STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34429.3.S9 (R-2413CA)	1	12

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34429.3.S9 (R-2413CA) F.A. PROJ. N/A

COUNTY ROCKINGHAM

PROJECT DESCRIPTION US 220 /FUTURE I-73 FROM NORTH OF NC 65 TO NORTH OF SR 2338 (NEWMAN RD.)

SITE DESCRIPTION PROPOSED BRIDGE ON -LREV SB- (US 220 SB) OVER -NC68 NB- (NC 68 NB) AT -LREV SB- STA. 90+64.5

INVENTORY

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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

O. B. OTI

H. R. CONLEY

D. G. PINTER

J. R. MATULA

INVESTIGATED BY J. L. PEDRO

CHECKED BY N. T. ROBERSON

SUBMITTED BY N. T. ROBERSON

DATE FEBRUARY 2015

NORTH CAROLINA LICENSED SEAL 2157 GEOLOGIST JAIME LOVE PEDRO

DocuSigned by: Jaime Love Pedro 393571039B884B5...

2/4/2015

DRAWN BY: J. L. PEDRO, T. T. WALKER

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: 34429.3.S9

ID: R-2413CA

PROJECT REFERENCE NO.	SHEET NO.
34429.3.S9 (R-2413CA)	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	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
- SPT / DPT DMT / VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

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

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [X] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [X] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____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-48 AT -NC68_NB- STA. 15+16.7, OFFSET - 3.7m LT

ELEVATION: 264.46 M

NOTES:

REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET
34429.3.S9 (R-2413CA)	3

SITE PLAN

0 10 20
METERS

SKEW ANGLE = 70°

12+00
10+80
10+20
13+00
13+60
14+00
90+00
91+00

SR 2805 PRICE FARM RD 6.4 BST
-NC68SB_WALL-
TO STOKESDALE
DDI
375 CONC
US 220 6.4 BST
-NC68 SB-
PROPOSED RETAINING WALL W/ SINGLE FACED CONCRETE BARRIER
END BRIDGE
-LREV_SB- 90+81.993
EB1-A
EB2-A
-LREV SB-
BEGIN BRIDGE
-LREV_SB- 90+37.493
EB1-B
EB2-B
US 220 & NC 68 SBL 8.6 BST
NC 68 NBL 5.5 BST
-NC68 NB-
-L REV-
-LREV NB-
-LREV SB- POT 90+64.493 =
-NC68 NB- POC 13+10.588
TO MADISON
US 220 TO NC 68 NBL 8.6 BST
4.3 HW

PROJECT REFERENCE NO.	SHEET
34429.3.S9 (R-2413CA)	4
FENCE DIAGRAM THROUGH BORINGS PROJECTED ALONG -LREV_SB-	

0 4 8
METRIC
METERS
VE = 1:1

EB1-B
90+39.0
6.6m RT

US 220 SB

EB2-B
90+81.9
4.8m RT

RESIDUAL, TAN-ORANGE AND RED-BROWN, MEDIUM STIFF TO STIFF, MOIST, SILTY CLAY AND HIGHLY PLASTIC, SILTY CLAY

TAN-BROWN AND WHITE WITH SOME BLACK AND ORANGE, MEDIUM STIFF TO VERY STIFF, MOIST, SAPROLITIC,

SANDY AND CLAYEY SILT WITH SOME TO ABUNDANT MICA AND LOOSE, SILTY SAND

TAN, BROWN, AND ORANGE, MEDIUM DENSE TO VERY DENSE, MOIST, SAPROLITIC, SILTY SAND WITH TRACE TO SOME MICA

WEATHERED ROCK (GNEISS)

WEATHERED ROCK (GNEISS)

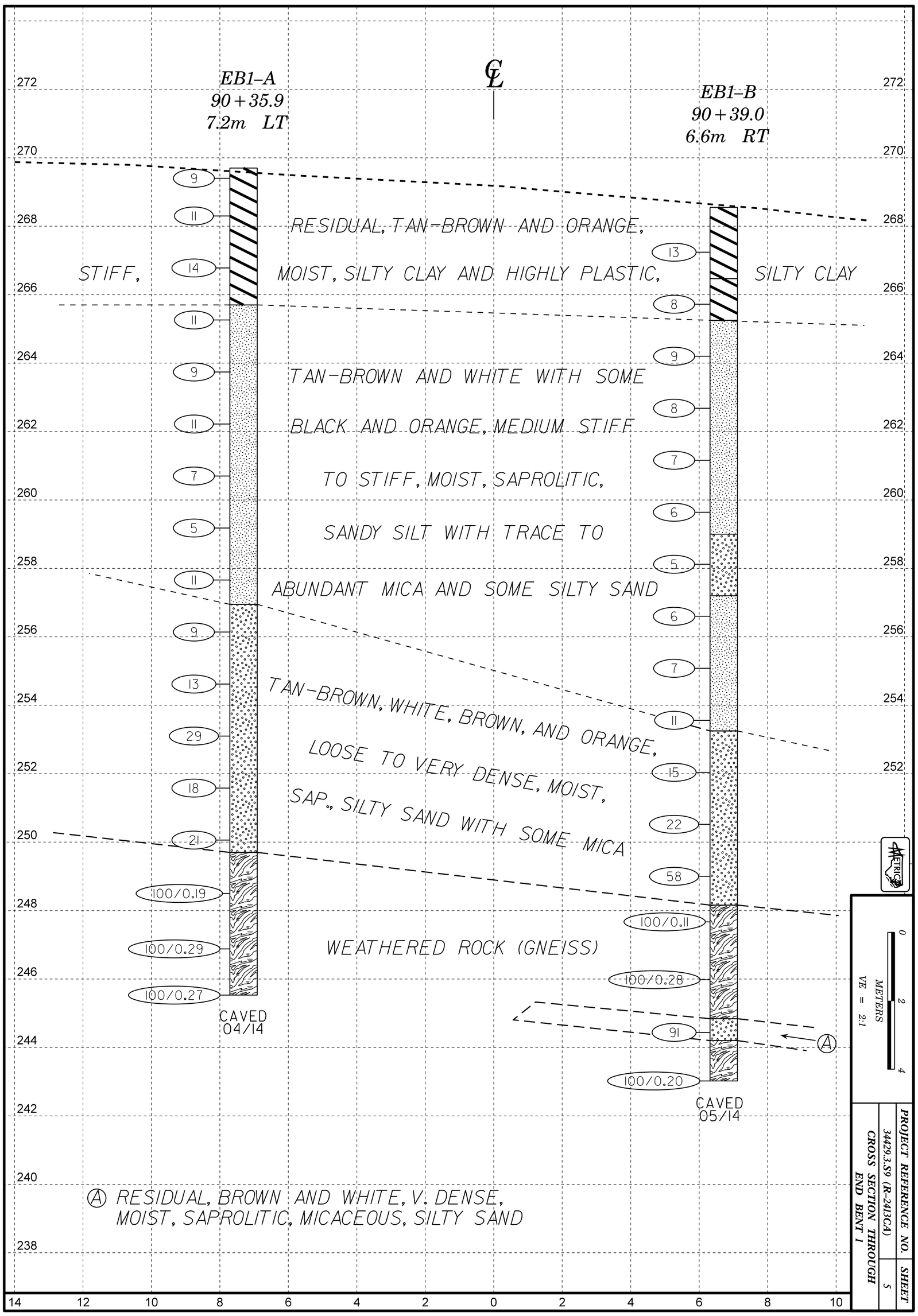
Ⓐ RESIDUAL, BROWN AND WHITE, V. DENSE, MOIST, SAPROLITIC, MICACEOUS, SILTY SAND

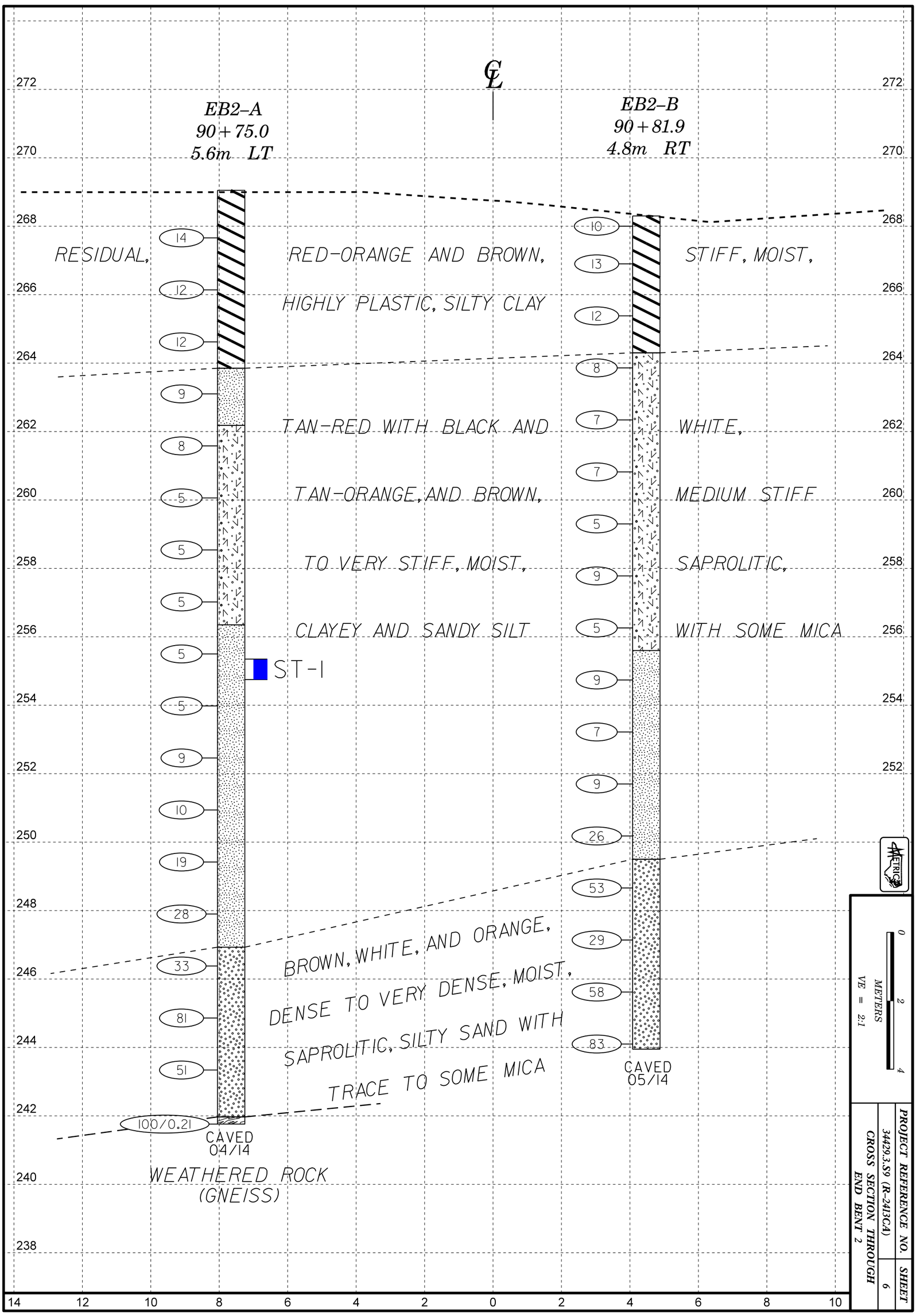
CAVED 05/14

CAVED 05/14

NOTE: GROUNDLINE DRAWN USING TIN FILE DATED 4/21/2014

90+40 90+60 90+80


EB1–A
90 + 35.9
7.2m LT
℄
EB1–B
90 + 39.0
6.6m RT
RESIDUAL, TAN–BROWN AND ORANGE,
STIFF, MOIST, SILTY CLAY AND HIGHLY PLASTIC, SILTY CLAY
TAN–BROWN AND WHITE WITH SOME
BLACK AND ORANGE, MEDIUM STIFF
TO STIFF, MOIST, SAPROLITIC,
SANDY SILT WITH TRACE TO
ABUNDANT MICA AND SOME SILTY SAND
TAN–BROWN, WHITE, BROWN, AND ORANGE,
LOOSE TO VERY DENSE, MOIST,
SAP., SILTY SAND WITH SOME MICA
WEATHERED ROCK (GNEISS)
100/0.19
100/0.29
100/0.27
CAVED
04/14
100/0.11
100/0.28
100/0.20
CAVED
05/14
Ⓐ RESIDUAL, BROWN AND WHITE, V. DENSE,
MOIST, SAPROLITIC, MICACEOUS, SILTY SAND
METRIC
METERS
VE = 2:1
PROJECT REFERENCE NO.
34429.3.59 (R-2413C4)
SHEET
5
CROSS SECTION THROUGH
END BENT 1



PROJECT REFERENCE NO.	SHEET
34429.3.59 (R-2413C4)	6

CROSS SECTION THROUGH
END BENT 2

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34429.3.S9	**TIP** R-2413CA	**COUNTY** ROCKINGHAM	**GEOLOGIST** Oti, O. B.
SITE DESCRIPTION PROPOSED BRIDGE ON -LREV_SB- (US 220 SB) OVER -NC68_NB- (NC 68 NB)			**GROUND WTR (m)**
BORING NO. EB1-A	**STATION** 90+35.9	**OFFSET** 7.2 m LT	**ALIGNMENT** -LREV_SB- **0 HR.** 10.30
COLLAR ELEV. 269.70 m	**TOTAL DEPTH** 24.17 m	**NORTHING** 281,521.3	**EASTING** 525,168.2 **24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Conley, H. R.	**START DATE** 04/28/14	**COMP. DATE** 04/28/14	**SURFACE WATER DEPTH** 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)
270										
	269.70	0.00	4	5	4	9		M		269.70 0.00 GROUND SURFACE
269										**RESIDUAL** TAN-BROWN, SILTY CLAY
	268.60	1.10	3	4	7	11		M		
268										
267	267.08	2.62	4	5	9	14		M		
266										
	265.56	4.14	4	5	6	11		M		265.70 4.00 TAN-BROWN AND WHITE, SAPROLITIC, SANDY SILT WITH TRACE MICA
265										
264	264.04	5.66	2	4	5	9		M		
263										
	262.52	7.18	3	4	7	11		M		
262										
261	261.00	8.70	2	3	4	7		M		
260										
	259.48	10.22	1	2	3	5		M		
259										
258	257.96	11.74	4	5	6	11		M		
257										
	256.44	13.26	2	3	6	9		M		256.95 12.75 TAN-BROWN AND WHITE, SAPROLITIC, SILTY SAND
256										
255	254.92	14.78	5	7	6	13		M		
254										
	253.40	16.30	8	14	15	29		M		
253										
252	251.88	17.82	8	10	8	18		M		
251										
	250.36	19.34	5	8	13	21		M		249.70 20.00
250										

WBS 34429.3.S9	**TIP** R-2413CA	**COUNTY** ROCKINGHAM	**GEOLOGIST** Oti, O. B.
SITE DESCRIPTION PROPOSED BRIDGE ON -LREV_SB- (US 220 SB) OVER -NC68_NB- (NC 68 NB)			**GROUND WTR (m)**
BORING NO. EB1-A	**STATION** 90+35.9	**OFFSET** 7.2 m LT	**ALIGNMENT** -LREV_SB- **0 HR.** 10.30
COLLAR ELEV. 269.70 m	**TOTAL DEPTH** 24.17 m	**NORTHING** 281,521.3	**EASTING** 525,168.2 **24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Conley, H. R.	**START DATE** 04/28/14	**COMP. DATE** 04/28/14	**SURFACE WATER DEPTH** 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
250						Match Line				
249	248.84	20.86	10	54	46/0.4					**WEATHERED ROCK** (GNEISS) *(continued)*
248						100/0.19				
247	247.32	22.38	25	41	59/0.14					
246						100/0.29				
	245.80	23.90	43	57/0.12		100/0.27				245.53 24.17 Boring Terminated at Elevation 245.53 m IN WEATHERED ROCK (GNEISS)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34429.3.S9	**TIP** R-2413CA	**COUNTY** ROCKINGHAM	**GEOLOGIST** Pedro, J. L.	
SITE DESCRIPTION PROPOSED BRIDGE ON -LREV_SB- (US 220 SB) OVER -NC68_NB- (NC 68 NB)				**GROUND WTR (m)**
BORING NO. EB1-B	**STATION** 90+39.0	**OFFSET** 6.6 m RT	**ALIGNMENT** -LREV_SB-	**0 HR.** Caved
COLLAR ELEV. 268.55 m	**TOTAL DEPTH** 25.53 m	**NORTHING** 281,529.6	**EASTING** 525,179.7	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 05/19/14	**COMP. DATE** 05/19/14	**SURFACE WATER DEPTH** 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))
269										
										268.55 / 0.00 GROUND SURFACE
268										**RESIDUAL** TAN-ORANGE, HIGHLY PLASTIC, SILTY CLAY
	267.54	1.01	3	5	8	13	SS-1	M		
267										
										266.47 / 2.08
266	266.02	2.53	3	4	4	8	SS-2	M		TAN-BROWN TO ORANGE-BROWN, SILTY CLAY
265										265.25 / 3.30
	264.50	4.05	2	4	5	9	SS-3	M		TAN-BROWN AND WHITE WITH SOME BLACK, SAPROLITIC, SANDY SILT WITH SOME TO ABUNDANT MICA
264										
263	262.98	5.57	2	3	5	8		M		
262										
	261.46	7.09	3	3	4	7		M		
261										
260	259.94	8.61	1	3	3	6		M		
259										259.00 / 9.55
	258.42	10.13	2	2	3	5	SS-4	M		BROWN, MICACEOUS, SILTY SAND
258										257.20 / 11.35
257	256.90	11.65	1	3	3	6	SS-5	M		TAN, BROWN, ORANGE, AND WHITE, SAPROLITIC, SANDY SILT
256										
	255.38	13.17	2	2	5	7		M		
255										
254	253.86	14.69	4	5	6	11	SS-6	M		
253										253.25 / 15.30
	252.34	16.21	2	6	9	15		M		BROWN AND ORANGE, SAPROLITIC, SILTY SAND WITH SOME MICA
252										
251	250.82	17.73	6	8	14	22		M		
250										
	249.30	19.25	18	31	27	58	SS-7	M		
249										

WBS 34429.3.S9	**TIP** R-2413CA	**COUNTY** ROCKINGHAM	**GEOLOGIST** Pedro, J. L.	
SITE DESCRIPTION PROPOSED BRIDGE ON -LREV_SB- (US 220 SB) OVER -NC68_NB- (NC 68 NB)				**GROUND WTR (m)**
BORING NO. EB1-B	**STATION** 90+39.0	**OFFSET** 6.6 m RT	**ALIGNMENT** -LREV_SB-	**0 HR.** Caved
COLLAR ELEV. 268.55 m	**TOTAL DEPTH** 25.53 m	**NORTHING** 281,529.6	**EASTING** 525,179.7	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 05/19/14	**COMP. DATE** 05/19/14	**SURFACE WATER DEPTH** 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
249						Match Line				
248										248.16 / 20.39 WEATHERED ROCK (GNEISS)
	247.78	20.77	100/0.11			100/0.11				
247										
	246.26	22.29	28	72/0.13		100/0.28				
246										
245										244.84 / 23.71
	244.74	23.81	28	29	62	91	SS-8	M		**RESIDUAL** BROWN AND WHITE, SAPROLITIC, MICACEOUS, SILTY SAND
244										244.20 / 24.35 **WEATHERED ROCK** (GNEISS)
	243.22	25.33	70	30/0.05		100/0.20				243.02 / 25.53 Boring Terminated at Elevation 243.02 m IN WEATHERED ROCK (GNEISS)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34429.3.S9	**TIP** R-2413CA	**COUNTY** ROCKINGHAM	**GEOLOGIST** Pedro, J. L.	
SITE DESCRIPTION PROPOSED BRIDGE ON -LREV_SB- (US 220 SB) OVER -NC68_NB- (NC 68 NB)				**GROUND WTR (m)**
BORING NO. EB2-A	**STATION** 90+75.0	**OFFSET** 5.6 m LT	**ALIGNMENT** -LREV_SB-	**0 HR.** Caved
COLLAR ELEV. 269.05 m	**TOTAL DEPTH** 27.29 m	**NORTHING** 281,557.9	**EASTING** 525,154.4	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 04/30/14	**COMP. DATE** 05/01/14	**SURFACE WATER DEPTH** 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)
270										
269										269.05 GROUND SURFACE 0.00
										RESIDUAL
268	267.96	1.09	3	5	9	14	SS-9	D		RED-ORANGE, HIGHLY PLASTIC, SILTY CLAY
267	266.44	2.61	3	5	7	12		D		
266	264.92	4.13	2	5	7	12		M		
265	263.40	5.65	4	4	5	9		M		263.85 5.20
264	261.88	7.17	2	3	5	8	SS-10	M		RED-ORANGE TO TAN-WHITE, SAPROLITIC, SANDY SILT
263	260.36	8.69	2	2	3	5		M		262.18 6.87
262	258.84	10.21	2	2	3	5		42%		TAN-RED WITH BLACK, SAPROLITIC, CLAYEY SILT
261	257.32	11.73	1	2	3	5		M		
260	255.80	13.25	1	2	3	5	SS-11	M		256.35 12.70
259	254.28	14.77	1	2	3	5		M		TAN-ORANGE AND BROWN, SAPROLITIC, SANDY SILT WITH SOME MICA
258	252.76	16.29	2	2	7	9		M		
257	251.24	17.81	4	5	5	10		M		
256	249.72	19.33								

WBS 34429.3.S9	**TIP** R-2413CA	**COUNTY** ROCKINGHAM	**GEOLOGIST** Pedro, J. L.	
SITE DESCRIPTION PROPOSED BRIDGE ON -LREV_SB- (US 220 SB) OVER -NC68_NB- (NC 68 NB)				**GROUND WTR (m)**
BORING NO. EB2-A	**STATION** 90+75.0	**OFFSET** 5.6 m LT	**ALIGNMENT** -LREV_SB-	**0 HR.** Caved
COLLAR ELEV. 269.05 m	**TOTAL DEPTH** 27.29 m	**NORTHING** 281,557.9	**EASTING** 525,154.4	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 04/30/14	**COMP. DATE** 05/01/14	**SURFACE WATER DEPTH** 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
250			4	7	12	Match Line 19	SS-12	M		TAN-ORANGE AND BROWN, SAPROLITIC, SANDY SILT WITH SOME MICA *(continued)*
249										
248	248.20	20.85	4	15	13	28		M		
247	246.68	22.37	5	11	22	33		M		246.93 22.12
246										BROWN, WHITE, AND ORANGE, SAPROLITIC, SILTY SAND WITH SOME MICA
245	245.16	23.89	11	31	50	81		M		
244	243.64	25.41	26	26	25	51		M		
243										
242	242.12	26.93	12	44	56/0.06	100/0.21				241.97 27.08
										241.76 **WEATHERED ROCK** (GNEISS) 27.29
										Boring Terminated at Elevation 241.76 m IN WEATHERED ROCK (GNEISS)
										Other Samples: M-10 (10.2 - 10.7) ST-1 (13.7 - 14.3)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34429.3.S9	**TIP** R-2413CA	**COUNTY** ROCKINGHAM	**GEOLOGIST** Oti, O. B.	
SITE DESCRIPTION PROPOSED BRIDGE ON -LREV_SB- (US 220 SB) OVER -NC68_NB- (NC 68 NB)				**GROUND WTR (m)**
BORING NO. EB2-B	**STATION** 90+81.9	**OFFSET** 4.8 m RT	**ALIGNMENT** -LREV_SB-	**0 HR.** Caved
COLLAR ELEV. 268.30 m	**TOTAL DEPTH** 24.35 m	**NORTHING** 281,568.4	**EASTING** 525,161.2	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 05/05/14	**COMP. DATE** 05/05/14	**SURFACE WATER DEPTH** 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)
269										
	268.30	0.00	3	4	6	10		M		268.30 0.00 GROUND SURFACE
268										**RESIDUAL** RED-BROWN, HIGHLY PLASTIC, SILTY CLAY
	267.20	1.10	4	6	7	13		M		
267										
	265.68	2.62	4	5	7	12		M		
266										
	264.16	4.14	3	4	4	8		M		264.30 4.00 TAN-BROWN, SAPROLITIC, CLAYEY SILT WITH TRACE MICA
265										
	262.64	5.66	3	3	4	7		M		
264										
	261.12	7.18	3	3	4	7		M		
263										
	259.60	8.70	1	2	3	5		M		
262										
	258.08	10.22	2	4	5	9		M		
261										
	256.56	11.74	1	2	3	5		M		
260										
	255.04	13.26	2	4	5	9		M		
259										
	253.52	14.78	1	3	4	7		M		
258										
	252.00	16.30	2	4	5	9		M		
257										
	250.48	17.82	11	13	13	26		M		
256										
	248.96	19.34	10	15	38					249.50 18.80 TAN-BROWN, SAPROLITIC, SILTY SAND WITH TRACE MICA
255										

WBS 34429.3.S9	**TIP** R-2413CA	**COUNTY** ROCKINGHAM	**GEOLOGIST** Oti, O. B.	
SITE DESCRIPTION PROPOSED BRIDGE ON -LREV_SB- (US 220 SB) OVER -NC68_NB- (NC 68 NB)				**GROUND WTR (m)**
BORING NO. EB2-B	**STATION** 90+81.9	**OFFSET** 4.8 m RT	**ALIGNMENT** -LREV_SB-	**0 HR.** Caved
COLLAR ELEV. 268.30 m	**TOTAL DEPTH** 24.35 m	**NORTHING** 281,568.4	**EASTING** 525,161.2	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Conley, H. R.	**START DATE** 05/05/14	**COMP. DATE** 05/05/14	**SURFACE WATER DEPTH** 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
249						Match Line		M		TAN-BROWN, SAPROLITIC, SILTY SAND WITH TRACE MICA *(continued)*
248										
	247.44	20.86	10	13	16	29 53		M		
247										
	245.92	22.38	23	28	30	58		M		
246										
	244.40	23.90	30	37	46	83		M		243.95 24.35 Boring Terminated at Elevation 243.95 m IN RESIDUAL (SILTY SAND)
245										
244										

PROJ. NO. - 34429.3.S9
ID NO. - R-2413CA
COUNTY - ROCKINGHAM

EB1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	6.6M RT	90+39.0	1.01-1.46	A-7-6(21)	56	31	8.7	26.0	17.1	48.3	100	96	70	-	-
SS-2	6.6M RT	90+39.0	2.53-2.98	A-7-6(15)	48	24	8.2	29.6	19.9	42.3	100	97	67	-	-
SS-3	6.6M RT	90+39.0	4.05-4.50	A-4(0)	39	NP	22.7	44.7	24.5	8.0	100	89	41	-	-
SS-4	6.6M RT	90+39.0	10.13-10.58	A-2-5(0)	47	NP	16.1	58.6	19.3	6.0	100	96	33	-	-
SS-5	6.6M RT	90+39.0	11.65-12.10	A-4(0)	33	NP	18.9	50.9	22.1	8.0	100	95	39	-	-
SS-6	6.6M RT	90+39.0	14.69-15.14	A-4(0)	34	NP	14.1	55.7	24.1	6.0	98	94	40	-	-
SS-7	6.6M RT	90+39.0	19.25-19.70	A-2-4(0)	29	NP	32.4	41.4	20.1	6.0	100	86	33	-	-
SS-8	6.6M RT	90+39.0	23.81-24.26	A-2-4(0)	32	NP	19.9	49.7	24.3	6.0	95	87	35	-	-

EB2-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-9	5.6M LT	90+39.0	1.09-1.54	A-7-6(17)	51	28	10.7	28.2	12.9	48.3	99	95	65	-	-
SS-10	5.6M LT	90+75.0	7.17-7.62	A-5(0)	41	NP	13.7	45.5	30.8	10.1	100	96	51	42.1	-
SS-11	5.6M LT	90+75.0	13.25-13.70	A-4(0)	30	NP	20.5	45.5	26.0	8.0	99	92	42	-	-
ST-1	5.6M LT	90+75.0	13.70-14.30	A-4(0)	35	3	15.5	48.6	29.9	6.0	10	96	48		
SS-12	5.6M LT	90+75.0	19.33-19.78	A-4(0)	34	NP	20.7	44.7	26.6	8.0	100	93	42	-	-

SITE PHOTOGRAPH

Proposed Bridge on -LREV_SB- (US 220 SB) over -NC68_NB- (NC 68 NB)

Looking Northwest towards End Bent 2

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34429.3.S9 (R-2413CA)	1	6

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34429.3.S9 (R-2413CA) F.A. PROJ. N/A

COUNTY ROCKINGHAM

PROJECT DESCRIPTION US 220 /FUTURE I-73 FROM NORTH OF NC 65 TO NORTH OF SR 2338 (NEWMAN RD.)

SITE DESCRIPTION

RETAINING WALL RIGHT OF -NC68_NB- AT STA. 12+55.6

RETAINING WALL LEFT OF -NC68_NB- AT STA. 13+18.1

RETAINING WALL LEFT OF -NC68_SB- AT STA. 12+10.0

WALL INVENTORY

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CAUTION NOTICE

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SUBMITTED BY N. T. ROBERSON

DATE FERUARY 2015

NORTH CAROLINA LICENSED SEAL 2157 GEOLOGIST JAIME LOVE PEDRO

DocuSigned by: Jaime Love Pedro 893571039B884B5...

2/18/2015

PROJECT: 34429.3.S9

ID: R-2413CA

DRAWN BY: J. L. PEDRO, T. T. WALKER

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.

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO.	SHEET NO.
34429.3.S9 (R-2413CA)	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 SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	>10%	>20%	HIGHLY	35% AND ABOVE

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

ABBREVIATIONS

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

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

EQUIPMENT USED ON SUBJECT PROJECT

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

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152mm CONTINUOUS FLIGHT AUGER
- [X] 203mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [X] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____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-48 AT -NC68_NB- STA. 15+16.7, OFFSET - 3.7m LT

ELEVATION: 264.46 M

NOTES:

REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET
34429.3.S9 (R-2413CA)	3

SITE PLAN

METRIC

0 7.5 15
METERS

END RETAINING WALL
-NC68SB_WALL- 11+40.000 =
-NC68 SB- 12+10.000 13.448 LT

PI Sta. 10+80.000

BEGIN RETAINING WALL
-NC68SB_WALL- 10+00.000 =
-NC68 SB- 13+50.880 27.283 LT

TO STOKESDALE

12+00

1200 WW

SR 2805 PRICE FARM RD 6.4 BST

1200 WW

12+00

13+00

PI

375 CONC

375 CONC

375 CONC

375 CONC

PI

-NC68 SB-

14+00

CONC

US 220 6.4 BST

1050 CONC

BEGIN WALL -NC68NB-
STA.12+55.600,7.057 RT

BEGIN WALL -NC68NB-
STA.13+18.100,3.457 LT

13+00

90+00

91+00

92+00

-LREV SB-

END WALL -NC68NB-
STA.13+68.500,3.457 LT

90+00

END WALL -NC68NB-
STA.12+91.650,7.057 RT

-L REV-

-LREV SB- SC 91+77.653

NC 68 NBL 5.5 BST

5.5 BST

-NC68 NB-

-LREV SB- POT 90+64.493 =
-NC68 NB- POC 13+10.588
Δ = 30° 34' 02.3"

91+00

14+00

375 CONC

-LREV NB-

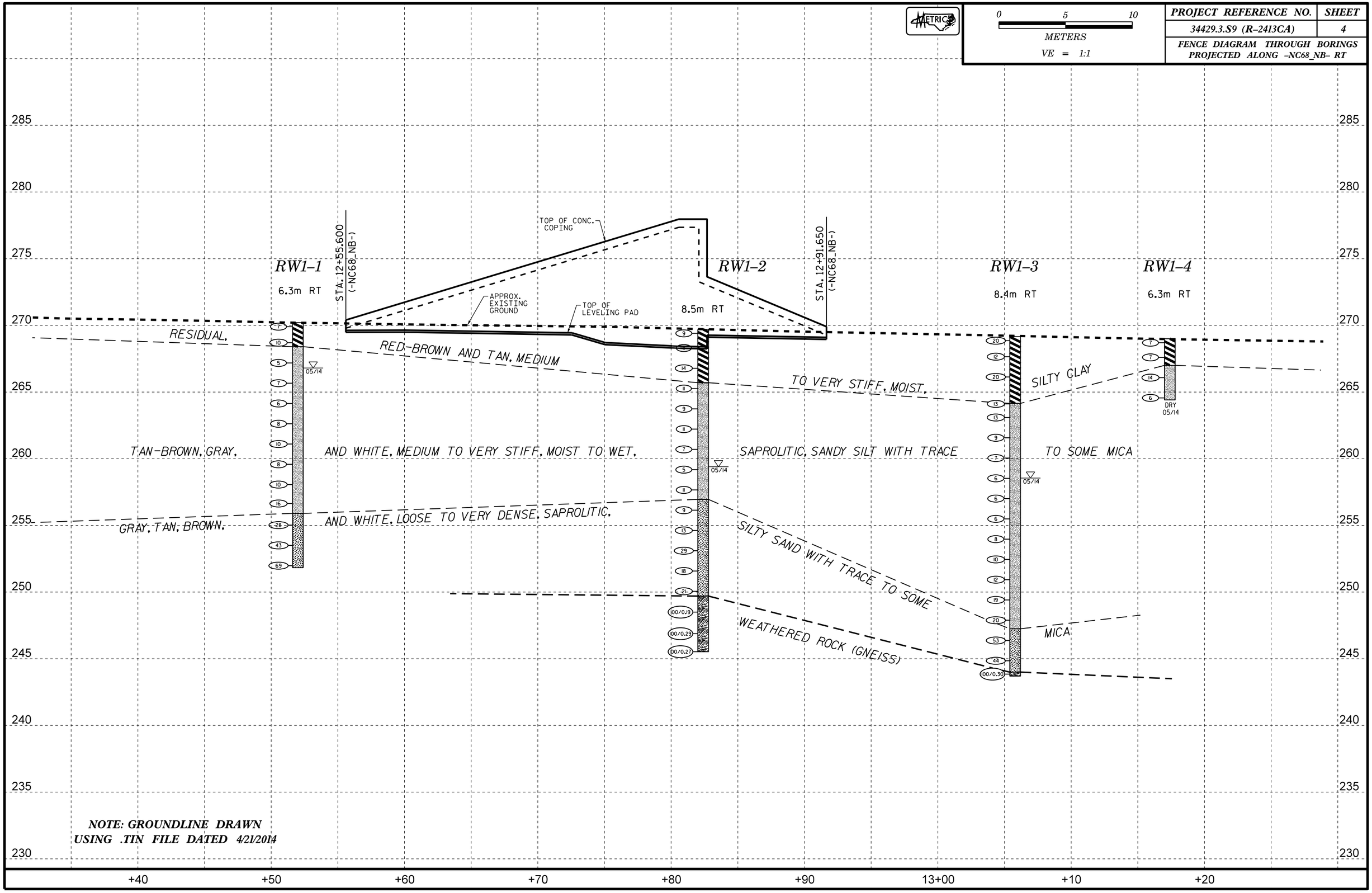
US 220 TO NC 68 NBL 8.6 BST

TO MADISON

PROJECT REFERENCE NO.	SHEET
34429.3.S9 (R-2413CA)	4

FENCE DIAGRAM THROUGH BORINGS PROJECTED ALONG -NC68_NB- RT

0 5 10
METERS
VE = 1:1



NOTE: GROUNDLINE DRAWN USING .TIN FILE DATED 4/21/2014

PROJECT REFERENCE NO.	SHEET
34429.3.S9 (R-2413CA)	5
FENCE DIAGRAM THROUGH BORINGS PROJECTED ALONG -NC68_NB- LT	

0 5 10
METERS
VE = 1:1

RW2-1 RW2-2 RW2-3 RW2-4 RW2-5

STA. 13+18.100 (-NC68_NB-)

STA. 13+68.500 (-NC68_NB-)

2.7m LT 4.7m LT 4.7m LT 2.7m LT 2.7m LT

FINISHED GRADE AT FRONT FACE OF WALL

APPROX. EXISTING GROUND

TOP OF LEVELING PAD

TOP OF CONC. COPING

RESIDUAL, TAN-BROWN AND RED BROWN AND TAN, MEDIUM TO VERY STIFF, MOIST WHITE, MEDIUM TO VERY STIFF, MOIST TO WET, SAPROLITIC, CLAYEY AND SILTY SAND

TAN-BROWN, MEDIUM DENSE TO VERY DENSE, MOIST, SAPROLITIC, SANDY SILT WITH TRACE MICA

WEATHERED ROCK (GNEISS)

05/14 04/14 CAVED 05/14 DRY 05/14 CAVED 05/14

100/0.23 100/0.15 100/0.30

285 280 275 270 265 260 255 250 245 240 235 230

+90 13+00 +10 +20 +30 +40 +50 +60 +70 +80

NOTE: GROUNDLINE DRAWN USING .TIN FILE DATED 4/21/2014

0	10	20

METERS

VE = 5:1

PROJECT REFERENCE NO.	SHEET
34429.3.S9 (R-2413CA)	6

FENCE DIAGRAM THROUGH BORINGS PROJECTED ALONG -NC68SB_WALL-

BEGIN WALL
-NC68SB_WALL- 10+00.000 =
-NC68_SB- 13+50.880
EL = 265.665

END WALL
-NC68SB_WALL- 11+40.000 =
-NC68_SB- 10+45.000
EL = 271.030

RW3-1
1.2m LT

RW3-2
1.6m LT

RW3-3
1.1m LT

RW3-4
0.4m LT

RW3-5
1.0m LT

RW3-6
0.8m LT

RW3-7
2.3m LT

RW3-8
2.3m LT

RESIDUAL, TAN-BROWN AND WHITE

TAN AND RED-BROWN, WITH BLACK, WITH SOME MICA

MEDIUM TO VERY STIFF, MOIST, SAPROLITIC, CLAYEY AND SANDY SILT

PLASTIC, MOIST, HIGHLY SILTY CLAY

NOTE: GROUNDLINE DRAWN USING TIN FILE DATED 4/21/2014