIERRA, INC.
5126 ACKLAND RD.
RALEIGH, NC 27612
PHONE (919) 571-8666
FAX (919) 571-8663



NOTE: ART. - ARTESIAN.

0 5 10M

CROSS SECTION END BENT 2
STRUCTURE 11 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL - MATERIALS ENGINEERING

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 (GOLDSBORO BYPASS) STRUCTURE 10 & 11 ON -L- OVER HOWELL BRANCH			**GROUND WTR (m)**
BORING NO. RL EB1-B	**STATION** 114+17.7	**OFFSET** 10.3m RT	**ALIGNMENT** -L-	**0 HR.** 0.61
COLLAR ELEV. 37.32 m	**TOTAL DEPTH** 21.30 m	**NORTHING** 186,417.9	**EASTING** 703,228.7	**24 HR.** 3.72
DRILL MACHINE B-40	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 04/13/07	**COMP. DATE** 04/13/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
38										
37.02	0.30								37.32 GROUND SURFACE	0.00
36.28	1.04	5	3	3	6		M		**COASTAL PLAIN** BROWN, LOOSE, CLAYEY SAND (A-2-6) (UNDIFFERENTIATED POST MIOCENE DEPOSITS)	
35.52	1.80	3	4	5	9		M		36.32	1.00
34.76	2.56	5	3	2	5		M		**COASTAL PLAIN** TAN, LOOSE, CLAYEY SILTY SAND (A-2-4)	
33.24	4.08	2	3	4	7		M		33.82	3.50
31.72	5.60	4	3	4	7		W		**COASTAL PLAIN** TAN, LOOSE, SAND (A-1-b)	
30.20	7.12	7	10	11	21		W		32.42	4.90
28.67	8.65	9	9	11	20		W		**COASTAL PLAIN** WHITE AND TAN, MED. DENSE, SANDY GRAVEL (A-1-A)	
27.22	10.10	8	6	7	13	SS-21	W		31.72	5.60
25.62	11.70	2	2	2	4		W		**COASTAL PLAIN** ORANGE AND TAN, MED. DENSE, SAND (A-3)	
24.09	13.23	6	10	11	21		W		29.32	8.00
22.57	14.75	21	28	35	63		W		**COASTAL PLAIN** ORANGE BROWN, MED. DENSE, CLAYEY SILTY SAND (A-2-4)	
21.04	16.28	8	12	14	26	SS-22	23%		27.52	9.80
19.52	17.80	13	19	25	44		W		**COASTAL PLAIN** DARK GREEN AND GRAY, LOOSE, CLAYEY SILTY SAND (A-2-4) (YORKTOWN FORMATION)	
18.00	19.32	43	49	51/.09	100/.24		W		25.67	11.65
16.47	20.85	23	35	42	77		W		**COASTAL PLAIN** DARK GRAY AND GREEN, V. STIFF, SANDY SILTY CLAY (A-7-5) WITH SAND LENSES (TAR HEEL FORMATION)	
		26	42	58	100				24.82	12.50
									COASTAL PLAIN GRAY, V. DENSE, SAND (A-1-b)	
									22.82	14.50
									COASTAL PLAIN DARK GRAY, V. STIFF TO HARD, SANDY SILTY CLAY (A-7-6)	
									20.12	17.20
									COASTAL PLAIN LIGHT GRAY, V. DENSE, SAND (A-3)	
									16.02	21.30
									Boring Terminated at Elevation 16.02 m IN CP: SAND (TARHEEL FORMATION)	
									MUD DENSITY =1.00 GPCC NOTE: OFFSET INTO FIELD FOR ACCESS	

NCDOT BORE SINGLE 07-014.GPJ NC_DOT.GDT 6/5/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.
SITE DESCRIPTION US 70 (GOLDSBORO BYPASS) STRUCTURE 10 & 11 ON -L- OVER HOWELL BRANCH			**GROUND WTR (m)**
BORING NO. RL B1-B	**STATION** 114+57.1	**OFFSET** 8.2m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 33.03 m	**TOTAL DEPTH** 24.56 m	**NORTHING** 186,423.2	**EASTING** 703,267.8	**24 HR.** N/A
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/02/07	**COMP. DATE** 05/03/07	**SURFACE WATER DEPTH** 0.05m	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
34										
32.33	0.70	1	1	WOH	1	SS-23	35%		33.03 WATER SURFACE (05/02/07) GROUND SURFACE	0.00
30.26	2.77	2	3	4	7	SS-24	46%		**ALLUVIAL** DARK BROWN, V. SOFT, SANDY SILT (A-4) WITH LITTLE ORG. (ORGANIC CONTENT 5.7%)	
28.73	4.30	3	2	1	3		W		32.03	1.00
27.21	5.82	3	1	2	3	SS-25	W		**ALLUVIAL** GRAY, V. SOFT, SILTY CLAY (A-7-6) WITH ORGANICS AND SAND LAYERS	
25.68	7.35	2	2	2	4		W		29.98	3.05
24.16	8.87	20	25	32	57		W		**ALLUVIAL** BLUE AND GRAY, LOOSE, SAND (A-3)	
22.64	10.39	16	25	40	65	SS-26	W		29.53	3.50
21.12	11.91	5	6	8	14		W		**ALLUVIAL** BLUE AND GRAY, V. LOOSE, CLAYEY SAND (A-2-6)	
19.59	13.44	4	6	9	15		W		27.93	5.10
18.06	14.97	15	19	19	38		W		**COASTAL PLAIN** DARK GREEN AND GRAY, V. LOOSE, CLAYEY SILTY SAND (A-2-4) (YORKTOWN FORMATION)	
16.54	16.49	25	31	40	71		W		24.93	8.10
15.02	18.01	11	10	13	23		W		**COASTAL PLAIN** GRAY, V. DENSE, SAND (A-1-B) WITH ORGANIC LAYERS (TARHEEL FORMATION)	
13.49	19.54	14	19	18	37	SS-27	W		23.43	9.60
11.97	21.06	8	14	18	32		W		**COASTAL PLAIN** GRAY, V. DENSE, SILTY SAND (A-2-4) MOD. TO HI. ORG. WITH LIGNITE *	
10.44	22.59	9	15	15	30		W		21.18	11.85
8.92	24.11	12	17	21	38	SS-28	19%		**COASTAL PLAIN** DARK GRAY, STIFF, SANDY SILTY CLAY (A-7-5) WITH OCC. SAND LENSES	
									18.83	14.20
									COASTAL PLAIN GRAY, DENSE TO V. DENSE, SAND (A-1-b) WITH SILT LAYERS	
									15.78	17.25
									COASTAL PLAIN LIGHT GRAY, MED. DENSE, CLAYEY SAND (A-2-6)	
									14.28	18.75
									COASTAL PLAIN LIGHT GRAY, DENSE, SAND (A-3)	
									12.61	20.42
									COASTAL PLAIN LIGHT GRAY, HARD, SANDY SILTY CLAY (A-7-5)	
									9.73	23.30
									COASTAL PLAIN ORANGE, BROWN AND GRAY, MOTTLED HARD, SILTY SANDY CLAY (A-7-5)	
									8.47	24.56
									Boring Terminated at Elevation 8.47 m IN CP: CLAY (TARHEEL FORMATION)	
									ARTESIAN CONDITIONS AT TERMINATION SIMILAR TO LL B1-A MUD DENSITY = 0.97 GPCC NOTE: OFFSET 6M LEFT DUE TO TREE AND EXISTING ROOT SYSTEM	
									* ORGANICS CONSIST OF WOOD FRAGMENTS	

NCDOT BORE SINGLE 07-014.GPJ NC_DOT.GDT 6/5/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.	
SITE DESCRIPTION US 70 (GOLDSBORO BYPASS) STRUCTURE 10 & 11 ON -L- OVER HOWELL BRANCH				**GROUND WTR (m)**
BORING NO. RL B2-B	**STATION** 114+93.3	**OFFSET** 10.5m RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 32.64 m	**TOTAL DEPTH** 24.38 m	**NORTHING** 186,424.0	**EASTING** 703,304.1	**24 HR.** N/A
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 04/26/07	**COMP. DATE** 04/27/07	**SURFACE WATER DEPTH** 0.23m	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
33									WATER SURFACE (04/26/07)	
									GROUND SURFACE 32.64	0.00
31.57	1.07								**ALLUVIAL** BROWN, SOFT, SANDY SILT (A-4) WITH LITTLE ORG. (ORGANIC CONTENT 8.4%)	
		WOH	WOH	3	3	SS-29	71%		31.04	1.60
30.05	2.59								**ALLUVIAL** ORANGE AND GRAY, LOOSE, CLAYEY SILTY SAND (A-2-4) WITH CLAY	
		6	4	2	6		W		29.54	3.10
28.53	4.11								**ALLUVIAL** LIGHT GREEN AND GRAY, LOOSE, SAND (A-1-b) WITH CLAY LENSES	
		6	4	2	6		W		27.76	4.88
27.01	5.63								**COASTAL PLAIN** DARK GRAY AND GREEN, V. LOOSE, CLAYEY SILTY SAND (A-2-4) (YORKTOWN FORMATION)	
		1	1	2	3		W			
25.48	7.16									
		2	1	1	2	SS-30	W		24.74	7.90
23.95	8.69								**COASTAL PLAIN** GRAY AND BROWN, MED. DENSE, SLI. SILTY SAND (A-1-b), MOD. TO HI. ORG. (TAR HEEL FORMATION) (ORGANIC CONTENT UP TO 17.1%) *	
		11	11	14	25		W			
22.43	10.21									
		8	10	14	24	SS-31	W		21.94	10.70
20.91	11.73								**COASTAL PLAIN** TAN AND GRAY, HARD SANDY SILT (A-4) WITH CEMENTED LAYER	
		21	37	61	98	SS-32	W		20.51	12.13
19.29	13.35								**COASTAL PLAIN** TAN, V. DENSE, SAND (A-3) WITH CEMENTED LAYER	
		46	54/.11		100/.26		W			
17.86	14.78									
		33	33	39	72		W		17.10	15.54
16.33	16.31								**COASTAL PLAIN** LIGHT GRAY, DENSE TO MED. DENSE, CLAYEY SILTY SAND (A-2-4) WITH CLAY LENSES	
		13	17	23	40	SS-33	W			
14.81	17.83									
		11	9	14	23		W		14.04	18.60
13.29	19.35								**COASTAL PLAIN** LIGHT GRAY, DENSE, SAND (A-1-b)	
		8	16	22	38		W		12.19	20.45
11.76	20.88								**COASTAL PLAIN** LIGHT GRAY, HARD, SANDY SILTY CLAY (A-6)	
		14	18	27	45		W			
10.24	22.40									
		12	18	26	44		W			
8.71	23.93									
		8	13	19	32		W		8.26	24.38

Boring Terminated at Elevation 8.26 m IN CP: CLAY (TARHEEL FORMATION)

ARTESIAN CONDITIONS AT 8.7M AND 22.4M
FLOW RATE = 19 TO 30 LPM, H = 1.60M
NOTE: OFFSET ~ 3M DUE TO TREE DEBRIS
MUD DENSITY =1.01 GPCC

* ORGANICS CONSIST OF WOOD FRAGMENTS

NCDOT BORE SINGLE 07-014.GPJ NC_DOT.GDT 6/5/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** BRUINSMA, C.	
SITE DESCRIPTION US 70 (GOLDSBORO BYPASS) STRUCTURE 10 & 11 ON -L- OVER HOWELL BRANCH				**GROUND WTR (m)**
BORING NO. RL EB2-B	**STATION** 115+28.6	**OFFSET** 15.9m RT	**ALIGNMENT** -L-	**0 HR.** 0.09
COLLAR ELEV. 35.26 m	**TOTAL DEPTH** 21.42 m	**NORTHING** 186,421.4	**EASTING** 703,339.7	**24 HR.** 0.07
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 04/19/07	**COMP. DATE** 04/20/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
36										
34.96	0.30								GROUND SURFACE 35.26	0.00
34.10	1.16	1	WOH	1	1		M		**COASTAL PLAIN** BROWN, ORANGE AND LIGHT GRAY, V. LOOSE TO MED. DENSE, SILTY SAND (A-2-4), MOD. ORG. (UNDIFFERENTIATED POST MIOCENE DEPOSITS)	
33.43	1.83	4	4	5	9		W		33.26	2.00
32.64	2.62	9	14	14	28		W		**COASTAL PLAIN** LIGHT GRAY, LOOSE, SAND (A-1-b)	
31.05	4.21	5	4	5	9		W		30.96	4.30
29.53	5.73	4	3	3	6	SS-34	33%		**COASTAL PLAIN** ORANGE AND GRAY, MED. STIFF TO STIFF, SILTY SANDY CLAY (A-6)	
28.01	7.25	5	6	9	15		W		29.11	6.15
26.48	8.78	1	1	1	2		W		**COASTAL PLAIN** GRAY, MED. DENSE, SAND (A-1-b)	
24.96	10.30	2	1	2	3		W		28.26	7.00
23.43	11.83	4	18	24	42		W		**COASTAL PLAIN** GRAY, GREEN, V. LOOSE, CLAYEY SILTY SAND (A-2-4) (YORKTOWN FORMATION)	
21.91	13.35	3	13	17	30		W		25.66	9.60
20.39	14.87	15	26	27	53		W		**COASTAL PLAIN** GRAY, DENSE, SAND (A-3), MOD. ORG. (TARHEEL FORMATION) *	
18.86	16.40	16	22	24	46		W		24.06	11.20
17.34	17.92	13	19	24	43		W		**COASTAL PLAIN** GRAY, DENSE, SAND (A-1-b), MOD. ORG. *	
15.81	19.45	10	11	18	29	SS-35	21%		22.66	12.60
14.29	20.97	7	9	13	22		W		**COASTAL PLAIN** GRAY AND BROWN, V. DENSE TO DENSE, SILTY SAND (A-2-4), MOD. ORG. W/ OCC. PYRITE CONCRETIONS AND PHOSPHATE NODULES WITH OCC. LIGNITE. *	
		14	11	13	24		W		19.66	15.60
									COASTAL PLAIN LIGHT GRAY, HARD, SANDY CLAY (A-6)	
									18.26	17.00
									COASTAL PLAIN LIGHT GRAY, V. STIFF CLAYEY SANDY SILT (A-4) WITH CLAY LENSES	
									15.26	20.00
									COASTAL PLAIN LIGHT GRAY, MED. DENSE, CLAYEY SILTY SAND (A-2-4) WITH OCC. CEMENTED SAND LENSES	
									13.84	21.42

Boring Terminated at Elevation 13.84 m IN CP: SAND (TARHEEL FORMATION)

MUD DENSITY =0.98 GPCC

* ORGANICS CONSIST OF WOOD FRAGMENTS

NCDOT BORE SINGLE 07-014.GPJ NC_DOT.GDT 6/5/07

TIERRA, INC. 2736 ROWLAND ROAD, RALEIGH, NORTH CAROLINA 27615

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

US 70 (GOLDSBORO BYPASS) - STRUCTURE 11 (RIGHT LANE)
ON -L- OVER HOWELL BRANCH
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA

WAYNE COUNTY

TIERRA, INC. PROJECT NO: 6211-07-014

BORING #		SAMPLE #	TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC	OC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED							
STATION #	OFFSET (METER)	DEPTH (METER)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY	LL	PI	%	%
RL EB1-B		SS-21	90	68	13	60	27	1	12	22	NP	-	-
A-2-4													
114+17.7	10.3 M RT	8.65-9.10											
RL EB1-B		SS-22	100	100	93	1	9	20	70	54	34	22.7	-
A-7-6													
114+17.7	10.3 M RT	14.75-15.20											
RL B1-B		SS-23	-	-	-	-	-	-	-	-	-	35.1	5.7
A-4													
114+57.1	8.18 M RT	0.70-1.15											
RL B1-B		SS-24	100	99	95	1	7	43	49	53	34	45.6	-
A-7-6													
114+57.1	8.18 M RT	2.77-3.22											
RL B1-B		SS-25	100	91	20	18	62	3	17	22	NP	-	-
A-2-4													
114+57.1	8.18 M RT	5.82-6.27											
RL B1-B		SS-26	68	61	12	28	58	5	9	20	NP	-	-
A-2-4													
114+57.1	8.18 M RT	10.39-10.84											
RL B1-B		SS-27	95	68	9	57	35	1	7	18	NP	-	-
A-3													
114+57.1	8.18 M RT	19.54-19.99											
RL B1-B		SS-28	99	67	50	39	12	3	46	45	25	18.6	-
A-7-6													
114+57.1	8.18 M RT	24.11-24.56											

TIERRA, INC. 2736 ROWLAND ROAD, RALEIGH, NORTH CAROLINA 27615

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

US 70 (GOLDSBORO BYPASS) - STRUCTURE 11 (RIGHT LANE)
ON -L- OVER HOWELL BRANCH
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA

WAYNE COUNTY

TIERRA, INC. PROJECT NO: 6211-07-014

BORING #		SAMPLE #	TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC	OC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED							
STATION #	OFFSET (METER)	DEPTH (METER)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY	LL	PI	%	%
RL B2-B		SS-29	-	-	-	-	-	-	-	-	-	70.8	8.4
A-4													
114+93.3	10.45 M RT	1.07-1.52											
RL B2-B		SS-30	92	84	19	21	59	4	16	27	NP	-	-
A-2-4													
114+93.3	10.45 M RT	7.16-7.61											
RL B2-B		SS-31	-	-	-	-	-	-	-	-	-	-	17.1
N/A													
114+93.3	10.45 M RT	10.21-10.66											
RL B2-B		SS-32	98	97	36	4	65	8	23	21	NP	-	-
A-4													
114+93.3	10.45 M RT	11.73-12.18											
RL B2-B		SS-33	100	79	27	41	34	4	21	24	7	-	-
A-2-4													
114+93.3	10.45 M RT	16.31-16.76											
RL EB2-B		SS-34	96	79	50	30	20	9	41	39	17	32.8	-
A-2-4													
115+28.6	15.9 M RT	4.21-4.66											
RL EB2-B		SS-35	100	98	55	7	48	18	27	22	7	20.5	-
A-4													
115+28.6	15.9 M RT	17.92-7.74											

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34461.1.3 TIP: R-2554BA COUNTY: WAYNE

DESCRIPTION(1): US 70 (GOLDSBORO BYPASS) - STRUCTURE 10 AND 11 ON -L- OVER HOWELL BRANCH

EXISTING BRIDGE

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

Bridge No.: N/A Length: N/A Total Bents: N/A Bents in Channel: N/A Bents in Floodplain: N/A
Foundation Type: NEW LOCATION

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: N/A

Interior Bents: N/A

Channel Bed: NONE EVIDENT

Channel Bank: NONE EVIDENT

EXISTING SCOUR PROTECTION

Type(3): N/A

Extent(4): N/A

Effectiveness(5): N/A

Obstructions(6): HIGH AMOUNT OF DEADFALL (MEDIUM TO LARGE TREES), BEAVER DAMS

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.

DESIGN INFORMATION

Channel Bed Material(7): MEDIUM TO COARSE SANDS

Channel Bank Material(8): SAND AND MUCK

Channel Bank Cover(9): GRASS AND SHRUBS ADJACENT TO ACTUAL CHANNEL

Floodplain Width(10): APPROX. 75 METERS

Floodplain Cover(11): GRASS, SHRUBS, OCCASIONAL TREES (YOUNG TO MODERATE IN AGE)

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

Channel Migration Tendency(13): TO THE WEST

Observations and Other Comments: CHANNEL IS ONLY 3 METERS WIDE, WETLAND IS 75 METERS WIDE
WATER IS PONDED THROUGHOUT WETLAND AREA.

Reported by: TIERRA, INC. **Date:** 5/8/2007

DESIGN SCOUR ELEVATIONS(14) Feet ____ Meters X

	BENTS										
	Bent 1	Bent 2									
100-year DSE	31.64	31.37									
500-year DSE	31.47	31.2									

Comparison of DSE to Hydraulics Unit theoretical scour:
The Geotechnical Engineering Unit agrees that the DSE is equal to the calculated theoretical scour elevation.

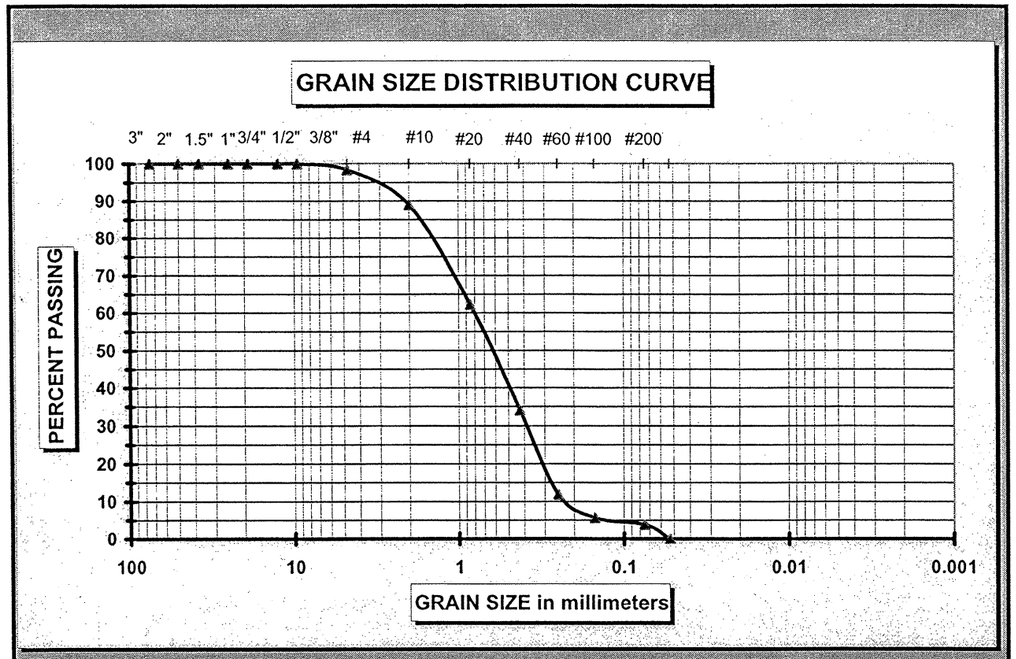
DSE determined by: **Date:** 5/29/2007

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	BANK	CHANNEL					
Sample No.	SS-24	SS-12					
Retained #4	0	1.6					
Passed #10	99.9	89					
Passed #40	99.2	34.1					
Passed #200	95.3	3.9					
Coarse Sand	1	88					
Fine Sand	7	8					
Silt	43	-					
Clay	49	-					
LL	53	-					
PI	34	NP					
AASHTO	A-7-6	A-1-b					
Station	114+57.1	114+93.4					
Offset	8.18 M RT	11.3 M LT					
Depth	2.77-3.22	4.18-4.63					

TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NORTH CAROLINA 27615

US 70 (GOLDSBORO BYPASS) - STRUCTURE 11 (RIGHT LANE)
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA



AASHTO M-145 Classification of Soil for Engineering Purposes					
Gravel	< 3" and > #10		Coarse Sand	< #10 and > #60	Cu = D60 / D10
			Fine Sand	< #60 and > #200	Cc = (D30)^2 / (D10 x D60)

BORING #:	LL B2-A	SAMPLE #:	SS-12	DEPTH:	4.18 - 4.63

GRAY AND GREEN SAND (A-1-b)

% PASSING #200 SIEVE: 4%

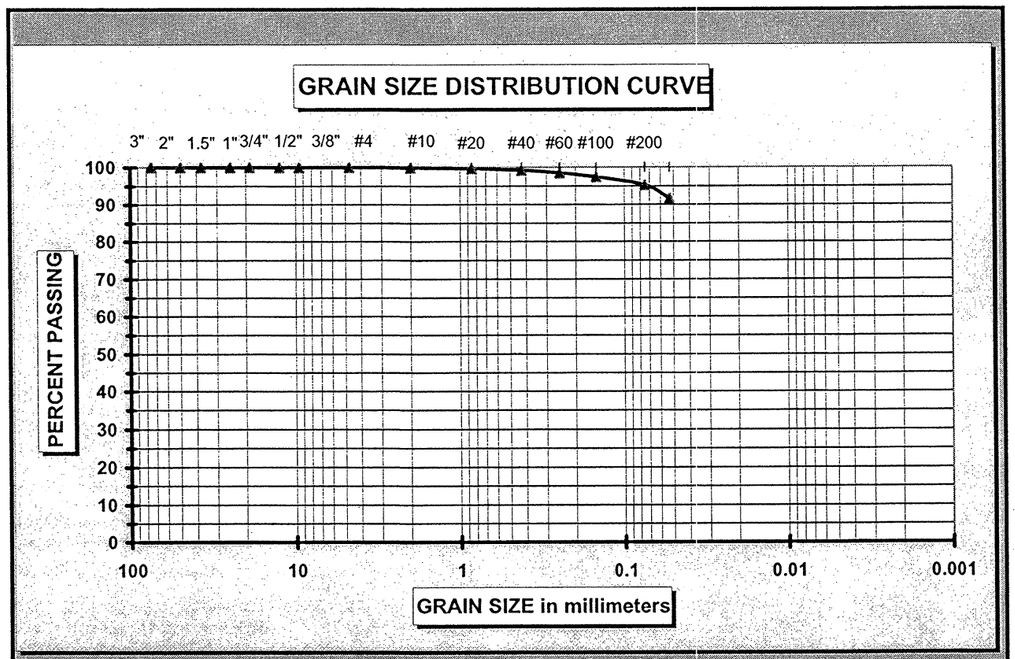
NATURAL MOISTURE CONTENT = N/A

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	-
PLASTIC LIMIT	-
PLASTIC INDEX	NP

TIERRA, INC. PROJECT #: 6211-07-014

TIERRA, INC. 2736 ROWLAND RD. RALEIGH, NORTH CAROLINA 27615

US 70 (GOLDSBORO BYPASS) - STRUCTURE 11 (RIGHT LANE)
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY
NCDOT Project No: 34461.1.3 - T.I.P. No: R-2554BA



AASHTO M-145 Classification of Soil for Engineering Purposes					
Gravel	< 3" and > #10		Coarse Sand	< #10 and > #60	Cu = D60 / D10
			Fine Sand	< #60 and > #200	Cc = (D30)^2 / (D10 x D60)

BORING #:	RL B1-B	SAMPLE #:	SS-24	DEPTH:	2.77 - 3.22

GRAY SANDY SILTY CLAY (A-7-6)

% PASSING #200 SIEVE: 95%

NATURAL MOISTURE CONTENT = 45.6%

ATTERBERG LIMIT (- #40 Material)	
LIQUID LIMIT	53
PLASTIC LIMIT	19
PLASTIC INDEX	34

TIERRA, INC. PROJECT #: 6211-07-014

STRUCTURE 11 (RIGHT LANE) PROFILE NEAR -L-, LOOKING FROM END BENT 1 UPSTATION.

STRUCTURE 11 (RIGHT LANE) PROFILE, LOOKING DOWNSTATION FROM BENT 2.

SITE PHOTOGRAPHS
STRUCTURE 11 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS
ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

STRUCTURE 11 (RIGHT LANE) END BENT 1, LOOKING LEFT TO RIGHT.

STRUCTURE 11 (RIGHT LANE) BENT 1, LOOKING RIGHT TO LEFT.

SITE PHOTOGRAPHS
STRUCTURE 11 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

STRUCTURE 11 (RIGHT LANE) BENT 2, LOOKING LEFT TO RIGHT.

STRUCTURE 11 (RIGHT LANE) END BENT 2, LOOKING LEFT TO RIGHT FROM STRUCTURE 10.

SITE PHOTOGRAPHS
STRUCTURE 11 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

HOWELL BRANCH, LOOKING UPSTREAM FROM –L-.

HOWELL BRANCH, LOOKING DOWNSTREAM FROM –L-.

SITE PHOTOGRAPHS
STRUCTURE 11 (RT LANE)

US 70 (GOLDSBORO BYP) STRUCTURE 10 & 11
ON -L- OVER HOWELL BRANCH
WAYNE COUNTY, NORTH CAROLINA
TIP NO: R-2554 BA, STATE PROJECT NO: 34461.1.3

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING

TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34461.1.3 (R-2554BA)	1	12

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34461.1.3 (R-2554BA) F.A. PROJ. NHF-70 (30)

COUNTY WAYNE

PROJECT DESCRIPTION US 70 (GOLDSBORO BYPASS) FROM EAST OF SR 1300 (SALEM CHURCH ROAD) TO EAST OF SR 1556 (WAYNE MEMORIAL DR.)

SITE DESCRIPTION BRIDGE ON -L- (US70 BYPASS) OVER -Y7- (NC 111) AT -L- STATION 118+92.556

INVENTORY

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	GEOTECHNICAL REPORT
4	SITE PLAN
5	PROFILE
6-7	CROSS SECTIONS
8-10	BORE LOGS
11	SOIL TEST RESULTS
12	SITE PHOTOGRAPH

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

D.N. ARGENBRIGHT

L.W. DAIL

T.J. WHITE

INVESTIGATED BY D.N. ARGENBRIGHT

CHECKED BY D.N. ARGENBRIGHT

SUBMITTED BY D.N. ARGENBRIGHT

DATE SEPTEMBER 2006

NORTH CAROLINA LICENSED SEAL 1050 GEOLOGIST DAVID N. ARGENBRIGHT

PROJECT: 34461.1.3

ID: R-2554BA

DRAWN BY: C.M. KENT

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.

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-2554BA	3446I.I.3	2	12

METRIC

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL 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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND 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		N.P.	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

P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<25
	SOFT	2 TO 4	25 TO 50
	MEDIUM STIFF	4 TO 8	50 TO 100
	STIFF	8 TO 15	100 TO 200
	VERY STIFF	15 TO 30	200 TO 400
	HARD	>30	>400

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	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)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- 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, YEL-BRN, 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 ARE 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 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 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 SEEPAGE

MISCELLANEOUS SYMBOLS

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

SAMPLE DESIGNATIONS

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

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
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- ☐ MOBILE B-___
- ☐ BK-51
- ☒ CME-45B
- ☐ CME-550
- ☐ PORTABLE HOIST
- ☐ OTHER _____
- ☐ OTHER _____

ADVANCING TOOLS:
- ☐ CLAY BITS
- ☐ 152 mm CONTINUOUS FLIGHT AUGER
- ☐ 203 mm HOLLOW AUGERS
- ☐ HARD FACED FINGER BITS
- ☐ TUNG.-CARBIDE INSERTS
- ☒ CASING ☐ W/ ADVANCER
- ☒ TRICONE 74 mm STEEL TEETH
- ☐ TRICONE _____ mm TUNG.-CARB.
- ☐ CORE BIT
- ☐ OTHER _____

HAMMER TYPE:
- ☒ AUTOMATIC ☐ MANUAL

CORE SIZE:
- ☐ -B_____
- ☐ -N_____
- ☐ -H_____

HAND TOOLS:
- ☐ POST HOLE DIGGER
- ☐ HAND AUGER
- ☐ SOUNDING ROD
- ☐ VANE SHEAR TEST
- ☐ OTHER _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN 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 2.5 cm PER 50 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 FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.
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 2.5 cm. 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 ROCKS 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 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
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 GEOLOGISTS 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 6 mm DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 WHICH 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 IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL WHICH 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, WHICH 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BY-7 517 -L- STATION 118+98.363 1.382 RT

ELEVATION: 38.111

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
MICHAEL F. EASLEY, GOVERNOR
P.O. BOX 25201, RALEIGH, N.C. 27611-5201
LYNDO TIPPETT, SECRETARY

September 20, 2006

STATE PROJECT: 34461.1.3 (R-2554BA)
F.A. PROJECT: NHF-70 (30)
COUNTY: Wayne
DESCRIPTION: US 70 (Goldsboro Bypass) from East of SR 1300 (Salem Church Rd.) to East of SR 1556 (Wayne Memorial Drive)

SUBJECT: Geotechnical Report - Bridge Foundation Investigation for Dual Structures on US 70 Bypass over NC 111 at -L- Station 118+92.556

Site Description

The new bridge site is located at the proposed crossing of US 70 Bypass over NC 111 in Goldsboro. The new structure will be built along the alignment of US 70 Bypass. Based on the proposed design, the new dual structures will have one span totaling 29.5± meters. The bents will have variable skews from 93° 23' 08" to 94° 58' 05".

One Standard Penetration Test (SPT) boring was made at or near each proposed bent location to provide subsurface information relative to foundation design. These borings were made with ATV mounted CME-45B drill machine and advanced by rotary drill methods using bentonite drilling fluid.

The bridge site is located in the Coastal Plain Physiographic Province and is underlain by recent upland and alluvial deposits, Pliocene age marine sediments of the Yorktown Formation, and Cretaceous age sediments of the Black Creek Formation. Topography along the project is nearly flat with an elevation of 38± meters.

Ground water elevations range from 36.7± meters to 37.9± meters.

Soil Description

Upland surficial soils generally consist of 0.5 to 3 meters of soft to stiff sandy clay (A-6) and clayey sandy silt (A-4). The cohesive soils are underlain by 3 to 4.5 meters of very loose to medium dense alluvial sand (A-2-4, A-3, A-1-b). The sediments of the Yorktown and Black Creek Formations underlie the surficial units. The Yorktown Formation (Pliocene) is composed of 6 to 7.5 meters of very loose to medium dense sand (A-2-4, A-3, A-1-b) and very soft to soft sandy clayey silt (A-4). The Cretaceous age Black Creek Formation immediately underlies the Yorktown at an elevation of 26± meters. This unit is composed of 3± meters of dense to very dense sand (A-2-4, A-3) with some lignite. Interlayered dense gray sand (A-2-4) and stiff to very stiff clayey sandy silt (A-4) underlie the granular soils.

Based on the proposed design, approximately 7.5 meters of embankment material will be placed on soft to stiff clayey sandy silt (A-4) and sandy clay (A-6) at each end bent. Additional fill will be required for construction of the end bent and side slopes. Borrow meeting Coastal Plain criteria is available in nearby areas.

Notice

This Geotechnical Foundation Report is based on the Preliminary General Drawing for the bridge on US 70 Bypass over NC 111 between existing US 117 and SR 1556 dated May 2006. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Prepared By:

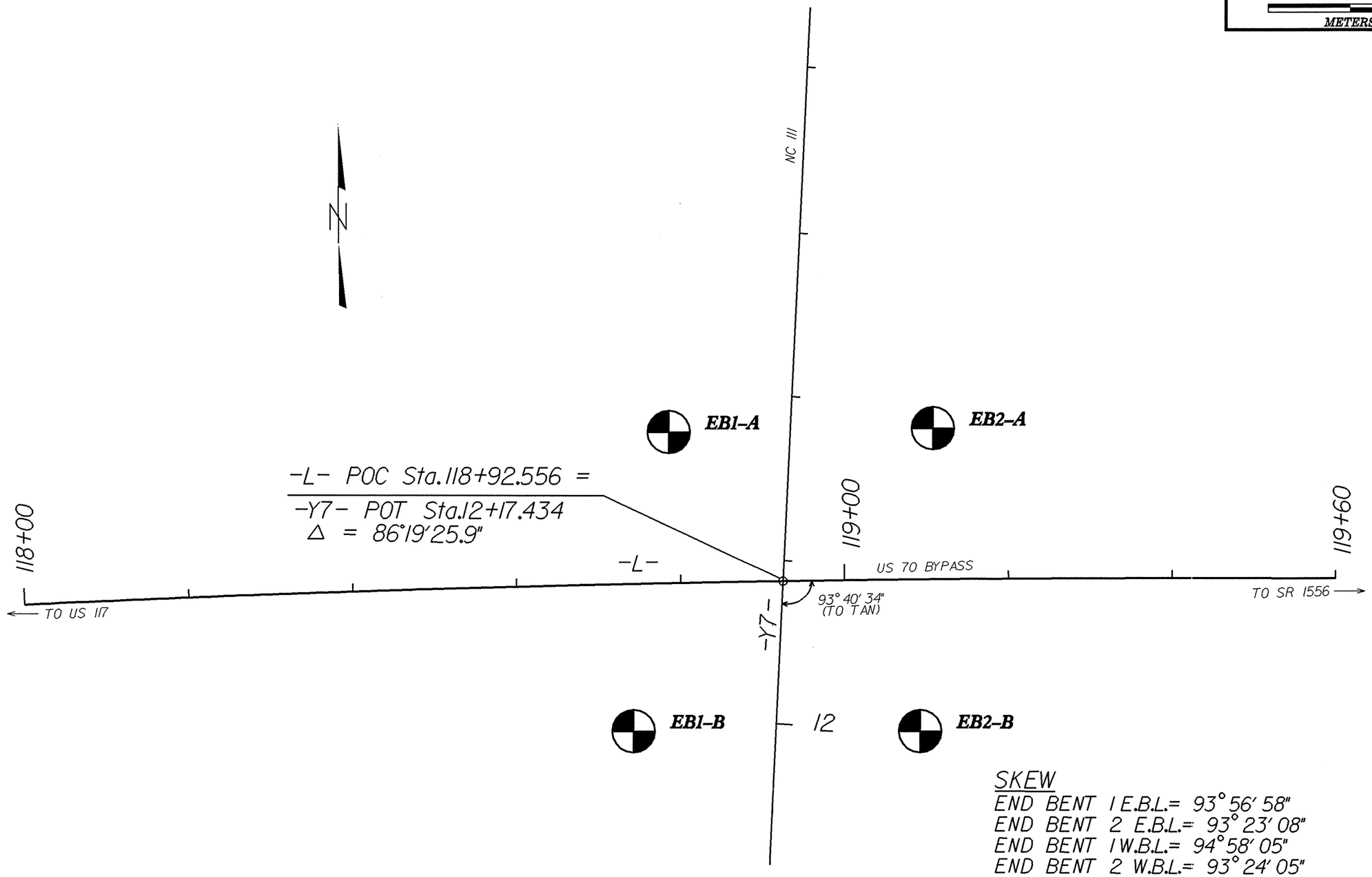
Dean N. Argenbright, L.G.
Regional Geological Engineer

PROJECT REFERENCE NO.	SHEET
34461.1.3(R-2554BA)	4

SITE PLAN

0 10 20

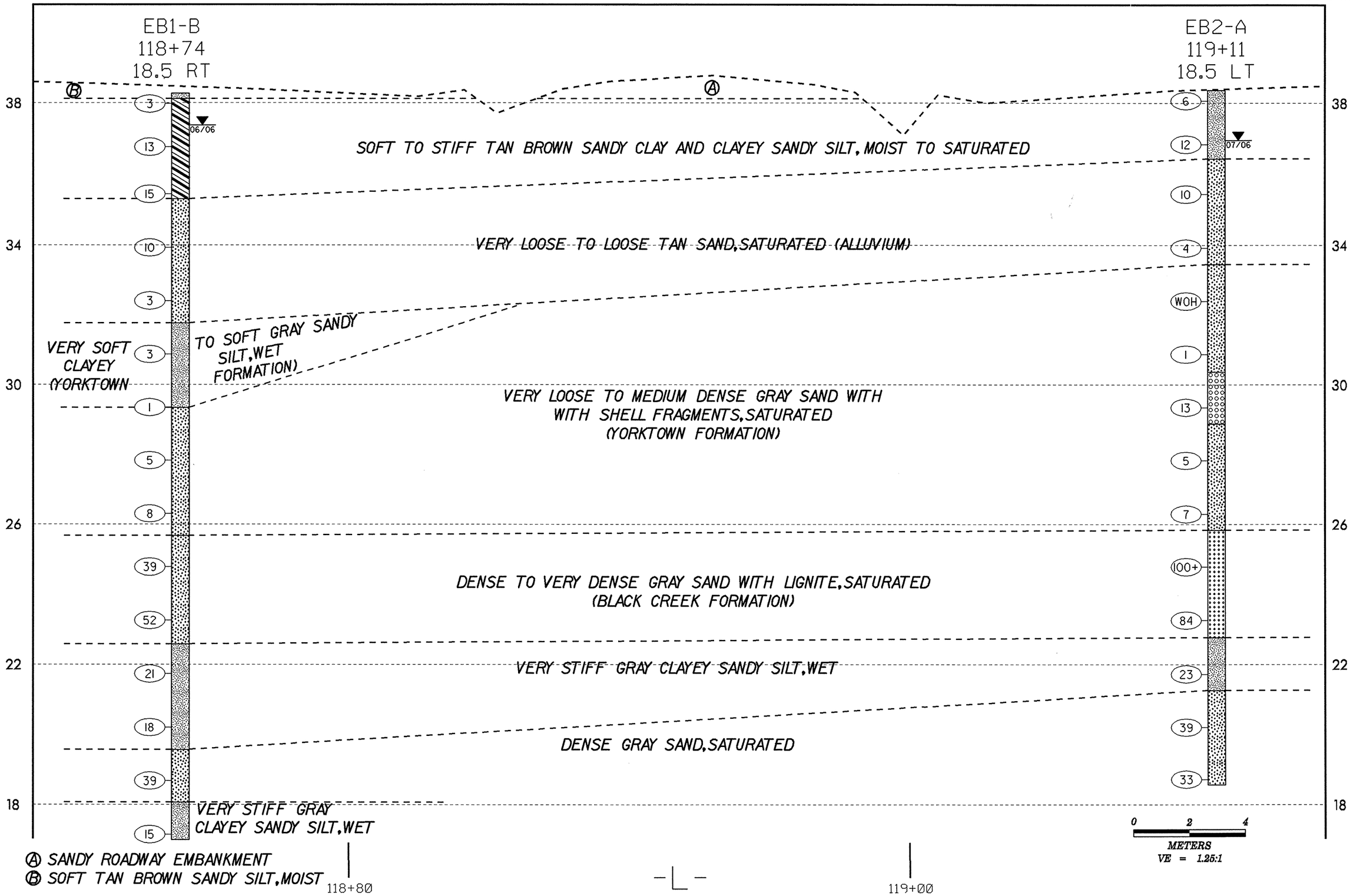
METERS



SKEW

END BENT 1 E.B.L.= 93° 56' 58"
END BENT 2 E.B.L.= 93° 23' 08"
END BENT 1 W.B.L.= 94° 58' 05"
END BENT 2 W.B.L.= 93° 24' 05"

PROFILE THROUGH BORINGS PROJECTED ALONG -L-



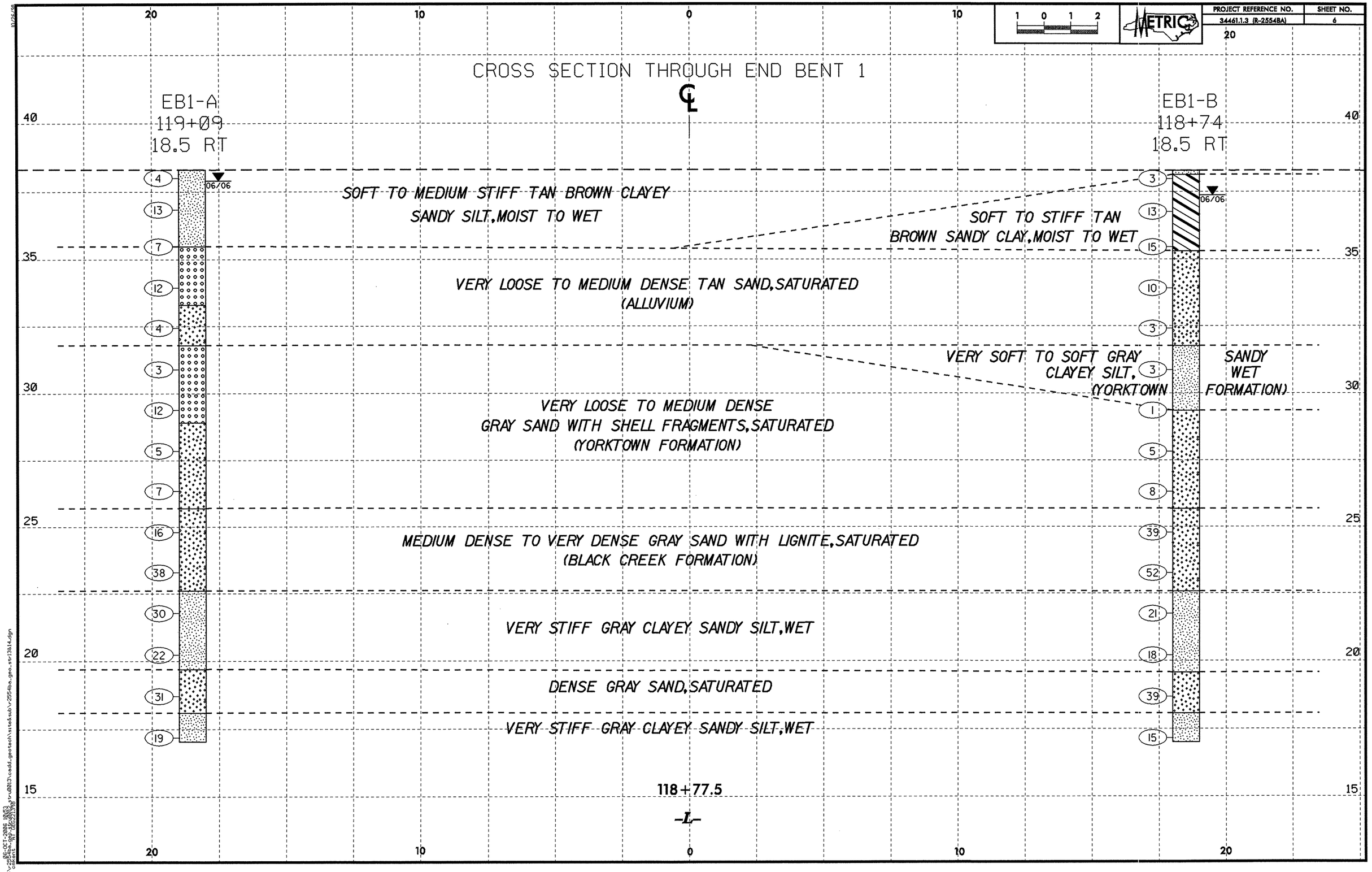
(A) SANDY ROADWAY EMBANKMENT
(B) SOFT TAN BROWN SANDY SILT, MOIST

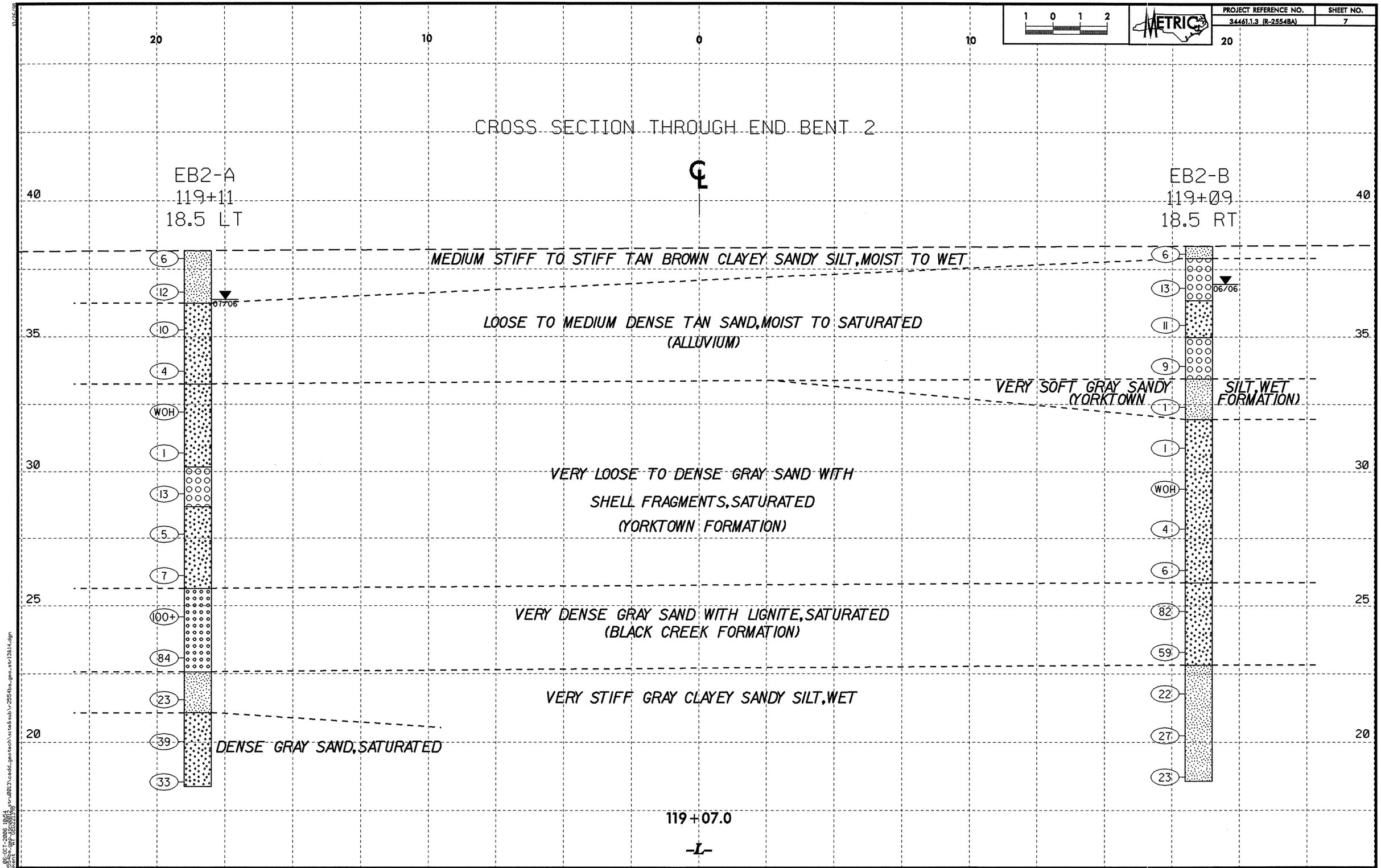
118+80 — -L- — 119+00

CROSS SECTION THROUGH END BENT 1

EB1-A
119+09
18.5 RT

EB1-B
118+74
18.5 RT





PROJECT REFERENCE NO.
34461.1.3 (R-2554BA)
SHEET NO.
7
METRIC
CROSS SECTION THROUGH END BENT 2
EB2-A
119+11
18.5 LT
EB2-B
119+09
18.5 RT
MEDIUM STIFF TO STIFF TAN BROWN CLAYEY SANDY SILT, MOIST TO WET
LOOSE TO MEDIUM DENSE TAN SAND, MOIST TO SATURATED
(ALLUVIUM)
VERY SOFT GRAY SANDY SILT, WET
(YORKTOWN FORMATION)
VERY LOOSE TO DENSE GRAY SAND WITH
SHELL FRAGMENTS, SATURATED
(YORKTOWN FORMATION)
VERY DENSE GRAY SAND WITH LIGNITE, SATURATED
(BLACK CREEK FORMATION)
VERY STIFF GRAY CLAYEY SANDY SILT, WET
DENSE GRAY SAND, SATURATED
07/06
06/06
119+07.0
-L-

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** D. N. ARGENBRIGHT
SITE DESCRIPTION BRIDGE ON -L- (US70 BYPASS) OVER -Y7- (NC 111)			**GROUND WATER**
BORING NO. EBI-A	**BORING LOCATION** 118+79	**OFFSET** 18.5m LT	**ALIGNMENT** -L-
COLLAR ELEV. 38.30m	**NORTHING** 186477	**EASTING** 703688	**24 HR.** 0.4m
TOTAL DEPTH 21.27m	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC
START DATE 06/21/06	**COMPLETION DATE** 06/21/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
38.00	0.00	1	2	2	0.3	4				
	1.16	4	6	7	0.3	13	SS-9			TAN BROWN CLAYEY SANDY SILT, MOIST TO WET
36.00	2.53	4	4	3	0.3	7				
34.00	4.05	4	5	7	0.3	12	SS-10			TAN SAND, SATURATED (ALLUVIUM)
	5.57	1	2	2	0.3	4	SS-11			
32.00	7.1	1	1	2	0.3	3	SS-12			GRAY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)
30.00	8.63	6	5	7	0.3	12				
28.00	10.15	2	2	3	0.3	5	SS-13			
	11.67	4	3	4	0.3	7				
26.00	13.2	7	5	11	0.3	16	SS-14			GRAY SAND WITH LIGNITE, SATURATED (BLACK CREEK FORMATION)
24.00	14.72	15	20	18	0.3	38				
22.00	16.24	10	9	21	0.3	30	SS-15			GRAY CLAYEY SANDY SILT, WET
	17.77	6	9	13	0.3	22				
20.00	19.29	9	15	16	0.3		SS-16			GRAY SAND, SATURATED

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** D. N. ARGENBRIGHT
SITE DESCRIPTION BRIDGE ON -L- (US70 BYPASS) OVER -Y7- (NC 111)			**GROUND WATER**
BORING NO. EBI-A	**BORING LOCATION** 118+79	**OFFSET** 18.5m LT	**ALIGNMENT** -L-
COLLAR ELEV. 38.30m	**NORTHING** 186477	**EASTING** 703688	**24 HR.** 0.4m
TOTAL DEPTH 21.27m	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC
START DATE 06/21/06	**COMPLETION DATE** 06/21/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
19.00										GRAY SAND, SATURATED
	20.82	8	8	11	0.3	31 19	SS-17			GRAY CLAYEY SANDY SILT, WET
17.00										BORING TERMINATED AT ELEVATION 17.03m IN STIFF CLAYEY SANDY SILT
15.00										
13.00										
11.00										
9.00										
7.00										
5.00										
3.00										
1.00										
-1.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** D. N. ARGENBRIGHT
SITE DESCRIPTION BRIDGE ON -L- (US70 BYPASS) OVER -Y7- (NC 111)			**GROUND WATER**
BORING NO. EBI-B	**BORING LOCATION** 118+74	**OFFSET** 18.5m RT	**ALIGNMENT** -L-	**0 HR.** N.M.
COLLAR ELEV. 38.27m	**NORTHING** 186441	**EASTING** 703683		**24 HR.** 0.9m
TOTAL DEPTH 21.27m	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC	
START DATE 06/20/06	**COMPLETION DATE** 06/21/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
38.00	0.00	3	2	1	0.3	X 3				TAN BROWN SANDY SILT, MOIST
	1.21	3	5	8	0.3	X 13	SS-1	12%		TAN BROWN SANDY CLAY, MOIST TO WET
36.00	2.53	3	6	9	0.3	X 15				
34.00	4.05	4	4	6	0.3	X 10	SS-2			TAN SAND, SATURATED (ALLUVIUM)
	5.57	2	1	2	0.3	X 3				
32.00	7.1	WOH	2	1	0.3	X 3	SS-3	18%		GRAY SANDY CLAYEY SILT, WET (YORKTOWN FORMATION)
30.00	8.63	WOH	WOH	1	0.3	X 1				
28.00	10.15	2	2	3	0.3	X 5	SS-4			GRAY SAND WITH SHELL FRAGMENTS, SATURATED
	11.67	3	4	4	0.3	X 8				
26.00	13.2	6	15	24	0.3	X 39	SS-5			GRAY SAND WITH LIGNITE, SATURATED (BLACK CREEK FORMATION)
24.00	14.72	17	23	29	0.3	X 52				
22.00	16.24	6	10	11	0.3	X 21	SS-6	19%		GRAY CLAYEY SANDY SILT, WET
	17.77	6	7	11	0.3	X 18				
20.00										GRAY SAND, SATURATED

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** D. N. ARGENBRIGHT
SITE DESCRIPTION BRIDGE ON -L- (US70 BYPASS) OVER -Y7- (NC 111)			**GROUND WATER**
BORING NO. EBI-B	**BORING LOCATION** 118+74	**OFFSET** 18.5m RT	**ALIGNMENT** -L-	**0 HR.** N.M.
COLLAR ELEV. 38.27m	**NORTHING** 186441	**EASTING** 703683		**24 HR.** 0.9m
TOTAL DEPTH 21.27m	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC	
START DATE 06/20/06	**COMPLETION DATE** 06/21/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
19.00	19.29	14	16	23	0.3	X 39	SS-7			
	20.82	3	6	9	0.3	X 15	SS-8			GRAY CLAYEY SANDY SILT, WET
17.00						BORING TERMINATED AT ELEVATION -7.00m IN VERY STIFF CLAYEY SANDY SILT.				
15.00										
13.00										
11.00										
9.00										
7.00										
5.00										
3.00										
1.00										
-1.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** F. M. WESCOTT
SITE DESCRIPTION BRIDGE ON -L- (US70 BYPASS) OVER -Y7- (NC 111)			**GROUND WATER**
BORING NO. EB2-A	**BORING LOCATION** 119+11	**OFFSET** 18.5m LT	**ALIGNMENT** -L-
COLLAR ELEV. 38.17m	**NORTHING** 186478	**EASTING** 703719	**24 HR.** 1.4m
TOTAL DEPTH 19.79m	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC
START DATE 07/17/06	**COMPLETION DATE** 07/17/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
38.00	0.00	1	3	3	0.3	6	SS-18			TAN BROWN CLAYEY SANDY SILT, MOIST TO WET
	1.22	4	6	6	0.3	12		▼		
36.00	2.62	3	4	6	0.3	10	SS-19			TAN SAND, SATURATED (ALLUVIUM)
34.00	4.15	1	2	2	0.3	4				
	5.67	WOH	WOH	WOH	0.3	0	SS-20			
32.00	7.19	1	0	1	0.3	1				GRAY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)
30.00	8.72	6	8	5	0.3	13	SS-21			
28.00	10.24	2	3	2	0.3	5	SS-22			
26.00	11.77	3	3	4	0.3	7				
	13.29	43	96	41	0.2	100+	SS-23			GRAY SAND WITH LIGNITE, SATURATED (BLACK CREEK FORMATION)
24.00	14.81	10	37	47	0.3	84				
22.00	16.34	8	10	13	0.3	23	SS-24			GRAY CLAYEY SANDY SILT, WET
20.00	17.86	8	14	25	0.3	39	SS-25			GRAY SAND, SATURATED
	19.34	8	15	18	0.3	33				BORING TERMINATED AT ELEVATION 18.38m IN DENSE SAND.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** J. R. SWARTLEY
SITE DESCRIPTION BRIDGE ON -L- (US70 BYPASS) OVER -Y7- (NC 111)			**GROUND WATER**
BORING NO. EB2-B	**BORING LOCATION** 119+09	**OFFSET** 18.5m RT	**ALIGNMENT** -L-
COLLAR ELEV. 38.36m	**NORTHING** 186441	**EASTING** 703718	**24 HR.** 1.4m
TOTAL DEPTH 19.79m	**DRILL MACHINE** CME-45B	**DRILL METHOD** ROTARY W/MUD	**HAMMER TYPE** AUTOMATIC
START DATE 07/18/06	**COMPLETION DATE** 07/18/06	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

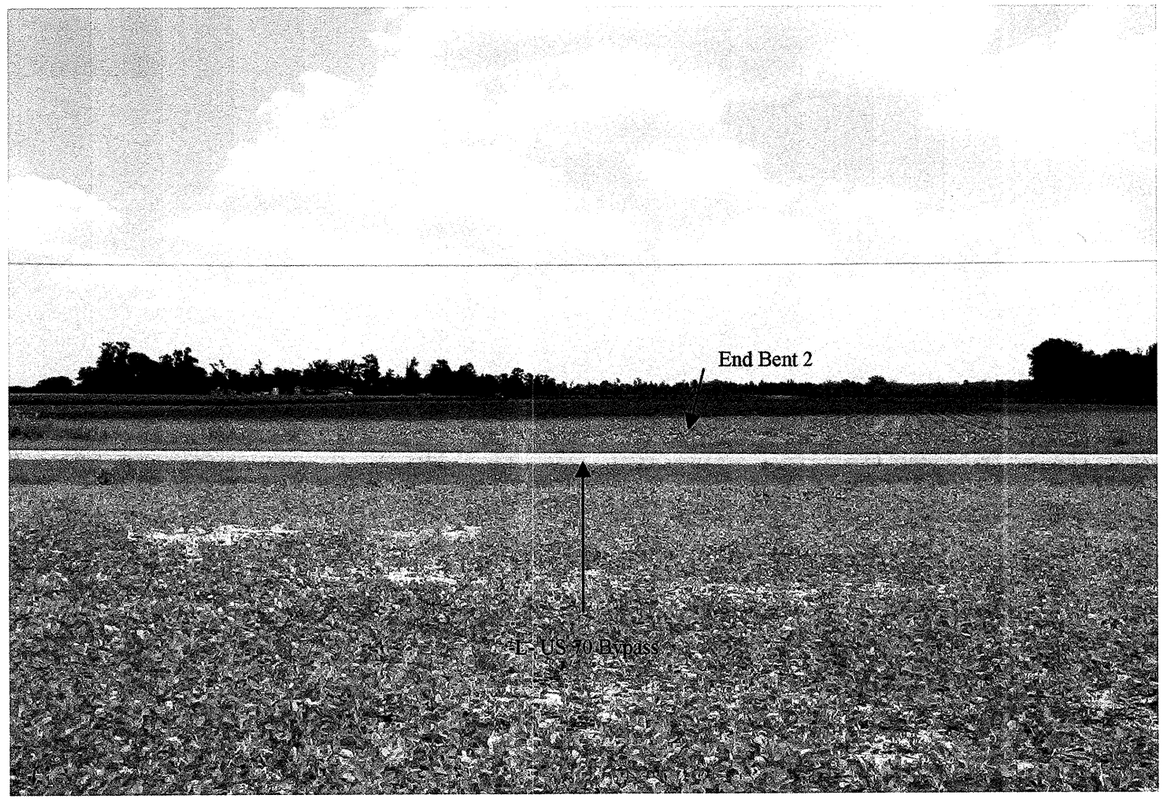
ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
38.00	0.00	1	4	2	0.3	6				TAN BROWN CLAYEY SANDY SILT, MOIST
	1.25	3	6	7	0.3	13	SS-27	▼		
36.00	2.62	4	5	6	0.3	11	SS-28			TAN SAND, MOIST TO SATURATED (ALLUVIUM)
34.00	4.14	6	5	4	0.3	9	SS-29			
	5.66	1	0	1	0.3	1	SS-30			GRAY SANDY SILT, WET (YORKTOWN FORMATION)
32.00	7.18	WOH	WOH	1	0.3	1	SS-31			
30.00	8.70	WOH	WOH	WOH	0.3	0	SS-32			GRAY SAND WITH SHELL FRAGMENTS, SATURATED
28.00	10.22	1	2	2	0.3	4	SS-33			
26.00	11.74	1	3	3	0.3	6				
	13.26	12	45	37	0.3	82	SS-34			GRAY SAND WITH LIGNITE, SATURATED (BLACK CREEK FORMATION)
24.00	14.78	9	19	40	0.3	59				
22.00	16.3	6	9	13	0.3	22	SS-35			GRAY CLAYEY SANDY SILT, WET
20.00	17.82	3	9	18	0.3	27				BORING TERMINATED AT ELEVATION 18.57m IN VERY STIFE CLAYEY SANDY SILT
19.00	19.34	3	8	15	0.3	23	SS-36			

R-2554BA
34461.1.3
-L- (US 70 BYPASS) OVER -Y7- (NC 111)

HOLE NO.	SAMPLE NO.	2.0 mm	425 um	75 um	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
EB1-B	SS-1	94	89	52	12.2	37.8	18.3	31.7	40	26	A-6(9)	1.21-1.66	12.1%	
E.B.Lane	SS-2	91	81	13	38.2	49.0	3.2	9.6	20	NP	A-2-4(0)	4.05-4.50		
	SS-3	100	96	69	11.8	23.3	28.3	36.5	33	NP	A-4(0)	7.10-7.55	18.2%	
	SS-4	89	79	23	25.7	48.6	7.0	18.7	23	NP	A-2-4(0)	10.15-10.60		
	SS-5	92	78	15	38.6	47.8	7.2	6.4	24	NP	A-2-4(0)	13.20-13.65		
	SS-6	100	99	62	3.6	42.0	26.0	28.4	28	NP	A-4(0)	16.24-16.69	19.2%	
	SS-7	100	99	20	2.6	80.0	9.0	8.4	24	NP	A-2-4(0)	19.29-19.74		
	SS-8	100	99	66	2.2	37.4	32.0	28.4	27	NP	A-4(0)	20.82-21.27		
EB1-A	SS-9	100	91	48	20.8	35.2	15.6	28.4	33	7	A-4(1)	1.16-1.61		
W.B.Lane	SS-10	94	64	7	76.2	17.8	2.0	4.0	21	NP	A-3(0)	4.05-4.50		
	SS-11	100	82	21	49.0	31.0	7.6	12.4	29	NP	A-2-4(0)	5.57-6.02		
	SS-12	98	64	8	69.0	24.0	2.6	4.4	32	NP	A-3(0)	7.10-7.55		
	SS-13	87	77	16	28.2	53.4	10.0	8.4	22	NP	A-2-4(0)	10.15-10.60		
	SS-14	86	80	17	26.8	54.8	12.0	6.4	26	NP	A-2-4(0)	13.20-13.65		
	SS-15	100	97	65	7.2	33.0	31.4	28.4	27	NP	A-4(0)	16.24-16.69		
	SS-16	100	97	27	8.0	66.8	10.8	14.4	21	NP	A-2-4(0)	19.29-19.74		
	SS-17	100	94	45	9.6	49.8	22.2	18.4	25	NP	A-4(0)	20.82-21.27		
EB2-A	SS-18	100	92	60	14.8	31.0	24.7	29.6	26	3	A-4(0)	0.30-0.45		
W.B. Lane	SS-19	100	78	16	43.5	42.3	2.8	11.3	16	NP	A-2-4(0)	2.62-3.07		
	SS-20	100	74	13	56.9	31.8	4.0	7.3	23	NP	A-2-4(0)	5.67-6.12		
	SS-21	100	45	12	72.5	17.2	3.0	7.3	28	NP	A-1-b(0)	8.72-9.17		
	SS-22	86	80	22	19.6	54.9	10.1	15.4	25	NP	A-2-4(0)	10.24-10.69		
	SS-23	100	92	4	25.1	71.7	2.0	1.2	26	NP	A-3(0)	13.29-13.64		
	SS-24	100	98	49	0.3	56.0	21.1	22.7	27	NP	A-4(0)	16.34-16.79		
	SS-25	100	99	16	3.0	83.4	8.3	5.3	24	NP	A-2-4(0)	17.86-18.31		
EB2-B	SS-27	100	41	6	82.2	13.0	1.6	3.2	33	6	A-1-b(0)	1.25-1.70		
E.B. Lane	SS-28	96	78	18	49.8	33.0	1.8	15.4	22	NP	A-2-4(0)	2.62-3.07		
	SS-29	100	41	6	82.2	13.0	1.6	3.2	19	NP	A-1-b(0)	4.14-4.59		
	SS-30	100	99	38	3.4	66.8	10.3	19.4	20	NP	A-4(0)	5.66-6.11		
	SS-31	100	63	11	63.8	27.1	7.9	1.2	25	NP	A-2-4(0)	7.18-7.63		
	SS-32	100	73	12	57.4	31.2	1.4	10.0	21	NP	A-2-4(0)	8.70-9.15		
	SS-33	66	59	15	24.8	52.4	12.8	10.0	20	NP	A-2-4(0)	10.22-10.67		
	SS-34	100	98	12	9.6	80.4	6.0	4.0	10	NP	A-2-4(0)	13.26-13.71		
	SS-35	100	99	58	2.6	50.4	27.0	20.0	33	8	A-4(3)	16.30-16.75		
	SS-36	100	98	63	4.4	46.6	31.0	18.0	29	6	A-4(2)	19.34-19.79		

34461.1.3 (R-2554BA)
Bridge On -L- (US 70 Bypass) Over –Y7- (NC 111)
Wayne Co.

Looking East Toward End Bent 2



STATE	STATE PROJECT REFERENCE NO.		SHEET NO.	TOTAL SHEETS
N.C.	34461.1.3		1	49
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION		
R-2554BA	NHF-70 (30)	P.E.		
		CONST.		

ID: R-2554BA

PROJECT: 34461.1.3

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

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34461.1.3 I.D. NO. R-2554BA

F.A. PROJECT NHF-70 (30)

COUNTY WAYNE

PROJECT DESCRIPTION US 70 (GOLDSBORO BYPASS) FROM SR 1300 (SALEM CHURCH RD) TO EAST OF SR 1556 (WAYNE MEMORIAL DR)

SITE DESCRIPTION STRUCTURES 14 AND 15; DUAL BRIDGES ON -L- OVER STONEY CREEK

CONTENTS:

	SHEET
STRUCTURE TITLE SHEET	1
NC DEPARTMENT OF TRANSPORTATION, DIVISION OF HIGHWAYS, GEOTECHNICAL ENGINEERING UNIT, SOIL AND ROCK LEGEND, TERMS, SYMBOLS AND ABBREVIATIONS	2
GEOTECHNICAL REPORT	3-4
SITE LOCATION MAP AND TOPOGRAPHIC SITE MAP (DRAWING NOS. 1-2)	5
BORING LOCATION PLAN (DRAWING NO. 3)	6
PROFILE 13.0m LEFT OF -L- (DRAWING NOS. 4-5)	7-8
CROSS SECTION ALONG LEFT LANE END BENT 1 (DRAWING NO. 6)	9
CROSS SECTION ALONG LEFT LANE BENT 1 (DRAWING NO. 7)	10
CROSS SECTION ALONG LEFT LANE BENT 2 (DRAWING NO. 8)	11
CROSS SECTION ALONG LEFT LANE BENT 3 (DRAWING NO. 9)	12
CROSS SECTION ALONG LEFT LANE BENT 4 (DRAWING NO. 10)	13
CRCROSS SECTION ALONG LEFT LANE END BENT 2 (DRAWING NO. 11)	14
LEFT LANE BORING LOGS	15-20
LEFT LANE AASHTO/ASTM LABORATORY TEST RESULTS	21-22
LEFT LANE SCOUR REPORT	23
LEFT LANE GRAIN SIZE CURVES	24
LEFT LANE SITE PHOTOGRAPHS	25-27
BORING LOCATION PLAN (DRAWING NO. 12)	28
PROFILE 13.0m RIGHT OF -L- (DRAWING NOS. 13-14)	29-30
CROSS SECTION ALONG RIGHT LANE END BENT 1 (DRAWING NO. 15)	31
CROSS SECTION ALONG RIGHT LANE BENT 1 (DRAWING NO. 16)	32
CROSS SECTION ALONG RIGHT LANE BENT 2 (DRAWING NO. 17)	33
CROSS SECTION ALONG RIGHT LANE BENT 3 (DRAWING NO. 18)	34
CROSS SECTION ALONG RIGHT LANE BENT 4 (DRAWING NO. 19)	35
CROSS SECTION ALONG RIGHT LANE END BENT 2 (DRAWING NO. 20)	36
RIGHT LANE BORING LOGS	37-42
RIGHT LANE AASHTO/ASTM LABORATORY TEST RESULTS	43-44
RIGHT LANE SCOUR REPORT	45
RIGHT LANE GRAIN SIZE CURVES	46-47
RIGHT LANE SITE PHOTOGRAPHS	48-49

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS 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.

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.

DRAWN BY: R. RAHIE

		PERSONNEL	
INVESTIGATED BY	MACTEC ENGINEERING AND CONSULTING, INC.		W. DEOBALD
CHECKED BY	S. CRISCENZO		J. HOWARD
SUBMITTED BY	W. DEOBALD		D. RHODES
DATE	05/25/07		
REVISED	06/18/07		

For Letting

NORTH CAROLINA LICENSED SEAL 1730 GEOLOGIST WILLIAM BRIAN DEOBALD

SEAL

SIGNATURE

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604
(919) 876-0416

ID	PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-2554BA	34461.1.3	2	49

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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND 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 PLASTIC INDEX	6 MX		N.P.	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
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

P.I. OF A-7-5 ≤L.L. - 30 : P.I. OF A-7-6 >L.L. - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^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	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	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
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
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

LL — LIQUID LIMIT
PL — PLASTIC LIMIT
OM — OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT

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, YEL-BRN, 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 ARE 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 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 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 SEEPAGE

MISCELLANEOUS SYMBOLS

ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
SOIL SYMBOL
ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
INFERRED SOIL BOUNDARIES
INFERRED ROCK LINE
ALLUVIAL SOIL BOUNDARY
25/025 DIP/DIP DIRECTION OF ROCK STRUCTURES
SOUNDING ROD

SPT CPT DPT DMT VST PMT TEST BORING
AUGER BORING
CORE BORING
MW MONITORING WELL
PIEZOMETER INSTALLATION
SLOPE INDICATOR INSTALLATION
SPT N-VALUE
REF SPT REFUSAL

SAMPLE DESIGNATIONS
S - BULK SAMPLE
SS - SPLIT SPOON SAMPLE
ST - SHELBY TUBE SAMPLE
RS - ROCK SAMPLE
RT - RECOMPACTED TRIAXIAL SAMPLE
CBR - CBR SAMPLE
MARSH
TREE LINE

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
C.I. - CAVE IN
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FIAD - FILLED IMMEDIATELY AFTER DRILLING
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
LS. - LIMESTONE
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
V. - VERY
VST - VANE SHEAR TEST
W - MOISTURE CONTENT

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] DIEDRICH D-50
- [ ] CME-550
- [X] CME-45 ON MARSH BUGGY
- [ ] CME-55 ON BARGE
- [ ] PORTABLE HOIST
- [ ] OTHER CME-55 TRAILOR
- [ ] OTHER

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 7-9cm STEEL TEETH
- [ ] TRICONE TUNG.-CARB.
- [ ] CORE BIT
- [ ] OTHER SIDE-DISCHARGE WING BIT

HAMMER TYPE:
- [ ] AUTOMATIC
- [X] MANUAL

CORE SIZE:
- [ ] -B
- [ ] -N
- [ ] -H

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN 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 2.5 cm PER 50 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 FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.
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 2.5 cm. 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 ROCKS 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 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
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 GEOLOGISTS 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 6 mm DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 WHICH 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 IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL WHICH 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, WHICH 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: NCDOT BASELINE POINTS BL-578, ELEV: 30.803m AND BL-577B, ELEV: 30.577m

NOTES:
Geotechnical Exploration Performed By:

MACTEC
MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604
(919) 876-0416

Subject: **Geotechnical Report**

Description: **Structures 14 & 15: Dual Bridges on -L- over Stoney Creek**
US 70 Goldsboro Bypass
Project Number: 34461.1.3
Tip Number: R-2554BA
F.A. Number: NHF-70 (30)
MACTEC Project Number: 6468-07-1706

Project Information

The purpose of this investigation was to obtain geotechnical information for design and construction of proposed dual bridges over Stoney Creek approximately 300 meters north of Tommy's Road, Goldsboro, North Carolina (Drawings 1 and 2). The bridges are part of a proposed segment of the US 70 Goldsboro Bypass from east of SR 1300 (Salem Church Road) to east of SR 1556 (Wayne Memorial Drive). Our understanding of this project comes from conversations with NCDOT Geotechnical Engineering Unit personnel and from documents and drawings provided by the Geotechnical Engineering Unit, including a Request for Proposal dated March 19, 2007, a Bridge Survey and Hydraulic Design Report dated March 1, 2006 and electronic drawings obtained via the NCDOT file transfer system.

The proposed bridges are parallel structures, each 168 meters long and 11 meters wide. Each bridge is to be constructed on six bents with two side spans 33 meters long, one center span 36 meters long, and two side spans 33 meters long. Bents are skewed 90° to the alignment -L-.

We were requested to drill up to three SPT-borings along each bent-line, for a maximum of 18 borings for the project. The initial plan was to drill 12 borings, including all of the "A" borings along the left-lane structure and all of the "B" borings along the right-lane structure. A third boring was to be drilled along selected bent-lines per NCDOT's direction. The need for a third boring was to be based on findings in the initial borings. We were instructed by NCDOT to advance borings to the depth of 20 meters.

Field Testing

During April and May, 2007, MACTEC advanced 12 borings at locations shown on the Boring Location Plans (Drawings 3 and 12). The borings were drilled with a CME-45B marsh buggy-mounted drill rig. The borings were advanced using rotary-wash drilling techniques.

All borings were advanced to a depth of approximately 20 meters. Standard penetration tests (SPT) were conducted and soil samples collected at approximately five-foot intervals. Samples were collected from within the soil profile using split-barrel samplers and 140 lb. manual hammers. Undisturbed samples of shallow cohesive soil were collected with Shelby tubes for consolidation testing.

Proposed boring locations were established at the project site utilizing GPS equipment. As-drilled boring location coordinates were captured with GPS equipment. The collected coordinates were corrected as necessary using post-processing differential correction. Conventional survey

techniques were used to establish the collar elevations at all boring locations and selected ground surface points depicted on the subsurface profile and cross-section drawings included with this report. R-2554BA Baseline Survey Points 577B and 578, established at the project site by NCDOT, were used as benchmarks.

A Slope Indicator pneumatic piezometer (P-1) was installed in boring LL EB2-A for short-term monitoring of the groundwater table. The piezometer was set at elevation 12.88 meters mean sea level (msl). A zone around the piezometer (elevation 10.08 to 14.00 meters msl) was backfilled with #2-well gravel. The boring was sealed with bentonite to the ground surface. A Piezometer Construction Record is included in the Supportive Documents for this report

Laboratory Testing

Split-barrel samples (SS-1 through SS-35) and undisturbed samples (ST-1 and ST-2) were selected for laboratory testing. AASHTO classification and grain-size distribution tests were performed on 34 of the samples. Six of the samples were tested for organic content. Cohesive soils were also tested for moisture content

Laboratory testing was performed in general accordance with applicable ASTM/AASHTO/ NCDOT specifications. Test results for AASHTO classification, grain-size distribution, organic and moisture content are included with this report.

Undisturbed sample ST-1, taken in boring RL EB1-B, was tested for consolidation. Test results will be provided as a separate supportive document upon completion of testing.

Physiography

There is approximately 9 meters of relief between the approach areas and the floodplain of Stoney Creek, and the ground surface slopes downward gradually toward End Bents 1 and 2. The ground surface at End Bents 1 is at 31± meters msl. The ground surface ranges in elevation from 29 to 32± meters msl along End Bents 2. The low area along End Bents 2 occurs at the right lane where a small drainage flows westward toward Stoney Creek. The flood plain is at elevation 29± meters msl along the interior bent locations.

The bridge site is undeveloped. The approach from the west crosses an agricultural field and a stand of mature pine and hardwood trees in the vicinity of End Bent 1. The approach from the east crosses an area previously logged and now vegetated mostly by brush and a new growth of pine and hardwood trees in the vicinity of End Bent 2. The flood plain is covered by grasses and scattered groupings of brush and hardwood trees. The main channel of Stoney Creek meanders through the site, crossing the alignment between Bents 2 and 3. The water surface elevation of Stoney Creek was measured at 29.17 meters msl on May 10, 2007. Site photographs included in this report show site conditions during our field investigation.

Geology

The project site is located in the western portion of the Carolina Coastal Plain Physiographic Province. The Carolina Coastal Plain is a wedge of mostly marine sediments and sedimentary rocks that gradually thickens to the east, towards the present day coast-line, that were deposited

during depositional cycles caused by fluctuating sea-levels. The Coastal Plain sediments encountered at the project site were deposited at a time when sea-level was much higher than its present condition. The depositional processes that resulted in the sediments encountered at the project site are the same as those in existence today along the current coast-line. Younger sediments lie at the surface near the coast. Older sediments, which underlie these younger sediments, lie at or near the surface further inland. The 1985 Geologic Map of North Carolina, compiled by the N.C. Geologic Survey, indicates that the project site is underlain by sediments of the Yorktown and Black Creek Formations. Most of soils encountered during our investigation are consistent with the description of the Black Creek Formation. We encountered the following stratigraphic units at the project site:

- Alluvium
- Coastal Plain Undivided
- Black Creek Formation

Boring logs describing subsurface conditions at each of the boring locations are included in this report. Generalized profiles, Drawings 4-5 and 13-14, depict subsurface conditions along the length of both structures. Generalized cross-sections, Drawings 6 to 11 and 15 to 20, depict subsurface conditions along each bent of both structures.

Soil

Alluvium was encountered in borings located in or near the wetland associated with Stoney Creek, from approximately Bent 1 to 4 along the Left Lane Structure, and Bent 1 to End Bent 2 along the Right Lane Structure. The alluvial soils typically consist of a surface layer of very loose, sandy muck underlain by very loose to medium dense, silty, fine to coarse sand and gravel (A-2-4/A-3/A-1-b) with trace organics. Within the floodplain of Stoney Creek, alluvial soils overlie Coastal Plain Undivided and Black Creek Formation sediments at approximate elevations ranging from 25 to 29± meters msl.

Coastal Plain Undivided soils were encountered at the surface in Left Lane borings EB1-A and EB2-A, and Right Lane boring EB1-B, and below alluvium at all other boring locations, except for LL B2-A and RL B3-B where Coastal Plain Undivided sediments were not encountered. The soils typically consist of very loose to medium dense, silty, fine to coarse sand (A-2-4/A-3) with trace organics and gravel; and locally, soft, sandy, silt and clay (A-4/A-7-6) with trace organics. Coastal Plain Undivided sediments are generally lightly colored brown, tan, orange, yellow, green, and gray and are locally mottled. The base of the Coastal Plain Undivided / top of the Black Creek Formation ranges in elevation from approximately 24 to 25± meters msl.

The Black Creek Formation was encountered underlying Coastal Plain Undivided or Alluvial sediments, and generally consists of a layered sequence of sands and clays. The upper sand layer consists of very loose to very dense, clayey, silty, fine to coarse sand (A-2-4/A-3/A-1-b) with trace mica, pyrite, and gravel, and trace to moderate organics/lignite. The bottom of the upper sand / top of the upper clay ranges in elevation from approximately 19 to 23± meters msl. The upper clay consists of very stiff to hard, sandy, silt and clay (A-4/A-6/A-7-6) with mica, trace pyrite and organics; and locally with interbedded, dense, clayey, silty, fine sand (A-2-6/A-2-4). The bottom of the upper clay / top of the lower sand ranges in elevation from approximately 12 to 14± meters msl. The lower sand consists of medium dense to very dense, silty, fine to coarse sand

SHEET 4

Structures 14 & 15: Dual Bridges on -L- over Stoney Creek
North Carolina Department of Transportation
June 18, 2007
MACTEC Project No. 6468-07-1706

(A-2-4/A-3/A-1-b) with mica, trace gravel and pyrite. The bottom of the lower sand / top of the lower clay, where encountered, ranges in elevation from approximately 9 to 10± meters msl. The lower clay consists of hard, sandy clay (A-7-6) with mica. The upper and lower clays serve as confining units to the artesian groundwater conditions observed in the lower sand layer. Sediments within the Black Creek Formation are generally darkly colored black, grays, browns, and greens, and locally mottled. All borings were terminated in the lower sand or lower clay of the Black Creek Formation. The pyrite observed throughout the sediment of the Black Creek Formation occurs as disseminated euhedral crystals and sparse cemented concretions with sand and lignite.

Groundwater

Groundwater was encountered primarily in two water-bearing zones; first from above and second from below the upper clay layer found within the Black Creek Formation. Generally, the soils are wet to saturated from the ground surface to the top of the upper clay layer at elevation 19 to 23± meters msl. Groundwater in the zone below the upper clay layer at elevation 12 to 14± meters msl is artesian and was observed to rise within our drill casing to heights of 1.5 to 3± meters above ground surface at the completion of a boring. Flow from the artesian zone was estimated at 3 to 5 gallons per minute. Borings were backfilled with bentonite pellets shortly after drilling to contain the artesian flow and re-isolate the artesian zone from the surficial water-bearing zone. Consequently, 24-hour groundwater level measurements were not obtained from borings, with the exception of LL EB2-A.

The artesian hydraulic head was measured with a pneumatic piezometer, P-1, installed in boring LL EB2-A. The piezometric elevation was determined three times over a two week period in May 2007, and was found to be generally consistent with our observations of the water table in the drill casings. Piezometer readings and piezometric elevation data for the three monitoring events are listed in the following table:

Piezometer P-1
P-1 Elevation 12.88 meters msl
Ground Surface Elevation 31.60 meters msl

Date	Time	Reading 1 (psi)	Reading 2 (psi)	Reading 3 (psi)	Piezometric Elevation (m)
5/9/07	1530	30.00	30.20	30.25	34.11
5/16/07	1010	30.37	30.32	30.34	34.24
5/21/07	1015	30.30	30.34	30.27	34.22

Piezometric Elevation: The static level to which groundwater would be expected to rise in a tightly cased well.

SHEET 5

REFERENCE: Delorme Street Atlas

SCALE: 1 inch = 1 mile

NOTE: SITE LOCATION IS APPROXIMATE

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

SITE LOCATION MAP
STRUCTURES 14 & 15; DUAL BRIDGES ON -L- OVER
STONEY CREEK
NCDOT PROJ. NO. 34461.1.3 (R-2554BA)
WAYNE COUNTY, NORTH CAROLINA

DRAWN: MBL	DATE: MAY 2007	DRAWING
ENG CHECK:	SCALE: 1 : 62500	1
APPROVAL:	JOB: 6468-07-1706	

NORTHEAST GOLDSBORO, N.C.
NW/4 GOLDSBORO 15' QUADRANGLE
35077-D8-TM-024
1983
DMA 5454 IV NW – SERIES V842

CONTOUR INTERVAL 2 METERS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

GRAPHIC SCALE FEET

2000 1000 0 2000 4000

NOTE:: SITE LOCATION IS APPROXIMATE

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

TOPOGRAPHIC SITE MAP
STRUCTURES 14 & 15; DUAL BRIDGES ON -L- OVER
STONEY CREEK
NCDOT PROJ. NO. 34461.1.3 (R-2554BA)
WAYNE COUNTY, NORTH CAROLINA

DRAWN: MBL	DATE: MAY 2007	DRAWING
ENG CHECK:	SCALE: 1 : 24000	2
APPROVAL:	JOB: 6468-07-1706	

SHEET: 6

STONEY CREEK

LL EB1-B
LL B1-A
LL B2-A
LL B3-A
LL B4-A
LL EB2-A

RL EB1-B
RL B1-B
RL B2-B
RL B3-B
RL B4-B
RL EB2-A

131+00
132+00
133+00
134+00

-BL- S 67° 14' 17.9" E
S 68° 04' 11.0" E
S 68° 04' 03.9" E
-BL- S 75° 11' 14.6" E

BL POT 50+92.798
-T2-203 PINC 5+49.233=
-L- STA. 133+01.410 (1.429m LT)
ELEV.= 29.966
NAIL SET

-T2-201 POT 5+00.000=
-L- STA. 133+06.077 (47.042m LT)
ELEV.= 30.236
NAIL SET

-T2-202 PINC 5+29.043=
-L- STA. 132+94.509 (20.403m LT)
ELEV.= 29.974
NAIL SET

S 45° 24' 16.4" W
S 68° 30' 17.2" W
S 30° 46' 19.5" W

BL- 577B PINC 49+51.111=
-L- STA. 131+59.729 (0.203m LT)
EL. 30.557

BL- 578 PINC 51+18.114=
-L- STA. 133+26.726 (1.655m LT)
EL. 30.803

-T2- 204 PINC 5+79.387=
-L- STA. 132+96.775 (28.366m RT)
ELEV.= 30.455
NAIL SET

S 38° 25' 50.5" W

-T2-205 6+16.223=
-L- STA. 132+86.313 (63.686m RT)
ELEV.= 30.555
NAIL SET

S 40° 38' 28.5" W

-T2- 206 POT 6+40.398=
-L- STA. 132+77.403 (86.158m RT)
ELEV.= 29.198
NAIL SET

0 10 20 40
HORIZONTAL SCALE (METER)
1:1000

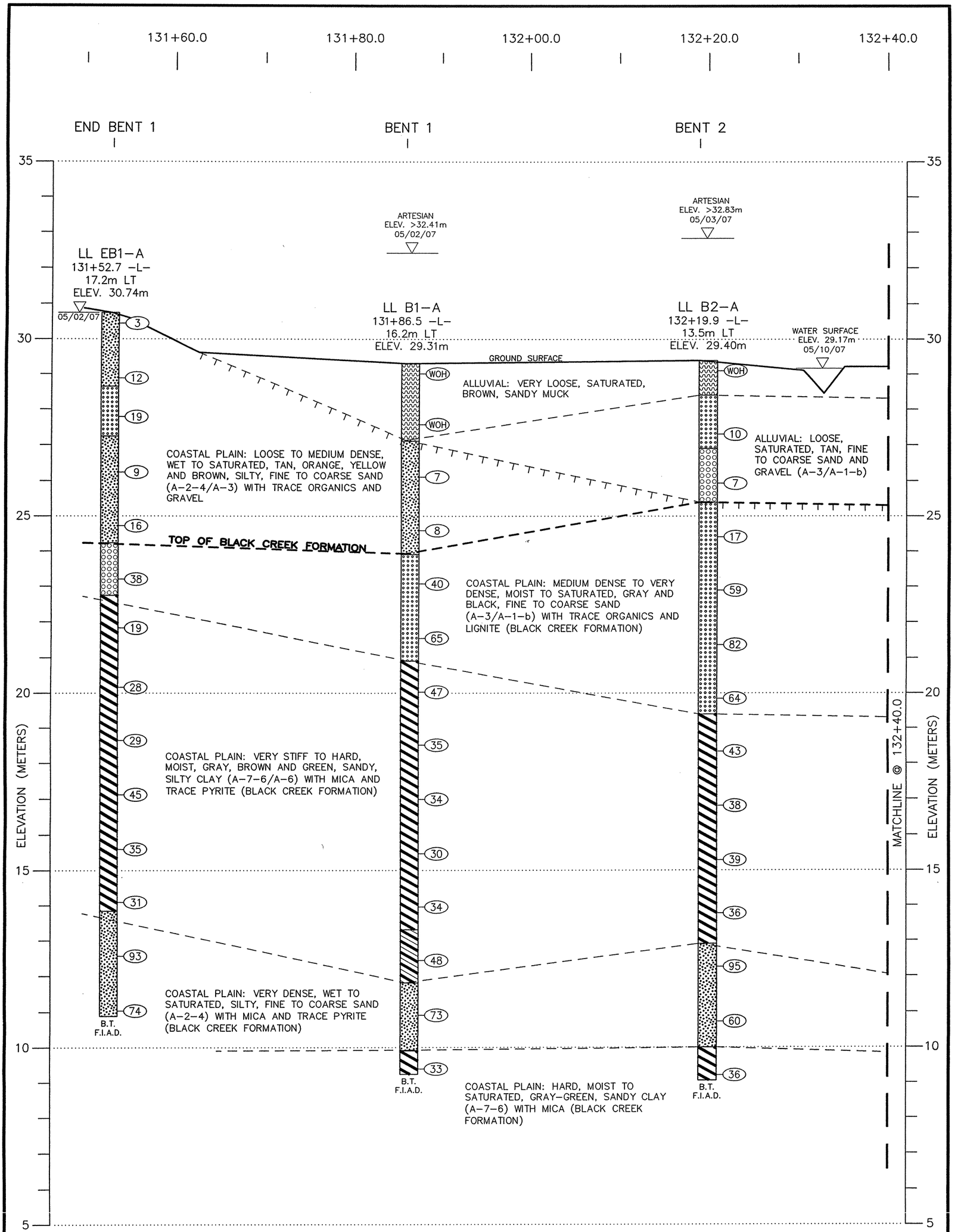
NAD 83

BORING LOCATION PLAN

STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: M.B.L.	JOB : 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 3



0 1 2 4
VERTICAL SCALE (METERS)
1:100

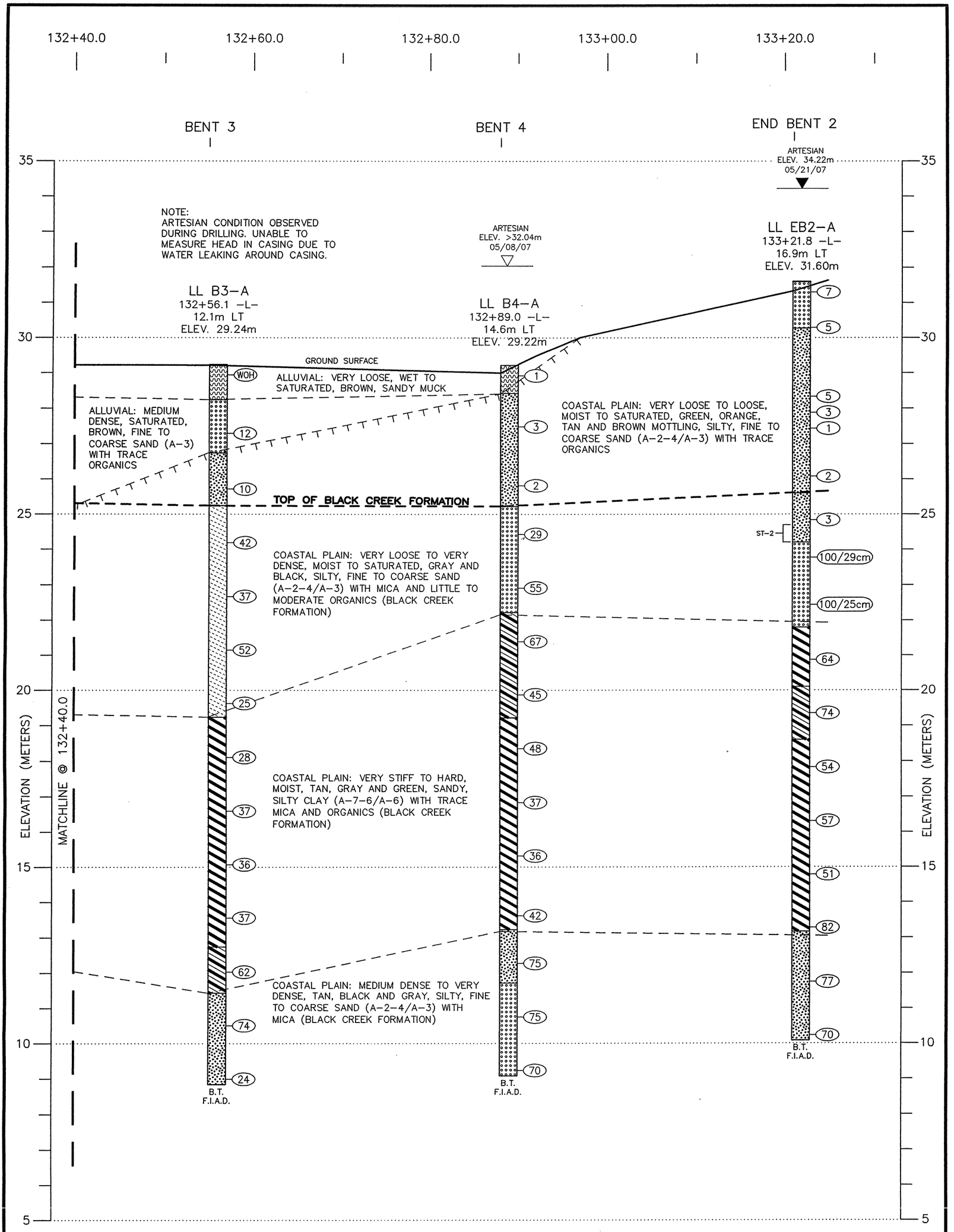
0 4 8 16
HORIZONTAL SCALE (METERS)
1:400

PROFILE 13.0m LEFT OF -L-
STRUCTURES 14 & 15; DUAL BRIDGES ON -L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: W.B.D.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 4

SHEET 7



0 1 2 4
VERTICAL SCALE (METERS)
1:100

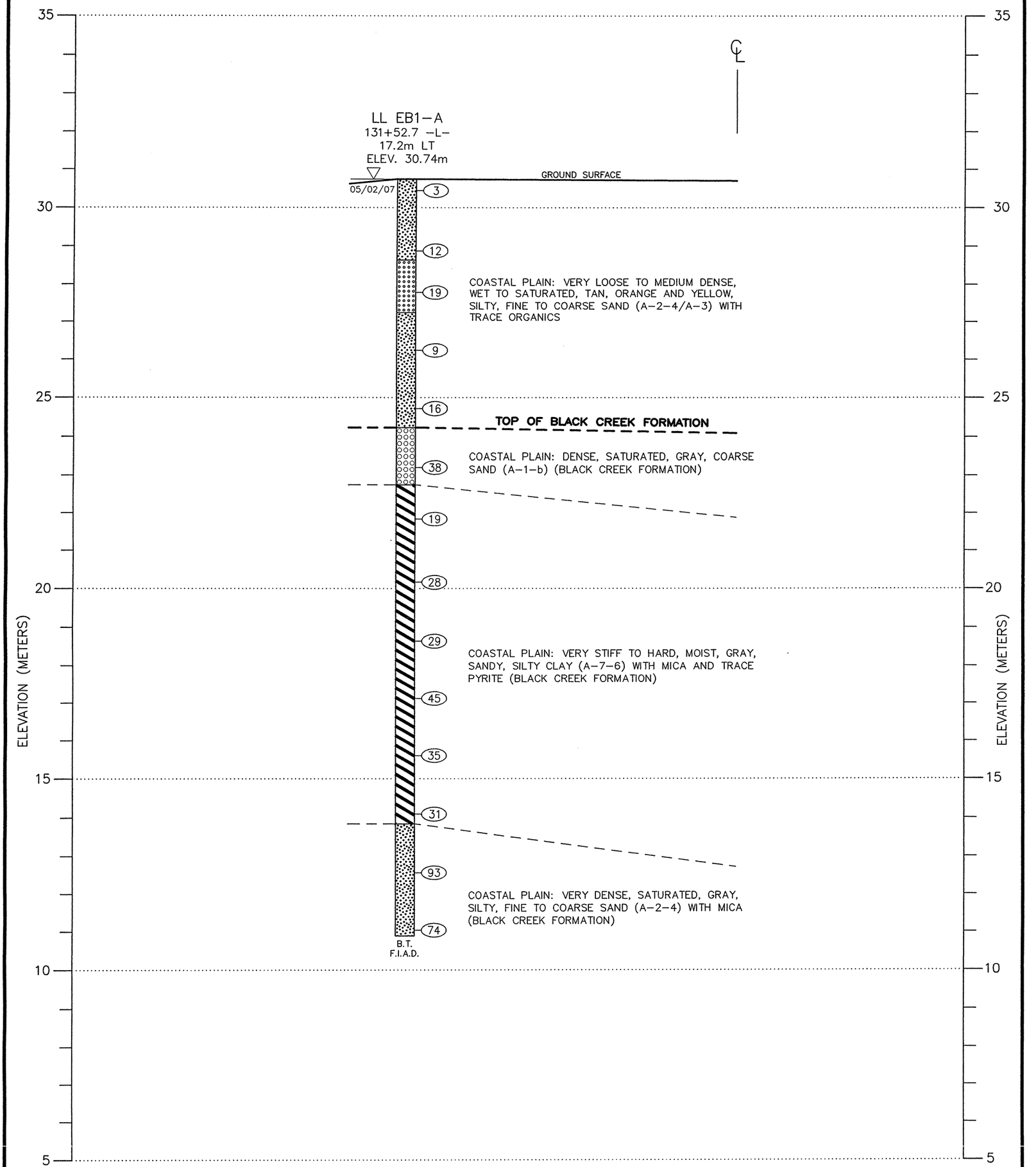
0 4 8 16
HORIZONTAL SCALE (METERS)
1:400

PROFILE 13.0m LEFT OF -L-
STRUCTURES 14 & 15; DUAL BRIDGES ON -L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
06/18/07	DFT CHECK: W.B.D.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 5

SHEET 8



0 1 2 4
VERTICAL SCALE (METERS)
1:100

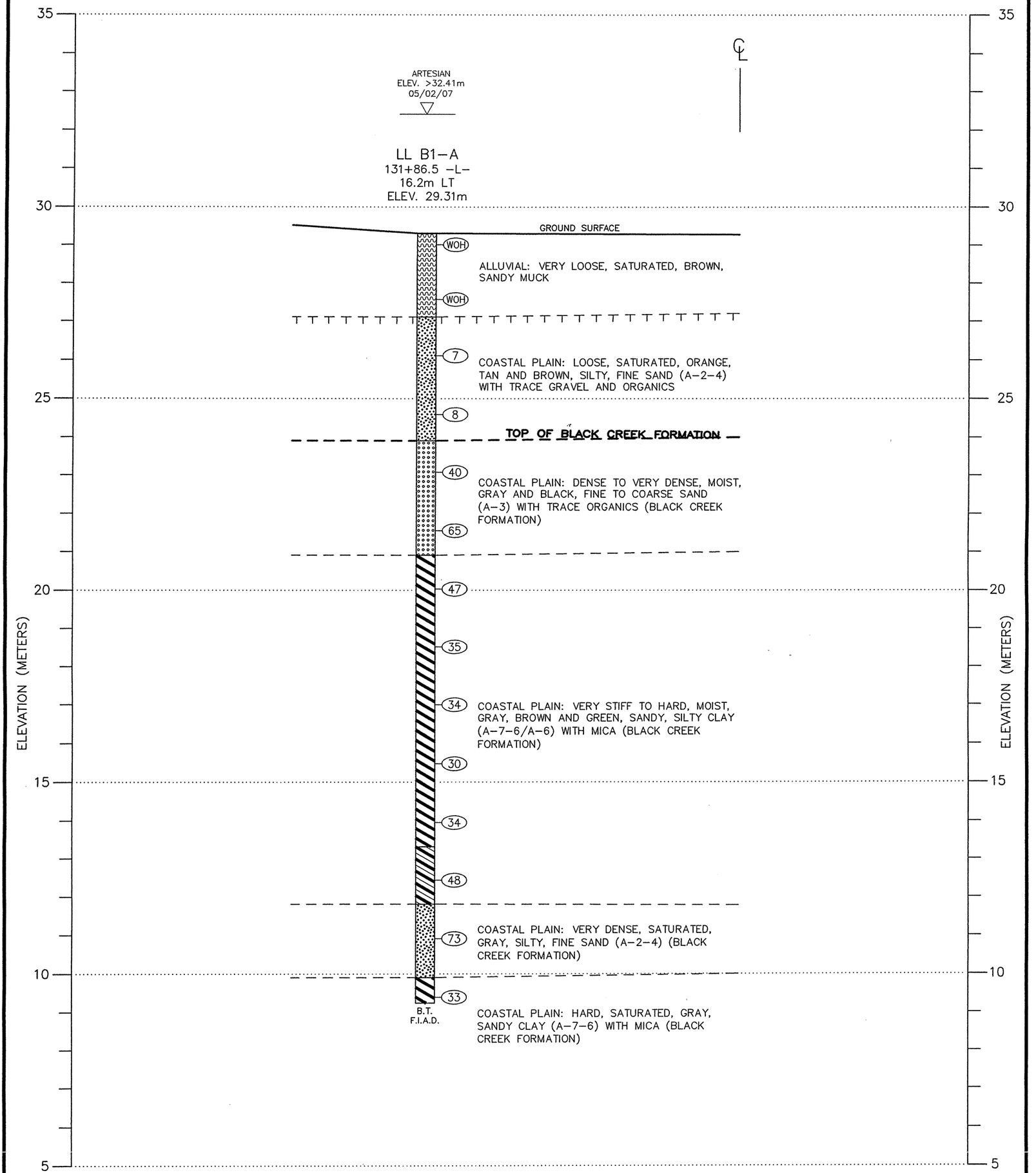
0 2 4 8
HORIZONTAL SCALE (METERS)
1:200

CROSS SECTION ALONG LEFT LANE END BENT 1
STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: W.B.D.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 6

SHEET 6



0 1 2 4
VERTICAL SCALE (METERS)
1:100

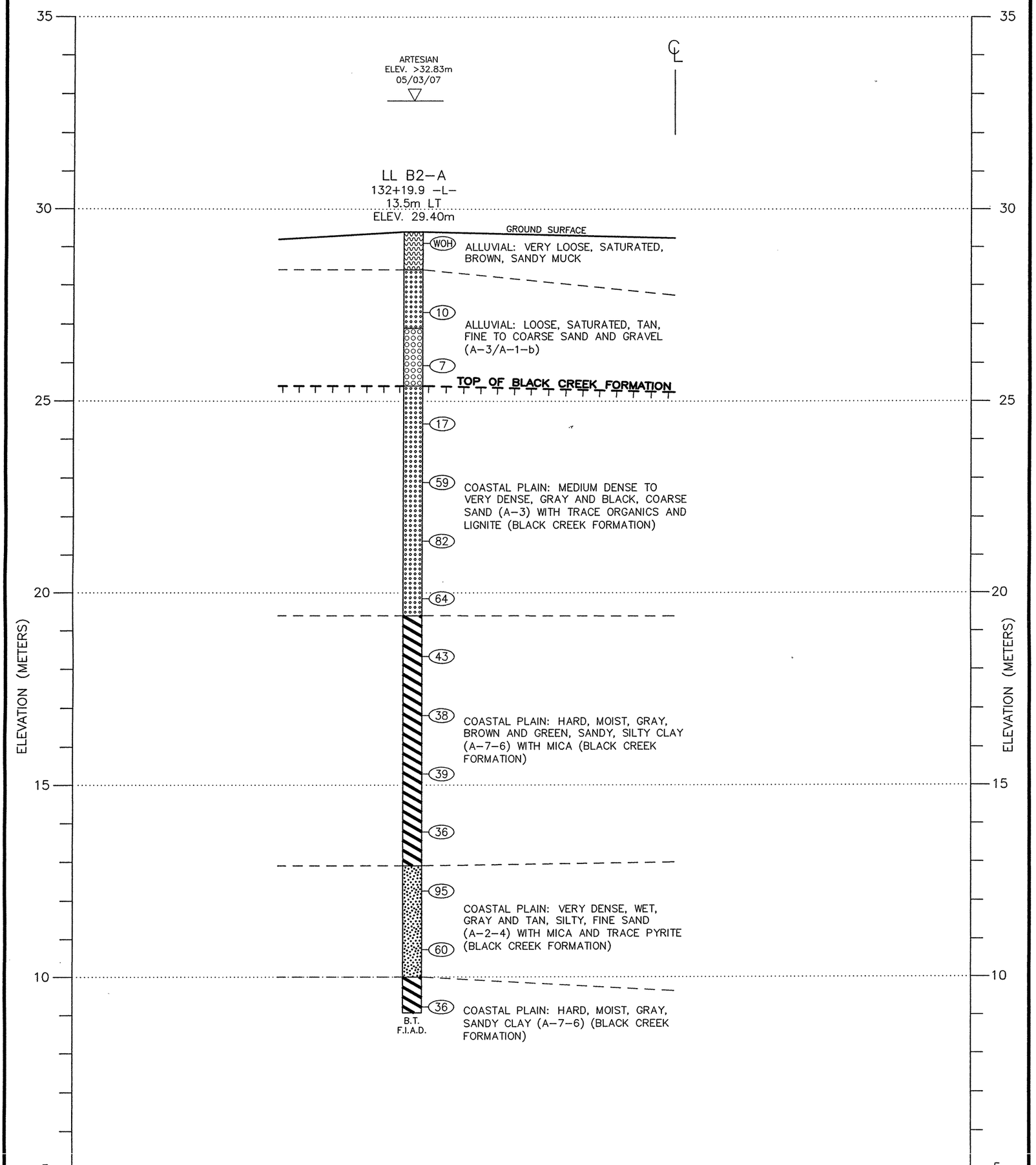
0 2 4 8
HORIZONTAL SCALE (METERS)
1:200

CROSS SECTION ALONG LEFT LANE BENT 1
STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: W.B.D.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 7

SHEET 10



0 1 2 4
VERTICAL SCALE (METERS)
1:100

0 2 4 8
HORIZONTAL SCALE (METERS)
1:200

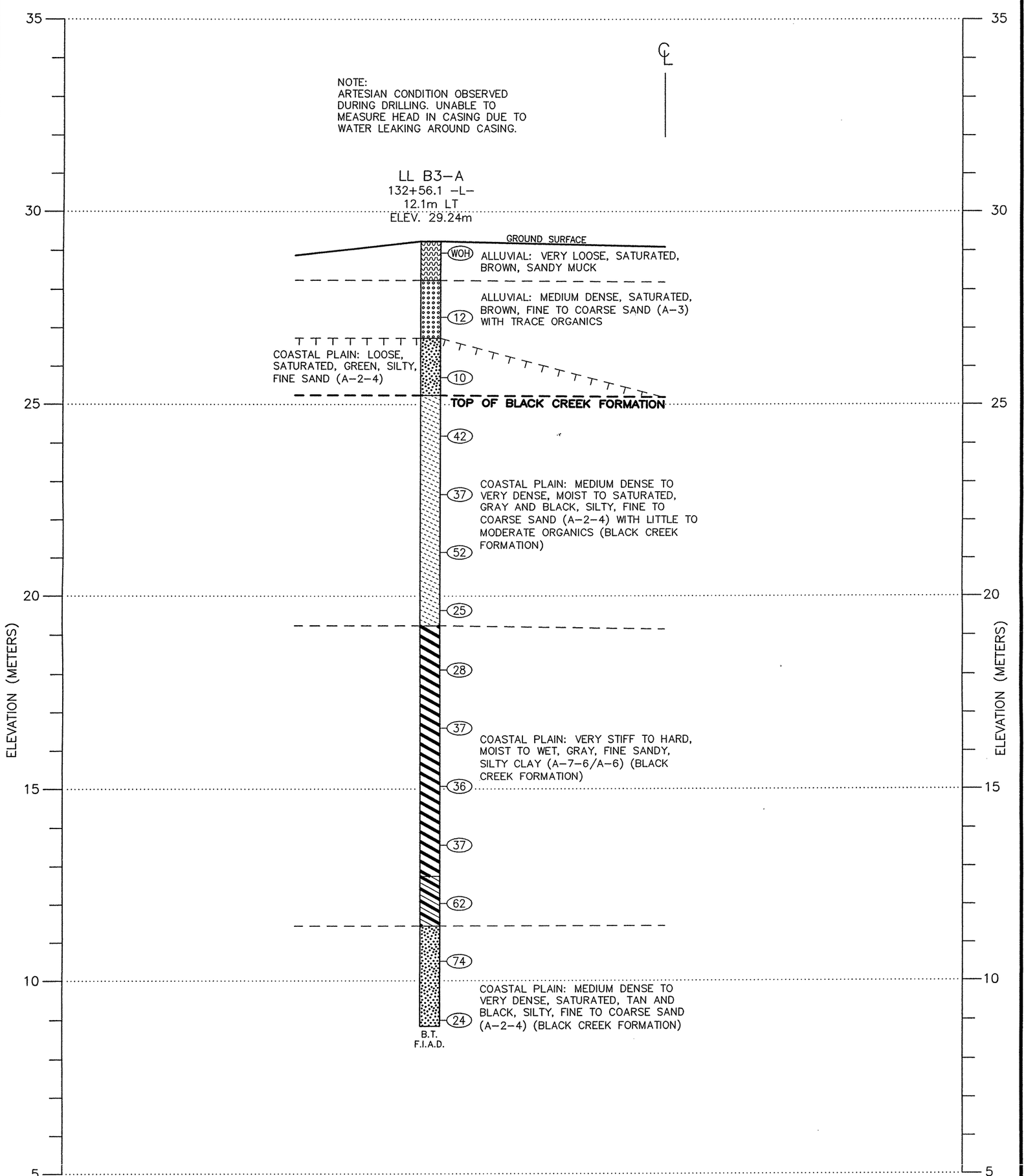
CROSS SECTION ALONG LEFT LANE BENT 2

STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: W.B.D.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 8

SHEET 11



0 1 2 4
VERTICAL SCALE (METERS)
1:100

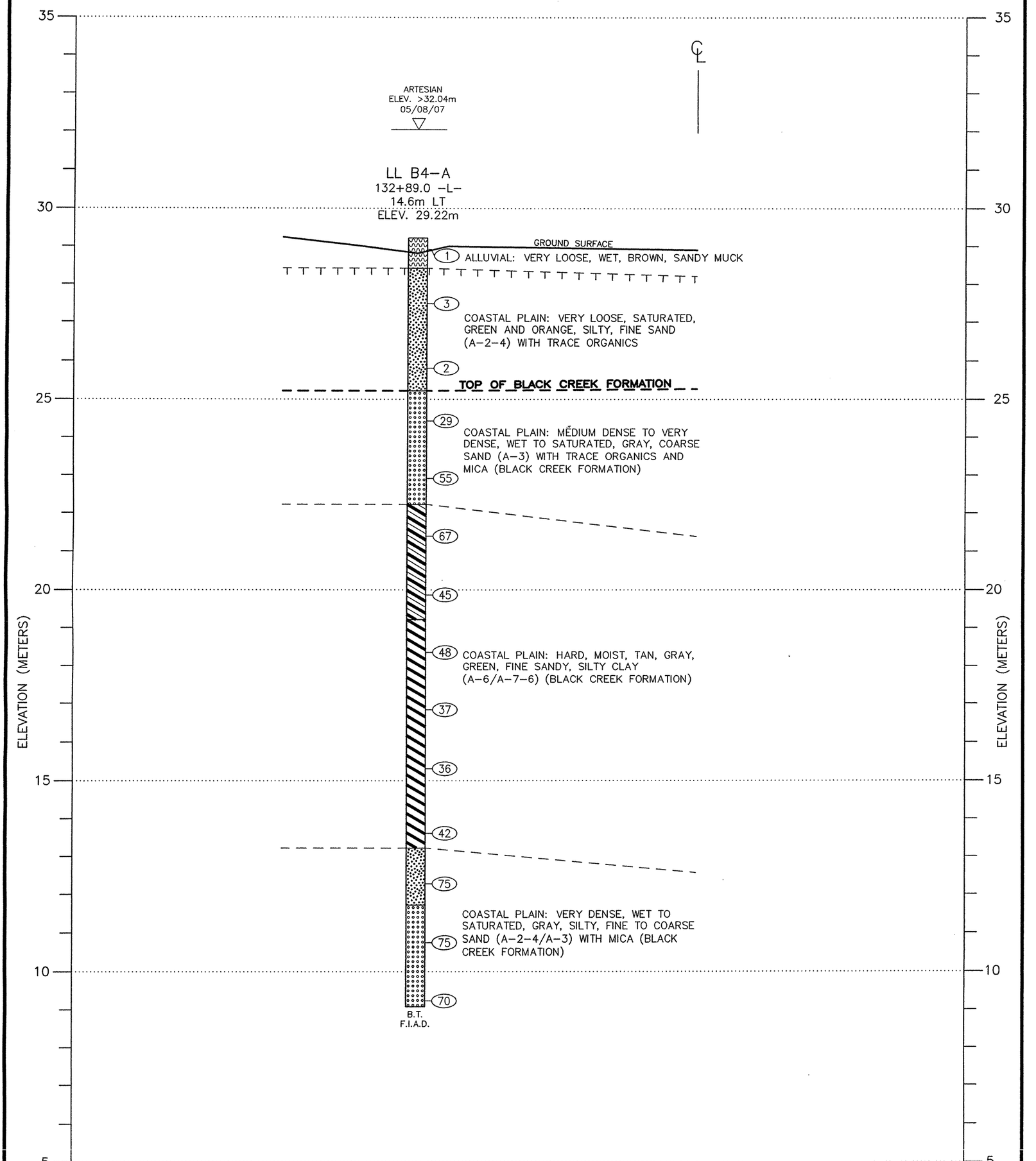
0 2 4 8
HORIZONTAL SCALE (METERS)
1:200

CROSS SECTION ALONG LEFT LANE BENT 3
STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
06/18/07	DFT CHECK: W.B.D.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 9

SHEET 12



0 1 2 4
VERTICAL SCALE (METERS)
1:100

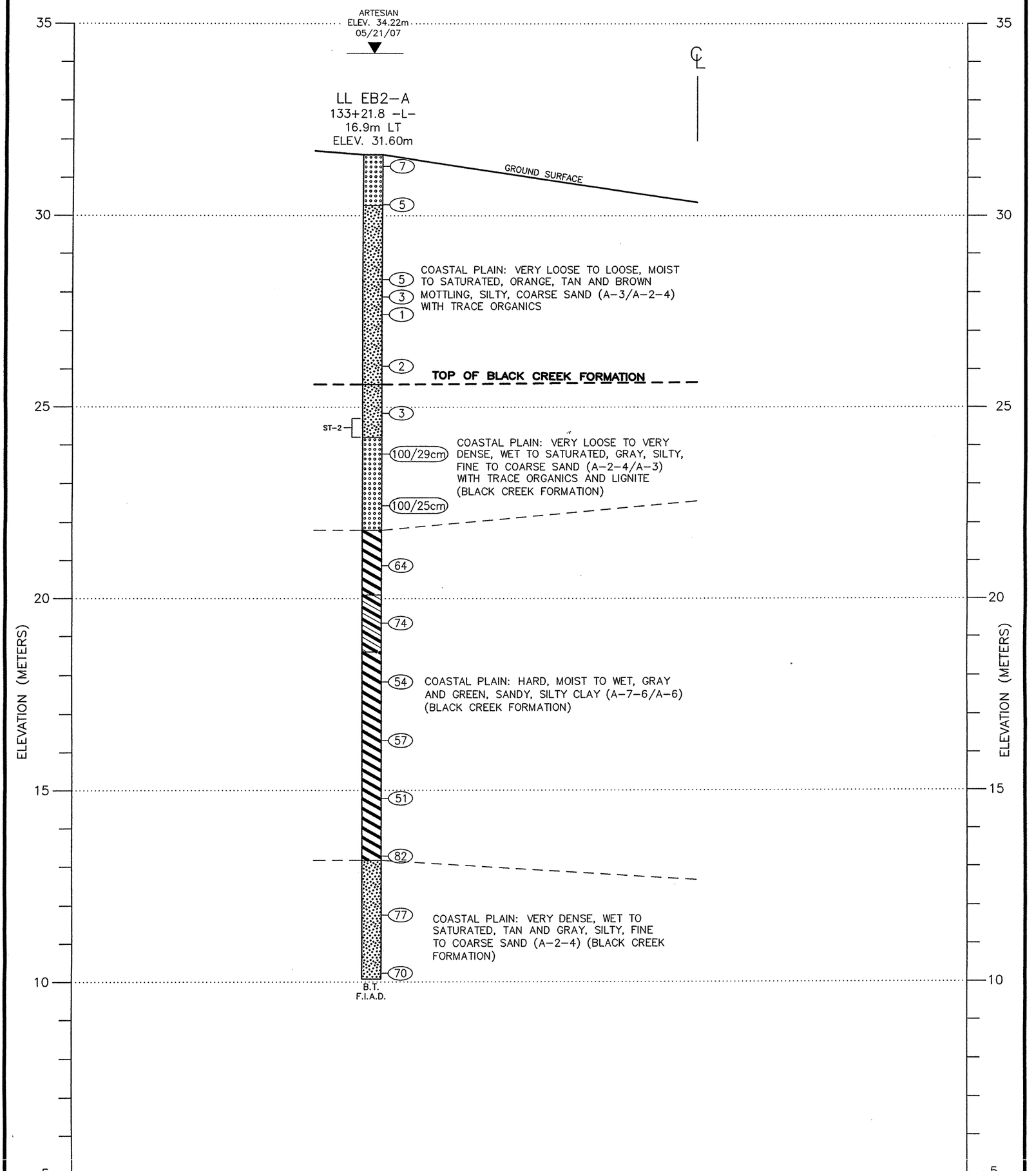
0 2 4 8
HORIZONTAL SCALE (METERS)
1:200

CROSS SECTION ALONG LEFT LANE BENT 4
STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: W.B.D.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 10

SHEET 13



0 1 2 4
VERTICAL SCALE (METERS)
1:100

0 2 4 8
HORIZONTAL SCALE (METERS)
1:200

CROSS SECTION ALONG LEFT LANE END BENT 2
STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: W.B.D.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 11

SHEET 14

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne		**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. LL EB1-A	**STATION** 131+52.7	**OFFSET** 17.2m LT	**ALIGNMENT** -L-	**0 HR.** 0.00
COLLAR ELEV. 30.74 m	**TOTAL DEPTH** 19.85 m	**NORTHING** 186,228.0	**EASTING** 704,934.4	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/01/07	**COMP. DATE** 05/02/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (m)	DEPTH (m)
31											
30.74	0.00						▽		GROUND SURFACE	30.74	0.00
		1	1	2	3	SS-18	W		**COASTAL PLAIN** Tan and orange, silty, fine to coarse SAND (A-2-4) with trace organics		
29.18	1.56										
		7	8	4	12	SS-19	W			28.64	2.10
28.08	2.66								**COASTAL PLAIN** Tan-yellow, fine to coarse SAND (A-3)		
		3	7	12	19	SS-20	Sat.			27.24	3.50
26.54	4.20								**COASTAL PLAIN** Orange-tan, silty, fine SAND (A-2-4)		
		2	3	6	9	SS-21	Sat.				
25.02	5.72										
		5	7	9	16	SS-22	Sat.			24.24	6.50
23.50	7.24								**COASTAL PLAIN** Gray, coarse SAND (A-1-b) (Black Creek Formation)		
		4	18	20	38	SS-23	Sat.			22.74	8.00
22.13	8.61								**COASTAL PLAIN** Gray, gray-brown, and gray-green, sandy, silty, CLAY (A-7-6) with mica and trace pyrite (Black Creek Formation)		
		4	8	11	19		M				
20.46	10.28										
		6	12	16	28	SS-24	35%				
18.94	11.80										
		10	13	16	29		M				
17.42	13.32										
		11	19	26	45	SS-25	20%				
15.90	14.84										
		12	14	21	35		M				
14.38	16.36										
		10	14	17	31	SS-26	24%			13.84	16.90
12.86	17.88								**COASTAL PLAIN** Gray, silty, fine to coarse SAND (A-2-4) with mica (Black Creek Formation)		
		34	52	41	93	SS-27	Sat.				
11.34	19.40										
		18	28	46	74	SS-28	Sat.			10.89	19.85

NCDOT BORE DOUBLE MACTEC 6468-07-1706.GPJ NC_DOT.GDT 6/18/07

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne		**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. LL EB1-A	**STATION** 131+52.7	**OFFSET** 17.2m LT	**ALIGNMENT** -L-	**0 HR.** 0.00
COLLAR ELEV. 30.74 m	**TOTAL DEPTH** 19.85 m	**NORTHING** 186,228.0	**EASTING** 704,934.4	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/01/07	**COMP. DATE** 05/02/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
11					Match Line				

Boring Terminated at Elevation 10.89 m in Coastal Plain: Very dense, silty, coarse SAND (A-2-4) (Black Creek Formation)

Bits Used: 7.3 cm Side-Discharge Finger Bit

Drilling Fluid Properties: 1.01 g/cm^3

Casing Depth (4"): 1.04 m

Boring backfilled/sealed with bentonite pellets immediately after drilling completed.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne	**GEOLOGIST** J. Howard	
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. LL B1-A	**STATION** 131+86.5	**OFFSET** 16.2m LT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 29.31 m	**TOTAL DEPTH** 20.07 m	**NORTHING** 186,214.4	**EASTING** 704,965.4	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/02/07	**COMP. DATE** 05/02/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
30									ELEV. (m) DEPTH (m)
29.31	0.00								29.31 GROUND SURFACE 0.00
27.87	1.44	WOH	WOH	WOH	0		Sat.		**ALLUVIAL** Brown, sandy MUCK
26.41	2.90	WOH	WOH	WOH	0		Sat.		27.11 2.20 **COASTAL PLAIN** Orange, tan, brown, silty, fine SAND (A-2-4) with trace organics and gravel
24.89	4.42	2	3	4	7	SS-29	Sat.		
23.37	5.94	3	4	4	8		Sat.		23.91 5.40 **COASTAL PLAIN** Gray and black, fine to coarse SAND (A-3) with trace organics (Black Creek Formation)
21.85	7.46	8	15	25	40		M		
20.33	8.98	27	31	34	65		M		20.91 8.40 **COASTAL PLAIN** Gray with brown and green, sandy, silty CLAY (A-7-6) with mica (Black Creek Formation)
18.81	10.50	9	22	25	47		M		
17.29	12.02	10	16	19	35		M		
15.77	13.54	12	15	19	34		M		
14.25	15.06	11	13	17	30		M		
12.73	16.58	9	14	20	34		M		13.31 16.00 **COASTAL PLAIN** Green, fine sandy, silty CLAY (A-6) with mica (Black Creek Formation)
11.21	18.10	18	21	27	48	SS-30	22%		11.81 17.50 **COASTAL PLAIN** Light gray, silty, fine SAND (A-2-4) (Black Creek Formation)
9.69	19.62	27	35	38	73		Sat.		9.91 19.40

NCDOT BORE DOUBLE MACTEC 6468-07-1706.GPJ NC_DOT.GDT 6/18/07

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne	**GEOLOGIST** J. Howard	
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. LL B1-A	**STATION** 131+86.5	**OFFSET** 16.2m LT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 29.31 m	**TOTAL DEPTH** 20.07 m	**NORTHING** 186,214.4	**EASTING** 704,965.4	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/02/07	**COMP. DATE** 05/02/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
10					Match Line				
		10	13	20	33		Sat.		9.24 20.07 **COASTAL PLAIN** Gray-green, sandy CLAY (A-7-6) with mica (Black Creek Formation) *(continued)*

Boring Terminated at Elevation 9.24 m in Coastal Plain: Hard, sandy CLAY (A-7-6) with mica (Black Creek Formation)

Bits Used: 7.3 cm Side-Discharge Finger Bit

Drilling Fluid Properties: 1.03 g/cm^3

Casing Depth (4"): 1.66 m

Note: Artesian condition observed during drilling. Flow estimated at ~1 gal/minute. Unable to measure static head in casing. Head exceeds 3.10 m above ground surface. Boring backfilled/sealed with bentonite pellets immediately after drilling completed.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne		**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. LL B2-A	**STATION** 132+19.9	**OFFSET** 13.5m LT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 29.40 m	**TOTAL DEPTH** 20.34 m	**NORTHING** 186,199.4	**EASTING** 704,995.3	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/03/07	**COMP. DATE** 05/03/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
30										
29.40	0.00								29.40 GROUND SURFACE	0.00
		WOH	WOH	WOH	WOH		Sat.		**ALLUVIAL** Brown, sandy MUCK	
28.40	1.00									
27.60	1.80								**ALLUVIAL** Tan, fine to coarse SAND (A-3)	
		4	4	6	10		Sat.			
26.90	2.50									
26.23	3.17								**ALLUVIAL** Tan, fine to coarse SAND and GRAVEL (A-1-b)	
		1	3	4	7		Sat.			
25.40	4.00									
24.71	4.69								**COASTAL PLAIN** Gray with black, coarse SAND (A-3) with trace organics and lignite (Black Creek Formation)	
		4	7	10	17		Sat.			
23.19	6.21									
		21	29	30	59		Sat.			
21.67	7.73									
		15	26	56	82		Sat.			
20.15	9.25									
		28	28	36	64		Sat.			
19.40	10.00								**COASTAL PLAIN** Gray with brown and green, sandy, silty CLAY (A-7-6) with mica (Black Creek Formation)	
18.63	10.77	13	18	25	43		M			
17.11	12.29	14	15	23	38		M			
15.59	13.81	11	17	22	39		M			
14.07	15.33	11	15	21	36		M			
12.90	16.50									
12.55	16.85	20	40	55	95		W		**COASTAL PLAIN** Gray and tan, silty, fine SAND (A-2-4) with mica and trace pyrite (Black Creek Formation)	
11.03	18.37	9	18	42	60		W			
10.00	19.40									

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne		**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. LL B2-A	**STATION** 132+19.9	**OFFSET** 13.5m LT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 29.40 m	**TOTAL DEPTH** 20.34 m	**NORTHING** 186,199.4	**EASTING** 704,995.3	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/03/07	**COMP. DATE** 05/03/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
10					Match Line				
9.51	19.89								
		14	16	20	36		M		
9.06	20.34								**COASTAL PLAIN** Gray, sandy CLAY (A-7-6) (Black Creek Formation) *(continued)*

Boring Terminated at Elevation 9.06 m in Coastal Plain: Hard, sandy CLAY (A-7-6) (Black Creek Formation)

Bits Used: 7.3 cm Side-Discharge Finger Bit

Drilling Fluid Properties: 1.01 g/cm³

Casing Depth (4"): 3.16 m

Note: Artesian condition observed during drilling. Flow estimated at ~3.5 gal/minute. Unable to measure static head in casing. Head exceeds 3.43m above ground surface. Boring backfilled/sealed with bentonite pellets immediately after drilling completed.

NCDOT BORE DOUBLE MACTEC 6468-07-1706.GPJ NC_DOT.GDT 6/18/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne	**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)			**GROUND WTR (m)**
BORING NO. LL B3-A	**STATION** 132+56.1	**OFFSET** 12.1m LT	**ALIGNMENT** -L-	0 HR. Artesian
COLLAR ELEV. 29.24 m	**TOTAL DEPTH** 20.40 m	**NORTHING** 186,184.7	**EASTING** 705,028.5	24 HR. FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/03/07	**COMP. DATE** 05/07/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
30									
29.24	0.00								ELEV. (m) DEPTH (m)
		WOH	WOH	WOH	WOH 0		Sat.		29.24 GROUND SURFACE 0.00 **ALLUVIAL** Brown, sandy MUCK
27.59	1.65	1	5	7	12		Sat.		28.24 1.00 **ALLUVIAL** Brown, fine to coarse SAND (A-3) with trace organics
26.01	3.23	3	5	5	10		Sat.		26.74 2.50 **COASTAL PLAIN** Green, silty, fine SAND (A-2-4)
24.49	4.75	11	16	26	42		Sat.		25.24 4.00 **COASTAL PLAIN** Gray and black, silty, fine to coarse SAND (A-2-4) with little to moderate organics (Black Creek Formation) Organic Content SS-32=5.3% Organic Content SS-33=3.0%
22.97	6.27	11	17	20	37	SS-32	Sat.		
21.45	7.79	13	21	31	52		Sat.		
19.93	9.31	7	11	14	25	SS-33	M		
18.41	10.83	10	11	17	28		M		
16.89	12.35	12	17	20	37		M		
15.37	13.87	10	16	20	36		M		
13.85	15.39	13	16	21	37		M		
12.33	16.91	21	23	39	62	SS-31	21%		19.24 10.00 **COASTAL PLAIN** Gray, silty CLAY (A-7-6) (Black Creek Formation)
10.81	18.43	12	28	46	74		Sat.		12.74 16.50 **COASTAL PLAIN** Gray, fine sandy, CLAY (A-6) (Black Creek Formation) 11.44 17.80 **COASTAL PLAIN** Tan with black, silty, fine to coarse SAND (A-2-4) (Black Creek Formation)

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne	**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)			**GROUND WTR (m)**
BORING NO. LL B3-A	**STATION** 132+56.1	**OFFSET** 12.1m LT	**ALIGNMENT** -L-	0 HR. Artesian
COLLAR ELEV. 29.24 m	**TOTAL DEPTH** 20.40 m	**NORTHING** 186,184.7	**EASTING** 705,028.5	24 HR. FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/03/07	**COMP. DATE** 05/07/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
10					Match Line				
9.29	19.95	12	13	11	24		Sat.		8.84 20.40 Boring Terminated at Elevation 8.84 m in Coastal Plain: Medium dense, silty, fine to coarse SAND (A-2-4) (Black Creek Formation) Bits Used: 7.3 cm Side-Discharge Finger Bit Drilling Fluid Properties: 1.01 g/cm³ Casing Depth (4"): 1.64 m Note: Artesian condition observed during drilling. Unable to measure static head in casing due to water leaking around casing. Boring backfilled/sealed with bentonite pellets immediately after drilling completed.

NCDOT BORE DOUBLE MACTEC 6468-07-1706.GPJ NC_DOT.GDT 6/18/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne		**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. LL B4-A	**STATION** 132+89.0	**OFFSET** 14.6m LT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 29.22 m	**TOTAL DEPTH** 20.14 m	**NORTHING** 186,174.7	**EASTING** 705,059.9	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/08/07	**COMP. DATE** 05/08/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (m) / DEPTH (m))
30									
29.22	0.00								29.22 GROUND SURFACE 0.00
27.78	1.44	2	1	WOH	1		W		**ALLUVIAL** Brown, sandy MUCK — 28.42 / 0.80
26.11	3.11	2	1	2	3		Sat.		**COASTAL PLAIN** Green and orange, silty, fine SAND (A-2-4) with trace organics
24.73	4.49	1	1	1	2		Sat.		25.22 / 4.00
23.21	6.01	6	15	14	29		Sat.		**COASTAL PLAIN** Gray, coarse SAND (A-3) with trace organics and mica (Black Creek Formation)
21.69	7.53	19	34	21	55		W		22.22 / 7.00
20.17	9.05	17	23	44	67	SS-34	19%		**COASTAL PLAIN** Tan-gray, fine sandy, silty CLAY (A-6) with mica (Black Creek Formation)
18.65	10.57	18	20	25	45		M		19.22 / 10.00
17.13	12.09	17	23	25	48		M		**COASTAL PLAIN** Gray and gray-green, sandy, silty, CLAY (A-7-6) (Black Creek Formation)
15.61	13.61	12	15	22	37		M		
13.91	15.31	12	15	21	36		M		
12.57	16.65	13	18	24	42		M		13.22 / 16.00
11.05	18.17	15	30	45	75		W		**COASTAL PLAIN** Gray, silty, fine to coarse SAND (A-2-4) (Black Creek Formation)
		23	39	36	75		Sat.		11.72 / 17.50 **COASTAL PLAIN** Gray-tan, fine to coarse SAND (A-3) with mica (Black Creek Formation)

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne		**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. LL B4-A	**STATION** 132+89.0	**OFFSET** 14.6m LT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 29.22 m	**TOTAL DEPTH** 20.14 m	**NORTHING** 186,174.7	**EASTING** 705,059.9	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/08/07	**COMP. DATE** 05/08/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
10					Match Line				
9.53	19.69	28	29	41	70		Sat.		9.08 / 20.14

Boring Terminated at Elevation 9.08 m in Coastal Plain: Very dense, coarse SAND (A-3) with mica (Black Creek Formation)

Bits Used: 7.3 cm Side-Discharge Finger Bit

Drilling Fluid Properties: 1.02 g/cm³

Casing Depth (4"): 3.70 m

Note: Artesian condition observed during drilling. Flow estimated at ~4.5 gal/minute. Unable to measure static head in casing. Head exceeds 2.82 m above ground surface. Boring backfilled/sealed with bentonite pellets immediately after drilling completed.

NCDOT BORE DOUBLE MACTEC 6468-07-1706.GPJ NC_DOT.GDT 6/18/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne		**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. LL EB2-A	**STATION** 133+21.8	**OFFSET** 16.9m LT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 31.60 m	**TOTAL DEPTH** 21.52 m	**NORTHING** 186,164.5	**EASTING** 705,091.2	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/09/07	**COMP. DATE** 05/09/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
32									
31.60	0.00								**GROUND SURFACE** 0.00
		1	3	4	7		M		**COASTAL PLAIN** Orange-brown, coarse SAND (A-3) with trace organics
30.59	1.01								
		2	2	3	5		W		
28.63	2.97								30.27 1.33 **COASTAL PLAIN** Orange-tan with brown mottling, silty, coarse SAND (A-2-4)
28.18	3.42	2	3	2	5		W		
27.73	3.87	1	2	1	3		Sat.		
		1	WOH	1	1		Sat.		
26.38	5.22								
		2	1	1	2		Sat.		
25.14	6.46								25.60 6.00 **COASTAL PLAIN** Dark gray to gray, silty, fine SAND (A-2-4) (Black Creek Formation)
		1	2	1	3		W		
24.21	7.39						Sat.		24.21 7.39 **COASTAL PLAIN** Gray, fine to coarse SAND (A-3) with trace organics/lignite (Black Creek Formation)
		29	51	49/14			Sat.		
22.69	8.91				100/29				
		47	53/10		100/25		Sat.		
21.17	10.43								21.80 9.80 **COASTAL PLAIN** Dark gray, sandy CLAY (A-7-6) (Black Creek Formation)
		18	22	42	64		M		
19.65	11.95								20.10 11.50 **COASTAL PLAIN** Gray, fine sandy, silty CLAY (A-6) with trace organics (Black Creek Formation)
		24	30	44	74	SS-35	22%		
18.13	13.47								18.60 13.00 **COASTAL PLAIN** Gray and green, silty, sandy CLAY (A-7-6) (Black Creek Formation)
		18	25	29	54		M		
16.61	14.99								
		15	26	31	57		M		
15.09	16.51								
		15	22	29	51		M		
13.57	18.03								
		25	31	51	82		M		13.16 18.44 **COASTAL PLAIN** Tan-white and gray, silty, fine to coarse SAND (A-2-4) (Black Creek Formation)
12.05	19.55								
		22	28	49	77		W		

NCDOT BORE DOUBLE MACTEC 6468-07-1706.GPJ NC_DOT.GDT 6/18/07

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne		**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. LL EB2-A	**STATION** 133+21.8	**OFFSET** 16.9m LT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 31.60 m	**TOTAL DEPTH** 21.52 m	**NORTHING** 186,164.5	**EASTING** 705,091.2	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/09/07	**COMP. DATE** 05/09/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
12					Match Line				
10.53	21.07								
		35	31	39	70		Sat.		10.08 21.52 **COASTAL PLAIN** Tan-white and gray, silty, fine to coarse SAND (A-2-4) (Black Creek Formation) *(continued)*

Boring Terminated at Elevation 10.08 m in Coastal Plain: Very dense, silty, coarse SAND (A-2-4) (Black Creek Formation)

Bits Used: 7.3 cm Side-Discharge Finger Bit

Drilling Fluid Properties: 1.01 g/cm^3

Casing Depth (4"): 1.50 m

Note: Artesian condition observed after drilling completed. Static head ~1.45 m above ground surface. Boring backfilled/sealed with bentonite pellets to ground surface after piezometer installation.

Pneumatic piezometer (P1) installed in boring at 18.72 m from ground surface (Elev. 12.88 m)

Other Samples:
ST-2 (6.9 - 7.4)

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Structures 14&15: Dual Bridges on -L- over Stoney Creek (6468-07-1706)

PROJECT: 34461.1.3(R-2554BA) **COUNTY: WAYNE** **OWNER: N.C.D.O.T.**

DATE SAMPLED: APRIL 2007 **RECEIVED:** 4/27/2007 **REPORTED BY: MACTEC**

SAMPLED FROM: LL EB1-A

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		SS-18	SS-19	SS-20	SS-21	SS-22	SS-23
Retained 4.75 mm Sieve	(%)	0.0	0.0	0.0	0.0	0.0	0.0
Passing 2.00 mm Sieve	(%)	99.2	92.3	98.7	100.0	100.0	95.7
Passing 425 µm Sieve	(%)	72.3	73.3	83.2	96.9	94.1	40.4
Passing 75 µm Sieve	(%)	21.4	16.3	8.2	29.1	15.0	12.1

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	46.3	51.4	70.3	8.9	28.6	77.4
Fine Sand Ret - 53 µm	(%)	35.1	33.2	22.0	68.3	59.4	11.3
Silt 0.05 - 0.005 mm	(%)	10.4	6.0	0.9	6.6	0.4	4.4
Clay < 0.005 mm	(%)	8.3	9.5	6.8	16.2	11.6	6.9

Moisture Content	(%)	ND	ND	ND	ND	ND	ND
Liquid Limit, L.L.		22	20	16	22	19	60
Plasticity Index, P.I.		NP	NP	NP	NP	NP	NP
AASHTO Classification		A-2-4(0)	A-2-4(0)	A-3	A-2-4(0)	A-2-4(0)	A-1-b
Organic Content	(%)	ND	ND	ND	ND	ND	ND

Boring No.		LL EB1-A	LL EB1-A	LL EB1-A	LL EB1-A	LL EB1-A	LL EB1-A
Station		131+52.7	131+52.7	131+52.7	131+52.7	131+52.7	131+52.7
Offset		17.2 LT	17.2 LT	17.2 LT	17.2 LT	17.2 LT	17.2 LT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (M)	From	0.00	1.56	2.66	4.20	5.72	7.24
	to	0.45	2.01	3.11	4.65	6.17	7.69

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: _____
Laboratory Manager

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Structures 14&15: Dual Bridges on -L- over Stoney Creek (6468-07-1706)

PROJECT: 34461.1.3(R-2554BA) **COUNTY: WAYNE** **OWNER: N.C.D.O.T.**

DATE SAMPLED: APRIL 2007 **RECEIVED:** 4/27/2007 **REPORTED BY: MACTEC**

SAMPLED FROM: LL EB1-A, LL B1-A

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		SS-24	SS-25	SS-26	SS-27	SS-28	SS-29
Retained 4.75 mm Sieve	(%)	0.0	0.0	0.0	0.0	0.0	0.0
Passing 2.00 mm Sieve	(%)	99.5	100.0	100.0	100.0	99.4	100.0
Passing 425 µm Sieve	(%)	96.6	98.4	97.5	98.7	78.2	98.7
Passing 75 µm Sieve	(%)	88.6	91.5	78.5	19.1	16.2	30.9

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	5.4	3.3	3.6	3.1	51.0	4.4
Fine Sand Ret - 53 µm	(%)	7.7	8.1	25.1	82.9	35.2	71.2
Silt 0.05 - 0.005 mm	(%)	23.7	26.9	32.1	3.8	3.1	6.6
Clay < 0.005 mm	(%)	63.1	61.7	39.2	10.2	10.7	17.8

Moisture Content	(%)	34.6	20.1	23.6	ND	ND	ND
Liquid Limit, L.L.		59	53	45	19	16	22
Plasticity Index, P.I.		40	31	26	NP	NP	NP
AASHTO Classification		A-7-6(38)	A-7-6(31)	A-7-6(20)	A-2-4(0)	A-2-4(0)	A-2-4(0)
Organic Content	(%)	ND	ND	ND	ND	ND	ND

Boring No.		LL EB1-A	LL EB1-A	LL EB1-A	LL EB1-A	LL EB1-A	LL B1-A
Station		131+52.7	131+52.7	131+52.7	131+52.7	131+52.7	131+86.5
Offset		17.2 LT	17.2 LT	17.2 LT	17.2 LT	17.2 LT	16.2 LT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (M)	From	10.28	13.32	16.36	17.88	19.40	2.90
	to	10.73	13.77	16.81	18.33	19.85	3.35

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: _____
Laboratory Manager

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Structures 14&15: Dual Bridges on -L- over Stoney Creek (6468-07-1706)

PROJECT: 34461.1.3(R-2554BA) **COUNTY: WAYNE** **OWNER: N.C.D.O.T.**

DATE SAMPLED: APRIL-MAY, 2007 **RECEIVED:** 5/21/2007 **REPORTED BY: MACTEC**

SAMPLED FROM: LL B1-A, LL B3-A, LL B4-A, LL EB2-A

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		SS-30	SS-31	SS-32	SS-33	SS-34	SS-35
Retained 4.75 mm Sieve	(%)	0.0	0.0	ND	ND	0.0	0.0
Passing 2.00 mm Sieve	(%)	99.9	99.9	ND	ND	99.9	100.0
Passing 425 µm Sieve	(%)	98.6	99.4	ND	ND	98.8	99.5
Passing 75 µm Sieve	(%)	42.9	44.8	ND	ND	60.4	52.9

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	3.6	5.2	ND	ND	2.9	6.3
Fine Sand Ret - 53 µm	(%)	61.2	56.7	ND	ND	46.4	44.4
Silt 0.05 - 0.005 mm	(%)	30.5	12.0	ND	ND	21.6	18.2
Clay < 0.005 mm	(%)	4.7	26.1	ND	ND	29.0	31.1

Moisture Content	(%)	22.2	21.2	56.3	40.3	19.3	22.2
Liquid Limit, L.L.		32	26	ND	ND	31	31
Plasticity Index, P.I.		13	11	ND	ND	19	19
AASHTO Classification		A-6(2)	A-6(2)	ND	ND	A-6(8)	A-6(6)
Organic Content	(%)	ND	ND	5.3	3.0	ND	ND

Boring No.		LL B1-A	LL B3-A	LL B3-A	LL B3-A	LL B4-A	LL EB2-A
Station		131+86.5	132+56.1	132+56.1	132+56.1	132+89.0	133+21.8
Offset		16.2 LT	12.1 LT	12.1 LT	12.1 LT	14.6 LT	16.9 LT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (M)	From	16.58	16.91	6.27	9.31	7.53	11.95
	to	17.03	17.36	6.72	9.76	7.98	12.40

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by:
Laboratory Manager

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.

3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Structures 14&15: Dual Bridges on -L- over Stoney Creek (6468-07-1706)

PROJECT: 34461.1.3(R-2554BA) **COUNTY: WAYNE** **OWNER: N.C.D.O.T.**

DATE SAMPLED: MAY 2007 **RECEIVED:** 5/17/2007 **REPORTED BY: MACTEC**

SAMPLED FROM: LL EB2-A

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		ST-2					
Retained 4.75 mm Sieve	(%)	0.9					
Passing 2.00 mm Sieve	(%)	97.7					
Passing 425 µm Sieve	(%)	85.7					
Passing 75 µm Sieve	(%)	14.7					

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	32.2					
Fine Sand Ret - 53 µm	(%)	53.6					
Silt 0.05 - 0.005 mm	(%)	7.6					
Clay < 0.005 mm	(%)	6.6					

Moisture Content	(%)	ND					
Liquid Limit, L.L.		29					
Plasticity Index, P.I.		NP					
AASHTO Classification		A-2-4(0)					
Organic Content	(%)	ND					

Boring No.		LL EB2-A					
Station		133+21.8					
Offset		16.9 LT					
Alignment		-L-					
Depth (M)	From	6.91					
	to	7.39					

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by:
Laboratory Manager

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34461.1.3 TIP: R-2554BA COUNTY: Wayne

DESCRIPTION(1): STRUCTURES 14 & 15: DUAL BRIDGES ON -L- OVER STONEY CREEK

EXISTING BRIDGE

Information from: Field Inspection X Microfilm ____ (reel ____ pos: ____)
Other (explain) Not Applicable: No Existing Bridge

Bridge No.: ____ Length: ____ Total Bents: ____ Bents in Channel: ____ Bents in Floodplain: ____
Foundation Type: ____

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: ____

Interior Bents: ____

Channel Bed: ____

Channel Bank: ____

EXISTING SCOUR PROTECTION

Type(3): ____

Extent(4): ____

Effectiveness(5): ____

Obstructions(6): ____

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.

DESIGN INFORMATION

Channel Bed Material(7): Muck in the main channel; other soils in the near subsurface include A-2-4

Channel Bank Material(8): Muck along the main channel; other soil in the near subsurface and at the end bents includes A-2-4

Channel Bank Cover(9): Grasses and scattered groupings of brush and hardwood trees.

Floodplain Width(10): 500 feet

Floodplain Cover(11): Grass; scattered groupings of brush and hardwood trees.

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

Channel Migration Tendency(13): Banks of main channel are composed of muck; could migrate in either direction

Observations and Other Comments: Surface water mostly confined to the main channel located between bents 2 and 3 at the time of investigation.

Reported by: B. M. Peabody **Date:** 5/25/2007
MACTEC Engineering and Consulting, Inc.

DESIGN SCOUR ELEVATIONS(14) Feet ____ Meters X

	BENTS LL B1	LL B2	LL B3	LL B4							
100-year DSE	27.75	27.84	27.68	27.66							
500-year DSE	27.36	27.45	27.29	27.27							

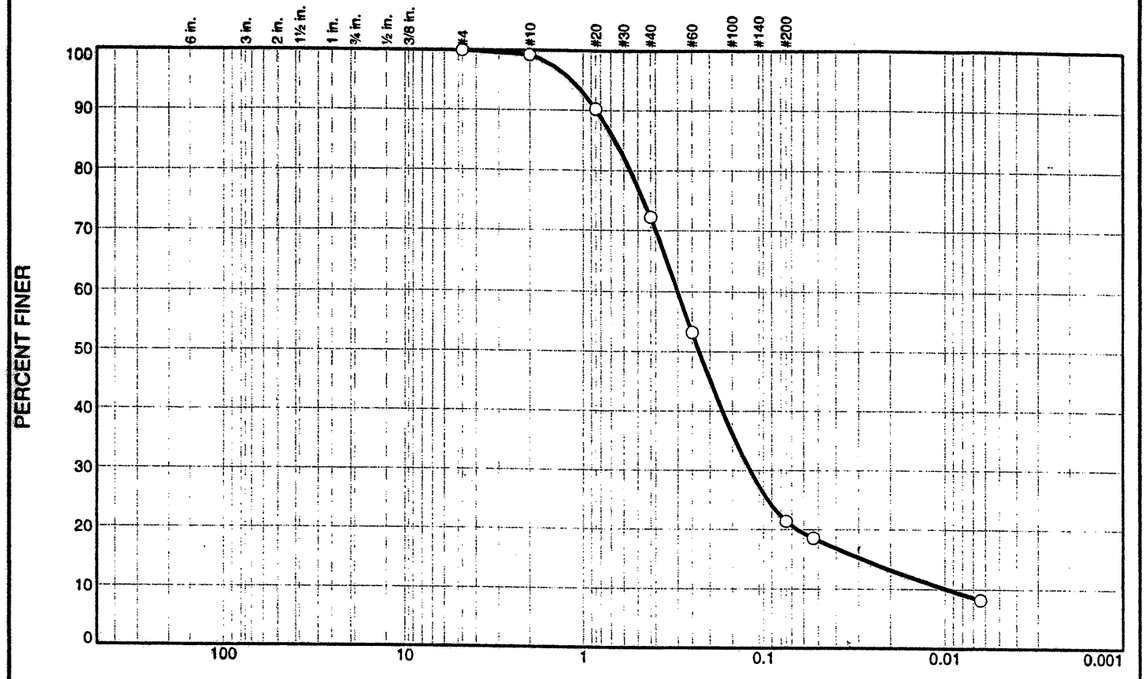
Comparison of DSE to Hydraulics Unit theoretical scour:
The Geotechnical Engineering Unit agrees with the scour calculations in the Bridge Survey & Hydraulic Report, dated 3/01/06, on all bents except for interior bent 4. DSE was calculated for bent 4.

DSE determined by: William F. Efland **Date:** 6/18/2007

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bank	Bed					
Sample No.	SS-18	SS-29					
Retained #4	0	0					
Passed #10	99.2	100					
Passed #40	72.3	98.7					
Passed #200	21.4	30.9					
Coarse Sand	46.3	4.4					
Fine Sand	35.1	71.2					
Silt	10.4	6.6					
Clay	8.3	17.8					
LL	22	22					
PI	NP	NP					
AASHTO	A-2-4(0)	A-2-4(0)					
Station	131+52.7	131+86.5					
Offset	17.2mLT	16.2mLT					
Depth	0.00-0.45	2.90-3.35					

Particle Size Distribution Report/ASTM D 422-63(2002)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.8	26.9	50.9	21.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.2		
#20	90.2		
#40	72.3		
#60	53.3		
#200	21.4		
#270	18.5		
0.0064 mm.	8.2		

* (no specification provided)

Soil Description

Dark silty sand with roots and woods.

Atterberg Limits

PL= NP LL= 22 PI= NP

Coefficients

D_{85}= 0.6637 D_{60}= 0.3004 D_{50}= 0.2280
D_{30}= 0.1188 D_{15}= 0.0285 D_{10}= 0.0097
C_u= 30.97 C_c= 4.84

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample No.: SS-18 **Source of Sample:** Boring LL-EB1-A **Date:** 5-11-07
Location: **Elev./Depth:** 0.00-0.45m

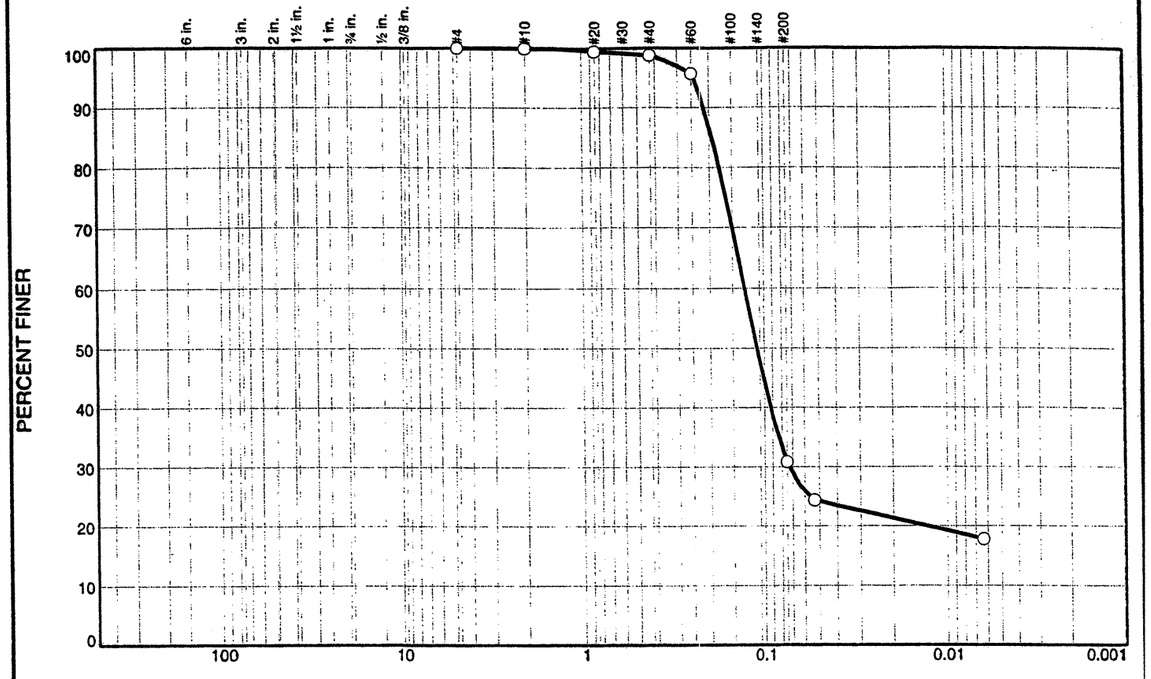
MACTEC, Inc.

Raleigh, North Carolina

Client: NCDOT
Project: DUAL BRIDGES ON -L-OVER STONEY CREEK STRUCTURES 14&15
Project No: 6468071706 **Figure**

Tested By: CS **Checked By:** LBJ

Particle Size Distribution Report/ASTM D 422-63(2002)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.3	67.8	30.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.4		
#40	98.7		
#60	95.6		
#200	30.9		
#270	24.4		
0.0063 mm.	17.8		

* (no specification provided)

Soil Description

Yellowish tan clayey sand.

Atterberg Limits

PL= NP LL= 22 PI= NP

Coefficients

D_{85}= 0.1925 D_{60}= 0.1285 D_{50}= 0.1100
D_{30}= 0.0729 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample No.: SS-29 **Source of Sample:** Boring LL-B1-A **Date:** 5-9-07
Location: **Elev./Depth:** 2.90m-3.35m

MACTEC, Inc.

Raleigh, North Carolina

Client: NCDOT
Project: DUAL BRIDGES ON -L-OVER STONEY CREEK STRUCTURES 14&15
Project No: 6468071706 **Figure**

Tested By: CS **Checked By:** LBJ

View looking up-station along Left Lane from boring LL EB1-A

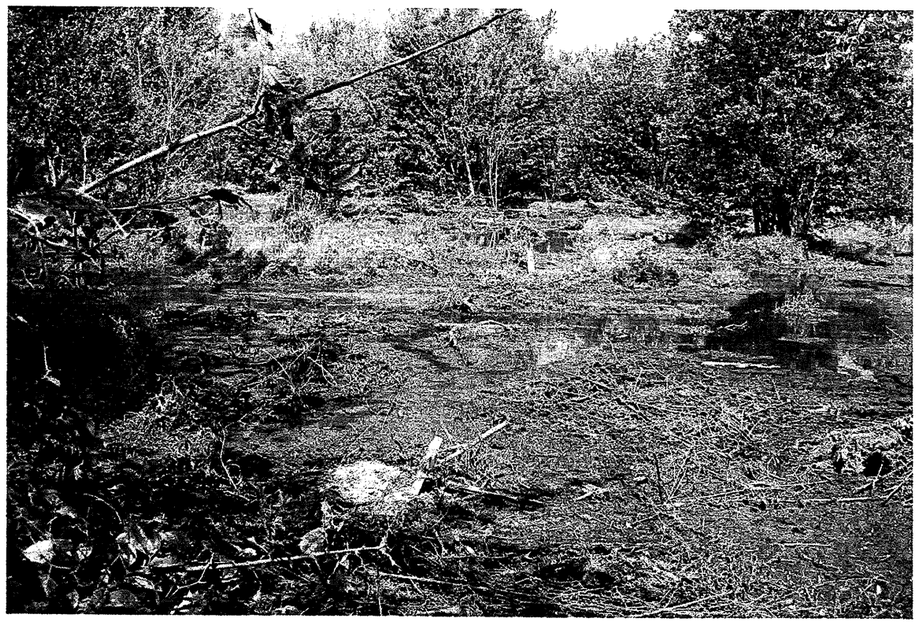
View along Bent One from boring LL B1-A towards RL B1-B

View along End Bent One from boring LL EB1-A towards RL EB1-B

View along Bent Two from boring LL B2-A towards RL B2-B

Site Photos
MACTEC Proj. No. 6468-07-1706

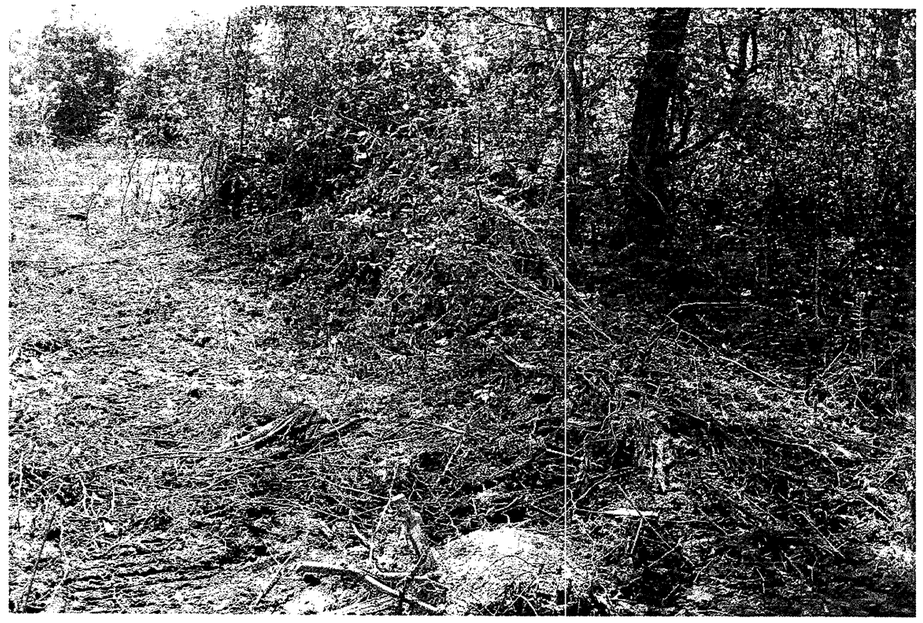
View along Bent Three from boring LL B3-A towards RL B3-B



View along Left Lane from boring LL B4-A towards LL B3-A

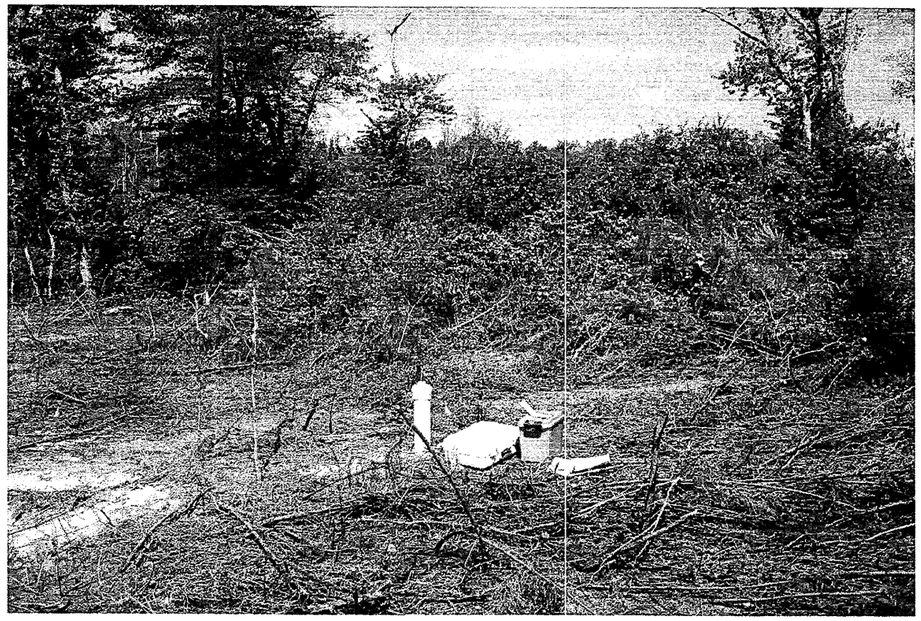
Structures 14 & 15; Dual Bridges on -L- over Stoney Creek (Left Lane)
NCDOT Proj. No. 34461.1.3 (R-2554BA)

View along Bent Four from boring LL B4-A towards RL B4-B

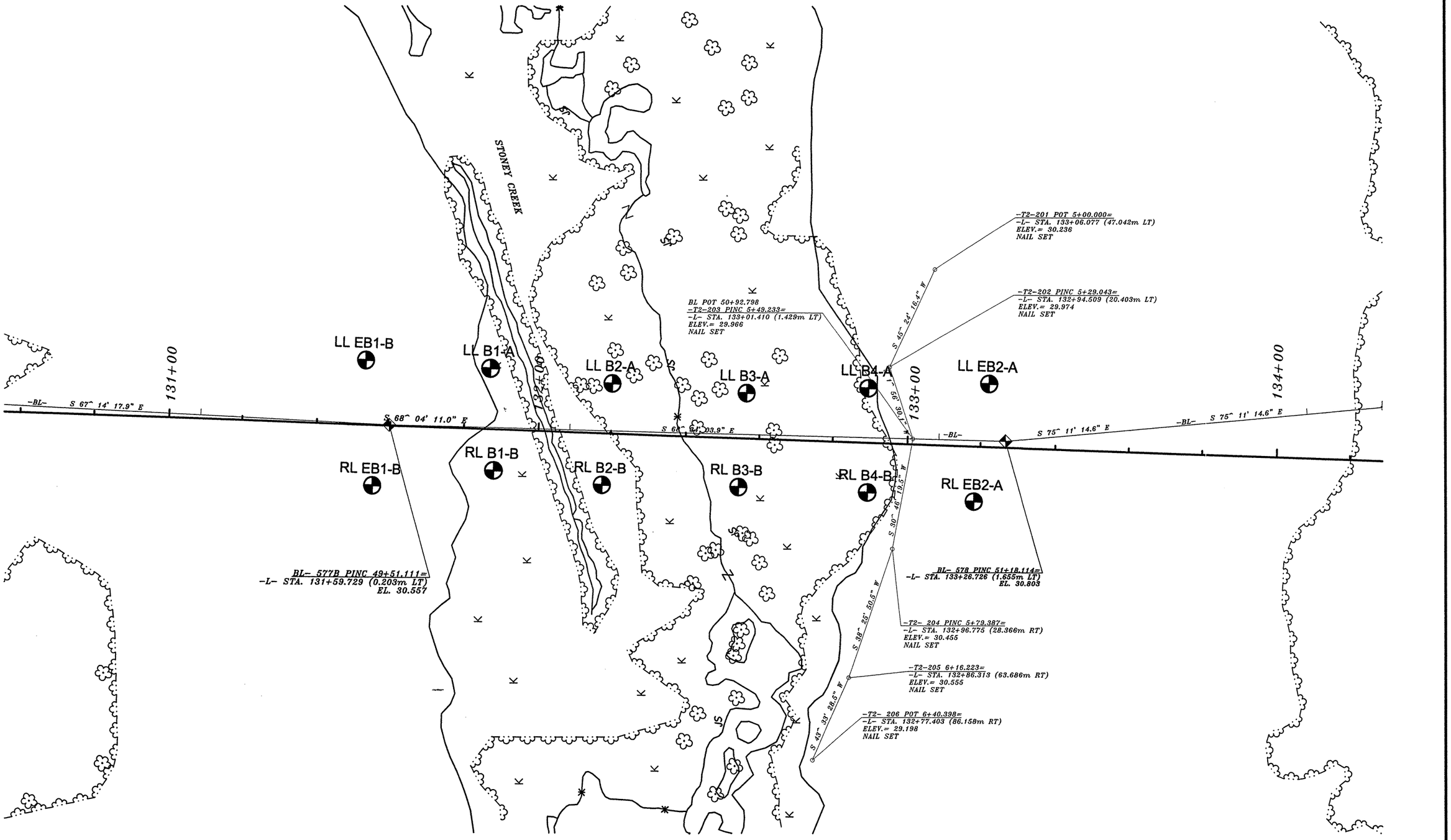


View along Left Lane from boring LL B4-A towards LL EB2-A

View along End Bent Two from boring LL EB2-A towards RL EB2-B



View looking down-station along Left Lane from boring LL EB2-A



0 10 20 40

HORIZONTAL SCALE (METER)
1:1000

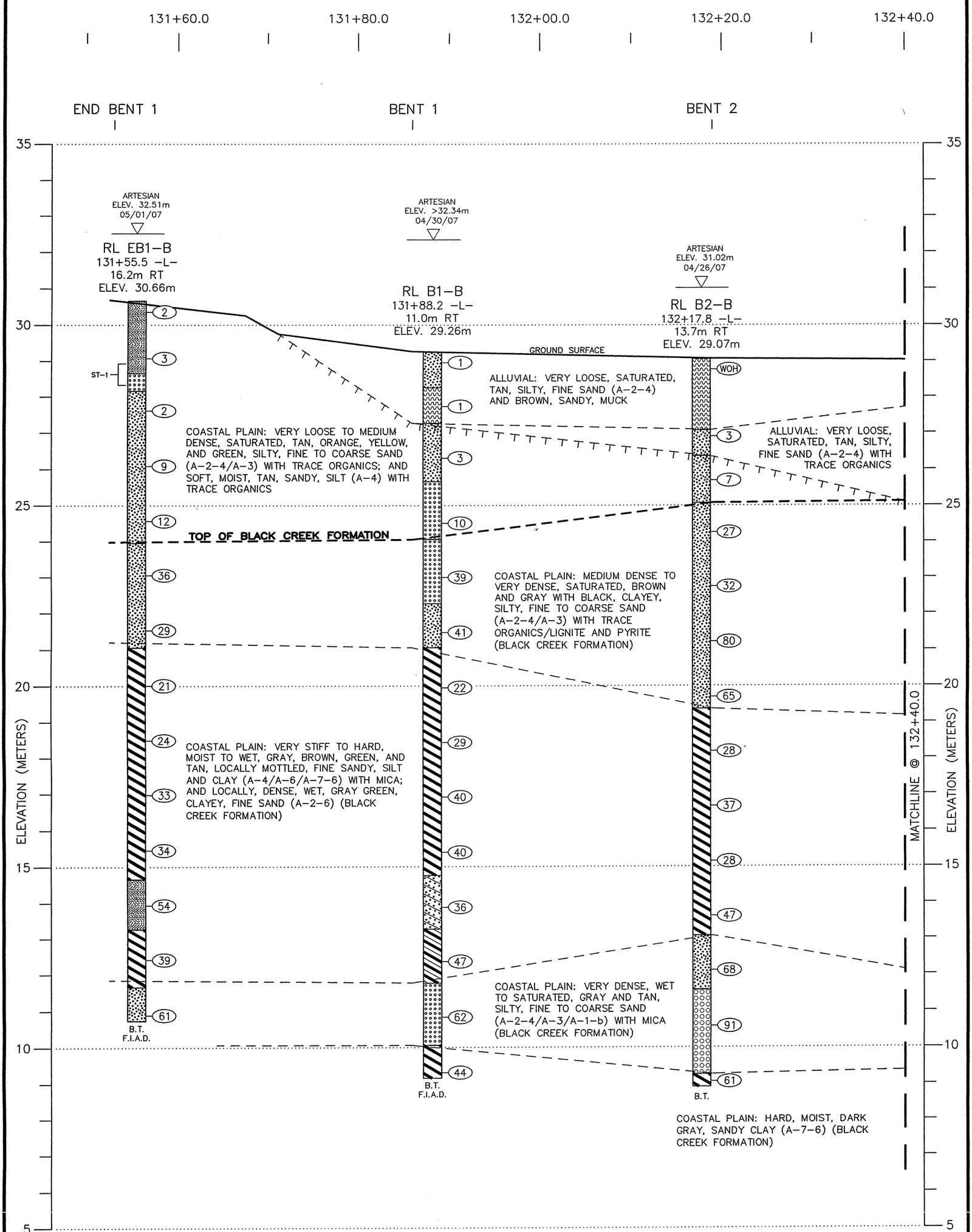
NAD 83

BORING LOCATION PLAN

STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: M.B.L.	JOB : 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 12



0 1 2 4
VERTICAL SCALE (METERS)
1:100

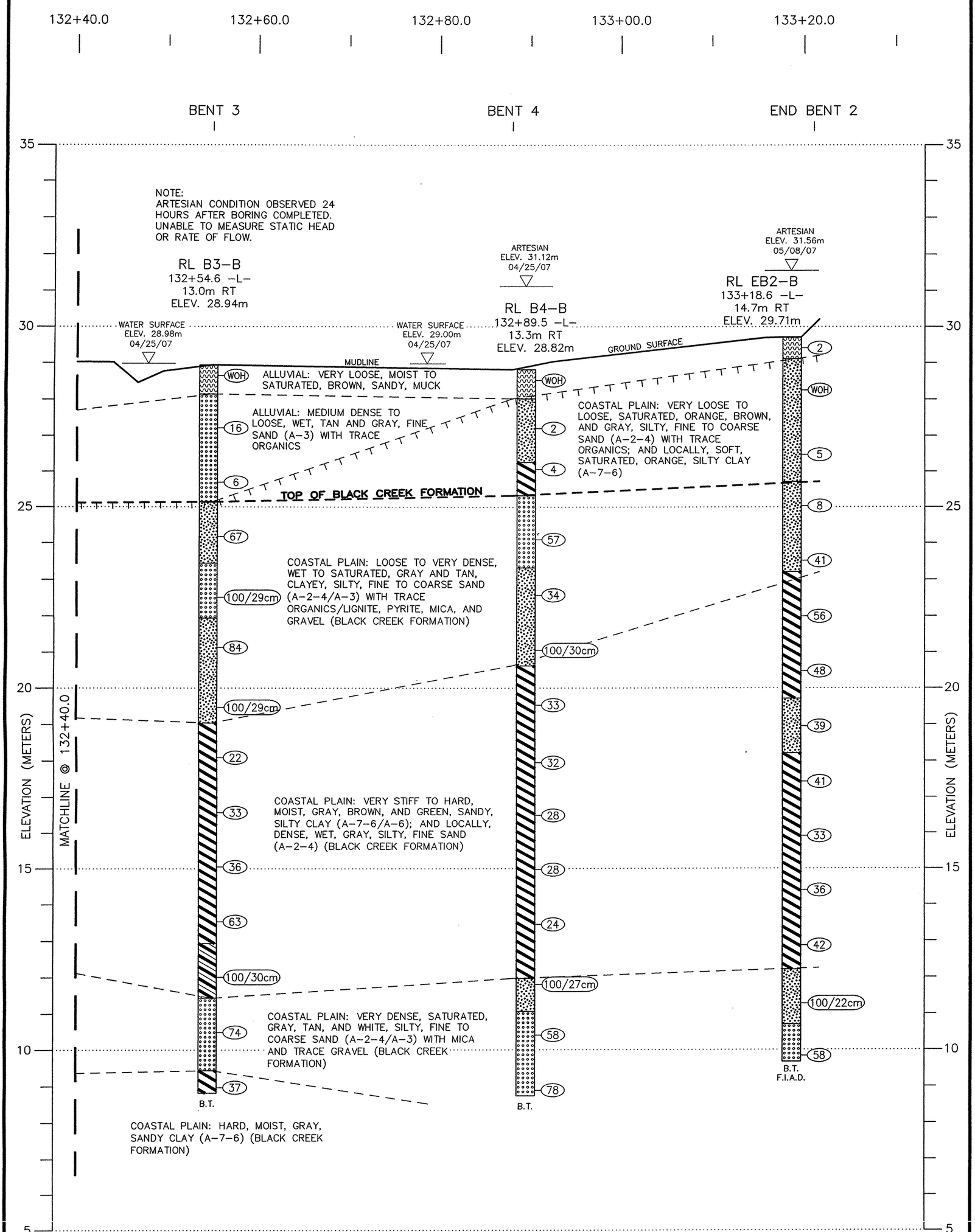
0 4 8 16
HORIZONTAL SCALE (METERS)
1:400

PROFILE 13.0m RIGHT OF -L-
STRUCTURES 14 & 15; DUAL BRIDGES ON -L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: M.B.L.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 13

SHEET 29



0 1 2 4
VERTICAL SCALE (METERS)
1:100

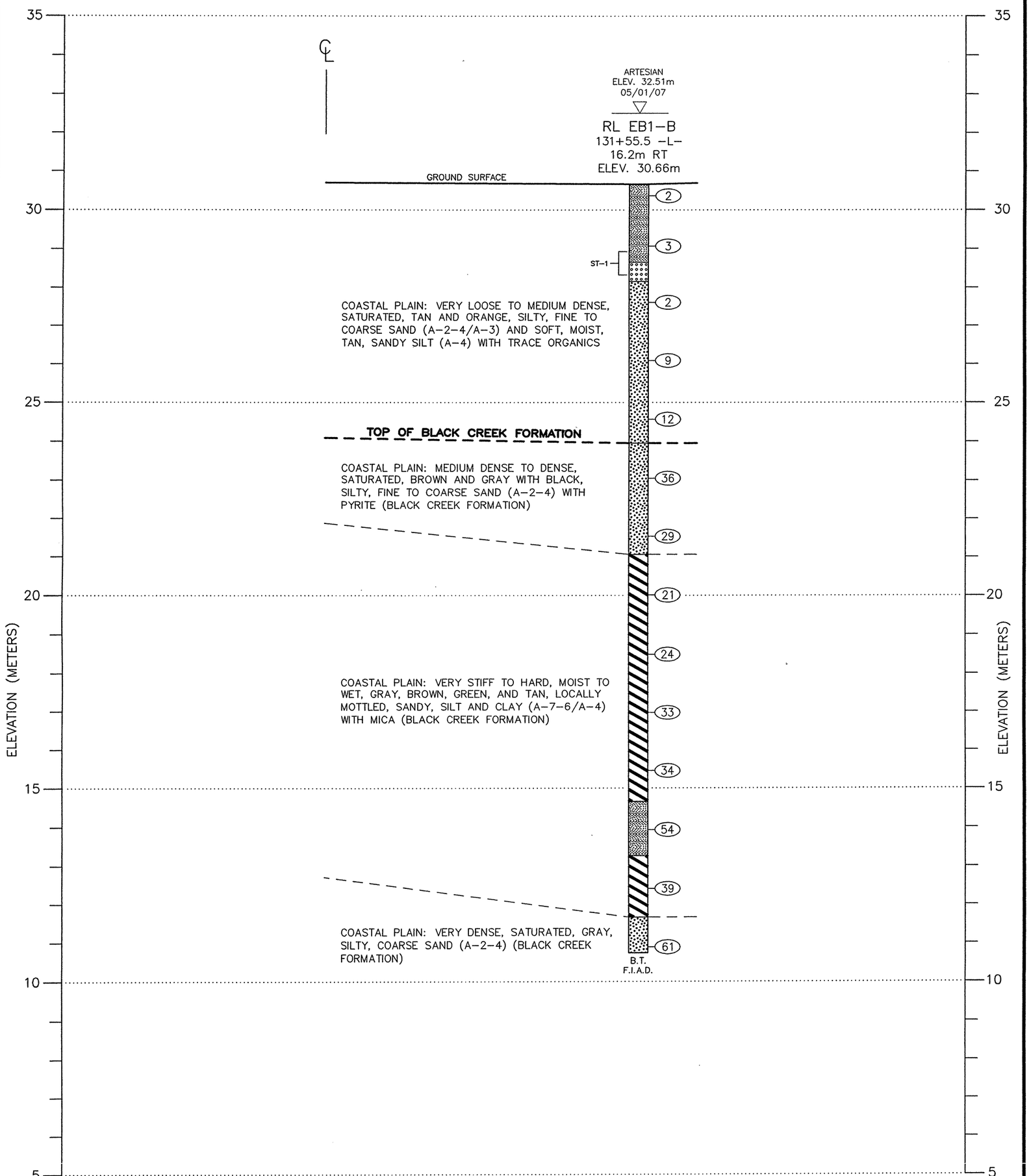
0 4 8 16
HORIZONTAL SCALE (METERS)
1:400

PROFILE 13.0m RIGHT OF -L-
STRUCTURES 14 & 15; DUAL BRIDGES ON -L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
06/18/07	DFT CHECK: M.B.L.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 14

SHEET 30



0 1 2 4
VERTICAL SCALE (METERS)
1:100

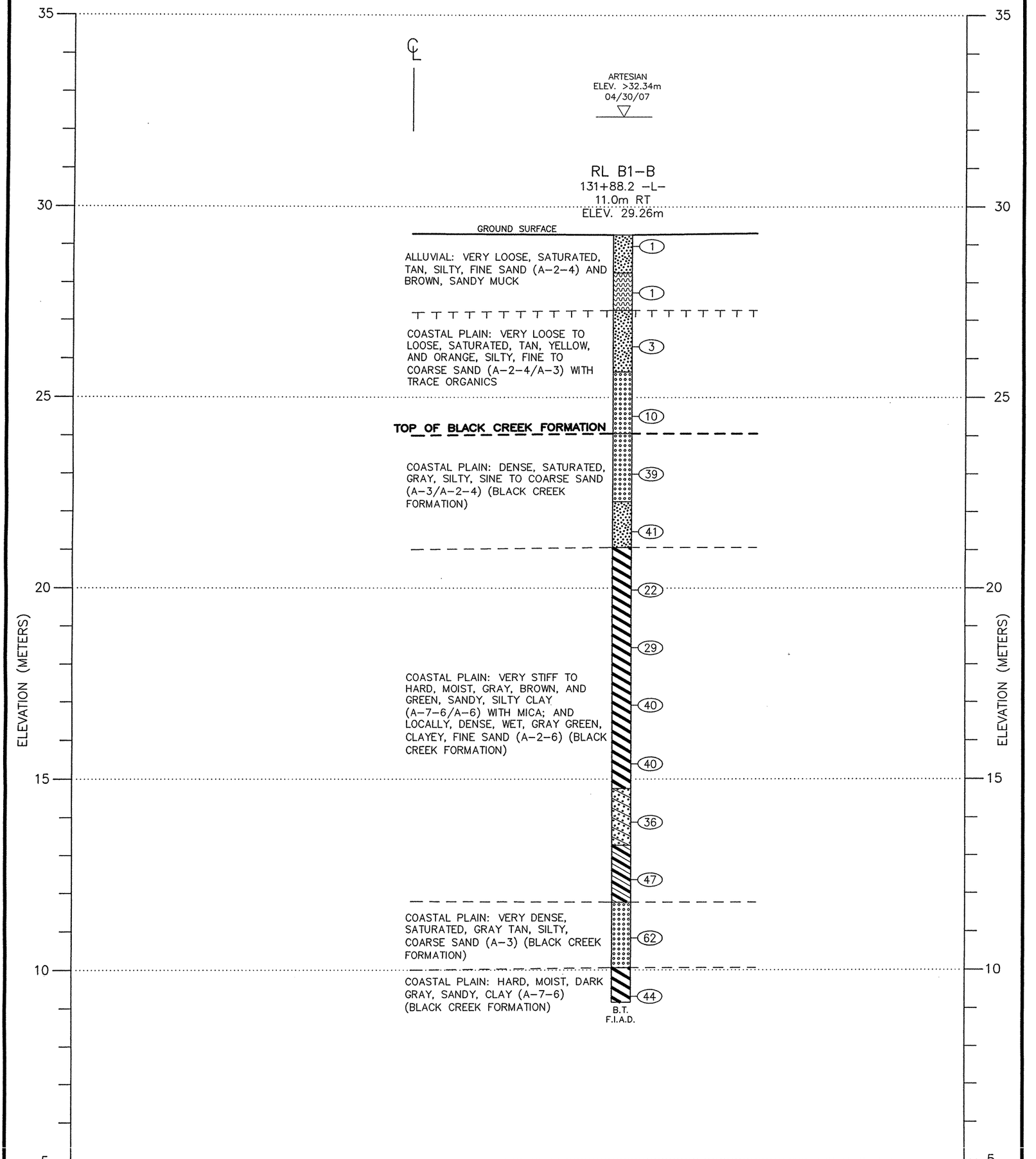
0 2 4 8
HORIZONTAL SCALE (METERS)
1:200

CROSS SECTION ALONG RIGHT LANE END BENT 1
STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: M.B.L.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 15

SHEET 31



0 1 2 4
VERTICAL SCALE (METERS)
1:100

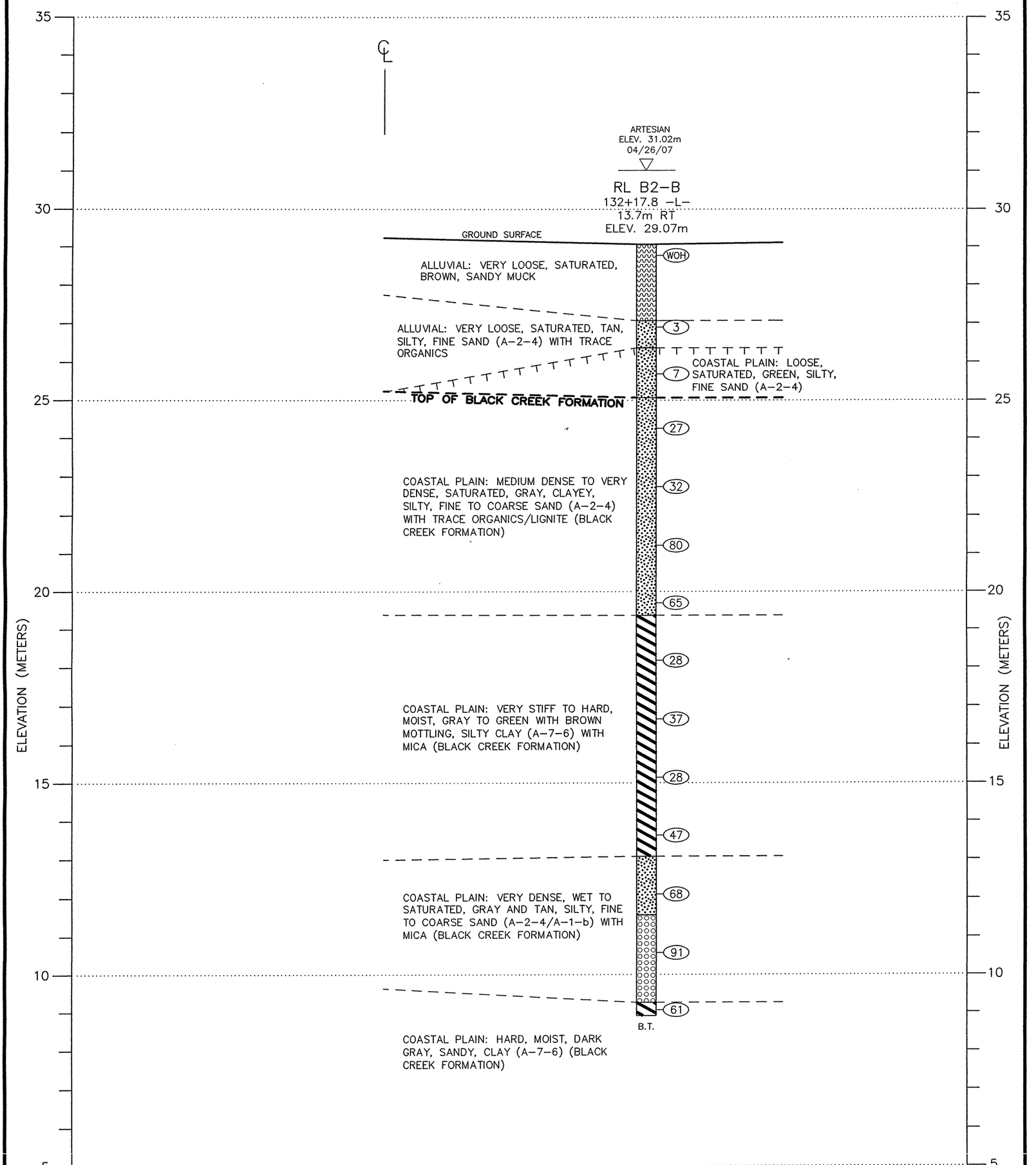
0 2 4 8
HORIZONTAL SCALE (METERS)
1:200

CROSS SECTION ALONG RIGHT LANE BENT 1
STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: M.B.L.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 16

SHEET 32



0 1 2 4
VERTICAL SCALE (METERS)
1:100

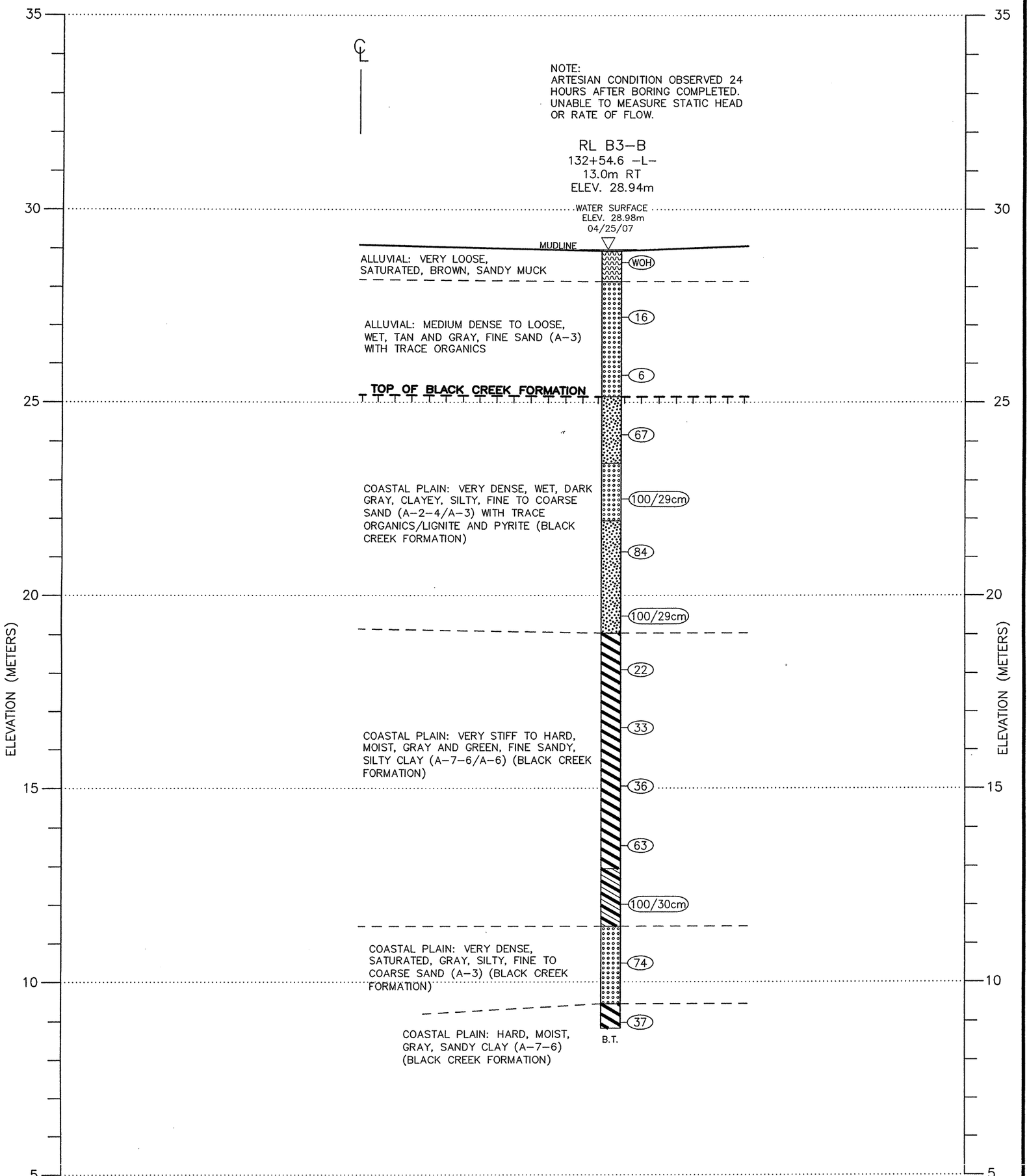
0 2 4 8
HORIZONTAL SCALE (METERS)
1:200

CROSS SECTION ALONG RIGHT LANE BENT 2
STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: M.B.L.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 17

SHEET 33



0 1 2 4
VERTICAL SCALE (METERS)
1:100

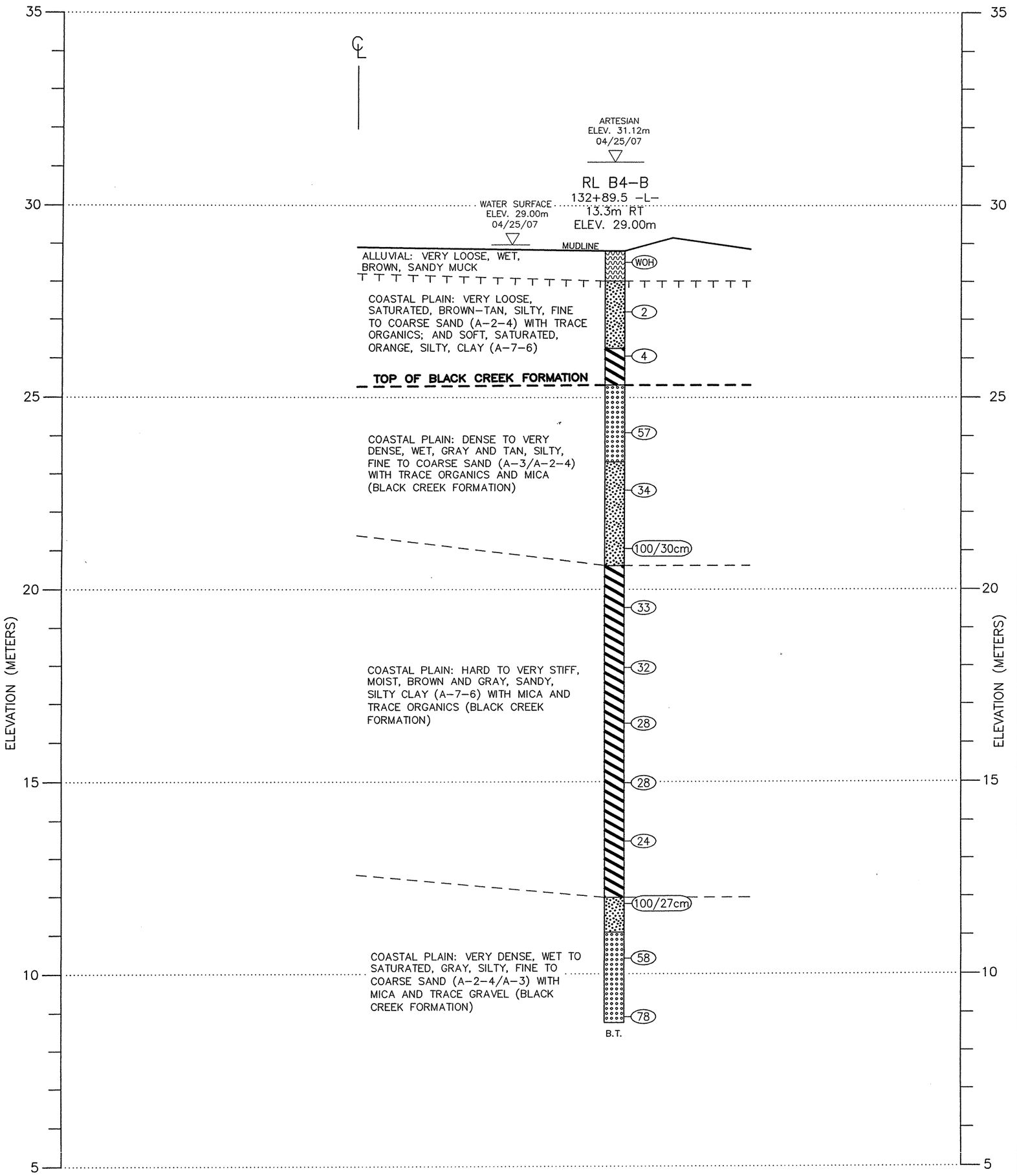
0 2 4 8
HORIZONTAL SCALE (METERS)
1:200

CROSS SECTION ALONG RIGHT LANE BENT 3
STRUCTURES 14 & 15; DUAL BRIDGES ON –L– OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R–2554BA)
F.A. No. NHF–70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
06/18/07	DFT CHECK: M.B.L.	JOB: 6468–07–1706
	ENG CHECK: S.J.C.	DWG: 18

SHEET 34



0 1 2 4
VERTICAL SCALE (METERS)
1:100

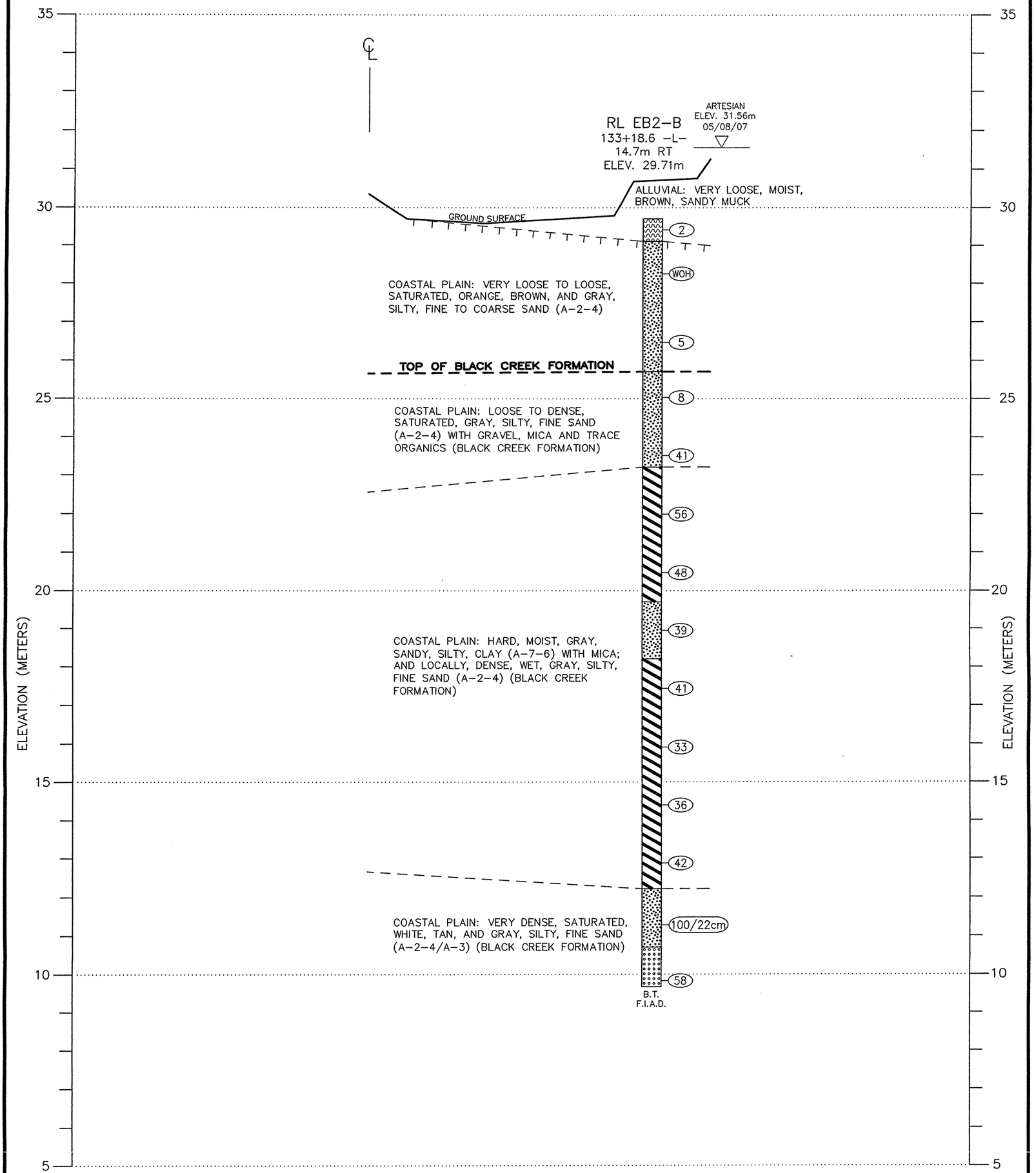
0 2 4 8
HORIZONTAL SCALE (METERS)
1:200

CROSS SECTION ALONG RIGHT LANE BENT 4
STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: M.B.L.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 19

SHEET 35



0 1 2 4
VERTICAL SCALE (METERS)
1:100

0 2 4 8
HORIZONTAL SCALE (METERS)
1:200

CROSS SECTION ALONG RIGHT LANE END BENT 2
STRUCTURES 14 & 15; DUAL BRIDGES ON
-L- OVER STONEY CREEK
NCDOT PROJECT NO. 34461.1.3 (R-2554BA)
F.A. No. NHF-70(30)
WAYNE COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 05/25/07
	DFT CHECK: M.B.L.	JOB: 6468-07-1706
	ENG CHECK: S.J.C.	DWG: 20

SHEET 36

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne	**GEOLOGIST** J. Howard	
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. RL EB1-B	**STATION** 131+55.5	**OFFSET** 16.2m RT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 30.66 m	**TOTAL DEPTH** 19.92 m	**NORTHING** 186,196.0	**EASTING** 704,924.6	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/01/07	**COMP. DATE** 05/01/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
31									
30.66	0.00								ELEV. (m) DEPTH (m)
		1	1	1	2	SS-12	M		30.66 GROUND SURFACE 0.00 **COASTAL PLAIN** Tan, sandy SILT (A-4) with trace organics Shelby Tube ST-1 pushed from 1.73 to 2.33 m, recovery=100%
29.37	1.29								
		1	1	2	3	SS-13	24% Sat.		28.66 2.00 **COASTAL PLAIN** 28.16 Tan-orange, coarse SAND (A-3) 2.50
27.91	2.75								
		1	1	1	2	SS-14	Sat.		**COASTAL PLAIN** Tan and orange, silty, fine to coarse SAND (A-2-4)
26.39	4.27								
		3	5	4	9		Sat.		
24.87	5.79								
		4	6	6	12		Sat.		
23.35	7.31								
		11	13	23	36		Sat.		23.96 6.70 **COASTAL PLAIN** Brown and Gray with black, silty, fine to coarse SAND (A-2-4) with pyrite (Black Creek Formation)
21.83	8.83								
		13	10	19	29		Sat.		
20.31	10.35								
		9	9	12	21		M		21.06 9.60 **COASTAL PLAIN** Dark gray with brown mottling, silty CLAY (A-7-6) with mica (Black Creek Formation)
18.79	11.87								
		8	10	14	24		M		
17.27	13.39								
		10	14	19	33		M		
15.75	14.91								
		11	14	20	34		M		
14.23	16.43								14.66 16.00 **COASTAL PLAIN** Green, fine sandy, SILT (A-4) with mica (Black Creek Formation)
		17	20	34	54		W		
12.71	17.95								13.26 17.40 **COASTAL PLAIN** Tan, sandy CLAY (A-7-6) with mica (Black Creek Formation)
		13	16	23	39		M		
11.19	19.47								11.66 19.00 **COASTAL PLAIN** Gray, silty, coarse SAND (A-2-4) (Black Creek Formation)
		26	32	29	61		Sat.		10.74 19.92

NCDOT BORE DOUBLE MACTEC 6468-07-1706.GPJ NC_DOT.GDT 6/18/07

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne	**GEOLOGIST** J. Howard	
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. RL EB1-B	**STATION** 131+55.5	**OFFSET** 16.2m RT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 30.66 m	**TOTAL DEPTH** 19.92 m	**NORTHING** 186,196.0	**EASTING** 704,924.6	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/01/07	**COMP. DATE** 05/01/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
11					Match Line				Boring Terminated at Elevation 10.74 m in Coastal Plain: Very dense, silty, coarse SAND (A-2-4) (Black Creek Formation) Bits Used: 7.3 cm Side-Discharge Finger Bit Drilling Fluid Properties: 1.03 g/cm³ Casing Depth (4"): 4.14 m Note: Artesian condition observed during drilling. Static head measured at 1.85 m above ground surface within casing. Boring backfilled/sealed with bentonite pellets. Other Samples: ST-1 (1.7 - 2.3)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne	**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)			**GROUND WTR (m)**
BORING NO. RL B1-B	**STATION** 131+88.2	**OFFSET** 11.0m RT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 29.26 m	**TOTAL DEPTH** 20.10 m	**NORTHING** 186,185.2	**EASTING** 704,956.9	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 04/30/07	**COMP. DATE** 04/30/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
30										
29.26	0.00								29.26 GROUND SURFACE	0.00
		WOH	1	WOH	1		Sat.		**ALLUVIAL** Tan, silty, fine SAND (A-2-4) with trace organics	
28.03	1.23								28.26	1.00
		WOH	WOH	1	1		Sat.		**ALLUVIAL** Brown, sandy MUCK	
26.61	2.65								27.26	2.00
		1	1	2	3		Sat.		**COASTAL PLAIN** Tan and yellow, silty, fine SAND (A-2-4) with trace organics	
24.81	4.45								25.66	3.60
		1	3	7	10		Sat.		**COASTAL PLAIN** Tan and orange, coarse SAND (A-3)	
23.29	5.97								24.06	5.20
		16	17	22	39		Sat.		**COASTAL PLAIN** Gray, coarse SAND (A-3) (Black Creek Formation)	
21.77	7.49								22.26	7.00
		13	17	24	41		Sat.		**COASTAL PLAIN** Gray, silty, fine SAND (A-2-4) (Black Creek Formation)	
20.25	9.01								21.06	8.20
		7	9	13	22		M		**COASTAL PLAIN** Dark gray, gray, and brown, fine sandy, silty, CLAY (A-7-6) with mica (Black Creek Formation)	
18.73	10.53									
		9	12	17	29		M			
17.21	12.05									
		14	18	22	40		M			
15.69	13.57									
		13	18	22	40		M			
14.17	15.09									
		12	13	23	36	SS-15	28%			
12.65	16.61								14.76	14.50
		13	19	28	47	SS-16	20%		**COASTAL PLAIN** Gray green, clayey, fine SAND (A-2-6) (Black Creek Formation)	
11.13	18.13								13.26	16.00
		20	30	32	62		Sat.		**COASTAL PLAIN** Gray green, sandy, CLAY (A-6) with mica (Black Creek Formation)	
									11.76	17.50
									COASTAL PLAIN Gray tan, silty, coarse SAND (A-3) (Black Creek Formation) Artesian conditions observed during drilling. Flow estimated at >5 gal/minute and static head measured in casing at >3.08m above ground surface.	
									10.06	19.20

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne	**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)			**GROUND WTR (m)**
BORING NO. RL B1-B	**STATION** 131+88.2	**OFFSET** 11.0m RT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 29.26 m	**TOTAL DEPTH** 20.10 m	**NORTHING** 186,185.2	**EASTING** 704,956.9	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 04/30/07	**COMP. DATE** 04/30/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
10					Match Line				
9.61	19.65	16	20	24	44		M		**COASTAL PLAIN** Dark gray, sandy, CLAY (A-7-6) (Black Creek Formation) *(continued)* 9.16 / 20.10

Boring Terminated at Elevation 9.16 m in Coastal Plain: Hard, sandy CLAY (A-7-6) (Black Creek Formation)

Bits Used: 7.3 cm Side-Discharge Finger Bit

Drilling Fluid Properties: 1.01 g/cm^3

Casing Depth (4"): 4.17 m

Note: Artesian condition observed during drilling. Flow estimated at >5 gal/minute. Unable to measure static head in casing. Head exceeds 3.08m above ground surface. Boring backfilled/sealed with bentonite pellets immediately after drilling completed.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne	**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)			**GROUND WTR (m)**
BORING NO. RL B2-B	**STATION** 132+17.8	**OFFSET** 13.7m RT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 29.07 m	**TOTAL DEPTH** 20.16 m	**NORTHING** 186,175.0	**EASTING** 704,983.3	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 04/26/07	**COMP. DATE** 04/26/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
30									ELEV. (m) DEPTH (m)
29.07	0.00								29.07 GROUND SURFACE 0.00
27.20	1.87	WOH	WOH	WOH	WOH 0	SS-1	Sat.		**ALLUVIAL** Brown, sandy MUCK (Organic Content=14.6%)
25.99	3.08	1	1	2	3	SS-2	Sat.		27.07 2.00 **ALLUVIAL** Tan, silty, fine SAND (A-2-4) with trace organics (Organic Content=1.7%) 26.37 2.70 **COASTAL PLAIN** Green, silty, fine SAND (A-2-4)
24.56	4.51	4	3	4	7	SS-3	Sat.		25.07 4.00 **COASTAL PLAIN** Gray, clayey, silty, fine to coarse SAND (A-2-4) with trace organics/lignite (Organic Content=2.7%) (Black Creek Formation)
23.04	6.03	8	10	17	27	SS-4	Sat.		
21.52	7.55	13	15	17	32		Sat.		
20.00	9.07	36	36	44	80	SS-5	Sat.		
18.48	10.59	43	29	36	65	SS-6	Sat.		
16.96	12.11	11	11	17	28		M		19.37 9.70 **COASTAL PLAIN** Gray to green with brown mottling, silty CLAY (A-7-6) with mica (Black Creek Formation)
15.44	13.63	14	17	20	37	SS-7	22%		
13.92	15.15	11	12	16	28		M		
12.40	16.67	11	14	33	47	SS-8	22%		13.07 16.00 **COASTAL PLAIN** Gray, silty, fine SAND (A-2-4) with mica (Black Creek Formation) Artesian conditions observed during drilling. Flow estimated at >5 gal/minute and static head measured in casing at 1.95m above ground surface. 11.57 17.50 **COASTAL PLAIN** Tan and gray, silty, coarse SAND (A-1-b) (Black Creek Formation)
10.88	18.19	21	21	47	68	SS-9	W		
		26	40	51	91	SS-10	Sat.		

NCDOT BORE DOUBLE MACTEC 6468-07-1706.GPJ NC_DOT.GDT 6/18/07

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne	**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)			**GROUND WTR (m)**
BORING NO. RL B2-B	**STATION** 132+17.8	**OFFSET** 13.7m RT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 29.07 m	**TOTAL DEPTH** 20.16 m	**NORTHING** 186,175.0	**EASTING** 704,983.3	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 04/26/07	**COMP. DATE** 04/26/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
10					Match Line				
9.36	19.71	21	28	33	61	SS-11	16%		9.26 19.81 8.91 20.16 **COASTAL PLAIN** Dark gray, sandy CLAY (A-7-6) (Black Creek Formation) Boring Terminated at Elevation 8.91 m in Coastal Plain: Hard, sandy CLAY (A-7-6) (Black Creek Formation)

Bits Used: 7.3 cm Side-Discharge Finger Bit

Drilling Fluid Properties: 1.09 g/cm^3

Casing Depth (4"): 3.13 m

Note: Artesian condition observed during drilling. Static head measured at 1.95 m above ground surface within casing, flow estimated at >5 gal/minute. Boring backfilled/sealed with bentonite pellets immediately after drilling completed.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne		**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. RL B3-B	**STATION** 132+54.6	**OFFSET** 13.0m RT	**ALIGNMENT** -L-	**0 HR.** Water
COLLAR ELEV. 28.94 m	**TOTAL DEPTH** 20.12 m	**NORTHING** 186,161.9	**EASTING** 705,017.7	**24 HR.** Boring
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 04/25/07	**COMP. DATE** 04/25/07	**SURFACE WATER DEPTH** 0.04m	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
29									
28.94	0.00	1	WOH	WOH	WOH		Sat.		ELEV. (m) 28.94 — MUD LINE — DEPTH (m) 0.00
									ALLUVIAL Brown, sandy MUCK
27.51	1.43								28.14 — 0.80
		1	9	7	16		W		**ALLUVIAL** Tan and gray, fine SAND (A-3) with trace organics
25.99	2.95								
		WOH	1	5	6		W		
24.47	4.47								25.14 — 3.80
		27	32	35	67		W		**COASTAL PLAIN** Dark gray, silty, fine to coarse SAND (A-2-4) with trace organics/lignite (Black Creek Formation)
22.95	5.99								23.44 — 5.50
		28	45	55/14	100/29		W		**COASTAL PLAIN** Dark gray, silty, fine to coarse SAND (A-3) (Black Creek Formation)
21.43	7.51								21.94 — 7.00
		22	22	62	84		W		**COASTAL PLAIN** Dark gray, clayey, silty, fine SAND (A-2-4) with trace lignite and pyrite (Black Creek Formation)
19.91	9.03								
		22	39	61/14	100/29		W		
18.39	10.55								19.04 — 9.90
		7	11	11	22		M		**COASTAL PLAIN** Dark gray and gray green, silty CLAY (A-7-6) (Black Creek Formation)
16.87	12.07								
		8	13	20	33		M		
15.35	13.59								
		4	12	24	36		M		
13.83	15.11								
		10	21	42	63		M		
12.31	16.63								12.94 — 16.00
		19	45	55	100/30		M		**COASTAL PLAIN** Gray, fine sandy, silty, CLAY (A-6) (Black Creek Formation)
10.79	18.15								11.44 — 17.50
		20	30	44	74		Sat.		**COASTAL PLAIN** Gray, silty, fine to coarse SAND (A-3) (Black Creek Formation)
9.27	19.67								9.44 — 19.50
		13	16	21	37		M		**COASTAL PLAIN** Gray, sandy CLAY (A-7-6) (Black Creek
									8.82 — 20.12

NCDOT BORE DOUBLE MACTEC 6468-07-1706.GPJ NC_DOT.GDT 6/19/07

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne		**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. RL B3-B	**STATION** 132+54.6	**OFFSET** 13.0m RT	**ALIGNMENT** -L-	**0 HR.** Water
COLLAR ELEV. 28.94 m	**TOTAL DEPTH** 20.12 m	**NORTHING** 186,161.9	**EASTING** 705,017.7	**24 HR.** Boring
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 04/25/07	**COMP. DATE** 04/25/07	**SURFACE WATER DEPTH** 0.04m	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
9					Match Line				Formation)
									Boring Terminated at Elevation 8.82 m in Coastal Plain: Hard, sandy CLAY (A-7-6) (Black Creek Formation)
									Bits Used: 7.3 cm Side-Discharge Finger Bit
									Drilling Fluid Properties: ND
									Casing Depth (4"): 4.20 m
									Note: Artesian condition observed 24 hours after boring completed. Unable to measure static head or rate of flow. Boring backfilled/sealed with bentonite pellets.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne	**GEOLOGIST** J. Howard	
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. RL B4-B	**STATION** 132+89.5	**OFFSET** 13.3m RT	**ALIGNMENT** -L-	**0 HR.** Water
COLLAR ELEV. 28.82 m	**TOTAL DEPTH** 20.08 m	**NORTHING** 186,148.6	**EASTING** 705,050.0	**24 HR.** Boring
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 04/25/07	**COMP. DATE** 04/25/07	**SURFACE WATER DEPTH** 0.18m	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
29									
28.82	0.00	WOH	WOH	WOH	WOH 0		W		ELEV. (m) 28.82 — MUD LINE — DEPTH (m) 0.00 **ALLUVIAL** Brown, sandy MUCK
27.50	1.32	1	WOH	2	2		Sat.		28.02 — 0.80 **COASTAL PLAIN** Brown-tan, silty, fine to coarse SAND (A-2-4) with trace organics
26.36	2.46	1	2	2	4	SS-17	52%		26.26 — 2.56 **COASTAL PLAIN** Orange, silty CLAY (A-7-6)
24.39	4.43	15	24	33	57		W		25.32 — 3.50 **COASTAL PLAIN** Gray, coarse SAND (A-3) with trace organics (Black Creek Formation)
22.87	5.95	11	14	20	34		W		23.32 — 5.50 **COASTAL PLAIN** Gray and tan, silty, fine SAND (A-2-4) with mica (Black Creek Formation)
21.35	7.47	48	52/15		100/30		W		
19.83	8.99	20	17	16	33		M		20.62 — 8.20 **COASTAL PLAIN** Brown gray and gray, sandy, silty CLAY (A-7-6) with mica and trace organics (Black Creek Formation)
18.25	10.57	11	12	20	32		M		
16.79	12.03	12	12	16	28		M		
15.27	13.55	9	13	15	28		M		
13.75	15.07	10	10	14	24		M		
12.23	16.59	17	40	60/12	100/27		W		11.97 — 16.85 **COASTAL PLAIN** Gray, silty, fine SAND (A-2-4) with mica (Black Creek Formation)
10.71	18.11	25	25	33	58		Sat.		11.07 — 17.75 **COASTAL PLAIN** Gray, silty, fine to coarse SAND (A-3) with trace gravel (Black Creek Formation) Artesian condition observed diring drilling. Flow measured at >5 gal/minute and static head at 2.3m above ground surface inside casing.
9.19	19.63	18	27	51	78		Sat.		8.74 — 20.08

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne	**GEOLOGIST** J. Howard	
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. RL B4-B	**STATION** 132+89.5	**OFFSET** 13.3m RT	**ALIGNMENT** -L-	**0 HR.** Water
COLLAR ELEV. 28.82 m	**TOTAL DEPTH** 20.08 m	**NORTHING** 186,148.6	**EASTING** 705,050.0	**24 HR.** Boring
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 04/25/07	**COMP. DATE** 04/25/07	**SURFACE WATER DEPTH** 0.18m	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
9					Match Line				Boring Terminated at Elevation 8.74 m in Coastal Plain: Very dense, silty, fine to coarse SAND (A-3) (Black Creek Formation) Bits Used: 7.3 cm Side-Discharge Finger Bit Drilling Fluid Properties: ND Casing Depth (4"): 1.92 m Note: Artesian condition observed during drilling. Static head measured at 2.3 m above ground surface within casing, flow estimated at >5 gal/minute. Boring backfilled/sealed with bentonite pellets.

NCDOT BORE DOUBLE MACTEC 6468-07-1705.GPJ NC_DOT.GDT 6/18/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne		**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. RL EB2-B	**STATION** 133+18.6	**OFFSET** 14.7m RT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 29.71 m	**TOTAL DEPTH** 20.04 m	**NORTHING** 186,136.4	**EASTING** 705,076.4	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/08/07	**COMP. DATE** 05/08/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
30										
29.71	0.00								29.71 GROUND SURFACE	0.00
		1	1	1	2		M		ALLUVIAL	
28.54	1.17								29.11 Brown, sandy MUCK	0.60
		WOH	WOH	WOH	WOH		Sat.		COASTAL PLAIN Orange, brown, and gray, silty, fine to coarse SAND (A-2-4)	
26.76	2.95									
		2	2	3	5		Sat.			
25.32	4.39								25.71	4.00
		3	4	4	8		Sat.		COASTAL PLAIN Gray, silty, fine SAND (A-2-4) with gravel, mica, and trace organics (Black Creek Formation)	
23.80	5.91									
		15	20	21	41		Sat.		23.21	6.50
22.28	7.43								COASTAL PLAIN Gray, sandy CLAY (A-7-6) with mica (Black Creek Formation)	
		15	24	32	56		M			
20.76	8.95									
		23	21	27	48		M			
19.24	10.47								19.71	10.00
		25	21	18	39		W		COASTAL PLAIN Gray, silty, fine SAND (A-2-4) (Black Creek Formation)	
17.72	11.99								18.21	11.50
		9	17	24	41		M		COASTAL PLAIN Gray, silty CLAY (A-7-6) (Black Creek Formation)	
16.20	13.51									
		13	15	18	33		M			
14.68	15.03									
		7	14	22	36		M			
13.16	16.55									
		11	16	26	42		M			
11.64	18.07								12.21	17.50
		28	65	35/7	100/22		Sat.		COASTAL PLAIN White and gray, silty, fine SAND (A-2-4) (Black Creek Formation)	
10.12	19.59								10.71 Artesian conditions observed during drilling. Flow estimated at ~3 gal/minute	19.00
		12	22	36	58		Sat.		COASTAL PLAIN Tan-gray, fine SAND (A-3) Black Creek Formation)	
									9.67	20.04

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** Wayne		**GEOLOGIST** J. Howard
SITE DESCRIPTION Sturctures 14 and 15: Dual Bridges on -L- over Stoney Creek (MACTEC Project No. 6468-07-1706)				**GROUND WTR (m)**
BORING NO. RL EB2-B	**STATION** 133+18.6	**OFFSET** 14.7m RT	**ALIGNMENT** -L-	**0 HR.** Artesian
COLLAR ELEV. 29.71 m	**TOTAL DEPTH** 20.04 m	**NORTHING** 186,136.4	**EASTING** 705,076.4	**24 HR.** FIAD
DRILL MACHINE CME-45B	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Manual	
START DATE 05/08/07	**COMP. DATE** 05/08/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
10					Match Line				

Boring Terminated at Elevation 9.67 m in Coastal Plain: Very dense, fine SAND (A-3) (Black Creek Formation)

Bits Used: 7.3 cm Side-Discharge Finger Bit

Drilling Fluid Properties: 1.02 g/cm^3

Casing Depth (4"): 2.68 m

Note: Artesian condition observed during drilling. Static head measured at 1.85 m above ground surface within casing, flow estimated at >3 gal/minute.. Boring backfilled/sealed with bentonite pellets.

NCDOT BORE DOUBLE MACTEC 6468-07-1706.GPJ NC_DOT.GDT 6/18/07

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Structures 14&15: Dual Bridges on -L- over Stoney Creek (6468-07-1706)

PROJECT: 34461.1.3(R-2554BA) **COUNTY: WAYNE** **OWNER: N.C.D.O.T.**

DATE SAMPLED: APRIL 2007 **RECEIVED:** 4/27/2007 **REPORTED BY: MACTEC**

SAMPLED FROM: RL B2-B

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

Lab Sample No.		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Retained 4.75 mm Sieve	(%)	ND	0.0	0.0	0.4	0.0	3.9
Passing 2.00 mm Sieve	(%)	ND	99.8	99.9	96.0	99.3	92.1
Passing 425 µm Sieve	(%)	ND	95.3	96.2	59.7	65.0	47.4
Passing 75 µm Sieve	(%)	ND	18.3	21.8	26.0	12.1	20.7

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	ND	20.0	8.0	56.6	69.8	60.5
Fine Sand Ret - 53 µm	(%)	ND	64.4	74.3	18.9	19.1	19.8
Silt 0.05 - 0.005 mm	(%)	ND	6.6	5.2	9.9	7.0	8.0
Clay < 0.005 mm	(%)	ND	8.9	12.5	14.7	4.0	11.7

Moisture Content	(%)	223.1	ND	ND	ND	ND	ND
Liquid Limit, L.L.		ND	23	24	36	21	25
Plasticity Index, P.I.		ND	NP	NP	NP	NP	10
AASHTO Classification		ND	A-2-4(0)	A-2-4(0)	A-2-4(0)	A-2-4(0)	A-2-4(0)
Organic Content	(%)	14.6	1.7	ND	2.7	ND	ND

Boring No.		RL B2-B	RL B2-B	RL B2-B	RL B2-B	RL B2-B	RL B2-B
Station		132+17.8	132+17.8	132+17.8	132+17.8	132+17.8	132+17.8
Offset		13.7 RT	13.7 RT	13.7 RT	13.7 RT	13.7 RT	13.7 RT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (M)	From	0.00	1.87	3.08	4.51	7.55	9.07
	to	0.45	2.32	3.53	4.96	8.00	9.52

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: _____
Laboratory Manager

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Structures 14&15: Dual Bridges on -L- over Stoney Creek (6468-07-1706)

PROJECT: 34461.1.3 (R-2554BA) **COUNTY:WAYNE** **OWNER: N.C.D.O.T.**

DATE SAMPLED: APRIL 2007 **RECEIVED:** 4/27/2007 **REPORTED BY: MACTEC**

SAMPLED FROM: RL B2-B, RL EB1-B

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Retained 4.75 mm Sieve	(%)	0.0	0.0	0.0	0.0	0.0	0.0
Passing 2.00 mm Sieve	(%)	100.0	100.0	100.0	99.9	100.0	99.7
Passing 425 µm Sieve	(%)	96.0	97.9	99.4	45.7	87.7	86.9
Passing 75 µm Sieve	(%)	83.8	84.7	32.5	10.1	62.8	42.1

SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	6.8	2.9	1.8	79.3	29.0	27.2
Fine Sand Ret - 53 µm	(%)	12.1	22.5	71.7	11.8	11.3	34.7
Silt 0.05 - 0.005 mm	(%)	29.4	42.6	9.2	3.2	15.5	22.6
Clay < 0.005 mm	(%)	51.7	32.0	17.3	5.7	44.2	15.5

Moisture Content	(%)	21.7	21.9	ND	ND	15.6	ND
Liquid Limit, L.L.		48	46	24	18	69	22
Plasticity Index, P.I.		22	27	4	NP	53	5
AASHTO Classification		A-7-6(20)	A-7-6(23)	A-2-4(0)	A-1-b	A-7-6(30)	A-4(0)
Organic Content	(%)	ND	ND	ND	ND	ND	ND

Boring No.		RL B2-B	RL B2-B	RL B2-B	RL B2-B	RL B2-B	RL EB1-B
Station		132+17.8	132+17.8	132+17.8	132+17.8	132+17.8	131+55.5
Offset		13.7 RT	13.7 RT	13.7 RT	13.7 RT	13.7 RT	16.2 RT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (M)	From	12.11	15.15	16.67	18.19	19.71	0.00
	to	12.56	15.60	17.12	18.64	20.16	0.45

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by: _____
Laboratory Manager

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Structures 14&15: Dual Bridges on -L- over Stoney Creek (6468-07-1706)

PROJECT: 34461.1.3 (R-2554BA) **COUNTY:WAYNE** **OWNER: N.C.D.O.T.**

DATE SAMPLED: APRIL 2007 **RECEIVED:** 4/27/2007 **REPORTED BY: MACTEC**

SAMPLED FROM: RL EB1-B, RL B1-B, RL B4-B

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-13	SS-14	SS-15	SS-16	SS-17	ST-1
Retained 4.75 mm Sieve	(%)	0.0	0.1	1.3	0.0	0.0	0.0
Passing 2.00 mm Sieve	(%)	99.9	96.3	96.1	100.0	98.6	98.3
Passing 425 µm Sieve	(%)	93.4	58.9	78.4	99.5	72.1	89.2
Passing 75 µm Sieve	(%)	53.4	12.9	26.7	65.6	36.4	73.5
SOIL MORTAR - 100%							
Coarse Sand Ret - 250 µm	(%)	13.9	69.5	48.0	1.7	49.0	19.7
Fine Sand Ret - 53 µm	(%)	39.8	17.9	26.6	40.6	16.0	5.8
Silt 0.05 - 0.005 mm	(%)	21.2	1.2	6.8	18.7	1.9	61.7
Clay < 0.005 mm	(%)	25.0	11.4	18.6	39.0	33.1	12.7
Moisture Content	(%)	24.4	ND	27.9	19.9	51.8	ND
Liquid Limit, L.L.		21	28	31	39	48	33
Plasticity Index, P.I.		7	7	15	22	33	7
AASHTO Classification		A-4(1)	A-2-4(0)	A-2-6(1)	A-6(12)	A-7-6(5)	A-4(5)
Organic Content	(%)	ND	ND	ND	ND	ND	ND
Boring No.		RL EB1-B	RL EB1-B	RL B1-B	RL B1-B	RL B4-B	RL EB1-B
Station		131+55.5	131+55.5	131+88.2	131+88.2	132+89.5	131+55.5
Offset		16.2 RT	16.2 RT	11.0 RT	11.0 RT	13.3 RT	16.2 RT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (M)	From	1.29	2.75	15.09	16.61	2.46	1.73
	to	1.74	3.20	15.54	17.06	2.91	2.33

REMARKS: ND=Not Determined, NP=Non-Plastic

Submitted by:

Laboratory Manager

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34461.1.3 TIP: R-2554BA COUNTY: Wayne

DESCRIPTION(1): STRUCTURES 14 & 15: DUAL BRIDGES ON -L- OVER STONEY CREEK

EXISTING BRIDGE

Information from: Field Inspection X Microfilm ____ (reel ____ pos: ____)
Other (explain) Not Applicable: No Existing Bridge

Bridge No.: ____ Length: ____ Total Bents: ____ Bents in Channel: ____ Bents in Floodplain: ____
Foundation Type: ____

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: ____

Interior Bents: ____

Channel Bed: ____

Channel Bank: ____

EXISTING SCOUR PROTECTION

Type(3): ____

Extent(4): ____

Effectiveness(5): ____

Obstructions(6): ____

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.

DESIGN INFORMATION

Channel Bed Material(7): Muck in the main channel; other soils in the near subsurface include A-2-4, A-7-6

Channel Bank Material(8): Muck along the main channel; other soil in the near subsurface and at the end bents includes A-4, A-2-4

Channel Bank Cover(9): Grasses and scattered groupings of brush and hardwood trees.

Floodplain Width(10): 500 feet

Floodplain Cover(11): Grass; scattered groupings of brush and hardwood trees.

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

Channel Migration Tendency(13): Banks of main channel are composed of muck; could migrate in either direction

Observations and Other Comments: Surface water mostly confined to the main channel located between bents 2 and 3 at the time of investigation.

Reported by: [signature] MACTEC Engineering and Consulting, Inc. **Date:** 5/25/2007

DESIGN SCOUR ELEVATIONS(14) Feet ____ Meters X

	BENTS RL B1	RL B2	RLB3	RL B4							
100-year DSE	27.7	27.51	27.38	27.26							
500-year DSE	27.31	27.12	26.99	26.87							

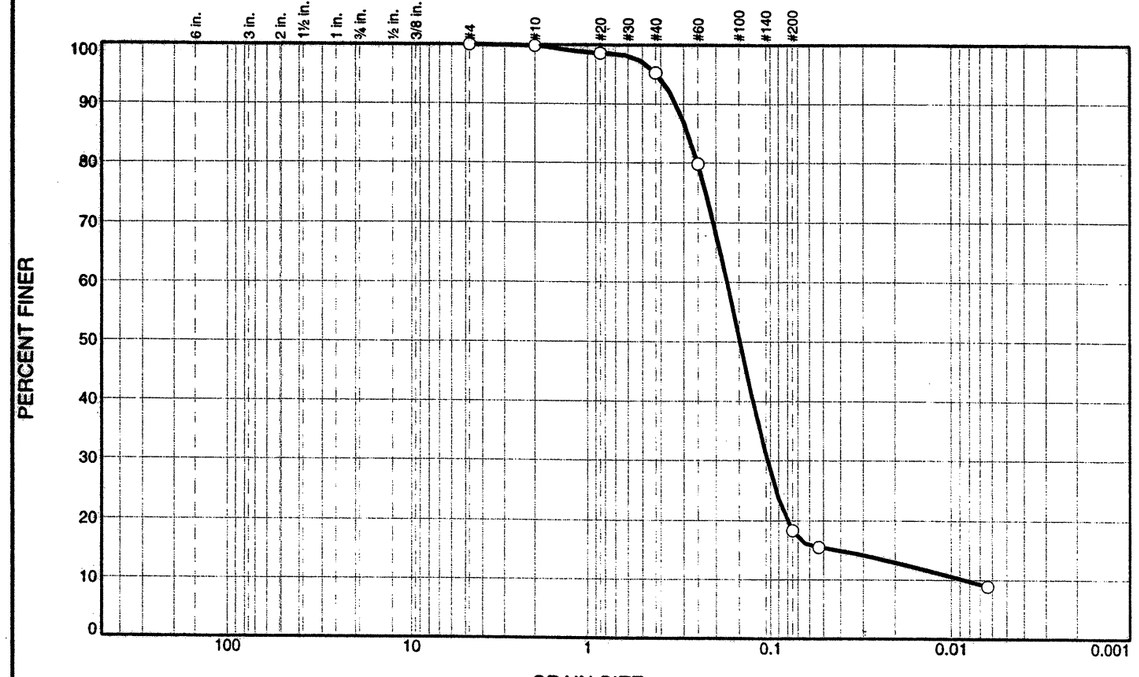
Comparison of DSE to Hydraulics Unit theoretical scour:
The Geotechnical Engineering Unit agrees with the scour calculations in the Bridge Survey & Hydraulic Report, dated 3/01/06, on all bents except for interior bent 4. DSE was calculated for bent 4.

DSE determined by: [signature] **Date:** 6/18/2007

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bed/Bank	Bed	Bed	Bank	Bed		
Sample No.	SS-1	SS-2	SS-3	SS-12	SS-17		
Retained #4	ND	0	0	0	0		
Passed #10	ND	99.8	99.9	99.7	98.6		
Passed #40	ND	95.3	96.2	86.9	72.1		
Passed #200	ND	18.3	21.8	42.1	36.4		
Coarse Sand	ND	20	8	27.2	49		
Fine Sand	ND	64.4	74.3	34.7	16		
Silt	ND	6.6	5.2	22.6	1.9		
Clay	ND	8.9	12.5	15.5	33.1		
LL	ND	23	24	22	48		
PI	ND	NP	NP	5	33		
AASHTO	MUCK	A-2-4(0)	A-2-4(0)	A-4(0)	A-7-6(5)		
Station	132+17.8	132+17.8	132+17.8	131+55.5	132+89.5		
Offset	13.7mRT	13.7mRT	13.7mRT	16.2mRT	13.3mRT		
Depth	0.00-0.45	1.87-2.32	3.08-3.53	0.00-0.45	2.46-2.91		

Particle Size Distribution Report/ASTM D 422-63(2002)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	4.5	77.0	18.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	98.6		
#40	95.3		
#60	79.8		
#200	18.3		
#270	15.5		
0.0064 mm.	8.9		

* (no specification provided)

Soil Description
DARK SILTY SAND W/ORGANIC

Atterberg Limits
PL= NP LL= 23 PI= NP

Coefficients
D_{85}= 0.2833 D_{60}= 0.1740 D_{50}= 0.1478
D_{30}= 0.1037 D_{15}= 0.0415 D_{10}= 0.0085
C_u= 20.38 C_c= 7.25

Classification
USCS= SM AASHTO= A-2-4(0)

Remarks
USED THE ENTIRE SAMPLES

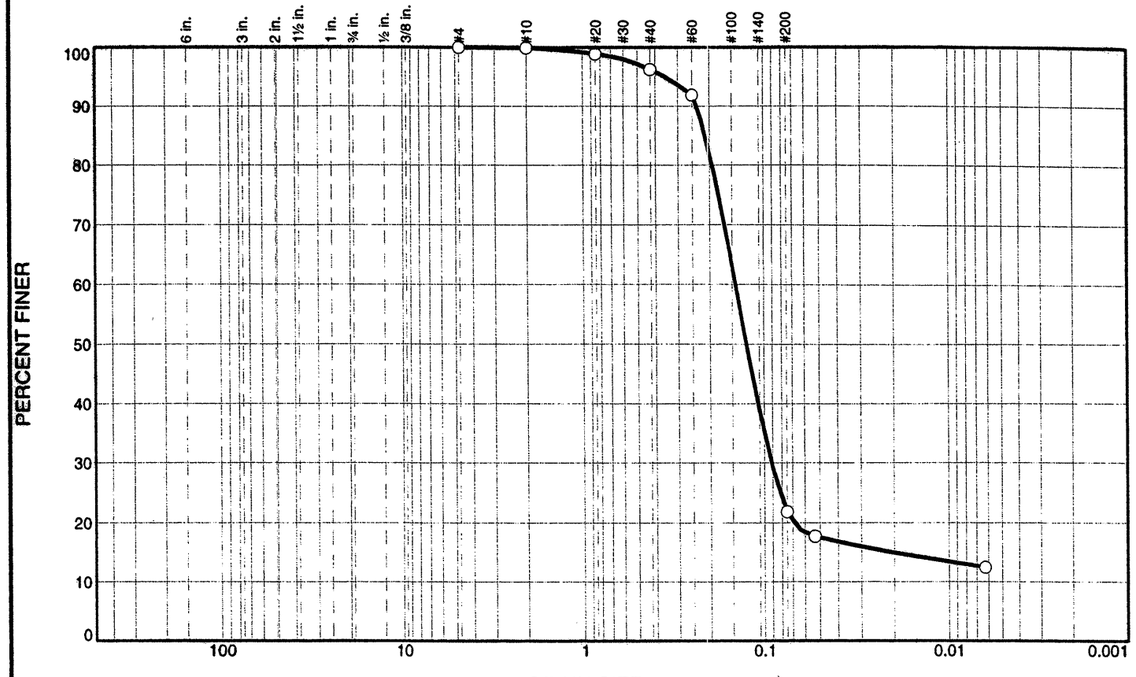
Sample No.: SS-2 **Source of Sample:** BORING RLB2-B **Date:** 5/8/07
Location: **Elev./Depth:** 1.87-2.32m

MACTEC, Inc.
Raleigh, North Carolina

Client: NCDOT
Project: DUAL BRIDGES ON -L-OVER STONEY CREEK STRUCTURES 14&15
Project No: 6468071706 **Figure**

Tested By: CS **Checked By:** LBJ

Particle Size Distribution Report/ASTM D 422-63(2002)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	3.7	74.4	21.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.9		
#40	96.2		
#60	91.9		
#200	21.8		
#270	17.7		
0.0062 mm.	12.5		

* (no specification provided)

Soil Description
GREEN SILTY SAND W/ORGANIC

Atterberg Limits
PL= NP LL= 24 PI= NP

Coefficients
D_{85}= 0.2118 D_{60}= 0.1437 D_{50}= 0.1251
D_{30}= 0.0914 D_{15}= 0.0204 D_{10}=
C_u= C_c=

Classification
USCS= SM AASHTO= A-2-4(0)

Remarks
USED THE ENTIRE SAMPLES

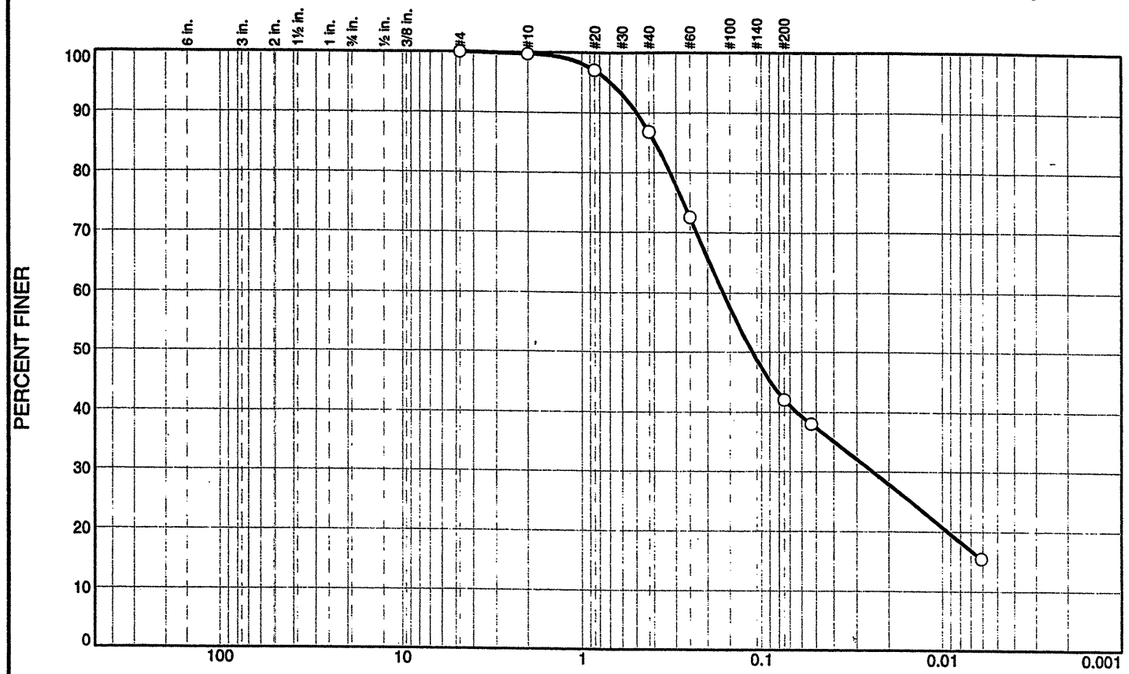
Sample No.: SS-3 **Source of Sample:** BORING RLB2-B **Date:** 5/8/07
Location: **Elev./Depth:** 3.08-3.53m

MACTEC, Inc.
Raleigh, North Carolina

Client: NCDOT
Project: DUAL BRIDGES ON -L-OVER STONEY CREEK STRUCTURES 14&15
Project No: 6468071706 **Figure**

Tested By: CS **Checked By:** LBJ

Particle Size Distribution Report/ASTM D 422-63(2002)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	12.8	44.8	42.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	97.1		
#40	86.9		
#60	72.6		
#200	42.1		
#270	38.0		
0.0061 mm.	15.5		

* (no specification provided)

Soil Description

Dark silty sand with organic.

Atterberg Limits

PL= 17 LL= 22 PI= 5

Coefficients

D_{85}= 0.3925 D_{60}= 0.1634 D_{50}= 0.1121
D_{30}= 0.0244 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

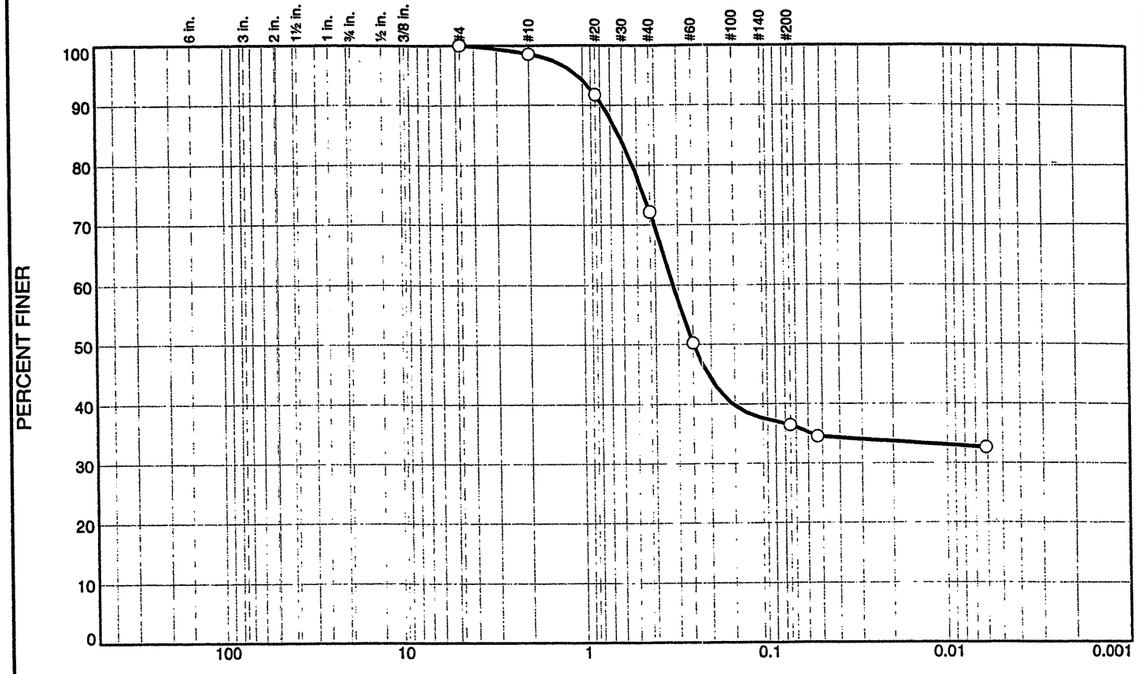
Sample No.: SS-12 **Source of Sample:** Boring RL-EB1-B **Date:** 5-11-07
Location: **Elev./Depth:** 0.0m-.45m

MACTEC, Inc.
Raleigh, North Carolina

Client: NCDOT
Project: DUAL BRIDGES ON -L-OVER STONEY CREEK STRUCTURES 14&15
Project No: 6468071706 **Figure**

Tested By: CS **Checked By:** LBJ

Particle Size Distribution Report/ASTM D 422-63(2002)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.4	26.5	35.7	36.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.6		
#20	91.8		
#40	72.1		
#60	50.3		
#200	36.4		
#270	34.5		
0.0061 mm.	32.6		

* (no specification provided)

Soil Description

Yellowish brown sandy clay.

Atterberg Limits

PL= 15 LL= 48 PI= 33

Coefficients

D_{85}= 0.6245 D_{60}= 0.3203 D_{50}= 0.2479
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-7-6(5)

Remarks

Sample No.: SS-17 **Source of Sample:** Boring RL-B4-B **Date:** 5-11-07
Location: **Elev./Depth:** 2.46-2.91m

MACTEC, Inc.
Raleigh, North Carolina

Client: NCDOT
Project: DUAL BRIDGES ON -L-OVER STONEY CREEK STRUCTURES 14&15
Project No: 6468071706 **Figure**

Tested By: CS **Checked By:** LBJ

View looking up-station along Right Lane from boring RL EB1-B

View looking down-station along Right Lane from boring RL B4-B

View along End Bent One from boring RL EB1-B towards LL EB1-A

View along Bent Four from boring RL B4-B towards LL B4-A

Site Photos
MACTEC Proj. No. 6468-07-1706

View looking up-station along Right Lane from boring RL B4-B

View along End Bent Two from boring RL EB2-B towards LL EB2-A

Structures 14 & 15; Dual Bridges on -L- over Stoney Creek (Right Lane)
NCDOT Proj. No. 34461.1.3 (R-2554BA)

View looking down-station along Right Lane from boring RL EB2-B

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34461.1.3 (R-2554BA)	1	8

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34461.1.3 F.A. PROJ. NHF-70 (30)

COUNTY WAYNE

PROJECT DESCRIPTION US 70 (GOLDSBORO BYPASS) FROM WEST OF SR 1300 (SALEM CHURCH ROAD) TO WEST OF SR 1714 (PARKSTOWN ROAD)

SITE DESCRIPTION STRUCTURE 16 ON -Y8- (SR 1556) OVER -L- (US 70 BYPASS) AT -Y8- STA. 15+85.032

ID: R-2554BA

PROJECT: 34461.1.3

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE(S)
5-7	BORE LOG REPORT(S)
8	SOIL TEST RESULTS

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

TCB

TMW

S&ME

INVESTIGATED BY JL STONE

CHECKED BY DN ARGENBRIGHT

SUBMITTED BY DN ARGENBRIGHT

DATE OCTOBER 2007

NORTH CAROLINA LICENSED SEAL 2007 GEOLOGIST JOSEPH L. STONE 10-24-07

DRAWN BY: CMK, TCB, JLS

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.
34461.1.3 (R-2554BA)	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 30 CM 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-7-5, A-7-6)	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							
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 (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<25
	SOFT	2 TO 4	25 TO 50
	MEDIUM STIFF	4 TO 8	50 TO 100
	STIFF	8 TO 15	100 TO 200
	VERY STIFF	15 TO 30	200 TO 400
	HARD	>30	>400

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)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- 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
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

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

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
- MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

EQUIPMENT USED ON SUBJECT PROJECT

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

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [ ] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 75 mm STEEL TEETH
- [ ] TRICONE __ mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B__
- [ ] -N__
- [ ] -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 3 CM 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 30 CM 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 BLOWS PER 30 CM*
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 BLOWS PER 30 CM*
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 6 MM 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 13 MM DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 25 MM 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 25 MM OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 M
WIDE	3 TO 10 M
MODERATELY CLOSE	30 TO 100 CM
CLOSE	5 TO 30 CM
VERY CLOSE	LESS THAN 5 CM

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 M
THICKLY BEDDED	0.5 - 1 M
THINLY BEDDED	0.05 - 0.5 M
VERY THINLY BEDDED	10 - 50 MM
THICKLY LAMINATED	2.5 - 10 MM
THINLY LAMINATED	< 2.5 MM

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 10 CM 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) OF A 63.5 KG HAMMER FALLING 0.76 M REQUIRED TO PRODUCE A PENETRATION OF 30 CM INTO SOIL WITH A 5 CM OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 3 CM 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 10 CM DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BY8-512B -L- STA. 146+76.94 20.84 LT

ELEVATION: 37.93 M

NOTES:

STRUCTURE 16

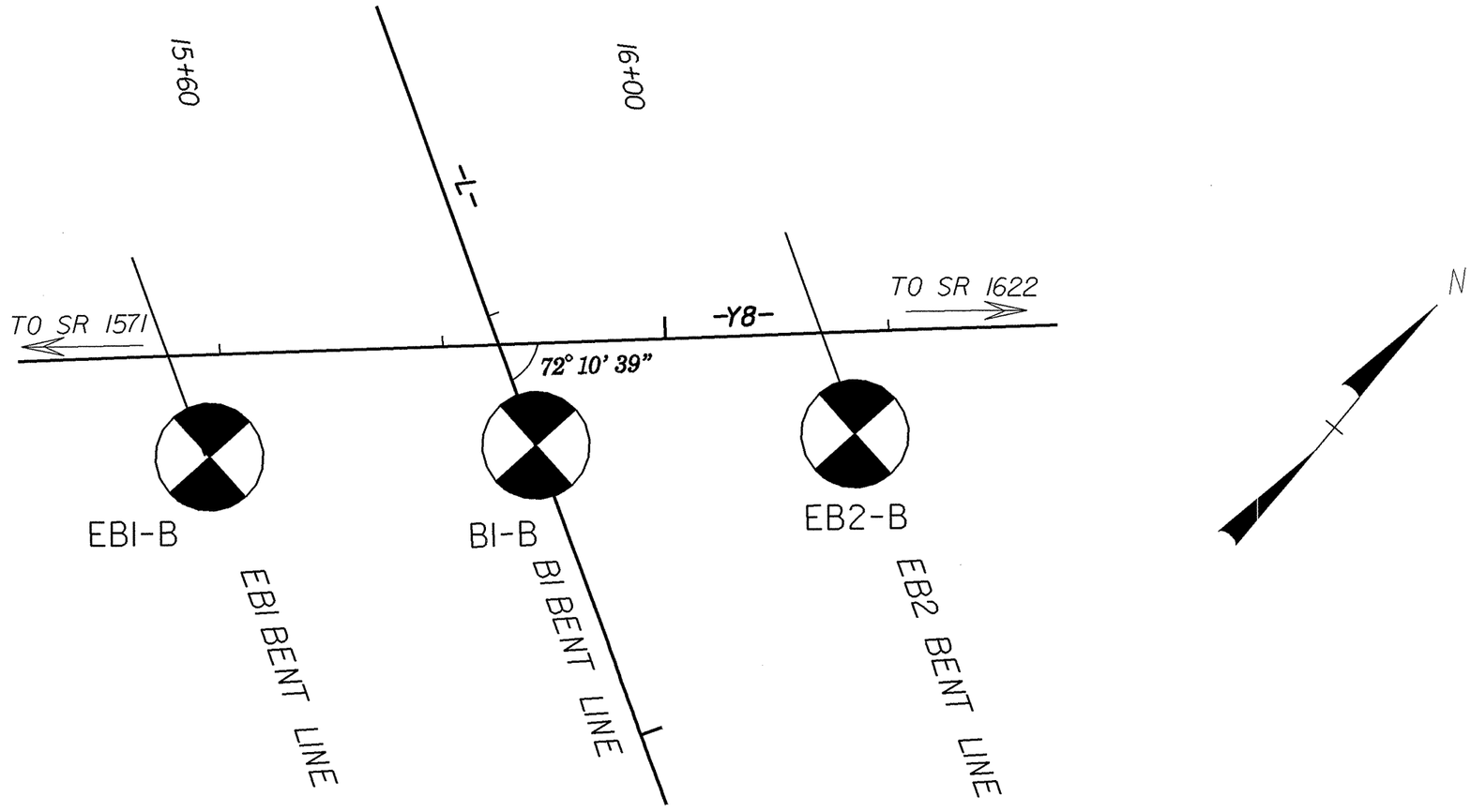
REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET
R-2554BA	3

SITE PLAN

0 10 20

METERS

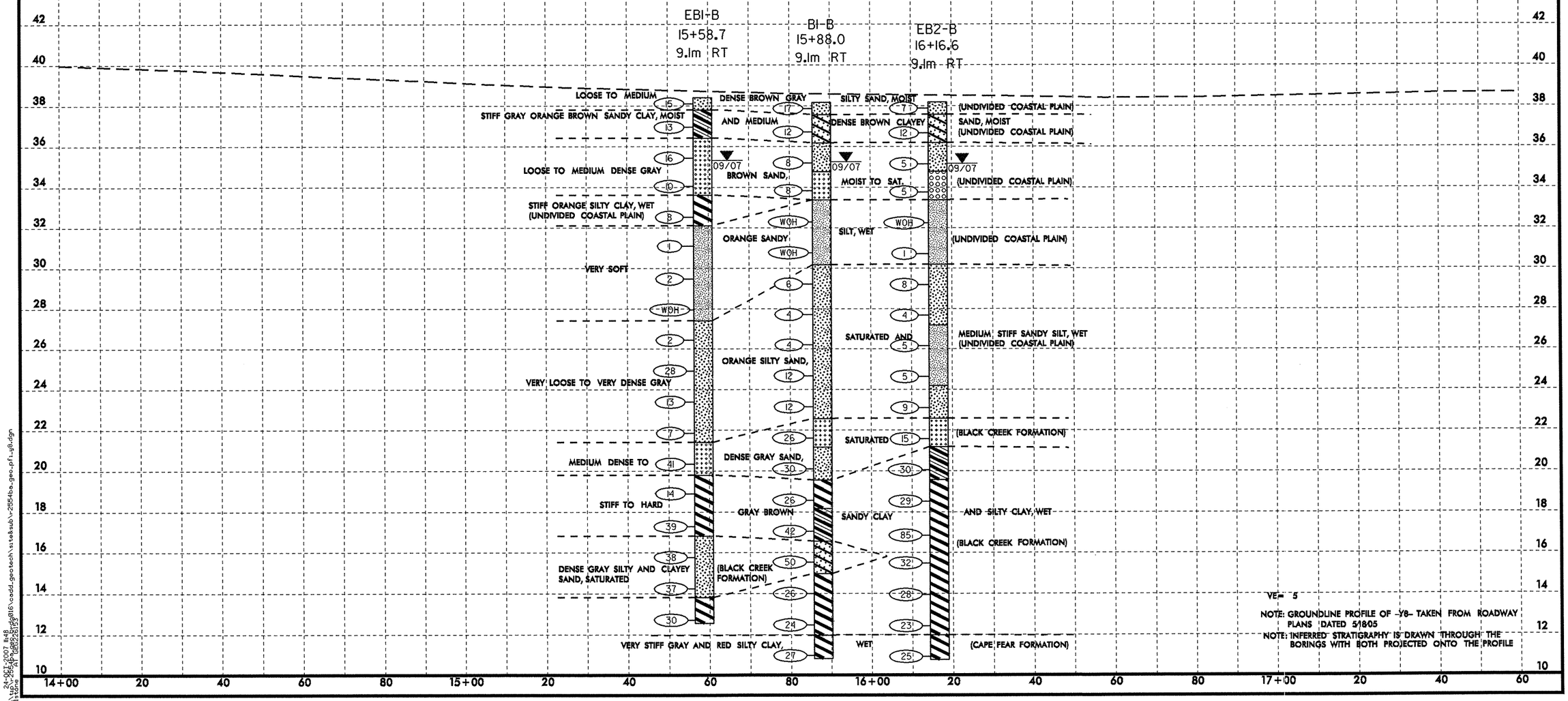


6/01/23

METRIC	PROJECT REFERENCE NO.	SHEET NO.
5 0 10	R-2554BA	4
CONST.REV.	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
R/W REV.	PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	

STRUCTURE 16

PROFILE THROUGH BORINGS PROJECTED ALONG -Y8-



VE= 5

NOTE: GROUNDLINE PROFILE OF -Y8- TAKEN FROM ROADWAY PLANS DATED 5/18/05

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

24-OCT-2007 11:48
c:\projects\2554ba\geo\dgn\2554ba_geo_pf1_sheet.dgn
jgibson
Active Parameter Set: 2554ba_geo_pf1_sheet
Default

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 16 ON -Y8- (SR 1556) OVER -L- (US 70 BYPASS)			**GROUND WTR (m)**
BORING NO. EB1-B	**STATION** 15+58.7	**OFFSET** 9.1m RT	**ALIGNMENT** -Y8- — **0 HR.** N/A
COLLAR ELEV. 38.49 m	**TOTAL DEPTH** 25.84 m	**NORTHING** 185,621.8	**EASTING** 706,319.1 — **24 HR.** 3.05
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 09/14/07	**COMP. DATE** 09/14/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	39									ELEV. (m) DEPTH (m)
	38.49	0.00								38.49 GROUND SURFACE 0.00
38			3	8	7	15	SS-134			BROWN SILTY SAND, MOIST
	37.33	1.16								37.89 0.60
37			4	5	8	13	SS-135			GRAY ORANGE SANDY CLAY, MOIST
	35.81	2.68								36.49 2.00
36			4	8	8	16	SS-136	▼		GRAY SAND, MOIST TO SATURATED
	34.44	4.05								33.69 4.80
35			4	5	5	10				ORANGE SILTY CLAY, WET
	32.91	5.58								32.19 6.30
34			1	4	4	8	SS-137	35%		ORANGE SANDY SILT, WET
	31.48	7.01								27.49 11.00
33			WOH	WOH	1	1				GRAY SILTY SAND, SATURATED
	29.86	8.63								
32			1	1	1	2	SS-138			
	28.34	10.15								
31			WOH	WOH	WOH	0				
	26.82	11.67								
30			WOH	1	1	2	SS-139	40%		
	25.29	13.20								
29			3	15	13	28	SS-140			
	23.77	14.72								
28			4	4	9	13	SS-141			
	22.23	16.26								
27			3	2	5	7				
	20.72	17.77								21.49 17.00
26			25	20	21	41	SS-142			COASTAL PLAIN DARK GRAY MICACEOUS SAND, SATURATED (BLACK CREEK FORMATION)
	19.29	19.20								19.89 18.60
25			5	5	9	14	SS-143			COASTAL PLAIN BROWN SANDY SILTY CLAY, WET (BLACK CREEK FORMATION)

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 10/23/07

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 16 ON -Y8- (SR 1556) OVER -L- (US 70 BYPASS)			**GROUND WTR (m)**
BORING NO. EB1-B	**STATION** 15+58.7	**OFFSET** 9.1m RT	**ALIGNMENT** -Y8- — **0 HR.** N/A
COLLAR ELEV. 38.49 m	**TOTAL DEPTH** 25.84 m	**NORTHING** 185,621.8	**EASTING** 706,319.1 — **24 HR.** 3.05
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 09/14/07	**COMP. DATE** 09/14/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	19					Match Line				
18	17.67	20.82	8	14	25	39	SS-144			COASTAL PLAIN BROWN SANDY SILTY CLAY, WET (BLACK CREEK FORMATION) *(continued)*
17	16.15	22.34	14	18	20	38	SS-145			16.89 21.60
16	14.62	23.87	20	18	19	37	SS-146			COASTAL PLAIN GRAY SILTY SAND, SATURATED (BLACK CREEK FORMATION)
15	13.10	25.39	10	13	17	30	SS-147			13.89 24.60
14										COASTAL PLAIN GRAY SILTY CLAY, WET (BLACK CREEK FORMATION)
13										12.65 25.84
12										Boring Terminated at Elevation 12.65 m IN VERY STIFF SILTY CLAY
11										
10										
9										
8										
7										
6										
5										
4										
3										
2										
1										
0										
-1										

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 16 ON -Y8- (SR 1556) OVER -L- (US 70 BYPASS)			**GROUND WTR (m)**
BORING NO. B1-B	**STATION** 15+88.0	**OFFSET** 9.1m RT	**ALIGNMENT** -Y8- — **0 HR.** N/A
COLLAR ELEV. 38.27 m	**TOTAL DEPTH** 27.36 m	**NORTHING** 185,644.4	**EASTING** 706,337.7 — **24 HR.** 2.93
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 09/18/07	**COMP. DATE** 09/18/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (m)	DEPTH (m)
	39										
	38.27	0.00								38.27 GROUND SURFACE	0.00
38			6	10	7	17	SS-161			BROWN ORANGE SILTY SAND, MOIST	
	37.67	0.60								37.67	0.60
37	37.11	1.16								BROWN CLAYEY SAND, MOIST	
			4	6	6	12	SS-162				
36	36.27	2.00								36.27 GRAY SAND, MOIST TO SATURATED	2.00
	35.59	2.68									
35			6	6	2	8	SS-163	▼			
	34.87	3.40									
34	34.24	4.03									
			3	3	5	8	SS-164				
33	33.47	4.80								33.47 ORANGE SANDY SILTY, WET	4.80
	32.69	5.58									
32			WOH	WOH	WOH	0	SS-165	44%			
	31.17	7.10									
31											
	30.27	8.00								30.27 ORANGE SILTY SAND AND SAND, SATURATED	8.00
30	29.62	8.65									
			5	2	4	6	SS-166				
29	28.12	10.15									
			1	2	2	4					
28	26.60	11.67									
			2	2	2	4	SS-167				
27	25.07	13.20									
			3	5	7	12					
26	23.55	14.72									
			2	5	7	12	SS-168				
25	22.67	15.60								22.67 COASTAL PLAIN DARK GRAY MICACOUS SAND WITH LIGNITE, SATURATED (BLACK CREEK FORMATION)	15.60
24	22.02	16.25									
			6	11	15	26	SS-169				
23	21.27	17.00								21.27	17.00
22	20.50	17.77									
			14	15	15	30	SS-170				
21	19.67	18.60								19.67	18.60
	18.98	19.29									
20			7	9	17	26					

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 16 ON -Y8- (SR 1556) OVER -L- (US 70 BYPASS)			**GROUND WTR (m)**
BORING NO. B1-B	**STATION** 15+88.0	**OFFSET** 9.1m RT	**ALIGNMENT** -Y8- — **0 HR.** N/A
COLLAR ELEV. 38.27 m	**TOTAL DEPTH** 27.36 m	**NORTHING** 185,644.4	**EASTING** 706,337.7 — **24 HR.** 2.93
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 09/18/07	**COMP. DATE** 09/18/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	19					Match Line				
18	17.45	20.82	11	17	25	42	SS-171			18.27 COASTAL PLAIN DARK GRAY MICACOUS SILTY CLAY AND SANDY CLAY, WET (BLACK CREEK FORMATION) *(continued)* 20.00
17	15.93	22.34	10	10	40	50	SS-172			16.67 21.60
16	14.40	23.87	8	11	15	26	SS-173			15.07 COASTAL PLAIN GRAY SILTY CLAY, WET (BLACK CREEK FORMATION) 23.20
15	12.88	25.39	9	10	14	24	SS-174			
14	11.36	26.91	8	11	16	27	SS-175			12.07 COASTAL PLAIN GRAY RED SILTY CLAY, WET (CAPE FEAR FORMATION) 26.20
13										10.91 27.36
12										Boring Terminated at Elevation 10.91 m IN VERY STIFF SILTY CLAY
11										
10										
9										
8										
7										
6										
5										
4										
3										
2										
1										
0										
-1										

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 10/24/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 16 ON -Y8- (SR 1556) OVER -L- (US 70 BYPASS)			**GROUND WTR (m)**
BORING NO. EB2-B	**STATION** 16+16.6	**OFFSET** 9.1m RT	**ALIGNMENT** -Y8- **0 HR.** N/A
COLLAR ELEV. 38.19 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 185,666.4	**EASTING** 706,356.0 **24 HR.** 2.68
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 09/17/07	**COMP. DATE** 09/17/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (m)	DEPTH (m)
	39										
	38.19	0.00								38.19 GROUND SURFACE	0.00
38			2	2	5	7	SS-148			BROWN SILTY SAND, MOIST	
	37.59	0.60								37.59 BROWN CLAYEY SAND, MOIST	
37	36.97	1.22									
			3	5	7	12	SS-149				
36											
	36.19	2.00								36.19 BROWN SILTY SAND, SAND AND GRAVEL, MOIST TO SATURATED	
	35.45	2.74									
35			2	3	2	5	SS-150				
	34.79	3.40								34.79 ORANGE SANDY SILT, WET	
34	34.08	4.11									
			3	2	3	5	SS-151				
33											
	33.39	4.80									
	32.55	5.64									
32			WOH	WOH	WOH	0	SS-152	43%			
	31.03	7.16									
31			WOH	WOH	1	1					
	30.19	8.00								30.19 ORANGE SILTY SAND, SATURATED	
30	29.50	8.69									
			2	3	5	8	SS-153				
29											
	28.98	10.21									
28			1	1	3	4					
	27.19	11.00								27.19 ORANGE SANDY SILT, WET	
27	26.46	11.73									
			1	1	4	5	SS-154				
26											
	25.93	13.26									
25			2	2	3	5					
	24.19	14.00								24.19 ORANGE SILTY SAND, SATURATED	
24	23.41	14.78									
			4	4	5	9	SS-155				
23											
	22.59	15.60								22.59 **COASTAL PLAIN** DARK GRAY SAND, SATURATED (BLACK CREEK FORMATION)	
22	21.88	16.31									
			7	9	6	15	SS-156				
21											
	21.19	17.00								21.19 DARK GRAY MICACEOUS SANDY CLAY AND SILTY CLAY, WET (BLACK CREEK FORMATION)	
	20.36	17.83									
20			10	12	18	30	SS-157				
	19.59	18.60									
19	18.84	19.35									

PROJECT NO. 34461.1.3	**ID.** R-2554BA	**COUNTY** WAYNE	**GEOLOGIST** Bottoms, T. C.
SITE DESCRIPTION STRUCTURE 16 ON -Y8- (SR 1556) OVER -L- (US 70 BYPASS)			**GROUND WTR (m)**
BORING NO. EB2-B	**STATION** 16+16.6	**OFFSET** 9.1m RT	**ALIGNMENT** -Y8- **0 HR.** N/A
COLLAR ELEV. 38.19 m	**TOTAL DEPTH** 27.42 m	**NORTHING** 185,666.4	**EASTING** 706,356.0 **24 HR.** 2.68
DRILL MACHINE BK-51	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 09/17/07	**COMP. DATE** 09/17/07	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (m)	DRIVE ELEV (m)	DEPTH (m)	BLOW COUNT 15cm	15cm	15cm	BLOWS PER 30 CM 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	19		9	10	19	Match Line 29	SS-158			**COASTAL PLAIN** DARK GRAY MICACEOUS SANDY CLAY AND SILTY CLAY, WET (BLACK CREEK FORMATION) *(continued)*
18										
	17.31	20.88	10	42	43	85				
17										
	15.79	22.40	10	15	17	32				
16										
15										
	14.26	23.93	10	13	15	28	SS-159			
14										
13										
	12.74	25.45	9	10	13	23				
12										
	11.22	26.97	9	11	14	25	SS-160			11.99 **COASTAL PLAIN** GRAY RED SILTY CLAY, WET (CAPE FEAR FORMATION) 26.20
11										10.77 Boring Terminated at Elevation 10.77 m IN VERY STIFF SILTY CLAY 27.42
10										
9										
8										
7										
6										
5										
4										
3										
2										
1										
0										
-1										

NCDOT BORE DOUBLE BORELOGS.GPJ NC_DOT.GDT 10/23/07

R-2554BA
STRUCTURE 16 ON -Y8- (SR 1556) OVER -L- (US 70 BYPASS)

HOLE #	SAMPLE #	RET 4	PASS 10	PASS 40	PASS 200	CSESAND	FINESAND	SI	CL	LL	PI	CLASS	DEPTH	MOIST.	ORG.
EB1-B	SS-134	-	100	88	23	27.7	52.9	10.2	9.1	16	NP	A-2-4(0)	0.3-0.45		
	SS-135	-	100	94	50	16.1	38.8	16.7	28.5	32	17	A-6(5)	1.16-1.61		
	SS-136	-	100	58	10	76.9	13.8	2.1	7.1	19	NP	A-3(0)	2.68-3.13		
	SS-137	-	100	91	86	9.8	5.5	31.9	52.8	51	26	A-7-6(24)	5.58-6.03	34.9%	
	SS-138		100	99	53	1.4	56.1	22.2	20.3	30	9	A-4(2)	8.63-9.08		
	SS-139	-	100	96	24	15.2	62.1	11.5	11.2	24	6	A-2-4(0)	11.67-12.12	40.3%	
	SS-140	-	91	86	19	14.0	68.5	10.4	7.1	27	2	A-2-4(0)	13.20-13.65		
	SS-141	-	100	99	20	6.0	77.0	5.8	11.2	24	NP	A-2-4(0)	14.72-15.17		
	SS-142	-	100	84	7	77.4	16.9	2.6	3.0	16	NP	A-3(0)	17.17-17.62		
	SS-143	-	100	95	78	9.3	17.3	30.7	42.7	48	27	A-7-6(21)	19.29-19.74		
	SS-144	-	100	86	55	33.7	14.3	15.3	36.6	45	27	A-7-6(11)	20.82-21.27		
	SS-145	-	100	78	20	54.5	25.8	4.5	15.2	28	9	A-2-4(0)	22.34-22.79		
	SS-146	-	96	73	13	37.4	49.9	5.6	7.1	23	NP	A-2-4(0)	23.87-24.32		
	SS-147	-	100	97	74	4.9	32.0	42.8	20.3	43	18	A-7-6(13)	25.39-25.84		
EB2-B	SS-148	-	100	89	30	27.2	47.5	10.1	15.2	19	4	A-2-4(0)	0.30-0.45		
	SS-149	-	100	92	34	27.5	41.5	8.8	22.2	29	14	A-2-6(1)	1.22-1.67		
	SS-150	-	100	86	14	70.1	17.0	3.8	9.1	17	NP	A-2-4(0)	2.74-3.19		
	SS-151	-	100	19	5	89.1	6.2	2.6	2.0	13	NP	A-1-b(0)	4.11-4.56		
	SS-152	-	100	100	61	0.6	58.1	25.2	16.1	27	5	A-4(1)	5.14-5.59	43.3%	
	SS-153	-	100	100	17	6.6	80.4	5.9	7.1	22	NP	A-2-4(0)	8.69-9.14		
	SS-154	-	100	97	38	9.7	56.9	15.3	18.1	22	4	A-4(0)	11.73-12.18		
	SS-155	-	100	94	18	23.3	62.1	7.6	7.1	18	NP	A-2-4(0)	14.78-15.23		
	SS-156	-	100	85	6	38.1	57.2	3.7	1.0	19	NP	A-3(0)	16.31-16.76		
	SS-157	-	100	67	36	46.9	20.5	19.6	13.1	33	11	A-6(0)	17.83-18.28		
	SS-158	-	100	98	86	4.0	16.9	40.7	38.3	52	33	A-7-6(30)	19.35-19.80		
	SS-159	-	100	98	78	3.2	27.6	47.0	22.2	41	20	A-7-6(15)	23.93-24.38		
	SS-160	-	100	100	99	0.4	1.2	27.8	70.6	73	47	A-7-6(54)	26.97-27.42		
B1-B	SS-161	-	100	87	25	29.7	49.6	13.6	7.1	15	NP	A-2-4(0)	0.30-0.45		
	SS-162	-	100	80	32	47.4	21.1	6.4	25.2	39	23	A-2-6(2)	1.16-1.61		
	SS-163	-	99	52	13	60.7	27.2	2.0	10.1	21	NP	A-2-4(0)	2.68-3.13		
	SS-164	-	100	75	9	71.1	20.5	2.4	6.0	12	NP	A-3(0)	4.05-4.50		
	SS-165	-	100	100	40	0.8	75.6	7.5	16.1	27	4	A-4(0)	5.58-6.03	44.3%	
	SS-166	-	100	92	25	15.5	62.1	10.3	12.1	22	NP	A-2-4(0)	8.65-9.10		
	SS-167	-	100	95	26	11.8	65.9	9.2	13.1	21	NP	A-2-4(0)	11.67-12.12		
	SS-168	-	100	100	18	3.6	81.6	5.7	9.1	25	NP	A-2-4(0)	14.72-15.17		
	SS-169	-	100	99	10	36.3	55.9	3.7	4.0	18	NP	A-3(0)	16.25-16.70		
	SS-170	-	98	95	19	10.7	74.0	9.3	6.0	25	NP	A-2-4(0)	17.77-18.22		
	SS-171	-	100	98	85	4.6	15.1	31.9	48.4	55	39	A-7-6(34)	19.29-19.74		
	SS-172	-	100	78	40	40.9	22.4	11.5	25.2	36	20	A-6(3)	20.82-21.27		
	SS-173	-	93	56	24	50.2	26.4	5.2	18.1	32	19	A-2-6(1)	22.34-22.79		
	SS-174	-	100	97	84	4.4	20.2	49.2	26.2	47	23	A-7-6(20)	23.87-24.32		
	SS-175	-	100	100	95	0.2	9.5	41.9	48.4	58	37	A-7-6(39)	26.91-27.36		