STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34400.1.1 (R-2233AB)	1	13

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34400.1.1 (R-2233AB) F.A. PROJ. NHF-221(9)

COUNTY RUTHERFORD

PROJECT DESCRIPTION US 221 FROM SOUTH OF FLOYD'S CREEK TO NORTH OF US 74 BYPASS

SITE DESCRIPTION BRIDGE NO. 631 ON US 221 OVER US 74 BYPASS

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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.

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PERSONNEL

R.W. TODD

M.L. SMITH

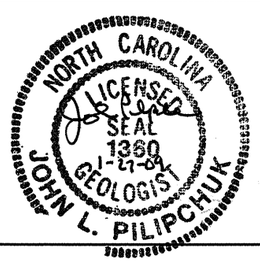
A.C. SMITH

INVESTIGATED BY J.P. ROGERS

CHECKED BY J.P. ROGERS

SUBMITTED BY J.L. PILIPCHUK

DATE JANUARY 2009



PROJECT: 34400.1.1

ID: R-2233AB

DRAWN BY: J.K. McCLURE

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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.
34400.1.1 (R-2233AB)	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

BOULDER (BLDR.)	COBBLE (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
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 PODRLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- 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-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [X] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [X] TRICONE 2 15/16" 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 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: BL-19 (GPS POINT "R2233AB-19")
PINC 305+64.25 -BL-=
563+67.58 -L- 36.80 LT. ELEVATION: FT.

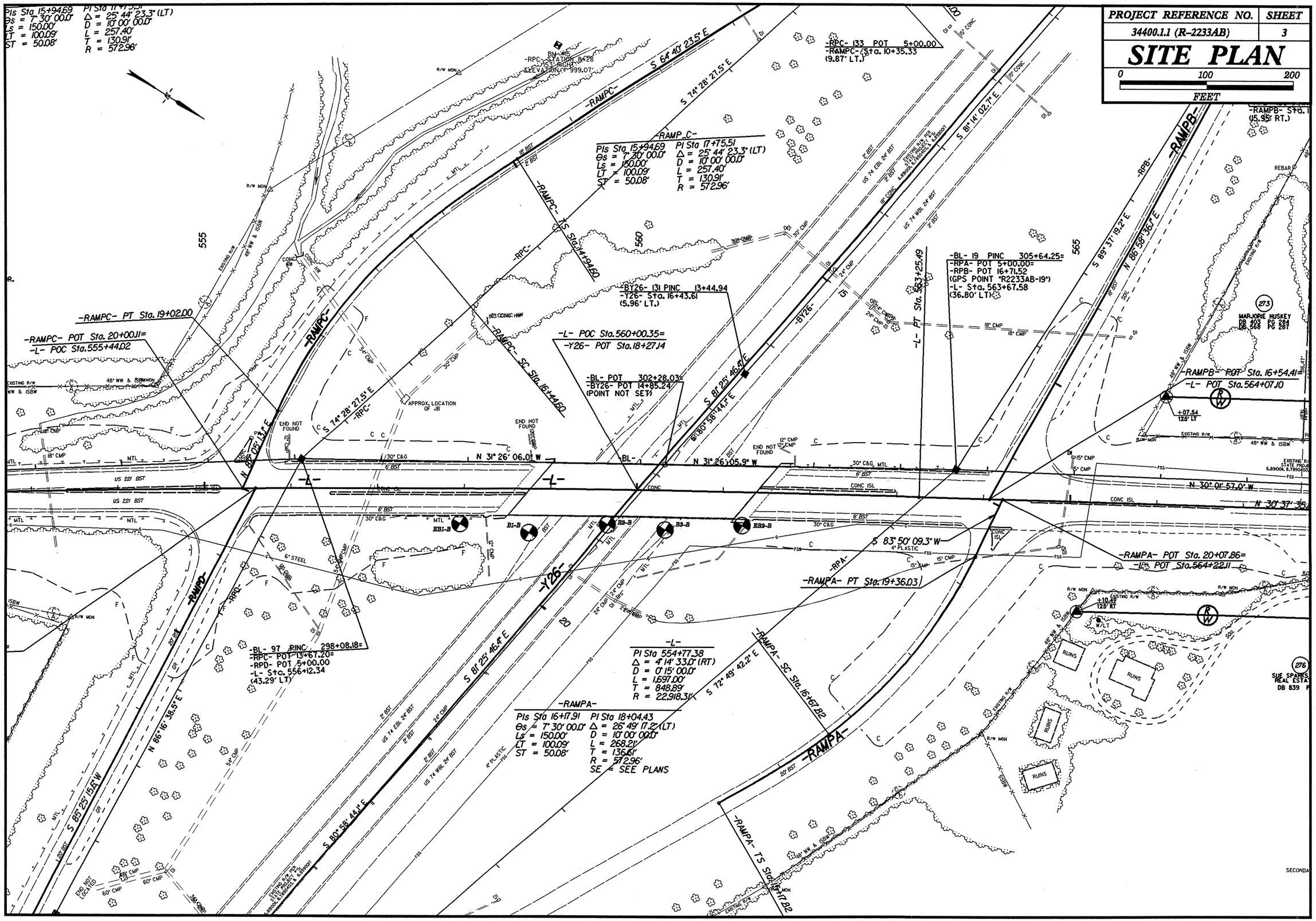
NOTES:

REVISED 02/23/06

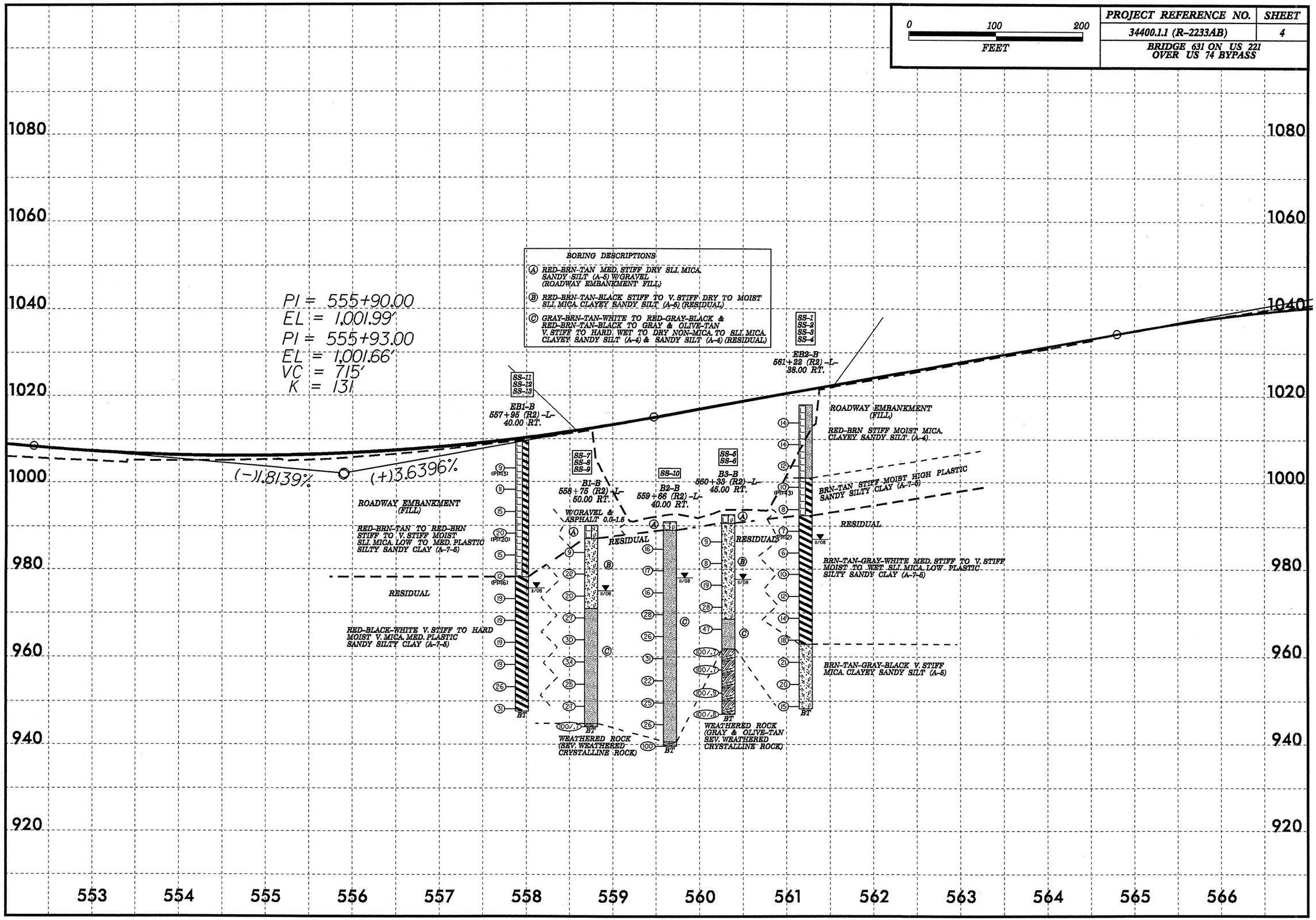
PROJECT REFERENCE NO.	SHEET
34400.1.1 (R-2233AB)	3

SITE PLAN

0 100 200
FEET

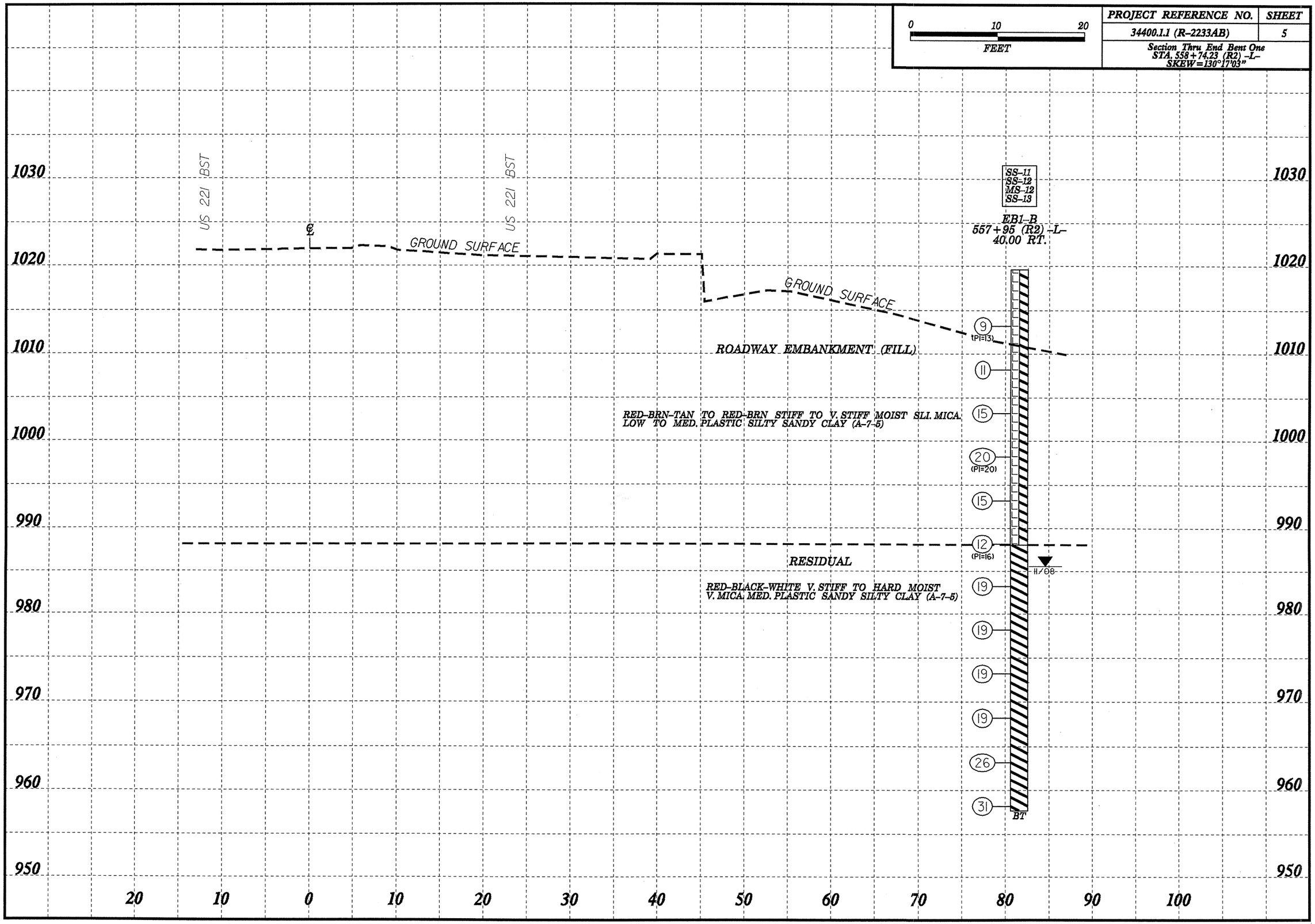


PROJECT REFERENCE NO.	SHEET
34400.1.1 (R-2233AB)	4
BRIDGE 631 ON US 221 OVER US 74 BYPASS	



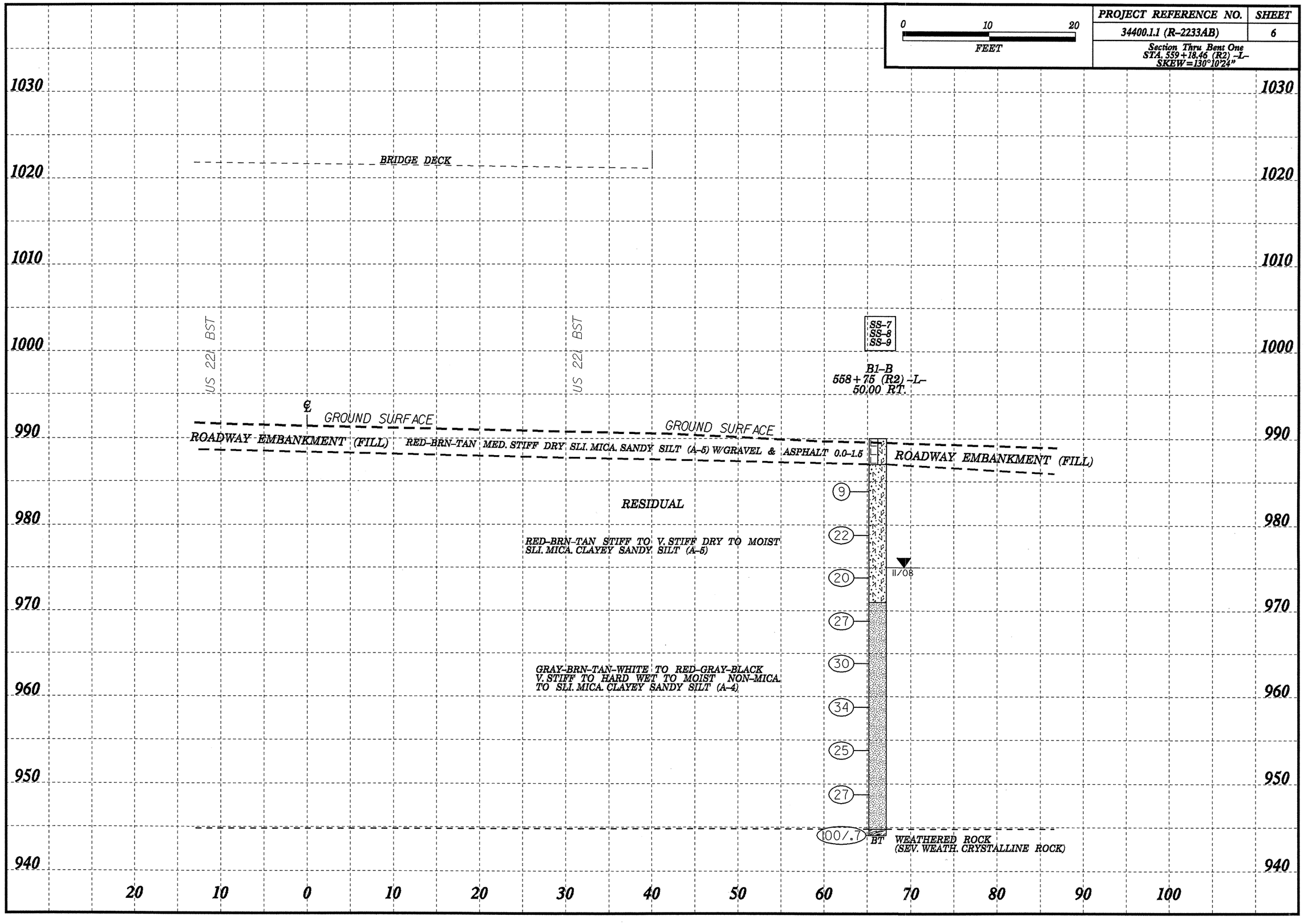
PROJECT REFERENCE NO.	SHEET
34400.1.1 (R-2233AB)	5

Section Thru End Bent One
STA. 558+74.23 (R2) -L-
SKEW=130°17'03"



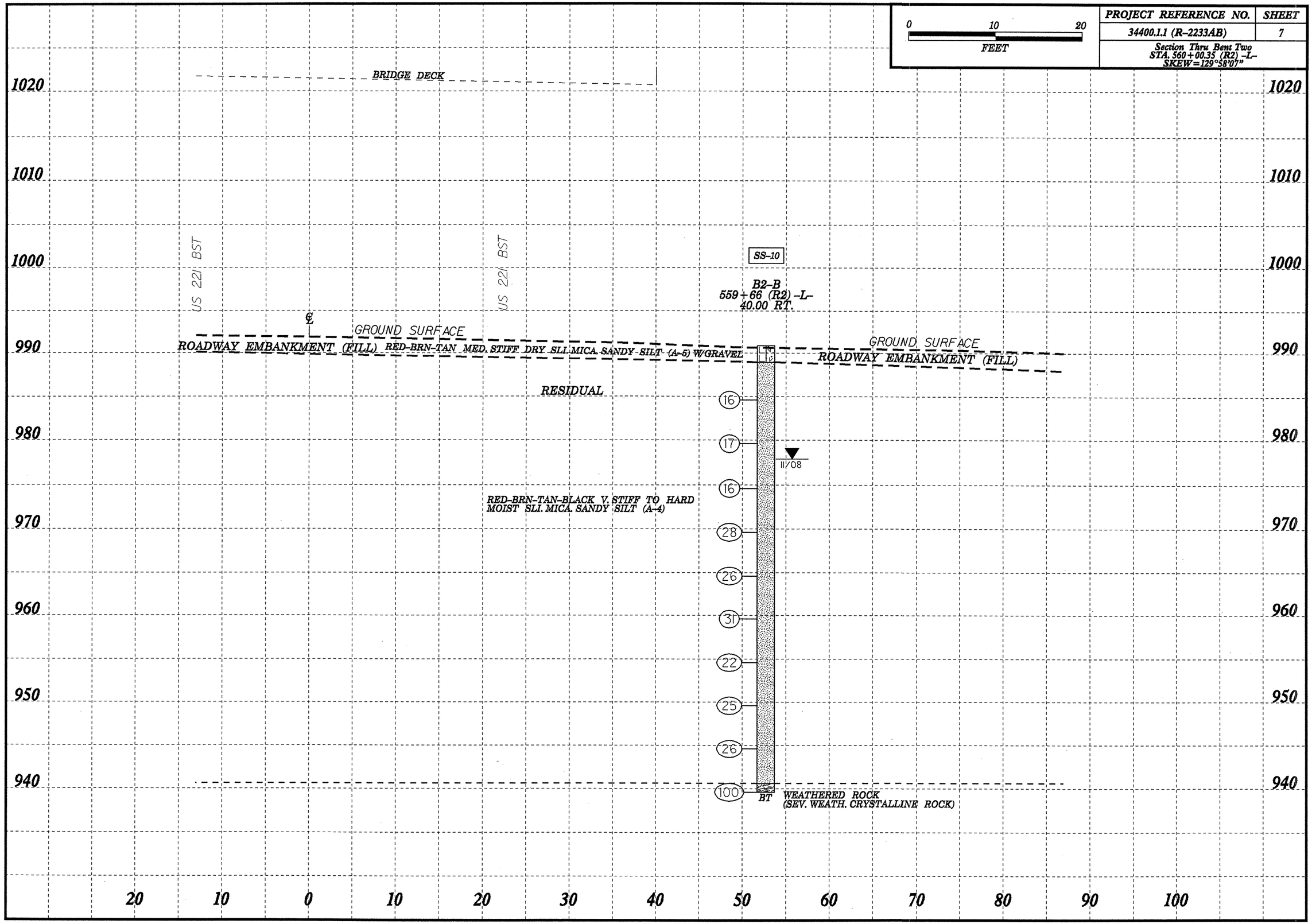
PROJECT REFERENCE NO.	SHEET
34400.1.1 (R-2233AB)	6

Section Thru Bent One
STA. 559+18.46 (R2) -L-
SKEW=130°10'24"



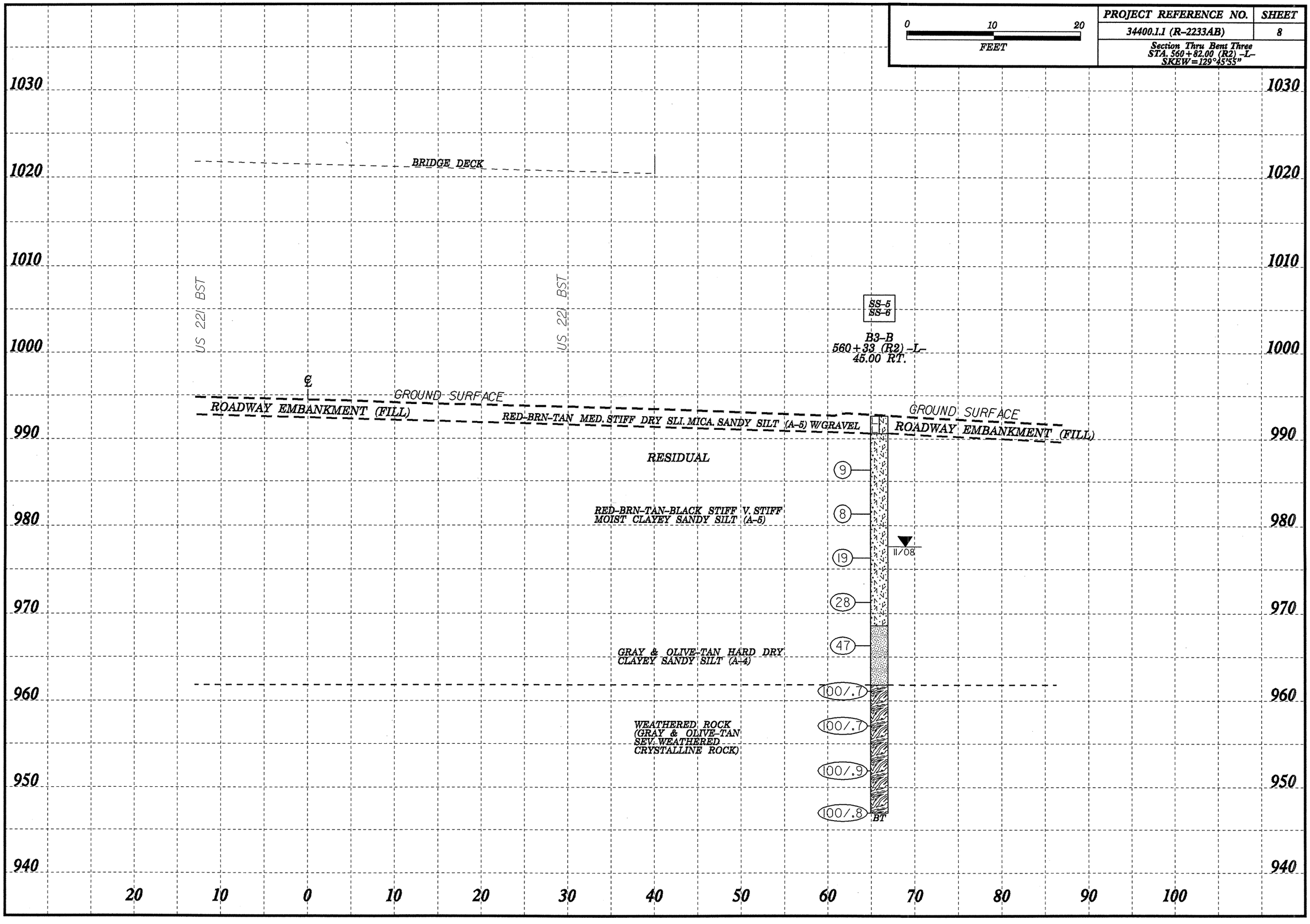
PROJECT REFERENCE NO.	SHEET
34400.1.1 (R-2233AB)	7

Section Thru Bent Two
STA. 560+00.35 (R2) -L-
SKEW=129°58'07"



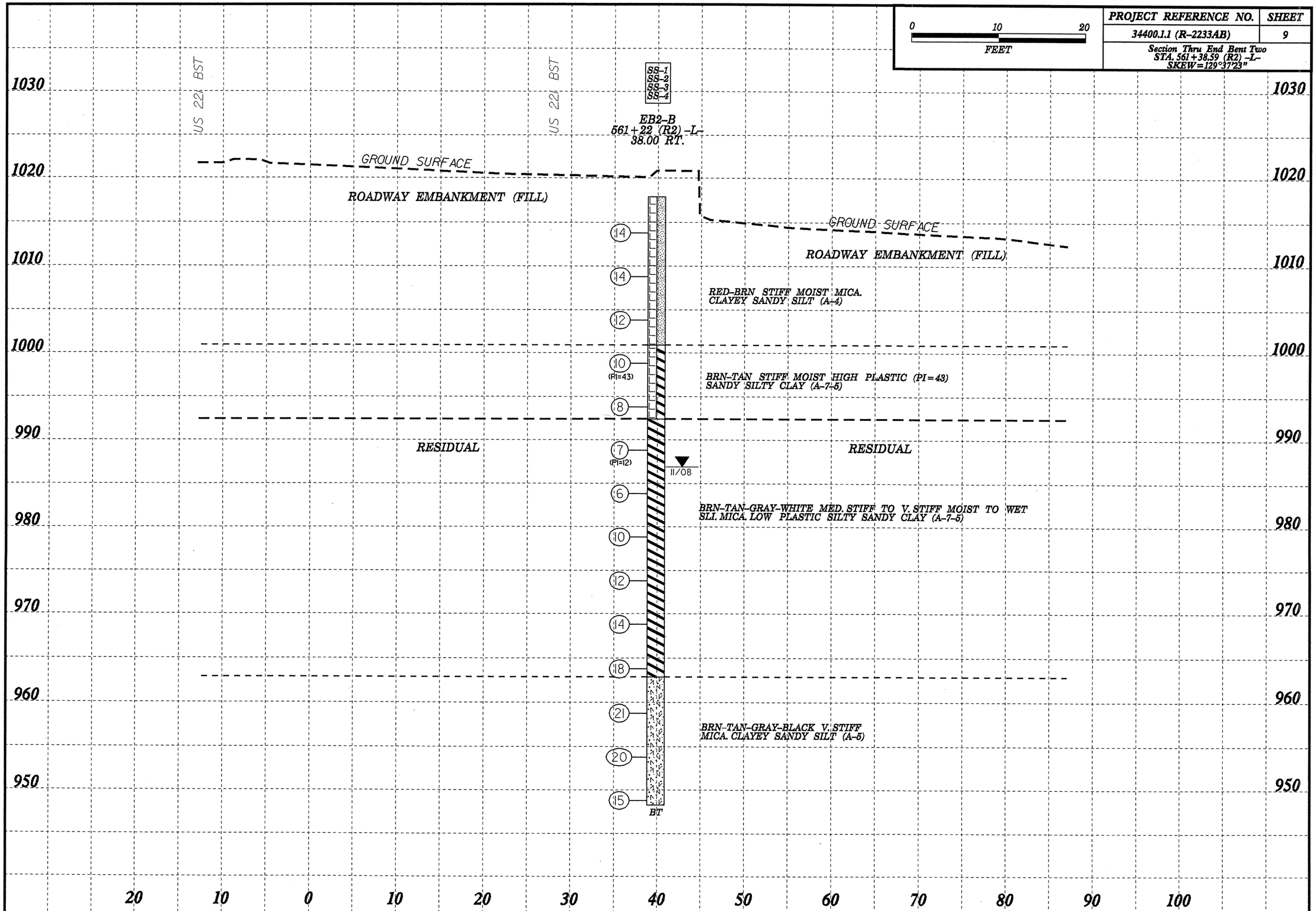
PROJECT REFERENCE NO.	SHEET
34400.1.1 (R-2233AB)	8

Section Thru Bent Three
STA. 560+82.00 (R2) -L-
SKEW=129°45'55"



PROJECT REFERENCE NO.	SHEET
34400.1.1 (R-2233AB)	9

Section Thru End Bent Two
STA. 561+38.59 (R2) -L-
SKEW=129°37'23"



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION BRIDGE 631 ON US221 OVER US 74 BYPASS			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 557+95	**OFFSET** 40ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 1,009.6 ft	**TOTAL DEPTH** 61.9 ft	**NORTHING** 579,599	**EASTING** 1,128,348	**24 HR.** 34.0
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Advancer		**HAMMER TYPE** Automatic
START DATE 11/20/09	**COMP. DATE** 11/21/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										1,009.6 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT RED-BRN-TAN TO RED-BRN STIFF TO V. STIFF MOIST SLI. MICA. LOW TO MED. PLASTIC (PI=13, 20) SILTY SANDY CLAY (A-7-5)	
	1,004.2	5.4	3	4	5	9	SS-11	M			
	999.2	10.4	3	4	7	11		M			
	994.2	15.4	5	5	10	15		M			
	989.2	20.4	4	8	12	20	SS-12	27% M			
	984.2	25.4	3	7	8	15		M			
	979.2	30.4	3	5	7	12	SS-13	M		978.1 **RESIDUAL** RED-BLACK-WHITE V. STIFF TO HARD MOIST V. MICA. MED. PLASTIC (PI=16) SANDY SILTY CLAY (A-7-5)	31.5
	974.2	35.4	5	9	10	19		M			
	969.2	40.4	6	9	10	19		M			
	964.2	45.4	7	9	10	19		M			
	959.2	50.4	7	8	11	19		M			
	954.2	55.4	10	12	14	26		M			
	949.2	60.4	12	14	17	31		M		947.7 Boring Terminated at Elevation 947.7 ft IN HARD MOIST MED. PLASTIC SANDY SILTY CLAY (A-7-5)	61.9

Other Samples:
M-12 (20.4 - 21.9)

NCDOT BORE SINGLE R-2233AB_GEO_BR631_RUTHERFORD.GPJ NC_DOT.GDT 01/20/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 10

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION BRIDGE 631 ON US221 OVER US 74 BYPASS			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 558+75	**OFFSET** 50ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 990.0 ft	**TOTAL DEPTH** 45.9 ft	**NORTHING** 579,672	**EASTING** 1,128,315	**24 HR.** 15.0
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Advancer		**HAMMER TYPE** Automatic
START DATE 11/17/08	**COMP. DATE** 11/17/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										990.0 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT RED-BRN-TAN MED. STIFF DRY SLI. MICA. SANDY SILT (A-5) W/ GRAVEL & ASPHALT 0.0-1.5	
	984.8	5.2	3	4	5	9	SS-7	D		987.0 **RESIDUAL** RED-BRN-TAN STIFF TO V. STIFF DRY TO MOIST SLI. MICA. CLAYEY SANDY SILT (A-5)	3.0
	979.8	10.2	4	8	14	22		D			
	974.8	15.2	5	9	11	20		M			
	969.8	20.2	21	11	16	27	SS-8	W		971.0 **RESIDUAL** GRAY-BRN-TAN-WHITE TO RED-GRAY-BLACK V. STIFF TO HARD WET TO MOIST NON-MICA. TO SLI. MICA. CLAYEY SANDY SILT (A-4)	19.0
	964.8	25.2	8	13	17	30		W			
	959.8	30.2	5	13	21	34	SS-9	M			
	954.8	35.2	7	11	14	25					
	949.8	40.2	12	12	15	27					
	944.8	45.2	57	43/.2		100/.7				944.8 / 944.1 **WEATHERED ROCK** (SEV. WEATH. CRYSTALLINE ROCK) Boring Terminated at Elevation 944.1 ft IN SEV. WEATH. CRYSTALLINE ROCK	45.2 / 45.9

NCDOT BORE SINGLE R-2233AB_GEO_BR631_RUTHERFORD.GPJ NC_DOT.GDT 01/22/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION BRIDGE 631 ON US221 OVER US 74 BYPASS			**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 559+66	**OFFSET** 40ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 990.9 ft	**TOTAL DEPTH** 51.3 ft	**NORTHING** 579,744	**EASTING** 1,128,258	**24 HR.** 13.0
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Advancer		**HAMMER TYPE** Automatic
START DATE 11/18/08	**COMP. DATE** 11/18/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
990.9										GROUND SURFACE	0.0
988.9										**ROADWAY EMBANKMENT** RED-BRN-TAN MED. STIFF DRY SLI. MICA. SANDY SILT (A-5) W/ GRAVEL	2.0
	985.6	5.3	5	7	9	16	SS-10	M		**RESIDUAL** RED-BRN-TAN-BLACK V. STIFF TO HARD MOIST SLI. MICA. SANDY SILT (A-4)	
	980.6	10.3	5	8	9	17		M			
	975.6	15.3	7	7	9	16		M			
	970.6	20.3	6	13	15	28		M			
	965.6	25.3	10	12	14	26		M			
	960.6	30.3	12	13	18	31		M			
	955.6	35.3	7	9	13	22		M			
	950.6	40.3	5	11	14	25		M			
	945.6	45.3	6	11	15	26		M			
	940.6	50.3	27	73/.5		100		M			
940.6										**WEATHERED ROCK** (SEV. WEATH. CRYSTALLINE ROCK)	50.3
939.6										Boring Terminated at Elevation 939.6 ft IN SEV. WEATH. CRYSTALLINE ROCK	51.3

NCDOT BORE SINGLE R-2233AB_GEO_BR631_RUTHERFORD.GPJ NC_DOT.GDT 01/22/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 11

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION BRIDGE 631 ON US221 OVER US 74 BYPASS			**GROUND WTR (ft)**
BORING NO. B3-B	**STATION** 560+33	**OFFSET** 45ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 992.6 ft	**TOTAL DEPTH** 45.6 ft	**NORTHING** 579,804	**EASTING** 1,128,228	**24 HR.** 15.0
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Advancer		**HAMMER TYPE** Automatic
START DATE 11/12/08	**COMP. DATE** 11/12/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
992.6										GROUND SURFACE	0.0
990.6										**ROADWAY EMBANKMENT** RED-BRN-TAN MED. STIFF DRY SLI. MICA. SANDY SILT (A-5) W/ GRAVEL	2.0
	987.3	5.3	3	4	5	9	SS-5	M		**RESIDUAL** RED-BRN-TAN-BLACK STIFF V. STIFF MOIST CLAYEY SANDY SILT (A-5)	
	982.3	10.3	2	4	4	8		M			
	977.3	15.3	5	8	11	19		M			
	972.3	20.3	7	14	14	28		M			
	967.3	25.3	9	19	28	47	SS-6	D			
	962.3	30.3	14	40	60/.2	100/.7		D			
	958.3	34.3	25	53	47/.2	100/.7					
	953.3	39.3	30	47	53/.4	100/.9					
	948.3	44.3	28	29	71/.3	100/.8					
968.6										**RESIDUAL** GRAY & OLIVE-TAN HARD DRY CLAYEY SANDY SILT (A-4)	24.0
961.8										**WEATHERED ROCK** (GRAY & OLIVE-TAN SEV. WEATH. CRYSTALLINE ROCK)	30.8
947.0										Boring Terminated at Elevation 947.0 ft IN SEV. WEATH. CRYSTALLINE ROCK	45.6

NCDOT BORE SINGLE R-2233AB_GEO_BR631_RUTHERFORD.GPJ NC_DOT.GDT 01/22/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

SHEET 12

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION BRIDGE 631 ON US221 OVER US 74 BYPASS			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 561+22	**OFFSET** 38ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 1,017.9 ft	**TOTAL DEPTH** 69.6 ft	**NORTHING** 579,876	**EASTING** 1,128,176	**24 HR.** 31.0
DRILL MACHINE CME-550X	**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
START DATE 11/06/08	**COMP. DATE** 11/07/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
1020										1,017.9 GROUND SURFACE	0.0
1015	1,014.8	3.1								**ROADWAY EMBANKMENT** RED-BRN STIFF MOIST MICA. CLAYEY SANDY SILT (A-4)	
			5	6	8	14	SS-1	M			
1010	1,009.8	8.1									
			4	6	8	14		M			
1005	1,004.8	13.1									
			4	6	6	12		M		1,000.9	17.0
1000	999.8	18.1								**ROADWAY EMBANKMENT** BRN-TAN STIFF MOIST HIGH PLASTIC (PI=43) SANDY SILTY CLAY (A-7-5)	
			4	4	6	10	SS-2	M			
995	994.8	23.1									
			3	3	5	8		M		992.4	25.5
990	989.8	28.1								**RESIDUAL** BRN-TAN-GRAY-WHITE MED. STIFF TO V. STIFF MOIST TO WET SLI. MICA. LOW PLASTIC (PI=12) SILTY SANDY CLAY (A-7-5)	
			1	3	4	7	SS-3	M			
985	984.8	33.1									
			3	3	3	6		M			
980	979.8	38.1									
			2	3	7	10		M			
975	974.8	43.1									
			3	6	6	12		M			
970	969.8	48.1									
			3	5	9	14		W			
965	964.8	53.1									
			5	9	9	18		W		962.9	55.0
960	959.8	58.1								**RESIDUAL** BRN-TAN-GRAY-BLACK V. STIFF MICA. CLAYEY SANDY SILT (A-5)	
			6	10	11	21	SS-4	M			
955	954.8	63.1									
			5	10	10	20		M			
950	949.8	68.1									
			3	6	9	15		M		948.3	69.6
945										Boring Terminated at Elevation 948.3 ft IN V. STIFF MOIST CLAYEY SANDY SILT (A-5)	
940											

NCDOT BORE SINGLE R-2233AB_GEO_BR631_RUTHERFORD.GPJ NC_DOT.GDT 01/20/09

TEST RESULTS

PROJECT: 34400.1.1 (R-2233AB)
COUNTY: RUTHERFORD
SITE DESCRIPTION: BRIDGE NO. 631 ON US 221 OVER US 74 BYPASS

SOIL SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING SIEVES 10	40	200	% MOISTURE	% ORGANIC	UNIT WT. (d)	VOID RATIO
		EB1-B																
SS-11	40.0 RT	557+95	5.40-6.90	A-7-5(5)	9	50	13	26.4	27.0	26.2	20.3	97	79	52	-	-		
MS-12	40.0 RT	557+95	20.40-21.90					0.0	0.0	0.0	0.0		0	0	27.5	-		
SS-12	40.0 RT	557+95	20.40-21.90	A-7-5(13)	20	55	20	17.3	22.2	19.9	40.7	97	87	64	-	-		
SS-13	40.0 RT	557+95	30.40-31.90	A-7-5(10)	12	56	16	18.1	27.8	33.7	20.3	97	86	61	-	-		
		B1-B																
SS-7	50.0 RT	558+75	5.20-6.70	A-5(1)	9	50	7	24.6	43.3	24.0	8.1	100	88	42	-	-		
SS-8	50.0 RT	558+75	20.20-21.70	A-4(1)	27	38	3	16.9	43.5	29.5	10.2	99	90	53	-	-		
SS-9	50.0 RT	558+75	30.20-31.70	A-4(4)	34	39	9	18.7	32.1	35.0	14.2	99	88	59	-	-		
		B2-B																
SS-10	40.0 RT	559+66	5.30-6.80	A-4(0)	16	40	5	29.5	38.8	23.6	8.1	97	81	41	-	-		
		B3-B																
SS-5	45.0 RT	560+33	5.30-6.80	A-5(1)	9	44	9	25.8	37.0	25.0	12.2	93	78	43	-	-		
SS-6	45.0 RT	560+33	25.30-26.80	A-4(0)	47	30	4	17.5	38.0	32.3	12.2	88	79	50	-	-		
		EB2-B																
SS-1	38.0 RT	561+22	3.10-4.60	A-4(2)	14	36	9	24.4	28.7	24.6	22.4	94	80	50	-	-		
SS-2	38.0 RT	561+22	18.10-19.60	A-7-5(39)	10	79	43	11.4	11.8	17.9	58.9	100	93	79	-	-		
SS-3	38.0 RT	561+22	28.10-29.60	A-7-5(5)	7	48	12	25.2	29.7	28.9	16.3	99	81	54	-	-		
SS-4	38.0 RT	561+22	58.10-59.60	A-5(3)	21	41	10	22.4	38.0	23.4	16.3	100	89	49	-	-		

ROCK SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	RQD	UNIT WT	Q(MPa) (MPsi)	E(MPa) (MPsi)

ID: R-2233AB

PROJECT: 34400.1.1

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2233AB	1	23

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34400.1.1		P.E.
		CONST.

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34400.1.1 I.D. NO. R-2233AB

F.A. PROJECT

COUNTY RUTHERFORD

PROJECT DESCRIPTION
US 221 FROM JUST SOUTH OF FLOYD'S CREEK TO JUST NORTH OF US 74

SITE DESCRIPTION
BRIDGE NO. 74 ON US 221 OVER CSX

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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.

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For Letting

INVESTIGATED BY J. HAMM PERSONNEL J. HAMM, T. EVANS

CHECKED BY G. LANG, P.E.

SUBMITTED BY FALCON ENGINEERING

DATE APRIL, 2009

NORTH CAROLINA PROFESSIONAL SEAL 31421 ENGINEER GABRIEL W. LANG SEAL

4-27-09

SIGNATURE

DRAWN BY: J. HAMM, T. EVANS

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PROJECT REFERENCE NO.	SHEET NO.
34400.1.1	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT PLASTIC RANGE (PI) 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
- 25/825 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-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [X] CME-55
- [ ] _____

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

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

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

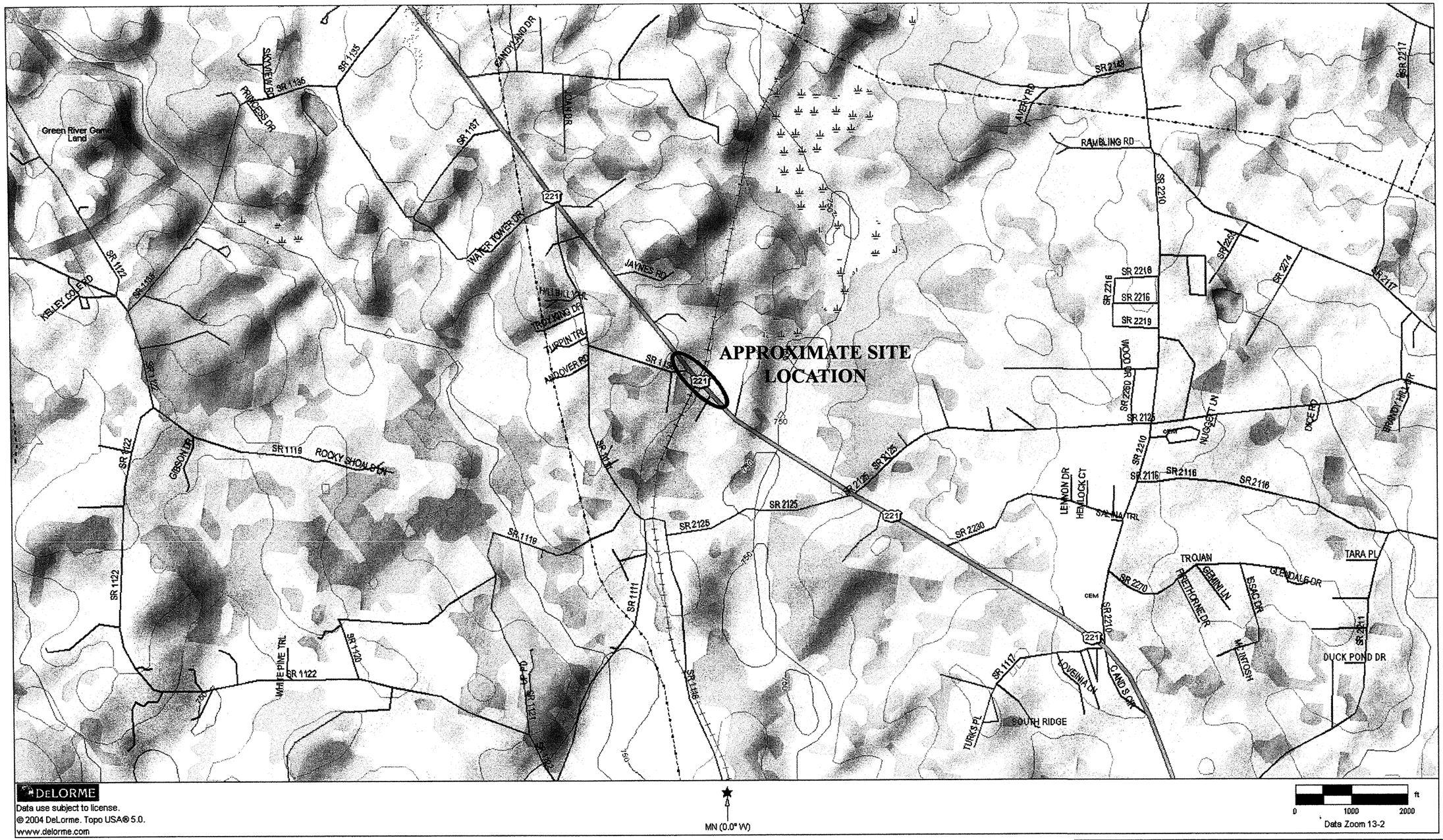
BENCH MARK: BM#1-L- STA. 39+10, 349' LT

ELEVATION: 832.55 FT.

NOTES:

FIAD - BORING FILLED IN AFTER DRILLING

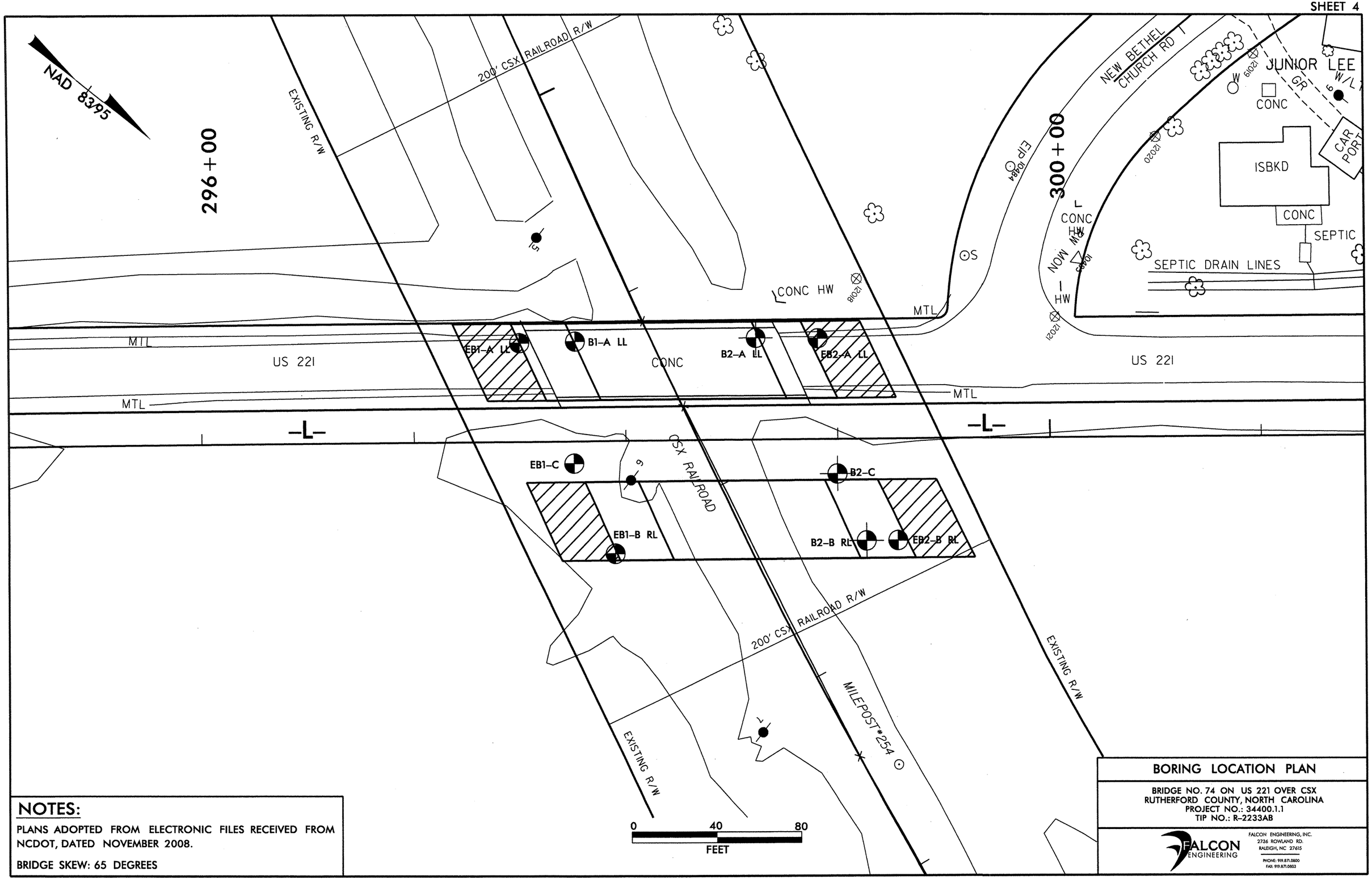
REVISED 02/23/06



SITE VICINITY MAP

BRIDGE NO. 74 ON US 221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
TIP NO: R-2233AB, STATE PROJECT NO: 34400.1.1

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



NOTES:

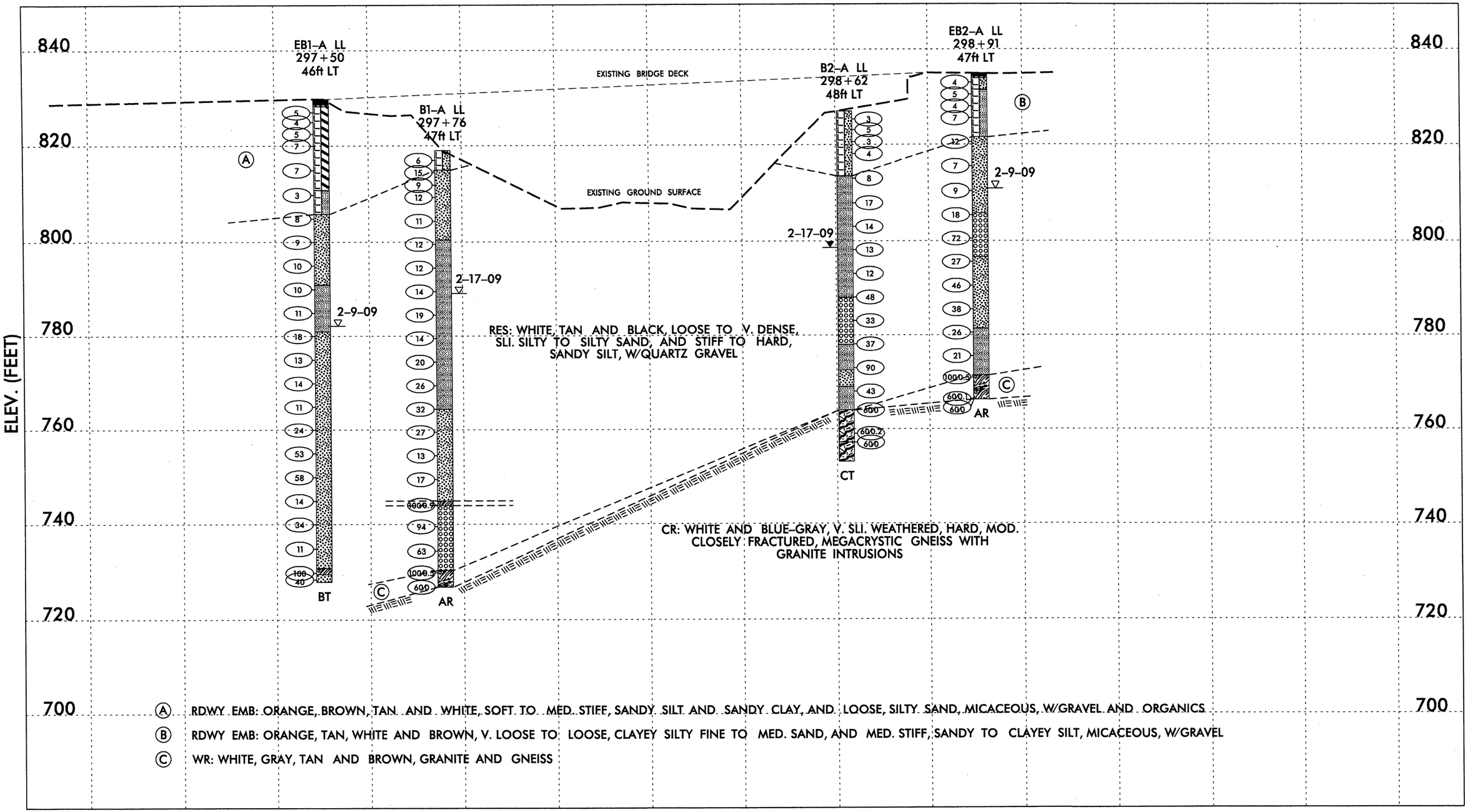
PLANS ADOPTED FROM ELECTRONIC FILES RECEIVED FROM NCDOT, DATED NOVEMBER 2008.

BRIDGE SKEW: 65 DEGREES

BORING LOCATION PLAN

BRIDGE NO. 74 ON US 221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
PROJECT NO.: 34400.1.1
TIP NO.: R-2233AB

FALCON ENGINEERING
FALCON ENGINEERING, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE: 919.871.0800
FAX: 919.871.0803



Ⓐ RDWY EMB: ORANGE, BROWN, TAN AND WHITE, SOFT TO MED. STIFF, SANDY SILT AND SANDY CLAY, AND LOOSE, SILTY SAND, MICACEOUS, W/GRAVEL AND ORGANICS

Ⓑ RDWY EMB: ORANGE, TAN, WHITE AND BROWN, V. LOOSE TO LOOSE, CLAYEY SILTY FINE TO MED. SAND, AND MED. STIFF, SANDY TO CLAYEY SILT, MICACEOUS, W/GRAVEL

Ⓒ WR: WHITE, GRAY, TAN AND BROWN, GRANITE AND GNEISS

NOTES:

- GROUNDLINE ADOPTED FROM SURVEY DATA OBTAINED BY FALCON IN MARCH, 2009
- STRATIGRAPHY IS DRAWN THROUGH BORINGS AND PROJECTED ON TO THE PROFILE
- BRIDGE SKEW: 65 DEGREES

VERTICAL SCALE 0 20 40

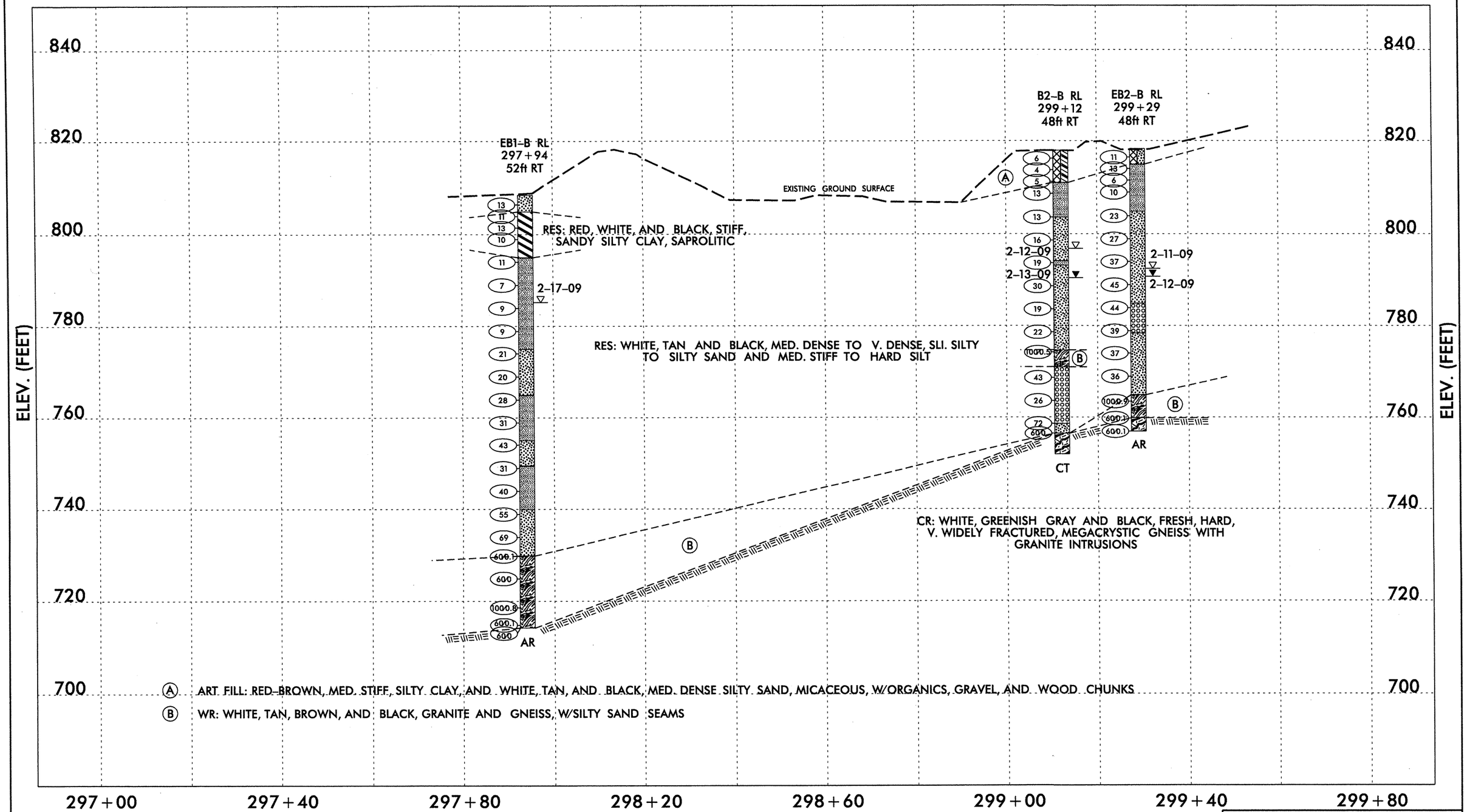
HORIZONTAL SCALE 0 20 40

SUBSURFACE PROFILE 46' LT OF -L-

BRIDGE NO. 74 ON US 221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
PROJECT NO: 34400.1.1
TIP NO: R-2233AB

FALCON ENGINEERING

FALCON ENGINEERING, INC.
3734 ROWLAND RD.
RALEIGH, NC 27610
PHONE: 919.231.2020
FAX: 919.231.2050



NOTES:

- GROUNDLINE ADOPTED FROM SURVEY DATA OBTAINED BY FALCON IN MARCH, 2009
- STRATIGRAPHY IS DRAWN THROUGH BORINGS AND PROJECTED ON TO THE PROFILE
- BRIDGE SKEW: 65 DEGREES

VERTICAL SCALE 0 20 40

HORIZONTAL SCALE 0 20 40

SUBSURFACE PROFILE 49' RT OF -L-

BRIDGE NO. 74 ON US 221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
PROJECT NO: 34400.1.1
TIP NO: R-2233AB

FALCON ENGINEERING

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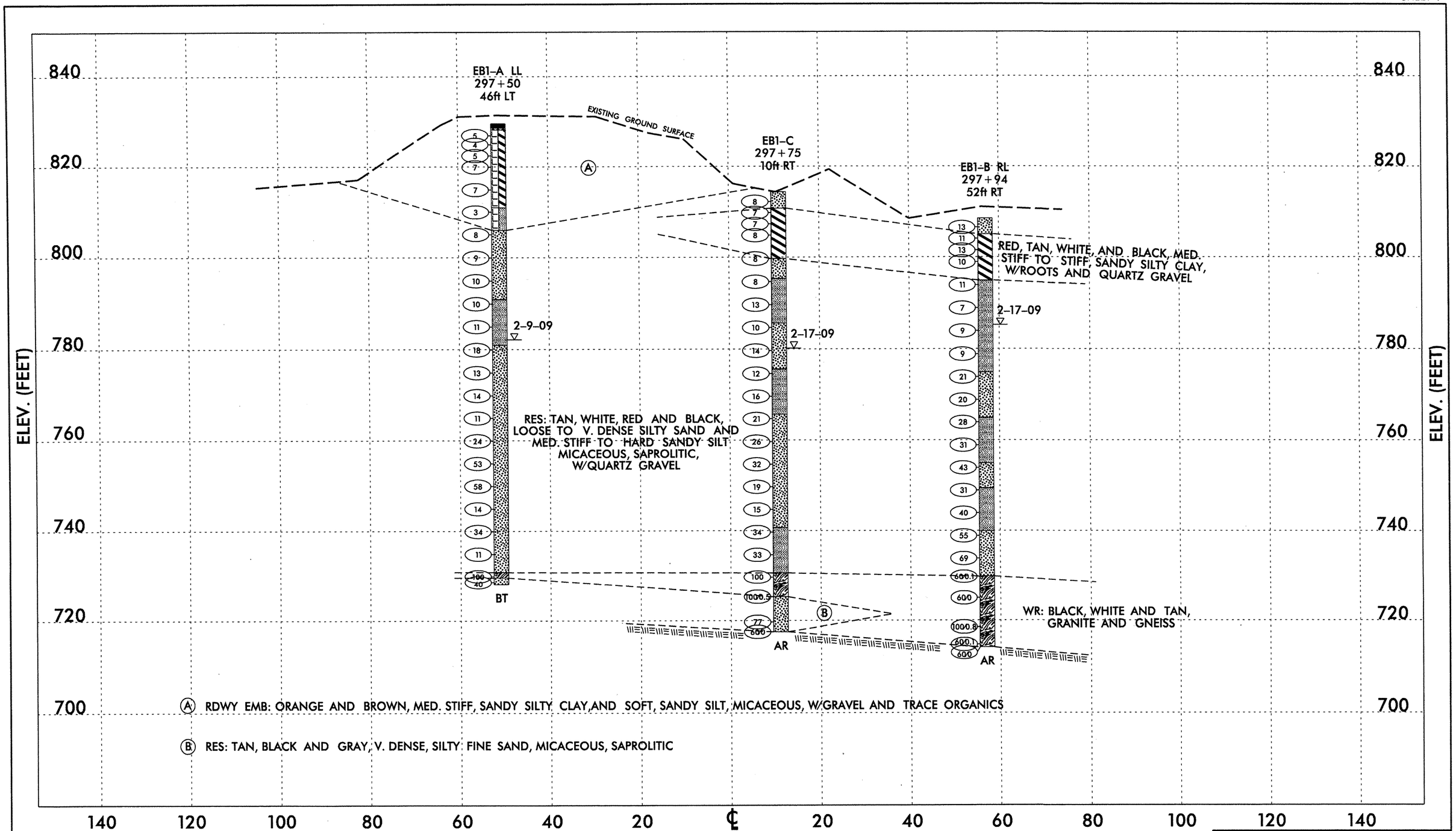
PHONE: 919.772.0800
FAX: 919.772.0805

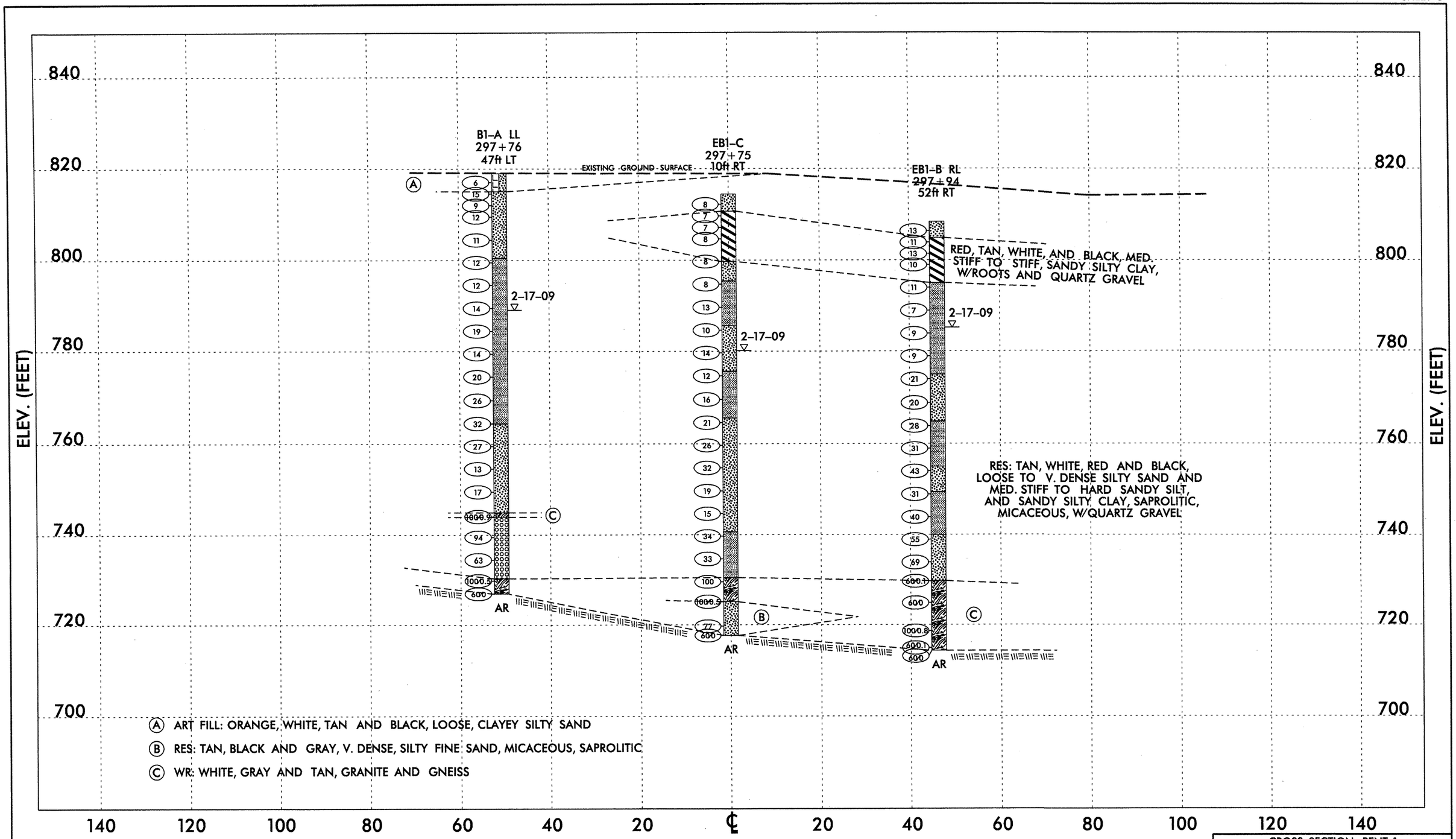


NOTES:
- GROUNDLINE ADOPTED FROM SURVEY DATA OBTAINED BY FALCON IN MARCH, 2009
- STRATIGRAPHY IS DRAWN THROUGH BORINGS AND PROJECTED ON TO THE PROFILE
- BRIDGE SKEW: 65 DEGREES

CROSS SECTION END BENT 1

BRIDGE NO. 74 ON US 221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
PROJECT NO: 34400.1.1
TIP NO: R-2233AB

FALCON ENGINEERING



NOTES:

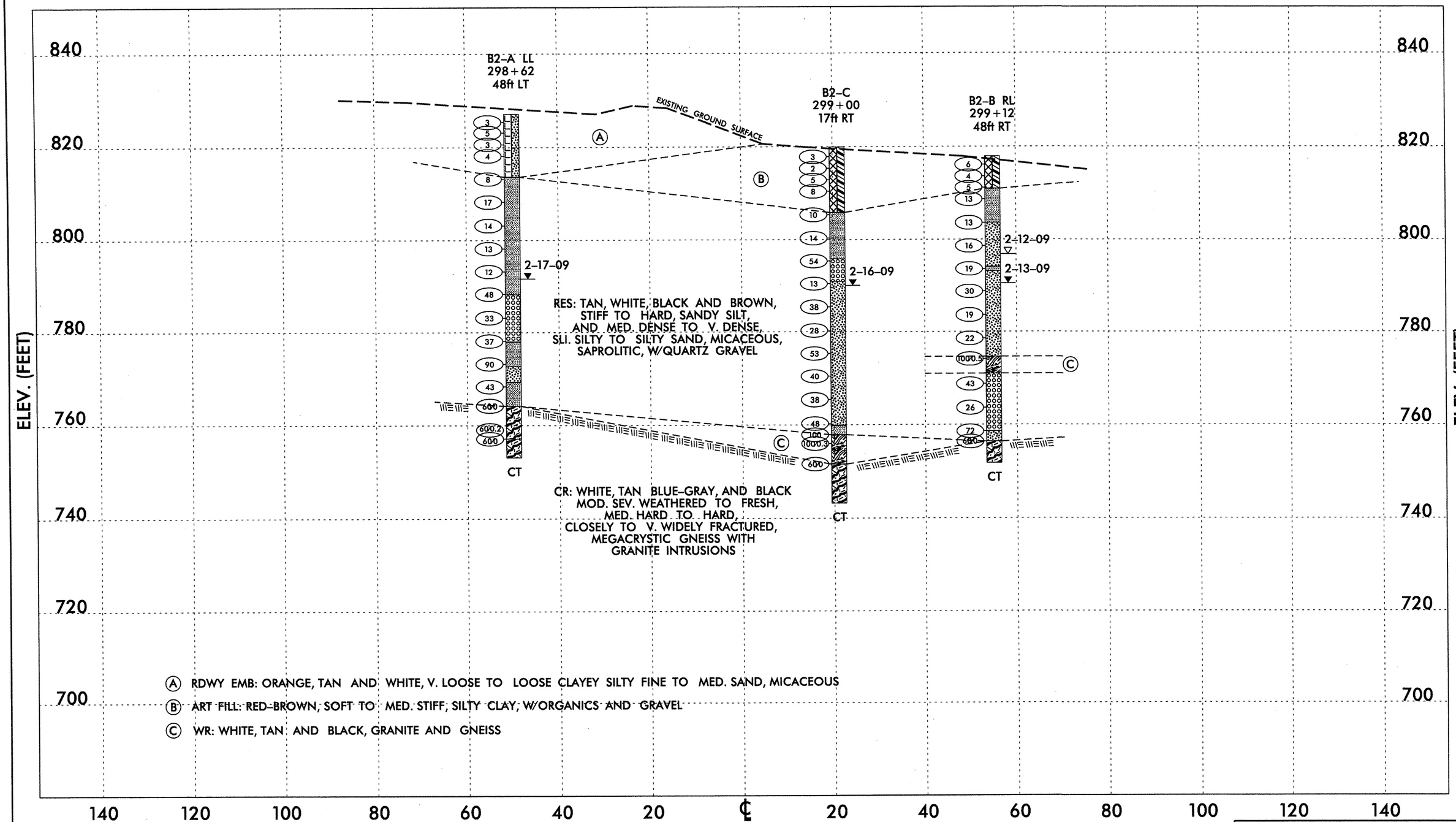
- GROUNDLINE ADOPTED FROM SURVEY DATA OBTAINED BY FALCON IN MARCH, 2009
- STRATIGRAPHY IS DRAWN THROUGH BORINGS AND PROJECTED ON TO THE PROFILE
- BRIDGE SKEW: 65 DEGREES

CROSS SECTION BENT 1

BRIDGE NO. 74 ON US 221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
PROJECT NO: 34400.1.1
TIP NO: R-2233AB

FALCON ENGINEERING

FALCON ENGINEERING, INC.
3736 ROWLAND RD.
RALEIGH, NC 27610
PHONE: 919.872.8800
FAX: 919.872.8810



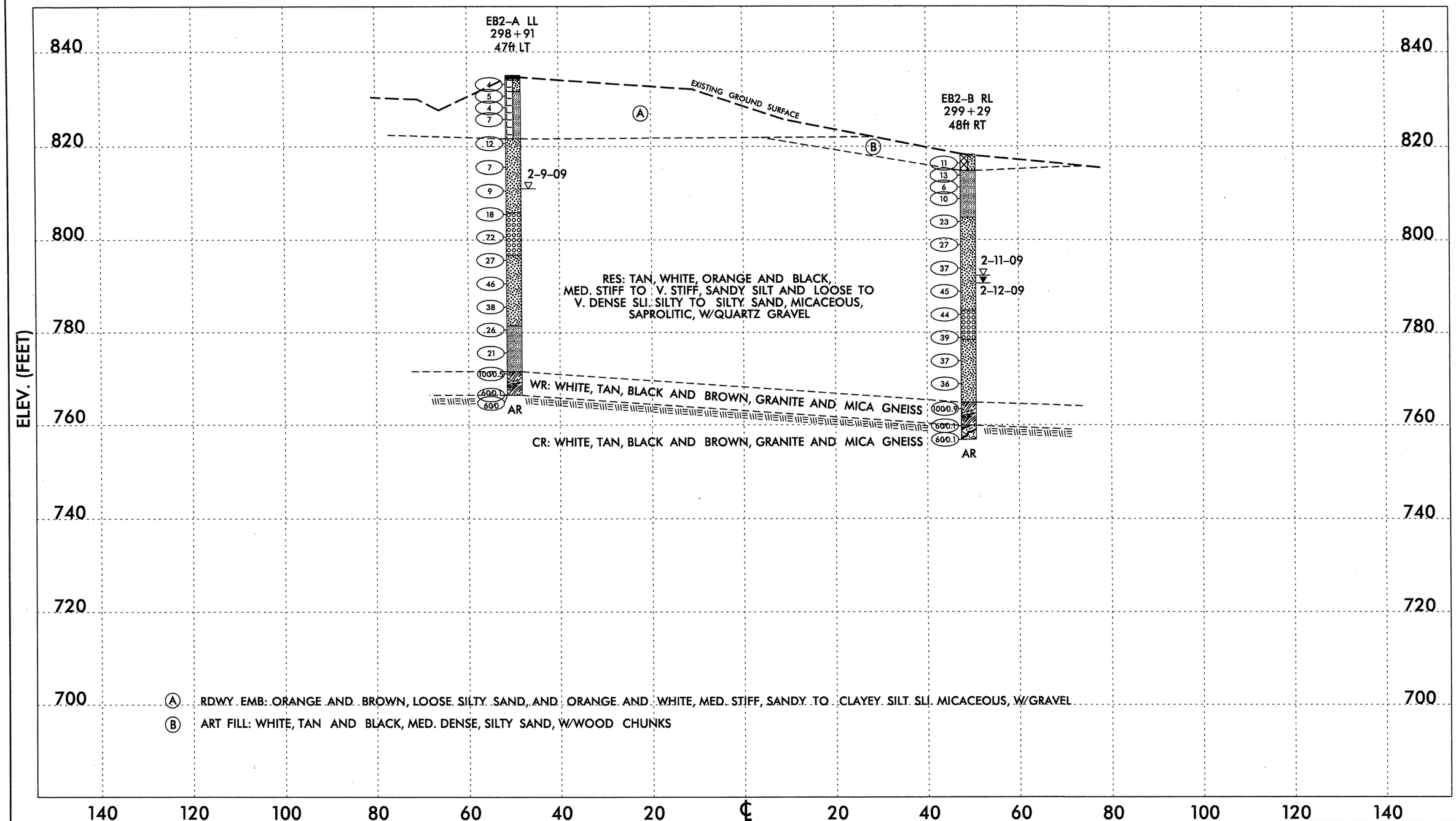
NOTES:
- GROUNDLINE ADOPTED FROM SURVEY DATA OBTAINED BY FALCON IN MARCH, 2009
- STRATIGRAPHY IS DRAWN THROUGH BORINGS AND PROJECTED ON TO THE PROFILE
- BRIDGE SKEW: 65 DEGREES

CROSS SECTION BENT 2

BRIDGE NO. 74 ON US 221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
PROJECT NO: 34400.1.1
TIP NO: R-2233AB

FALCON ENGINEERING

FALCON ENGINEERING, INC.
2726 ROWLAND RD.
RALEIGH, NC 27610
PHONE: 919.217.0800
FAX: 919.217.0810



Ⓐ RDWY EMB: ORANGE AND BROWN, LOOSE SILTY SAND, AND ORANGE AND WHITE, MED. STIFF, SANDY TO CLAYEY SILT SLI. MICACEOUS, W/GRAVEL

Ⓑ ART FILL: WHITE, TAN AND BLACK, MED. DENSE, SILTY SAND, W/WOOD CHUNKS

NOTES:
- GROUNDLINE ADOPTED FROM SURVEY DATA OBTAINED BY FALCON IN MARCH, 2009
- STRATIGRAPHY IS DRAWN THROUGH BORINGS AND PROJECTED ON TO THE PROFILE
- BRIDGE SKEW: 65 DEGREES

CROSS SECTION END BENT 2

BRIDGE NO. 74 ON US 221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
PROJECT NO: 34400.1.1
TIP NO: R-2233AB

FALCON ENGINEERING

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** J. HAMM
SITE DESCRIPTION BRIDGE ON US 221 OVER CSX			**GROUND WTR (ft)**
BORING NO. EB1-A LL	**STATION** 297+50	**OFFSET** 46ft LT	**ALIGNMENT** -L-
COLLAR ELEV. 829.6 ft	**TOTAL DEPTH** 101.6 ft	**NORTHING** 557,944	**EASTING** 1,142,675
DRILL MACHINE CME 550X	**DRILL METHOD** HSA		**HAMMER TYPE** AUTOMATIC
START DATE 02/09/09	**COMP. DATE** 02/09/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

GROUND WTR (ft)	
0 HR.	47.5
24 HR.	FIAD

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
	830									829.6 EXISTING ROADWAY	0.0
	827.9	1.7								828.6 ASPHALT PAVEMENT	1.0
825	825.9	3.7	3	3	2	5		M		828.2 AGGREGATE BASE COURSE	1.4
	823.4	6.2	2	2	2	4		M		**ROADWAY EMBANKMENT** ORANGE, BROWN AND TAN, SOFT TO MED. STIFF, SANDY AND SILTY CLAY (A-7-5/A-7-6), MICACEOUS, W/ GRAVEL AND TRACE ORGANICS	
820	820.9	8.7	2	2	3	5	SS-1	25%			
			3	4	3	7		M			
815	815.9	13.7									
			2	3	4	7	SS-2	24%			
810	810.9	18.7								810.9	18.7
			2	1	2	3		M		**ROADWAY EMBANKMENT** TAN AND BROWN, SOFT, SANDY SILT (A-4) MICACEOUS, TRACE ORGANICS	
805	805.9	23.7								805.9	23.7
			3	3	5	8		M		**RESIDUAL** TAN, WHITE AND BLACK , LOOSE, SILTY FINE SAND (A-2-4) MICACEOUS, SAPROLITIC, W/ QUARTZ GRAVEL AND WHITE SILT VEINS	
800	800.9	28.7									
			3	4	5	9		M			
795	795.9	33.7									
			3	5	5	10		M			
790	790.9	38.7								790.9	38.7
			4	5	5	10		W		**RESIDUAL** TAN AND BLACK, STIFF, FINE SANDY SILT (A-4), MICACEOUS, SAPROLITIC	
785	785.9	43.7									
			4	4	7	11		W			
780	780.9	48.7								780.9	48.7
			5	8	10	18		W		**RESIDUAL** TAN, BLACK, AND WHITE, MED. DENSE TO V. DENSE, SILTY FINE TO COARSE SAND (A-2-4), MICACEOUS, SAPROLITIC, W/ WHITE SILT VEINS AND QUARTZ GRAVEL, HARD LAYERS THROUGHOUT	
775	775.9	53.7									
			4	5	8	13		W			
770	770.9	58.7									
			6	6	8	14		W			
765	765.9	63.7									
			3	3	8	11		W			
760	760.9	68.7									
			5	11	13	24		W			
755	755.9	73.7									
			9	16	37	53		W			
750	750.9	78.7									
			21	30	28	58		W			
745	745.9	83.7									
			6	4	10	14		W			
740	740.9	88.7									
			20	14	20	34		W			
735	735.9	93.7									
			10	6	5	11		W			
730	730.9	98.7								730.9	98.7
	729.5	100.1	34	34	66	100		W		729.5 **WEATHERED ROCK** WHITE, TAN AND BLACK GRANITE	100.1
			34	25	15	40		W		728.0 **RESIDUAL** TAN, BLACK, AND WHITE, DENSE, SILTY FINE TO COARSE SAND (A-2-4), MICACEOUS, SAPROLITIC, W/ WHITE SILT VEINS AND QUARTZ GRAVEL	101.6
725											
720											
715											
710											

Boring Terminated at Elevation 728.0 ft IN RES: SILTY SAND (A-2-4)

NOTE: BORING OFFSET INTO ROAD DUE TO DIFFICULT ACCESS.

NCDOT BORE SINGLE G8037.01 - NCDOT R-2233AB.GPJ NC_DOT.GDT 4/24/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** J. HAMM
SITE DESCRIPTION BRIDGE ON US 221 OVER CSX			**GROUND WTR (ft)**
BORING NO. EB1-B RL	**STATION** 297+94	**OFFSET** 52ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 808.4 ft	**TOTAL DEPTH** 94.2 ft	**NORTHING** 558,039	**EASTING** 1,142,724
DRILL MACHINE CME 550X	**DRILL METHOD** HSA		**HAMMER TYPE** AUTOMATIC
START DATE 02/17/09	**COMP. DATE** 02/17/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 94.2 ft

GROUND WTR (ft)	
0 HR.	23.2
24 HR.	FIAD

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
	810									808.4 GROUND SURFACE	0.0
	807.4	1.0								**RESIDUAL** RED, WHITE AND BLACK, MED. DENSE, SILTY SAND (A-2-4), SAPROLITIC	
805	804.9	3.5	6	6	7	13		M		804.9	3.5
	802.4	6.0	4	6	5	11		M		**RESIDUAL** RED, WHITE AND BLACK, STIFF, SANDY SILTY CLAY (A-7-5), SAPROLITIC	
800	799.9	8.5	4	6	7	13		M			
			3	5	5	10	SS-4	32%			
795	794.9	13.5								794.9	13.5
			3	4	7	11		M		**RESIDUAL** RED, WHITE, BLACK AND TAN, MED. STIFF TO STIFF, COARSE SANDY SILT (A-4), MICACEOUS, SAPROLITIC	
790	789.9	18.5									
			3	3	4	7		M			
785	784.9	23.5									
			3	4	5	9		M			
780	779.9	28.5									
			3	4	5	9		W			
775	774.9	33.5								774.9	33.5
			7	9	12	21		W		**RESIDUAL** TAN, WHITE AND BLACK, MED. DENSE, SILTY FINE SAND (A-2-4), SAPROLITIC	
770	769.9	38.5									
			6	9	11	20		W			
765	764.9	43.5								764.9	43.5
			8	12	16	28		W		**RESIDUAL** TAN AND BLACK, V. STIFF TO HARD, FINE SANDY SILT (A-4), SAPROLITIC	
760	759.9	48.5									
			5	11	20	31		W			
755	754.9	53.5								754.9	53.5
			11	20	23	43		W		**RESIDUAL** TAN AND BLACK, DENSE, SILTY MED. TO COARSE SAND (A-2-4), SAPROLITIC, W/ SILT LAYERS	
750	749.9	58.5								749.4	59.0
			10	11	20	31		W		**RESIDUAL** TAN AND BLACK, HARD, SANDY SILT (A-4), W/ QUARTZ GRAVEL	
745	744.9	63.5									
			9	17	23	40		W			
740	739.9	68.5								739.9	68.5
			17	25	30	55		W		**RESIDUAL** GRAY, TAN AND BLACK, V. DENSE SILTY SAND (A-2-4), SAPROLITIC	
735	734.9	73.5									
			11	26	43	69		W			
730	729.9	78.5								729.9	78.5
			60/0.1			60/0.1		W		**WEATHERED ROCK** BROWN, WHITE AND TAN, GRANITE AND GNEISS, W/ RES. SILTY SAND LAYERS	
725	724.9	83.5									
			60/0			60/0		W			
720	719.9	88.5									
			40	47	53/.3	100/0.8		W			
715	714.9	93.5									
	714.2	94.2	60/0.1			60/0.1		W		714.2	94.2
710			60/0			60/0		W		Boring Terminated BY AUGER REFUSAL at Elevation 714.2 ft ON CR: GRANITE	
705											
700											
695											
690											

NOTE: DUE TO LARGE ROCK FRAGS, WEATHERED ROCK N-VALUES MAY BE HIGHER THAN ACTUAL CONDITIONS.

NCDOT BORE SINGLE G8037.01 - NCDOT R-2233AB.GPJ NC_DOT.GDT 4/24/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** J. HAMM
SITE DESCRIPTION BRIDGE ON US 221 OVER CSX			**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 297+75	**OFFSET** 10ft RT	**ALIGNMENT** -L-	**0 HR.** 34.2
COLLAR ELEV. 814.4 ft	**TOTAL DEPTH** 96.8 ft	**NORTHING** 557,998	**EASTING** 1,142,703	**24 HR.** FIAD
DRILL MACHINE CME 55	**DRILL METHOD** HSA		**HAMMER TYPE** AUTOMATIC
START DATE 02/17/09	**COMP. DATE** 02/17/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 96.8 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
	815									814.4 GROUND SURFACE	0.0
	813.2	1.2								**RESIDUAL** WHITE, TAN AND BLACK, LOOSE, SILTY SAND (A-2-4)	
810	810.7	3.7	3	3	5	8		M		810.7	3.7
	808.2	6.2	3	3	4	7		M		**RESIDUAL** TAN, WHITE AND BLACK, MED. STIFF, SANDY SILTY CLAY (A-7-5), W/ ROOTS AND QUARTZ GRAVEL	
805	805.7	8.7	2	3	4	7	SS-5	37%			
			2	3	5	8		M			
800	800.7	13.7								799.7	14.7
			3	3	5	8		M		**RESIDUAL** TAN AND BLACK, LOOSE, SILTY FINE SAND (A-2-4)	
795	795.7	18.7								795.4	19.0
			3	4	4	8		M		**RESIDUAL** TAN, WHITE AND BLACK, STIFF, FINE SANDY SILT (A-4)	
790	790.7	23.7									
			4	6	7	13		M			
785	785.7	28.7								785.7	28.7
			2	4	6	10		W		**RESIDUAL** TAN, WHITE, GRAY AND BLACK, LOOSE TO MED. DENSE, SILTY SAND (A-2-4), W/ QUARTZ GRAVEL	
780	780.7	33.7									
			4	6	8	14		W			
775	775.7	38.7								775.7	38.7
			3	5	7	12		W		**RESIDUAL** TAN, BLACK AND WHITE, STIFF TO V. STIFF, SANDY SILT (A-4), W/ QUARTZ GRAVEL AND SANDY LAYERS	
770	770.7	43.7									
			4	6	10	16		W			
765	765.7	48.7								765.7	48.7
			5	8	13	21		W		**RESIDUAL** TAN, WHITE, BLACK AND PINK, MED. DENSE TO DENSE, SILTY SAND (A-2-4), MICACEOUS, W/ QUARTZ GRAVEL AND SILT LAYERS AND VEINS	
760	760.7	53.7									
			7	10	16	26		W			
755	755.7	58.7									
			7	13	19	32		W			
750	750.7	63.7									
			4	7	12	19		W			
745	745.7	68.7									
			7	6	9	15		W			
740	740.7	73.7								740.7	73.7
			9	10	24	34		W		**RESIDUAL** TAN, WHITE AND BLACK, HARD, FINE SANDY SILT (A-4), SAPROLITIC, W/ QUARTZ GRAVEL	
735	735.7	78.7									
			6	9	24	33		W			
730	730.7	83.7								730.7	83.7
			19	42	58	100		W		**WEATHERED ROCK** WHITE, TAN, AND BLACK GRANITE	
725	725.7	88.7								725.2	89.2
			60	40/0		100/0.5		W		**RESIDUAL** TAN, BLACK AND GRAY, V. DENSE, SILTY FINE SAND (A-2-4), MICACEOUS, SAPROLITIC	
720	720.7	93.7									
			30	30	47	77		W			
	717.6	96.8								717.6	96.8
715			60/0			60/0				Boring Terminated BY AUGER REFUSAL at Elevation 717.6 ft ON CR: GRANITE	
710											
705											
700											
695											

NCDOT BORE SINGLE G8037.01 - NCDOT R-2233AB.GPJ NC_DOT.GDT 4/24/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** J. HAMM
SITE DESCRIPTION BRIDGE ON US 221 OVER CSX			**GROUND WTR (ft)**
BORING NO. B1-A LL	**STATION** 297+76	**OFFSET** 47ft LT	**ALIGNMENT** -L-	**0 HR.** 29.9
COLLAR ELEV. 819.0 ft	**TOTAL DEPTH** 92.0 ft	**NORTHING** 557,964	**EASTING** 1,142,658	**24 HR.** FIAD
DRILL MACHINE CME 550X	**DRILL METHOD** HSA		**HAMMER TYPE** AUTOMATIC
START DATE 02/16/09	**COMP. DATE** 02/17/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 92.0 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
	820									819.0 GROUND SURFACE	0.0
	818.0	1.0								**ART FILL** ORANGE, WHITE , TAN AND BLACK, CLAYEY SILTY SAND (A-2-4)	
815	815.5	3.5	3	2	4	6		M		815.0	4.0
	813.0	6.0	4	8	7	15		M		**RESIDUAL** TAN, WHITE AND BLACK, LOOSE TO MED. DENSE, SILTY SAND (A-2-4), SLI. MICACEOUS, W/ SILT LAYERS	
810	810.5	8.5	4	4	5	9		M			
			5	6	6	12		M			
805	805.5	13.5									
			3	5	6	11		M			
800	800.5	18.5								800.5	18.5
			5	6	6	12	SS-3	27%		**RESIDUAL** TAN, WHITE AND BLACK, STIFF TO V. STIFF, SANDY SILT (A-4), SLICKENSIDED, SAPROLITIC, W/ SAND SEAMS AND QUARTZ GRAVEL	
795	795.5	23.5									
			4	5	7	12		W			
790	790.5	28.5									
			4	7	7	14		W			
785	785.5	33.5									
			5	7	12	19		W			
780	780.5	38.5									
			5	5	9	14		W			
775	775.5	43.5									
			5	9	11	20		W			
770	770.5	48.5									
			12	12	14	26		W			
765	765.5	53.5								764.5	54.5
			5	11	21	32		W		**RESIDUAL** WHITE, GRAY AND TAN, MED. DENSE TO DENSE, SILTY COARSE SAND AND GRAVEL (A-2-4), MICACEOUS, W/ QUARTZ GRAVEL AND SILT VEINS	
760	760.5	58.5									
			16	13	14	27		W			
755	755.5	63.5									
			7	3	10	13		W			
750	750.5	68.5									
			7	7	10	17		W			
745	745.5	73.5								745.0	74.0
			17	40	60/0.4	100/0.9		W		744.0 **WEATHERED ROCK** WHITE, GRAY AND TAN, GRANITE	75.0
740	740.5	78.5								**RESIDUAL** WHITE AND GRAY, V. DENSE, SLI. SILTY COARSE SAND AND GRAVEL (A-1-b), W/ QUARTZ GRAVEL	
			23	34	60	94		W			
735	735.5	83.5									
			15	23	40	63		W			
730	730.5	88.5								730.5	88.5
			60	40/0		100/0.5		W		**WEATHERED ROCK** WHITE, TAN, AND GRAY, GRANITE	
	727.0	92.0								727.0	92.0
725			60/0			60/0				Boring Terminated BY AUGER REFUSAL at Elevation 727.0 ft ON CR: GRANITE	
720										NOTE: DRILLED THROUGH BRIDGE DECK WITH 4.5" ASPHALT AND 7" CONCRETE	
715											
710											
705											
700											

NCDOT BORE SINGLE G8037.01 - NCDOT R-2233AB.GPJ NC_DOT.GDT 4/24/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** J. HAMM
SITE DESCRIPTION BRIDGE ON US 221 OVER CSX			**GROUND WTR (ft)**
BORING NO. B2-A LL	**STATION** 298+62	**OFFSET** 48ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 827.0 ft	**TOTAL DEPTH** 73.9 ft	**NORTHING** 558,129	**EASTING** 1,142,647	**24 HR.** 35.5
DRILL MACHINE CME 550X	**DRILL METHOD** HSA		**HAMMER TYPE** AUTOMATIC
START DATE 02/10/09	**COMP. DATE** 02/16/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 62.9 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
	830										
	826.3	0.7								827.0 GROUND SURFACE	0.0
825	824.1	2.9	2	1	2	3		M		**ROADWAY EMBANKMENT** ORANGE, TAN AND WHITE, V. LOOSE TO LOOSE, CLAYEY SILTY FINE TO MED. SAND (A-2-4), MICACEOUS	
	821.6	5.4	3	3	2	5		M			
820	819.1	7.9	2	2	1	3		M			
815			2	2	2	4		M			
	814.1	12.9								813.6	13.4
810	809.1	17.9	3	4	4	8		M		**RESIDUAL** TAN, WHITE, BLACK AND BROWN, STIFF TO V. STIFF, FINE TO COARSE SANDY SILT (A-4), SLI. MICACEOUS, SAPROLITIC, W/ SOME SAND LENSES	
805	804.1	22.9	7	8	9	17		M			
800	799.1	27.9	7	7	7	14		M			
795	794.1	32.9	10	6	7	13		M			
790	789.1	37.9	5	6	6	12		W			
							SS-6	W		788.0	39.0
785	784.1	42.9	11	21	27	48		W		**RESIDUAL** WHITE AND GRAY, DENSE, SLI. SILTY SAND AND GRAVEL (A-1-b), MICACEOUS	
780	779.1	47.9	15	16	17	33		W			
										778.0	49.0
775	774.1	52.9	9	13	24	37		W		**RESIDUAL** TAN AND BLACK, HARD, FINE SANDY SILT (A-4), MICACEOUS, SAPROLITIC	
										772.6	54.4
770	769.1	57.9	34	49	41	90		W		**RESIDUAL** WHITE, BROWN AND BLACK, V. DENSE, SILTY COARSE SAND (A-2-4), W/ QUARTZ GRAVEL, SAPROLITIC, SLI. MICACEOUS	
										769.1	57.9
765	764.1	62.9	11	17	26	43		W		**RESIDUAL** TAN, BROWN AND BLACK, HARD, FINE SANDY SILT (A-4), MICACEOUS, SAPROLITIC, W/ WHITE COARSE SAND LENSES	
			60/0			60/0		W			
760	759.1	67.9								764.1	62.9
	757.1	69.9	60/0.2			60/0.2		W		**CRYSTALLINE ROCK** WHITE AND TAN, GRANITE AND GNEISS, W/ RESIDUAL LAYER FROM 65' TO 67.9'	
755			60/0			60/0		W			
										757.1	69.9
750										**CRYSTALLINE ROCK** WHITE AND BLUE-GRAY, V. SLI. WEATHERED, HARD, MOD. CLOSELY FRACTURED, MEGACRYSTIC GNEISS WITH GRANITE INTRUSIONS	
										753.1	73.9
745											
740											
735											
730											
725											
720											
715											
710											

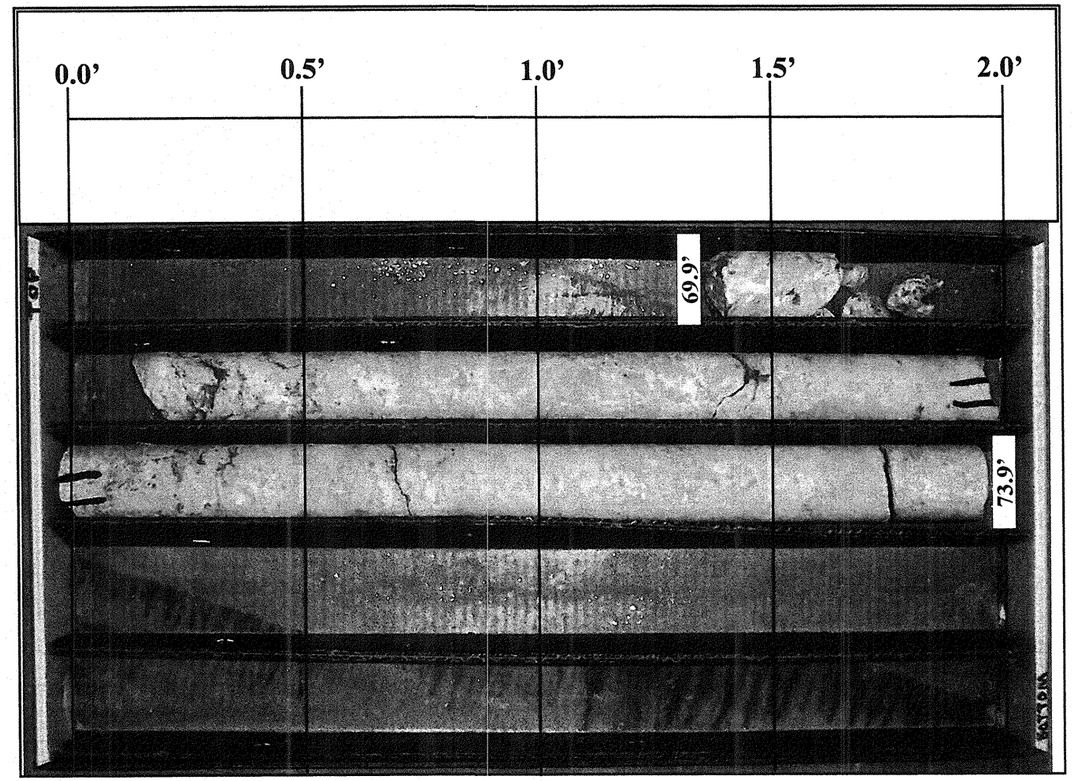
Boring Terminated at Elevation 753.1 ft IN CR: INTERBEDDED GRANITE AND GNEISS

NOTE: INTRODUCED WATER IN AUGERS DURING DRILLING TO PREVENT CAVE-IN AND DID NOT RECORD 0 HR LEVEL. DRILLED THROUGH BRIDGE DECK WITH 4.5" ASPHALT AND 7" CONCRETE.

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** J. HAMM
SITE DESCRIPTION BRIDGE ON US 221 OVER CSX			**GROUND WTR (ft)**
BORING NO. B2-A LL	**STATION** 298+62	**OFFSET** 48ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 827.0 ft	**TOTAL DEPTH** 73.9 ft	**NORTHING** 558,129	**EASTING** 1,142,647	**24 HR.** 35.5
DRILL MACHINE CME 550X	**DRILL METHOD** HSA		**HAMMER TYPE** AUTOMATIC
START DATE 02/10/09	**COMP. DATE** 02/16/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 62.9 ft
CORE SIZE NQ	**TOTAL RUN** 4.0 ft	**DRILLER** B. BOYCE	

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
	757.1										Begin Coring @ 69.9 ft	
755	757.1	69.9	4.0	4:00/1.0 6:30/1.0 6:15/1.0 9:50/1.0	(4.0) 100%	(3.4) 85%		(4.0) 100%	(3.4) 85%		757.1 **CRYSTALLINE ROCK** WHITE AND BLUE-GRAY, V. SLI. WEATHERED, HARD, MOD. CLOSELY FRACTURED, MEGACRYSTIC GNEISS WITH GRANITE INTRUSIONS	69.9
	753.1	73.9									753.1	73.9
750											Boring Terminated at Elevation 753.1 ft IN CR: INTERBEDDED GRANITE AND GNEISS	
745											NOTE: INTRODUCED WATER IN AUGERS DURING DRILLING TO PREVENT CAVE-IN AND DID NOT RECORD 0 HR LEVEL. DRILLED THROUGH BRIDGE DECK WITH 4.5" ASPHALT AND 7" CONCRETE.	
740												
735												
730												
725												
720												
715												
710												
705												
700												
695												
690												
685												
680												
675												
670												
665												
660												
655												
650												
645												
640												



Boring B2-A LL, Box 1 of 1, 69.9 feet to 73.9 feet.

SCALE 1"=4"

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 74 ON US 221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
TIP NO: R-2233AB, STATE PROJECT NO: 34400.1.1

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

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** J. HAMM
SITE DESCRIPTION BRIDGE ON US 221 OVER CSX			**GROUND WTR (ft)**
BORING NO. B2-B RL	**STATION** 299+12	**OFFSET** 48ft RT	**ALIGNMENT** -L-	**0 HR.** 21.1
COLLAR ELEV. 817.4 ft	**TOTAL DEPTH** 66.1 ft	**NORTHING** 558,129	**EASTING** 1,142,647	**24 HR.** 27.5
DRILL MACHINE CME 550X	**DRILL METHOD** HSA		**HAMMER TYPE** AUTOMATIC
START DATE 02/11/09	**COMP. DATE** 02/12/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 61.5 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
	820										
	816.6	0.0								817.4 GROUND SURFACE	0.0
815	814.1	3.3	1	2	4	6		M		**ARTIFICIAL FILL** RED-BROWN, MED. STIFF, SILTY CLAY (A-6), MICACEOUS, W/ ORGANICS AND GRAVEL	
	811.6	5.8	2	2	2	4		M			
810	809.1	8.3	1	3	2	5		M		810.4	7.0
805	804.1	13.3	2	6	7	13		M		**RESIDUAL** TAN, BLACK AND WHITE, STIFF, FINE SANDY SILT (A-4), HIGHLY MICACEOUS, SAPROLITIC, W/ ROOTS	
800	799.1	18.3	3	6	7	13		M		803.1	14.3
795	794.1	23.3	6	8	8	16		M		**RESIDUAL** WHITE, TAN, PINK AND BLACK, MED. DENSE, MED. TO COARSE SILTY SAND (A-2-4), MICACEOUS, SAPROLITIC, W/ SILT VEINS, QUARTZ GRAVEL	
										793.6	23.8
790	789.1	28.3	4	8	11	19		M		792.6 **RESIDUAL** TAN, RED, BLACK, WHITE AND PINK, V. STIFF, FINE SANDY SILT (A-4), MICACEOUS, SAPROLITIC	24.8
785	784.1	33.3	6	9	21	30		M		**RESIDUAL** TAN, BLACK, WHITE AND BROWN, MED. DENSE, SILTY FINE TO COARSE SAND (A-2-4), MICACEOUS, SAPROLITIC, W/ QUARTZ GRAVEL	
780	779.1	38.3	5	9	10	19		M			
775	774.1	43.3	9	12	10	22		W		774.1	43.3
770	769.1	48.3	60	40/0		100/0.5		W		**WEATHERED ROCK** WHITE, TAN AND BLACK, GRANITE	
										770.4	47.0
765	764.1	53.3	20	31	12	43		W		**RESIDUAL** WHITE, GRAY AND TAN, MED. DENSE TO V. DENSE, SLI. SILTY COARSE SAND AND GRAVEL (A-1-b) W/ A-2-4 LAYERS, WR LAYER FROM 57' TO 58.3'	
760	759.1	58.3	16	12	14	26	SS-7				
755	755.9	61.5	26	38	34	72		W		758.1	59.3
			60/0			60/0				755.9 **RESIDUAL** TAN AND BLACK, V. DENSE, SILTY FINE SAND (A-2-4), MICACEOUS, SAPROLITIC	61.5
750										751.3 **CRYSTALLINE ROCK** WHITE, GREENISH GRAY AND BLACK, FRESH, HARD, V. WIDELY FRACTURED, MEGACRYSTIC GNEISS WITH GRANITE INTRUSIONS	66.1
745											
740											
735											
730											
725											
720											
715											
710											
705											
700											

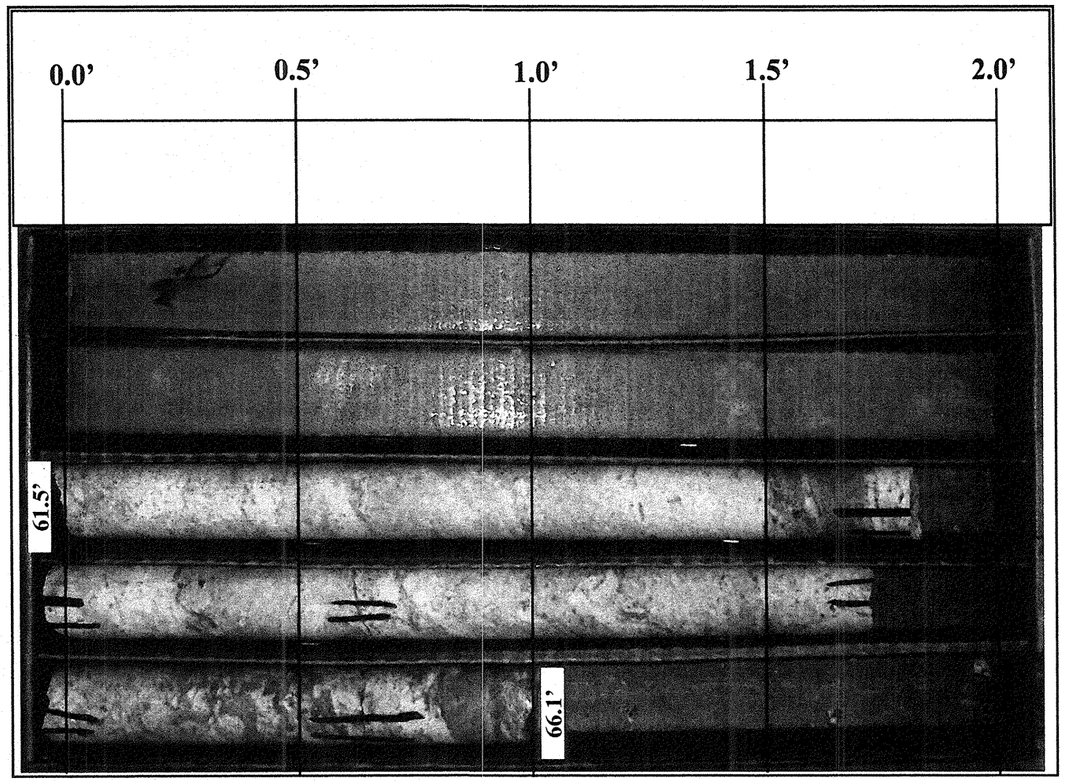
Boring Terminated at Elevation 751.3 ft IN CR: INTERBEDDED GRANITE AND GNEISS

NOTE: BORING OFFSET SLIGHTLY DOWNSTATION DUE TO EXISTING TOPOGRAPHY.

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** J. HAMM
SITE DESCRIPTION BRIDGE ON US 221 OVER CSX			**GROUND WTR (ft)**
BORING NO. B2-B RL	**STATION** 299+12	**OFFSET** 48ft RT	**ALIGNMENT** -L-	**0 HR.** 21.1
COLLAR ELEV. 817.4 ft	**TOTAL DEPTH** 66.1 ft	**NORTHING** 558,129	**EASTING** 1,142,647	**24 HR.** 27.5
DRILL MACHINE CME 550X	**DRILL METHOD** HSA		**HAMMER TYPE** AUTOMATIC
START DATE 02/11/09	**COMP. DATE** 02/12/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 61.5 ft
CORE SIZE NQ	**TOTAL RUN** 4.6 ft	**DRILLER** B. BOYCE	

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
	755.92										Begin Coring @ 61.5 ft	
	755.9	61.5	4.6	5:10/1.0 5:10/1.0 6:45/1.0 11:00/1.0 18:00/0.6	(4.3) 93%	(4.3) 93%		(4.3) 93%	(4.3) 93%		755.9 **CRYSTALLINE ROCK** WHITE, GREENISH GRAY AND BLACK, FRESH, HARD, V. WIDELY FRACTURED, MEGACRYSTIC GNEISS WITH GRANITE INTRUSIONS	61.5
	751.3	66.1									751.3	66.1
750											Boring Terminated at Elevation 751.3 ft IN CR: INTERBEDDED GRANITE AND GNEISS	
745											NOTE: BORING OFFSET SLIGHTLY DOWNSTATION DUE TO EXISTING TOPOGRAPHY.	
740												
735												
730												
725												
720												
715												
710												
705												
700												
695												
690												
685												
680												
675												
670												
665												
660												
655												
650												
645												
640												



Boring B2-B RL, Box 1 of 1, 61.5 feet to 66.1 feet.

SCALE 1"=4"

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 74 ON US 221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
TIP NO: R-2233AB, STATE PROJECT NO: 34400.1.1

FALCON ENGINEERING, INC.
2736 ROWLAND RD.
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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** J. HAMM
SITE DESCRIPTION BRIDGE ON US 221 OVER CSX			**GROUND WTR (ft)**
BORING NO. B2-C	**STATION** 299+00	**OFFSET** 17ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 820.6 ft	**TOTAL DEPTH** 76.6 ft	**NORTHING** 558,099	**EASTING** 1,142,631	**24 HR.** 30.0
DRILL MACHINE CME 550X	**DRILL METHOD** HSA		**HAMMER TYPE** AUTOMATIC
START DATE 02/12/09	**COMP. DATE** 02/13/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 68.3 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
	825										
820	819.5	1.1								820.6 GROUND SURFACE	0.0
	817.0	3.6	2	2	1	3		M		**ARTIFICIAL FILL** RED-BROWN, SOFT TO MED. STIFF, SILTY CLAY (A-6), TRACE ORGANICS AND GRAVEL	
815	814.5	6.1	WOH	1	1	2	SS-8	25%			
	812.0	8.6	34	3	2	5		M			
810			2	3	5	8		M			
	807.0	13.6								806.5	14.1
805			4	4	6	10		M		**RESIDUAL** TAN, WHITE, BROWN, PINK AND BLACK, STIFF, SANDY SILT (A-4), SAPROLITIC, SLI. MICACEOUS, W/ QUARTZ GRAVEL	
	802.0	18.6									
800			6	6	8	14		M			
	797.0	23.6								796.5	24.1
795			57	35	19	54		M		**RESIDUAL** WHITE AND GREENISH GRAY, V. DENSE, COARSE SAND AND GRAVEL (A-1-b)	
	792.0	28.6								791.5	29.1
790			12	6	7	13		M		**RESIDUAL** TAN AND BLACK, MED. DENSE TO V. DENSE, SILTY FINE SAND (A-2-4) SAPROLITIC, SLI. MICACEOUS, W/ QUARTZ GRAVEL	
	787.0	33.6									
785			15	22	16	38		M			
	782.0	38.6									
780			10	14	14	28		M			
	777.0	43.6									
775			13	19	34	53		W			
	772.0	48.6									
770			8	17	23	40	SS-9				
	767.0	53.6									
765			7	14	24	38		M			
	762.0	58.6									
760			10	15	33	48		M		760.6	60.0
	757.0	63.6						W		758.6 **RESIDUAL** WHITE, TAN AND BLACK, HARD, SANDY SILT (A-4) HIGHLY MICACEOUS, SAPROLITIC	62.0
755			100/0.3			100/0.3		W			
	752.3	68.3								752.3 **WEATHERED ROCK** BLACK, WHITE AND TAN, MICA GNEISS	68.3
750			60				RS-1	W		**CRYSTALLINE ROCK** TAN, WHITE AND BLUE-GRAY, MOD. SEVERELY WEATHERED TO FRESH, HARD TO MEDIUM HARD, CLOSELY TO MOD. CLOSELY FRACTURED, MEGACRYSTIC GNEISS WITH GRANITE INTRUSIONS	
745										744.0	76.6
740										Boring Terminated at Elevation 744.0 ft IN CR: INTERBEDDED GRANITE AND GNEISS	
735										NOTE: INTRODUCED WATER IN AUGERS DURING DRILLING TO PREVENT CAVE-IN AND DID NOT RECORD 0 HR LEVEL. BORING OFFSET SLIGHTLY DOWNSTATION AND TO THE RIGHT DUE TO EXISTING TOPOGRAPHY.	
730											
725											
720											
715											
710											
705											

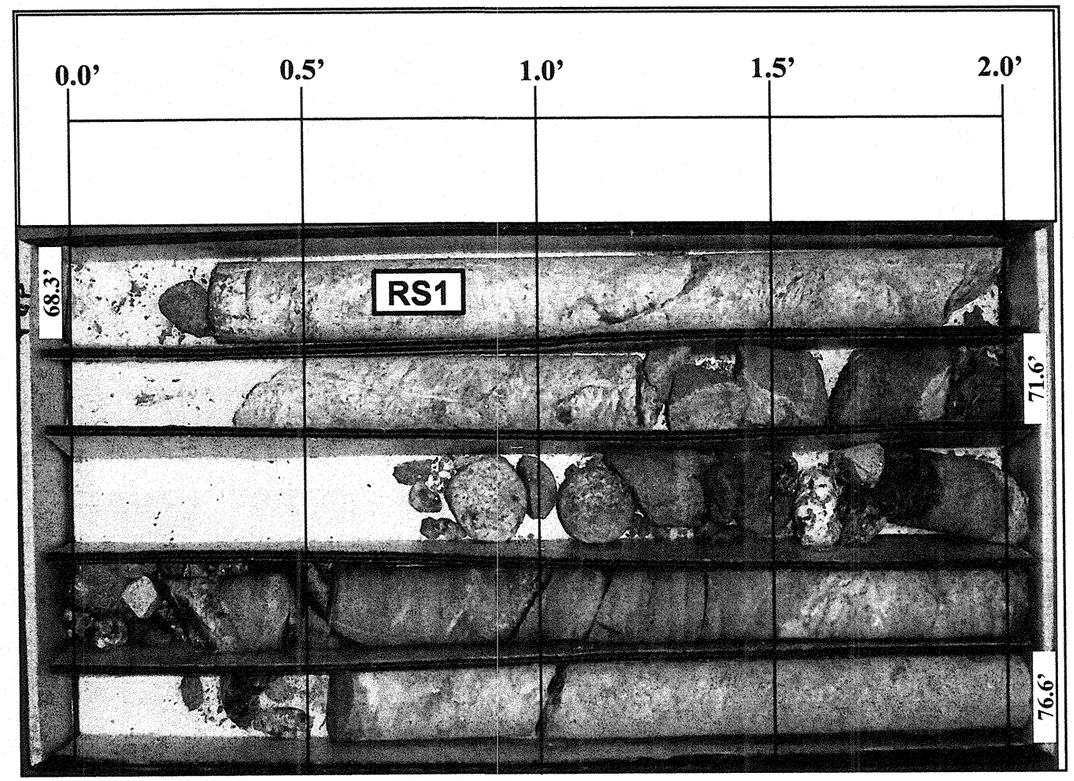
NCDOT BORE SINGLE G8037.01 - NCDOT R-2233AB.GPJ NC_DOT.GDT 4/24/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** J. HAMM
SITE DESCRIPTION BRIDGE ON US 221 OVER CSX			**GROUND WTR (ft)**
BORING NO. B2-C	**STATION** 299+00	**OFFSET** 17ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 820.6 ft	**TOTAL DEPTH** 76.6 ft	**NORTHING** 558,099	**EASTING** 1,142,631	**24 HR.** 30.0
DRILL MACHINE CME 550X	**DRILL METHOD** HSA		**HAMMER TYPE** AUTOMATIC
START DATE 02/12/09	**COMP. DATE** 02/13/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 68.3 ft
CORE SIZE NQ	**TOTAL RUN** 8.3 ft	**DRILLER** B. BOYCE	

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
	752.29										Begin Coring @ 68.3 ft	
750	752.3	68.3	3.3	4:45/1.0 5:30/1.0 3:15/1.0 3:20/0.3	(3.1) 94%	(2.3) 70%	RS-1	(7.2) 87%	(4.9) 59%		752.3 **CRYSTALLINE ROCK** TAN, WHITE AND BLUE-GRAY, MOD. SEVERELY WEATHERED TO FRESH, HARD TO MEDIUM HARD, CLOSELY TO MOD. CLOSELY FRACTURED, MEGACRYSTIC GNEISS WITH GRANITE INTRUSIONS	68.3
	749.0	71.6	5.0	2:15/1.0 2:05/1.0 2:25/1.0 4:15/1.0 6:25/1.0	(4.1) 82%	(2.6) 52%						
745	744.0	76.6									744.0	76.6
740											Boring Terminated at Elevation 744.0 ft IN CR: INTERBEDDED GRANITE AND GNEISS	
735											NOTE: INTRODUCED WATER IN AUGERS DURING DRILLING TO PREVENT CAVE-IN AND DID NOT RECORD 0 HR LEVEL. BORING OFFSET SLIGHTLY DOWNSTATION AND TO THE RIGHT DUE TO EXISTING TOPOGRAPHY.	
730												
725												
720												
715												
710												
705												
700												
695												
690												
685												
680												
675												
670												
665												
660												
655												
650												
645												
640												
635												

NCDOT CORE SINGLE G8037.01 - NCDOT R-2233AB.GPJ NC_DOT.GDT 4/24/09



Boring B2-C, Box 1 of 1, 68.3 feet to 76.6 feet.

SCALE 1"=4"

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 74 ON US 221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
TIP NO: R-2233AB, STATE PROJECT NO: 34400.1.1

FALCON ENGINEERING

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** J. HAMM
SITE DESCRIPTION BRIDGE ON US 221 OVER CSX			**GROUND WTR (ft)**
BORING NO. EB2-A LL	**STATION** 298+91	**OFFSET** 47ft LT	**ALIGNMENT** -L-	**0 HR.** 23.9
COLLAR ELEV. 835.0 ft	**TOTAL DEPTH** 68.6 ft	**NORTHING** 558,054	**EASTING** 1,142,586	**24 HR.** FIAD
DRILL MACHINE CME 550X	**DRILL METHOD** HSA		**HAMMER TYPE** AUTOMATIC
START DATE 02/09/09	**COMP. DATE** 02/09/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 68.6 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
	840										
835	834.1	0.9								835.0 / 834.3 EXISTING ROADWAY	0.0 / 0.7
	831.6	3.4	2	2	2	4		M		ASPHALT PAVEMENT 834.0	1.0
830	829.1	5.9	2	3	2	5		M		AGGREGATE BASE COURSE 831.6	3.4
	826.6	8.4	3	2	2	4	SS-10	22%		**ROADWAY EMBANKMENT** ORANGE AND BROWN, LOOSE, SILTY SAND (A-2-4), W/ GRAVEL	
825			3	3	4	7		M		**ROADWAY EMBANKMENT** ORANGE AND WHITE, MED. STIFF, SANDY TO CLAYEY SILT (A-4), SLI. MICACEOUS 821.6	13.4
	821.6	13.4									
820			5	6	6	12		M		**RESIDUAL** ORANGE AND BLACK, LOOSE TO MED. DENSE, SILTY FINE SAND (A-2-4), MICACEOUS, W/ QUARTZ GRAVEL	
	816.6	18.4									
815			3	3	4	7		M			
	811.6	23.4									
810			4	4	5	9		M			
	806.6	28.4								806.0	29.0
805			7	8	10	18		M		**RESIDUAL** WHITE, TAN AND BLACK, V. DENSE, SLI. SILTY MED. TO COARSE SAND (A-1-b), SAPROLITIC, W/ QUARTZ GRAVEL	
	801.6	33.4									
800			11	20	52	72	SS-11				
	796.6	38.4								796.6	38.4
795			15	13	14	27		M		**RESIDUAL** WHITE, TAN AND BLACK, MED. DENSE TO DENSE, SILTY SAND (A-2-4), MICACEOUS, SAPROLITIC, W/ QUARTZ GRAVEL AND LENSES OF ORANGE TO BROWN SANDY SILT	
	791.6	43.4									
790			9	16	30	46		W			
	786.6	48.4									
785			7	15	23	38		W			
	781.6	53.4								781.5	53.5
780			7	10	16	26		W		**RESIDUAL** ORANGE AND BLACK, V. STIFF, FINE SANDY SILT (A-4), MICACEOUS, SAPROLITIC, W/ QUARTZ GRAVEL	
	776.6	58.4									
775			9	10	11	21		W			
	771.6	63.4								771.6	63.4
770			60	40/0		100		W		**WEATHERED ROCK** WHITE, TAN AND BLACK, GRANITE	
	766.6	68.4									
765	766.5	68.5	60/0.1			60/0.1		W		766.4	68.6
			60/0			60/0		W		Boring Terminated BY AUGER REFUSAL at Elevation 766.4 ft ON CR: GRANITE	
760										NOTE: OFFSET BORING INTO ROAD DUE TO DIFFICULT ACCESS.	
755											
750											
745											
740											
735											
730											
725											
720											

NCDOT BORE SINGLE G8037.01 - NCDOT R-2233AB.GPJ NC_DOT.GDT 4/24/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** J. HAMM
SITE DESCRIPTION BRIDGE ON US 221 OVER CSX			**GROUND WTR (ft)**
BORING NO. EB2-B RL	**STATION** 299+29	**OFFSET** 48ft RT	**ALIGNMENT** -L-	**0 HR.** 25.9
COLLAR ELEV. 818.3 ft	**TOTAL DEPTH** 61.4 ft	**NORTHING** 558,141	**EASTING** 1,142,637	**24 HR.** 27.6
DRILL MACHINE CME 550X	**DRILL METHOD** HSA		**HAMMER TYPE** AUTOMATIC
START DATE 02/11/09	**COMP. DATE** 02/11/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 61.4 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
	820										
	817.4	0.9								818.3 GROUND SURFACE	0.0
815	814.9	3.4	4	6	5	11		M		**ARTIFICIAL FILL** WHITE, TAN AND BLACK, MED. DENSE, SILTY SAND (A-2-4), W/ WOOD CHUNKS 814.9	3.4
	812.4	5.9	4	6	7	13		M		**RESIDUAL** TAN, WHITE AND BLACK, MED. STIFF TO STIFF, FINE TO COARSE SANDY SILT (A-4), SLI. MICACEOUS, SAPROLITIC, W/ QUARTZ GRAVEL	
810	809.9	8.4	3	3	3	6		M			
			3	5	5	10	SS-12	19%			
805	804.9	13.4								804.9	13.4
			8	11	12	23		M		**RESIDUAL** TAN, WHITE AND BLACK, MED. DENSE TO DENSE, FINE TO COARSE, SILTY SAND (A-2-4), SLI. MICACEOUS, SAPROLITIC, W/ QUARTZ GRAVEL, SILT LAYER FROM 20' TO 23'	
800	799.9	18.4									
			15	14	13	27		M			
795	794.9	23.4									
			38	21	16	37		M			
790	789.9	28.4									
			9	21	24	45		M			
785	784.9	33.4								784.9	33.4
			22	15	29	44		W		**RESIDUAL** WHITE, BROWN AND BLACK, DENSE, SLI. SILTY COARSE SAND TO GRAVEL (A-1-b), MICACEOUS, SAPROLITIC, W/ QUARTZ GRAVEL 778.4	39.9
780	779.9	38.4									
			12	12	27	39		W			
775	774.9	43.4									
			8	16	21	37		M		**RESIDUAL** TAN AND BLACK, DENSE, SILTY FINE SAND (A-2-4), MICACEOUS, SAPROLITIC	
770	769.9	48.4									
			5	14	22	36	SS-13				
765	764.9	53.4								764.9	53.4
			29	28	72/0.4	100/0.9		W		**WEATHERED ROCK** WHITE, TAN AND BROWN, GRANITE AND MICA GNEISS 759.9	58.4
760	759.9	58.4									
	757.0	61.3	60/0.1			60/0.1		W		**CRYSTALLINE ROCK** WHITE, TAN AND BROWN, GRANITE AND MICA GNEISS 756.9	61.4
755			60/0.1			60/0.1		W		Boring Terminated BY AUGER REFUSAL at Elevation 756.9 ft ON CR: MICA GNEISS	
750											
745											
740											
735											
730											
725											
720											
715											
710											
705											
700											

NCDOT BORE SINGLE G8037.01 - NCDOT R-2233AB.GPJ NC_DOT.GDT 4/24/09

FALCON 2736 ROWLAND ROAD, RALEIGH, NORTH CAROLINA 27615

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

BRIDGE NO. 74 ON US 221 OVER CSX

NCDOT Project No: 34400.1.1 - T.I.P. No: R-2233AB

RUTHERFORD COUNTY

FALCON ENGINEERING, INC. PROJECT NO: G8037.01

BORING #		SAMPLE #	TOTAL SAMPLE			MINUS 2.00 mm FRACTION				Atterberg Limits		MC
AASHTO Classification			PERCENT PASSING			PERCENT RETAINED						
STATION #	OFFSET (FEET)	DEPTH (FEET)	#10	#40	#200	Coarse Sand	Fine Sand	SILT	CLAY	LL	PI	%
EB1-A LL		SS-1	98	81	58	17	15	-	-	51	21	25.0
A-7-5												
297+50	46 LT	6.2-7.7										
EB1-A LL		SS-2	97	78	53	19	17	-	-	49	21	23.9
A-7-6												
297+50	46 LT	13.7-15.2										
B1-A LL		SS-3	100	88	40	11	35	-	-	32	NP	27.2
A-4												
297+76	47 LT	18.5-20.0										
B1-B RL		SS-4	96	71	49	25	13	-	-	48	13	32.4
A-7-5												
297+94	52 RT	8.5-10.0										
EB1-C		SS-5	100	89	60	11	17	-	-	45	11	37.1
A-7-5												
297+75	10 RT	6.2-7.7										
B2-A LL		SS-6	77	39	20	25	12	-	-	25	NP	-
A-1-b												
298+62	48 LT	37.9-39.4										
B2-B RL		SS-7	70	36	18	34	13	-	-	21	NP	-
A-1-b												
299+15	48 RT	53.3-54.8										
B2-C		SS-8	86	69	38	26	23	-	-	35	15	25.1
A-6												
299+00	17 RT	3.6-5.1										
B2-C		SS-9	100	86	34	14	36	-	-	29	NP	-
A-2-4												
299+00	17 RT	48.6-50.1										
EB2-A LL		SS-10	94	76	45	18	21	-	-	34	6	22.3
A-4												
298+91	47 LT	5.9-7.4										
EB2-A LL		SS-11	81	48	22	33	16	-	-	-	NP	-
A-1-b												
298+91	47 LT	33.4-34.9										
EB2-B RL		SS-12	89	64	39	25	13	-	-	40	NP	18.7
A-4												
299+29	48 RT	8.4-9.9										
EB2-B RL		SS-13	99	85	29	14	37	-	-	30	NP	-
A-2-4												
299+29	48 RT	48.4-49.9										

SIGNATURE

NCDOT NO. 105-03-0803

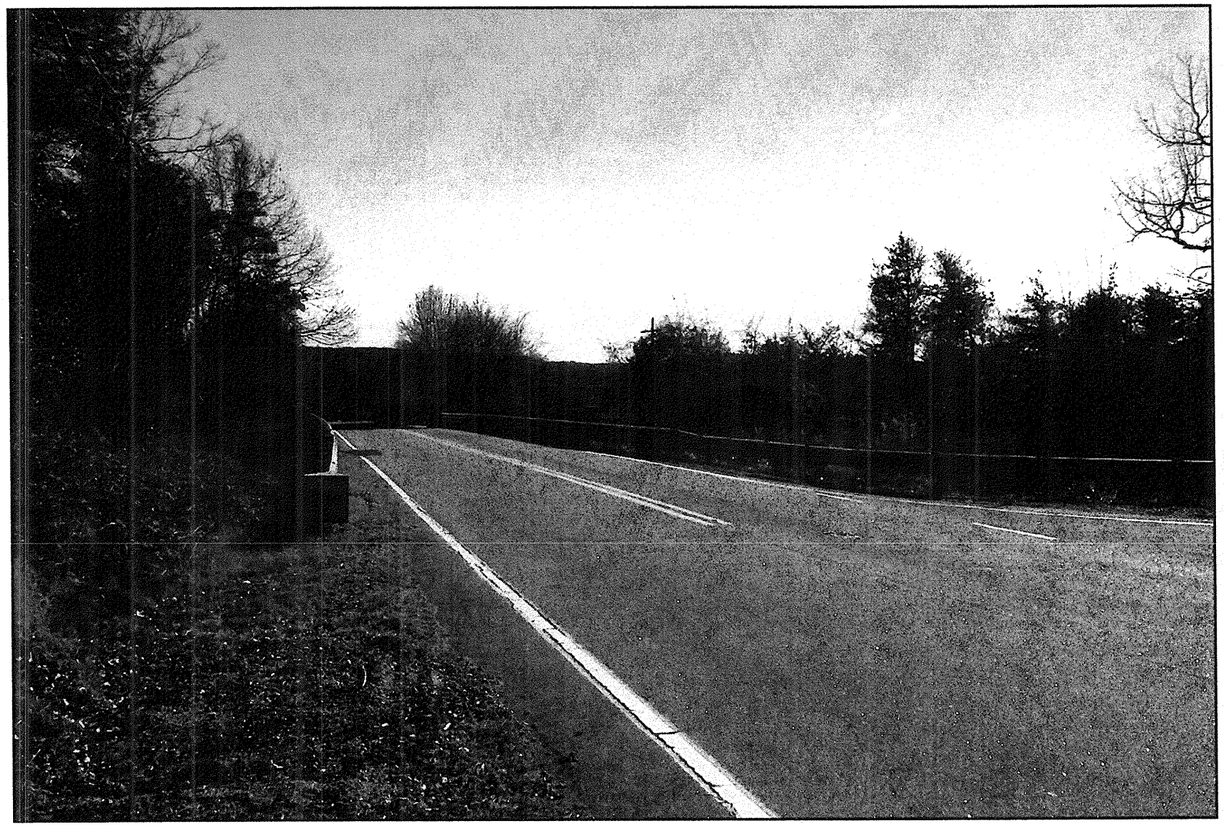
LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

PROJECT NO.: 34400.1.1 (R-2233AB)
F.A. NO.:
COUNTY: RUTHERFORD
BRIDGE NO. 74 ON US 221 OVER CSX

Sample #	Boring #	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (ft)	Diameter (ft)	Unit Weight (PCF)	Unconfined Compressive Strength (PSI)	Young's Modulus (PSI)	Splitting Tensile Strength (PSI)	Remarks
RS-1	B2-C	68.3-70	GRANITE	OCg	70.0%	0.31	0.16	153.9	4,128	755,457	-	

SIGNATURE

NCDOT NO. 105-03-0803



OVERVIEW OF EXISTING BRIDGE. LOOKING SOUTH (UPSTATION) FROM NEAR INTERSECTION OF US 221 AND NEW BETHEL CHURCH RD.

END BENT 1 AND BENT 1, LOOKING WEST TOWARD EXISTING BRIDGE FROM SOUTH SIDE OF CSX TRACKS.

SITE PHOTOGRAPHS

BRIDGE NO. 74 ON US221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
TIP NO: R-2233AB, STATE PROJECT NO: 34400.1.1

FALCON ENGINEERING

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

LOOKING EAST ALONG CSX TRACKS FROM EXISTING BRIDGE.

LOOKING WEST ALONG CSX TRACKS FROM EXISTING BRIDGE.

SITE PHOTOGRAPHS

BRIDGE NO. 74 ON US221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
TIP NO: R-2233AB, STATE PROJECT NO: 34400.1.1

FALCON ENGINEERING

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

BENT 2, LOOKING WEST AT EXISTING BRIDGE FROM NORTH SIDE OF CSX TRACKS.

END BENT 2, LOOKING EAST FROM SHOULDER OF EXISTING US 221.

SITE PHOTOGRAPHS

BRIDGE NO. 74 ON US221 OVER CSX
RUTHERFORD COUNTY, NORTH CAROLINA
TIP NO: R-2233AB, STATE PROJECT NO: 34400.1.1

FALCON ENGINEERING, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34400.1.1 (R-2233AB)	1	

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34400.1.1 (R-2233AB) F.A. PROJ. NHF-221(9)

COUNTY RUTHERFORD

PROJECT DESCRIPTION US 221 FROM SOUTH OF FLOYD'S CREEK TO NORTH OF US 74 BYPASS

SITE DESCRIPTION BRIDGE 055 ON US 221 (STA. 280+13.00 -L-) (SBL & NBL) OVER FLOYD'S CREEK

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
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4	PROFILE(S)
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9-20	BORE LOG & CORE REPORT(S)
21	SOIL TEST RESULTS
22	SCOUR REPORT
23-31	CORE 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

R.W. TODD

M.L. SMITH

A.C. SMITH

INVESTIGATED BY J.P. ROGERS

CHECKED BY J.P. PILIPCHUCK

SUBMITTED BY J.P. PILIPCHUCK

DATE MARCH 2009

NORTH CAROLINA LICENSED SEAL 1360 GEOLOGIST JOHN L. PILIPCHUK

PROJECT: 34400.1.1

ID: R-2233AB

DRAWN BY: J.K. McCLURE

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.
34400.1.1 (R-2233B)	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

BOULDER (BLDR.)	COBBLE (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
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
- 25/825 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-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [X] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [X] TRICONE 2 15/16" TUNG.-CARB.
- [X] CORE BIT
- [ ] _____

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

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: BL-64 PINC 22+28.88
-L- STA. 280+68.48
51.82 LT. ELEVATION: 757.96 FT.

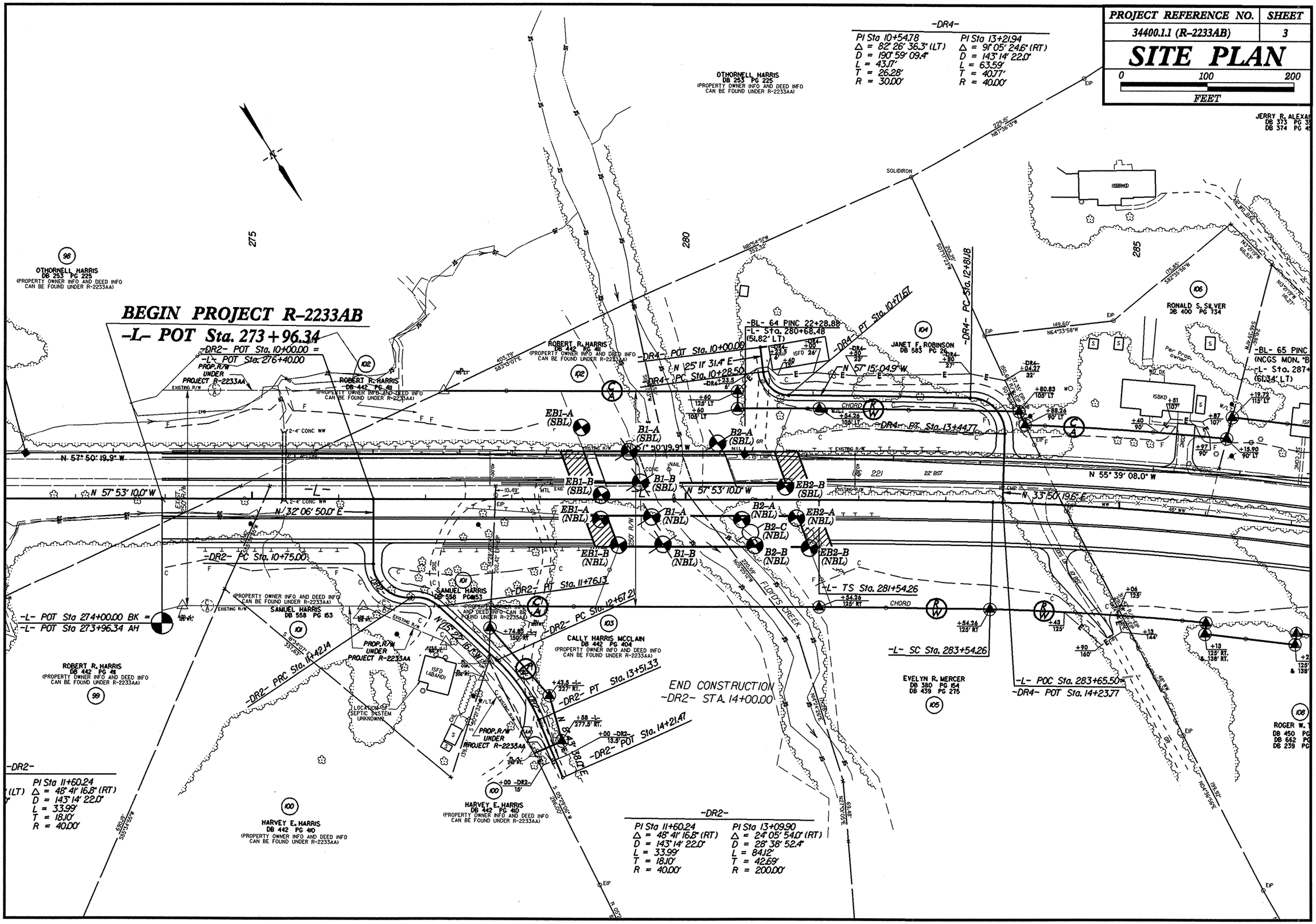
NOTES:

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET
34400.1.1 (R-2233AB)	3

SITE PLAN

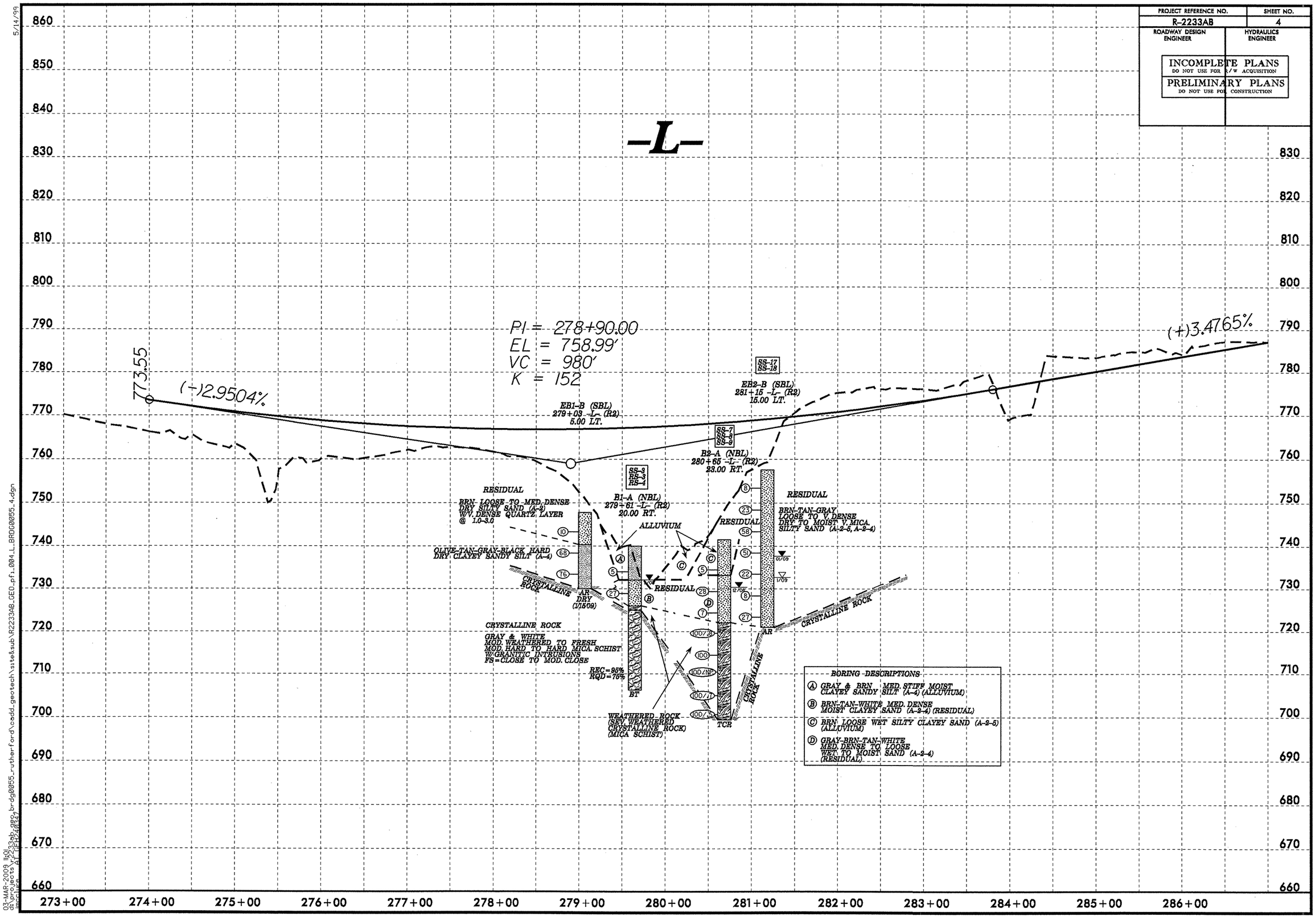
0 100 200
FEET



PROJECT REFERENCE NO.	SHEET NO.
R-2233AB	4
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



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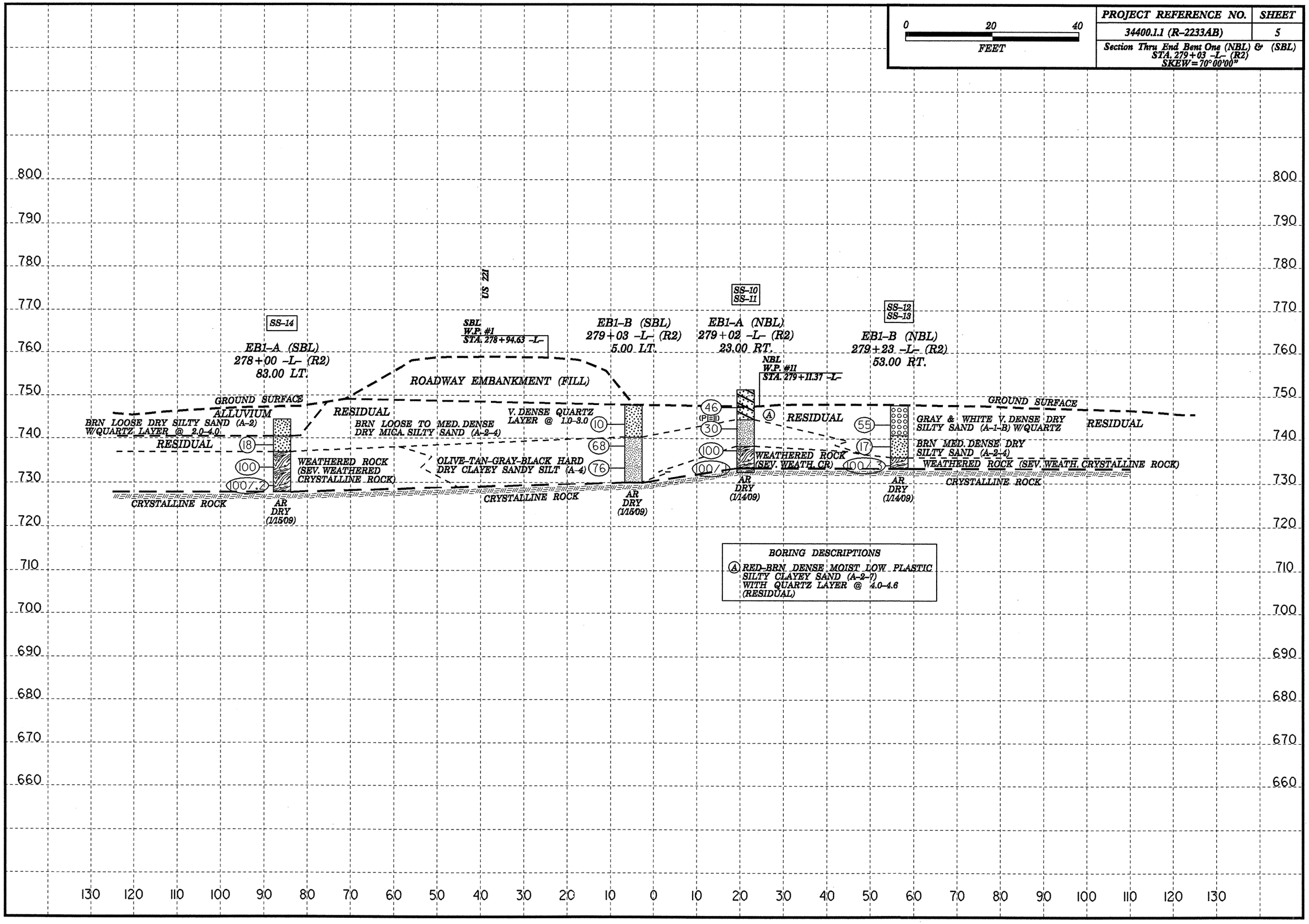
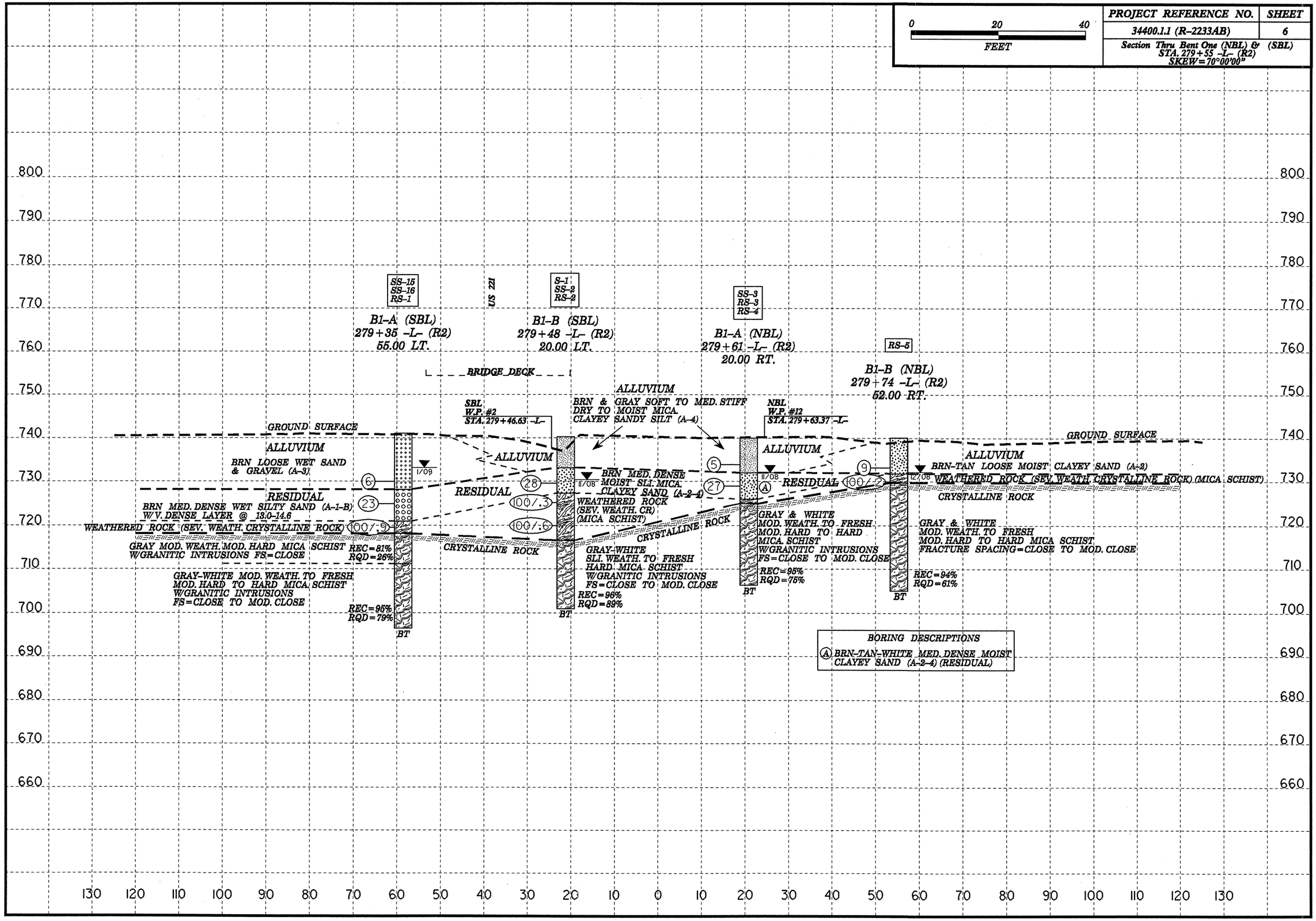
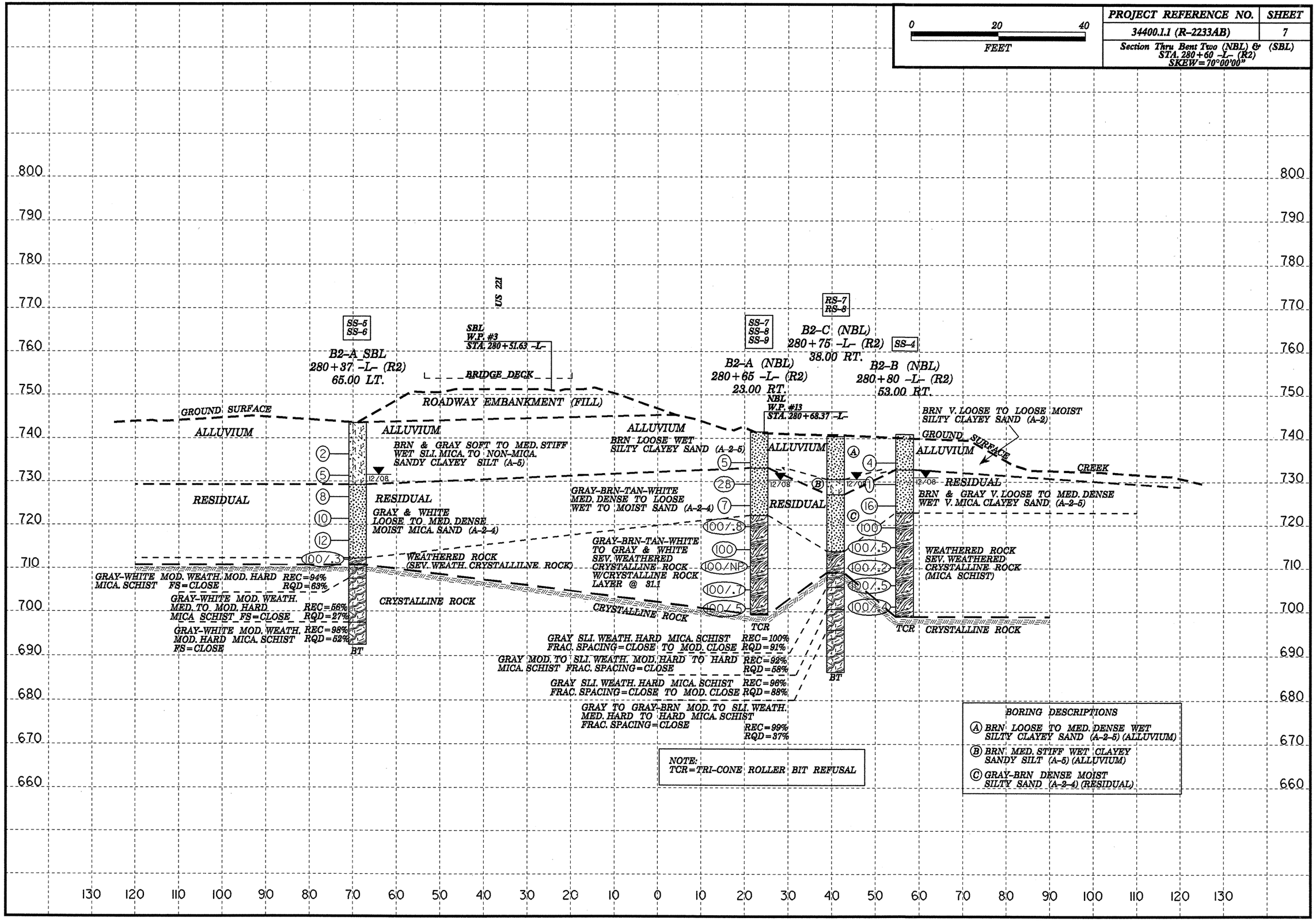
PROJECT REFERENCE NO.	SHEET
34400.1.1 (R-2233AB)	5
Section Thru End Bent One (NBL) & (SBL) STA. 279+03 -L- (R2) SKEW=70°00'00"	



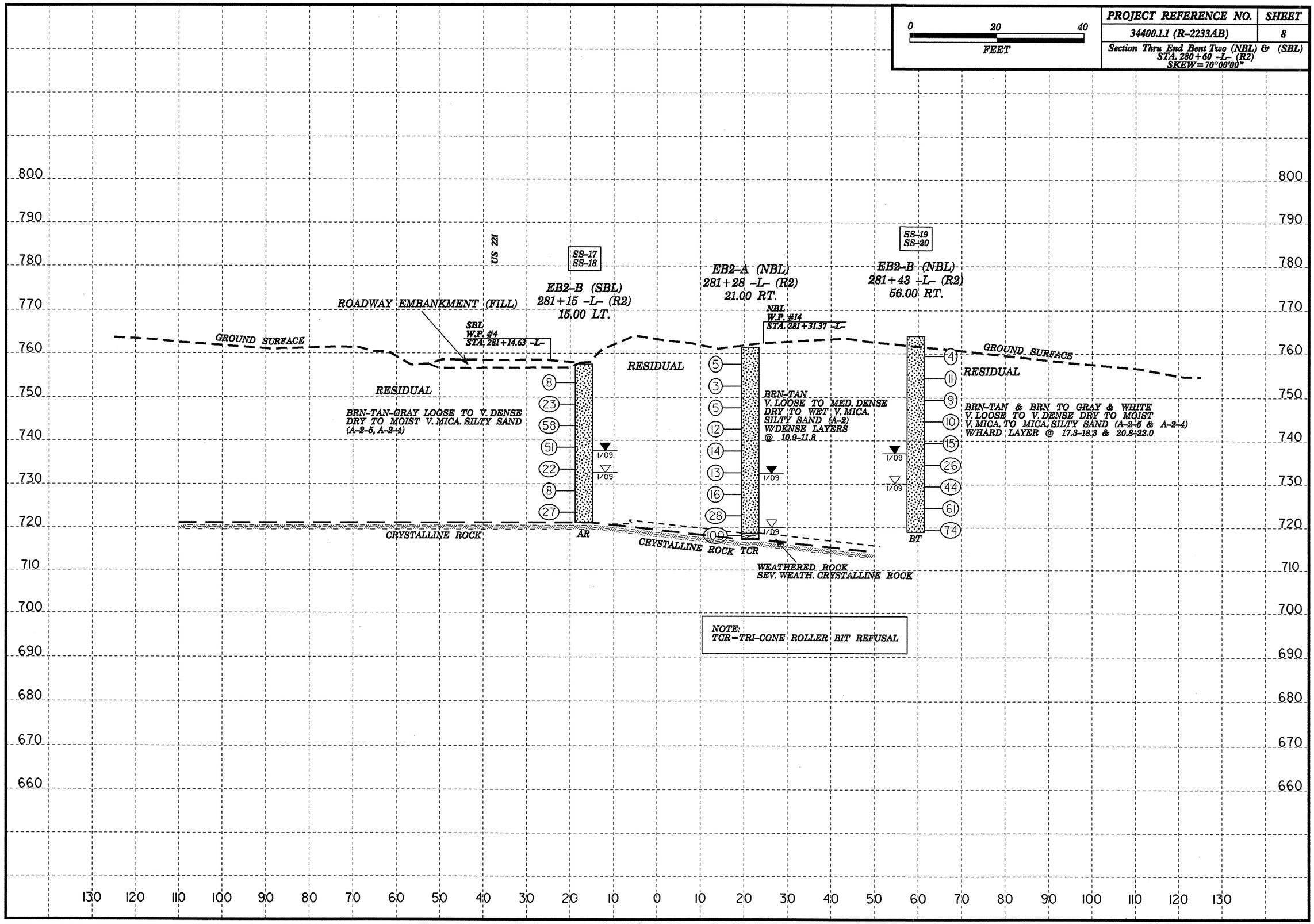
PROJECT REFERENCE NO.	SHEET
34400.1.1 (R-2233AB)	6
Section Thru Bent One (NBL) & (SBL) STA. 279+55 -L- (R2) SKEW=70°00'00"	



PROJECT REFERENCE NO.	SHEET
34400.1.1 (R-2233AB)	7
Section Thru Bent Two (NBL) & (SBL) STA. 280+60 -L- (R2) SKEW=70°00'00"	



PROJECT REFERENCE NO.	SHEET
34400.1.1 (R-2233AB)	8
Section Thru End Bent Two (NBL) & (SBL) STA. 280+60 -L- (R2) SKEW=70°00'00"	



NOTE:
TCR=TRI-CONE ROLLER BIT REFUSAL

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 NBL			**GROUND WTR (ft)**
BORING NO. EB1-A_NBL	**STATION** 279+02	**OFFSET** 23ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 751.4 ft	**TOTAL DEPTH** 19.0 ft	**NORTHING** 556,776	**EASTING** 1,144,098
DRILL MACHINE CME-550X	**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
START DATE 01/12/09	**COMP. DATE** 01/13/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 18.1 ft

GROUND WTR (ft)	
0 HR.	NM
24 HR.	Dry

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
755											
750										751.4 GROUND SURFACE	0.0
	748.3	3.1	2	6	40	46	SS-10	M		**RESIDUAL** RED-BRN DENSE MOIST LOW (PI=11) PLASTIC SILTY CLAYEY SAND (A-2-7) WITH QUARTZ LAYER @ 4.0-4.6	
745	743.3	8.1	11	13	17	30	SS-11	D		744.4 **RESIDUAL** OLIVE-GRAY-TAN-BLACK HARD DRY CLAYEY SANDY SILT (A-4)	7.0
740	738.3	13.1	30	21	79	100		D		738.3 **WEATHERED ROCK** SEV. WEATH. CRYSTALLINE ROCK	13.1
735	733.3	18.1	100/.1			100/.1		D		733.3 732.4 **CRYSTALLINE ROCK** Boring Terminated BY AUGER REFUSAL at Elevation 732.4 ft IN CRYSTALLINE ROCK	18.1 19.0
730											
725											
720											
715											
710											
705											
700											
695											
690											
685											
680											
675											

NCDOT BORE SINGLE R-2233AB_GEO_BR55_RUTHERFORD.GPJ NC_DOT.GDT 02/25/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 9

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 NBL			**GROUND WTR (ft)**
BORING NO. EB1-B_NBL	**STATION** 279+23	**OFFSET** 53ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 747.8 ft	**TOTAL DEPTH** 14.5 ft	**NORTHING** 556,813	**EASTING** 1,144,097
DRILL MACHINE CME-550X	**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
START DATE 01/13/09	**COMP. DATE** 01/13/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 14.5 ft

GROUND WTR (ft)	
0 HR.	NM
24 HR.	Dry

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
750											
										747.8 GROUND SURFACE	0.0
745	744.3	3.5	17	15	40	55	SS-12	D		**RESIDUAL** GRAY & WHITE V. DENSE DRY SILTY SAND (A-1-B) W/ QUARTZ	
740	739.3	8.5	13	10	7	17	SS-13	D		740.8 **RESIDUAL** BRN MED. DENSE DRY SILTY SAND (A-2-4)	7.0
735	734.3	13.5	100/.3			100/.3		D		735.8 **WEATHERED ROCK** SEV. WEATH. CRYSTALLINE ROCK	12.0
										733.3 Boring Terminated BY AUGER REFUSAL at Elevation 733.3 ft ON CRYSTALLINE ROCK	14.5
730											
725											
720											
715											
710											
705											
700											
695											
690											
685											
680											
675											
670											

NCDOT BORE SINGLE R-2233AB_GEO_BR55_RUTHERFORD.GPJ NC_DOT.GDT 02/25/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 NBL			**GROUND WTR (ft)**
BORING NO. B1-A_NBL	**STATION** 279+61	**OFFSET** 20ft RT	**ALIGNMENT** -L- / **0 HR.** NM
COLLAR ELEV. 740.0 ft	**TOTAL DEPTH** 33.7 ft	**NORTHING** 556,805	**EASTING** 1,144,047 / **24 HR.** 8.0
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing W/SPT & Core (NXBWL)		**HAMMER TYPE** Automatic
START DATE 11/25/08	**COMP. DATE** 11/25/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 15.0 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
740										740.0 GROUND SURFACE	0.0
735	734.9	5.1	2	3	2	5		M		**ALLUVIAL** GRAY & BRN MED. STIFF MOIST CLAYEY SANDY SILT (A-4) 732.0	8.0
730	729.9	10.1	5	5	22	27	SS-3	M		**RESIDUAL** BRN-TAN-WHITE MED. DENSE MOIST CLAYEY SAND (A-2-4) 726.0	14.0
725										725.0 **WEATHERED ROCK** SEV. WEATH. CRYSTALLINE ROCK (MICA SCHIST)	15.0
720							RS-3			**CRYSTALLINE ROCK** GRAY & WHITE MOD. WEATH. TO FRESH MOD. HARD TO HARD MICA. SCHIST WITH GRANITIC INTRUSIONS FRAC. SPACING = CLOSE TO MOD. CLOSE	
715							RS-4				
710											
705										706.3 Boring Terminated at Elevation 706.3 ft IN GRAY-WHITE SLI. WEATH. TO FRESH HARD MICA SCHIST	33.7
700											
695											
690											
685											
680											
675											
670											
665											
660											

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

SHEET 10

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 NBL			**GROUND WTR (ft)**
BORING NO. B1-A_NBL	**STATION** 279+61	**OFFSET** 20ft RT	**ALIGNMENT** -L- / **0 HR.** NM
COLLAR ELEV. 740.0 ft	**TOTAL DEPTH** 33.7 ft	**NORTHING** 556,805	**EASTING** 1,144,047 / **24 HR.** 8.0
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing W/SPT & Core (NXBWL)		**HAMMER TYPE** Automatic
START DATE 11/25/08	**COMP. DATE** 11/25/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 15.0 ft
CORE SIZE NXBWL	**TOTAL RUN** 18.7 ft	**DRILLER** Smith, M. L.	

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
725											Begin Coring @ 15.0 ft	
720	725.0 / 719.8	15.0 / 20.2	5.2	1.4/1.0	(4.8) 92%	(2.4) 46%		(17.8) 95%	(14.1) 75%		725.0 **CRYSTALLINE ROCK** GRAY & WHITE MOD. WEATHERED TO FRESH MOD. HARD TO HARD MICA. SCHIST WITH GRANITIC INTRUSIONS FS= CLOSE TO MOD. CLOSE	15.0
715	714.8	25.2	5.0	1.4/1.0	(4.8) 96%	(4.4) 88%	RS-3					
710	709.8	30.2	5.0	1.4/1.0	(4.8) 96%	(4.3) 86%	RS-4					
705	706.3	33.7	3.5		(3.4) 97%	(3.0) 86%					706.3 Boring Terminated at Elevation 706.3 ft IN GRAY-WHITE SLI. WEATH. TO FRESH HARD MICA SCHIST	33.7
700												
695												
690												
685												
680												
675												
670												
665												
660												
655												
650												
645												

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 NBL			**GROUND WTR (ft)**
BORING NO. B1-B_NBL	**STATION** 279+74	**OFFSET** 52ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 740.1 ft	**TOTAL DEPTH** 35.1 ft	**NORTHING** 556,839	**EASTING** 1,144,053	**24 HR.** 8.0
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing W/SPT & Core (NXBWL)		**HAMMER TYPE** Automatic
START DATE 12/03/08	**COMP. DATE** 12/03/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 10.4 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
745											
740										740.1 GROUND SURFACE	0.0
735	734.2	5.9	2	4	5	9		M		**ALLUVIAL** BRN-TAN LOOSE MOIST CLAYEY SAND (A-2)	
730	730.1	10.0	100/.2			100/.2	RS-5			731.8 **WEATHERED ROCK** SEV. WEATH. CRYSTALLINE ROCK (MICA SCHIST) 729.7	8.3 10.4
725										**CRYSTALLINE ROCK** GRAY & WHITE MOD. WEATH. TO FRESH MOD. HARD TO HARD MICA SCHIST FRACTURE SPACING=CLOSE TO MOD. CLOSE	
720											
715											
710											
705										705.0	35.1
700										Boring Terminated at Elevation 705.0 ft IN GRAY & WHITE MOD. WEATH. TO FRESH MOD. HARD TO HARD MICA SCHIST	
695											
690											
685											
680											
675											
670											
665											

NCDOT BORE SINGLE R-2233AB_GEO_BR55_RUTHERFORD.GPJ NC_DOT.GDT 02/25/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

SHEET
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PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 NBL			**GROUND WTR (ft)**
BORING NO. B1-B_NBL	**STATION** 279+74	**OFFSET** 52ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 740.1 ft	**TOTAL DEPTH** 35.1 ft	**NORTHING** 556,839	**EASTING** 1,144,053	**24 HR.** 8.0
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing W/SPT & Core (NXBWL)		**HAMMER TYPE** Automatic
START DATE 12/03/08	**COMP. DATE** 12/03/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 10.4 ft
CORE SIZE NXBWL	**TOTAL RUN** 24.7 ft	**DRILLER** Smith, M. L.	

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
729.7											Begin Coring @ 10.4 ft	
	729.7	10.4	5.2	1.6/1.0	(4.8) 92%	(2.6) 50%	RS-5	(23.2) 94%	(15.1) 61%		729.7 **CRYSTALLINE ROCK** GRAY & WHITE MOD. WEATH. TO FRESH MOD. HARD TO HARD MICA SCHIST FRACTURE SPACING=CLOSE TO MOD. CLOSE	10.4
725	724.5	15.6	5.0	1.5/1.0	(4.1) 82%	(2.7) 54%						
720	719.5	20.6	4.9	1.8/1.0	(4.9) 100%	(2.9) 59%						
715	714.6	25.5	4.8		(4.7) 98%	(3.6) 75%						
710	709.8	30.3	4.8		(4.7) 98%	(3.3) 69%						
705	705.0	35.1									705.0	35.1
700											Boring Terminated at Elevation 705.0 ft IN GRAY & WHITE MOD. WEATH. TO FRESH MOD. HARD TO HARD MICA SCHIST	
695												
690												
685												
680												
675												
670												
665												
660												
655												
650												

NCDOT CORE SINGLE R-2233AB_GEO_BR55_RUTHERFORD.GPJ NC_DOT.GDT 02/27/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 NBL			**GROUND WTR (ft)**
BORING NO. B2-A_NBL	**STATION** 280+65	**OFFSET** 23ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 741.5 ft	**TOTAL DEPTH** 42.1 ft	**NORTHING** 556,863	**EASTING** 1,143,960	**24 HR.** 11.2
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Advancer/Tri-cone		**HAMMER TYPE** Automatic
START DATE 12/05/08	**COMP. DATE** 12/05/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 42.1 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
745											
										741.5 GROUND SURFACE	0.0
740										**ALLUVIAL** BRN LOOSE WET SILTY CLAYEY SAND (A-2-5)	
735	735.4	6.1	2	3	2	5	SS-7	W		733.1	8.4
730	730.4	11.1	10	14	14	28	SS-8	W		**RESIDUAL** GRAY-BRN-TAN-WHITE MED. DENSE TO LOOSE WET TO MOIST SAND (A-2-4)	
725	725.4	16.1	2	3	4	7		M		722.1	19.4
720	720.4	21.1	31	69/.3		100/.8		M		**WEATHERED ROCK** GRAY-BRN-TAN-WHITE TO GRAY & WHITE SEV. WEATH. CRYSTALLINE ROCK W/ CRYSTALLINE ROCK LAYER @ 31.1	
715	715.4	26.1	27	73/.5		100		M			
710	710.4	31.1	100/0.0			100/NP		M			
705	706.2	35.3	36	39	61/.2	100/.7	SS-9	M			
700	701.2	40.3	100/.5			100/.5				699.4	42.1
										Boring Terminated TRI-CONE ROLLER REFUSAL at Elevation 699.4 ft ON CRYSTALLINE ROCK	
695											
690											
685											
680											
675											
670											
665											

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 NBL			**GROUND WTR (ft)**
BORING NO. B2-C_NBL	**STATION** 280+75	**OFFSET** 38ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 740.5 ft	**TOTAL DEPTH** 54.2 ft	**NORTHING** 556,881	**EASTING** 1,143,960
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Core (NXBWL)		**HAMMER TYPE** Automatic
START DATE 12/30/08	**COMP. DATE** 12/30/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 31.6 ft

GROUND WTR (ft)	
0 HR.	NM
24 HR.	10.0

ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT 0.5ft 0.5ft 0.5ft | BLOWS PER FOOT 0 25 50 75 100 | SAMP. NO. | MOI | LOG

SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))

740.5 — GROUND SURFACE — 0.0

ALLUVIAL
BRN LOOSE TO MED. DENSE WET SILTY CLAYEY SAND (A-2-5)

730.5 — 10.0

ALLUVIAL
BRN MED. STIFF WET CLAYEY SANDY SILT (A-5)

727.0 — 13.5

RESIDUAL
GRAY-BRN DENSE MOIST SILTY SAND (A-2-4)

714.0 — 26.5

WEATHERED ROCK
SEV. WEATH. CRYSTALLINE ROCK (MICA SCHIST)

708.9 — 31.6

CRYSTALLINE ROCK
GRAY SLI. WEATH. HARD MICA. SCHIST FRAC. SPACING=CLOSE TO MOD. CLOSE

705.6 — 34.9

CRYSTALLINE ROCK
GRAY MOD. TO SLI. WEATH. MOD. HARD TO HARD MICA. SCHIST FRAC. SPACING=CLOSE

700.6 — 39.9

CRYSTALLINE ROCK
GRAY SLI. WEATH. HARD MICA. SCHIST FRAC. SPACING=CLOSE TO MOD. CLOSE

695.8 — 44.7

CRYSTALLINE ROCK
GRAY TO GRAY-BRN MOD. TO SLI. WEATH. MED. HARD TO HARD MICA. SCHIST FRAC. SPACING=CLOSE

686.3 — 54.2

Boring Terminated at Elevation 686.3 ft IN GRAY TO GRAY-BRN MOD. TO SLI. WEATH. MED. HARD TO HARD MICA SCHIST

NCDOT BORE SINGLE R-2233AB_GEO_BR55_RUTHERFORD.GPJ NC_DOT.GDT 02/27/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

SHEET 1 3

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 NBL			**GROUND WTR (ft)**
BORING NO. B2-C_NBL	**STATION** 280+75	**OFFSET** 38ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 740.5 ft	**TOTAL DEPTH** 54.2 ft	**NORTHING** 556,881	**EASTING** 1,143,960
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Core (NXBWL)		**HAMMER TYPE** Automatic
START DATE 12/30/08	**COMP. DATE** 12/30/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 31.6 ft
CORE SIZE NXBWL	**TOTAL RUN** 22.6 ft	**DRILLER** Smith, M. L.	

GROUND WTR (ft)	
0 HR.	NM
24 HR.	10.0

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft))
708.9											Begin Coring @ 31.6 ft
	708.9	31.6	3.3	1/1.0	(3.3) 100%	(3.0) 91%		(3.3) 100%	(3.0) 91%		708.9 — 31.6 **CRYSTALLINE ROCK** GRAY SLI. WEATH. HARD MICA. SCHIST FRAC. SPACING=CLOSE TO MOD. CLOSE
705	705.6	34.9	5.0	1/1.0	(4.6) 92%	(2.9) 58%	RS-7	(4.6) 92%	(2.9) 58%		705.6 — 34.9 **CRYSTALLINE ROCK** GRAY MOD. TO SLI. WEATH. MOD. HARD TO HARD MICA. SCHIST FRAC. SPACING=CLOSE
700	700.6	39.9	4.8	1.2/1.0	(4.6) 96%	(4.2) 88%	RS-8	(4.6) 96%	(4.2) 88%		700.6 — 39.9 **CRYSTALLINE ROCK** GRAY SLI. WEATH. HARD MICA. SCHIST FRAC. SPACING=CLOSE TO MOD. CLOSE
695	695.8	44.7	4.7	1.2/1.0	(4.6) 98%	(1.5) 32%		(9.4) 99%	(3.5) 37%		695.8 — 44.7 **CRYSTALLINE ROCK** GRAY TO GRAY-BRN MOD. TO SLI. WEATH. MED. HARD TO HARD MICA. SCHIST FRAC. SPACING=CLOSE
690	691.1	49.4	4.8	1./1.0	(4.8) 100%	(2.0) 42%					
685	686.3	54.2									686.3 — 54.2 Boring Terminated at Elevation 686.3 ft IN GRAY TO GRAY-BRN MOD. TO SLI. WEATH. MED. HARD TO HARD MICA SCHIST

680 675 670 665 660 655 650 645 640 635 630

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SHEET 14

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 NBL			**GROUND WTR (ft)**
BORING NO. B2-B_NBL	**STATION** 280+80	**OFFSET** 53ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 741.0 ft	**TOTAL DEPTH** 42.1 ft	**NORTHING** 556,896	**EASTING** 1,143,964	**24 HR.** 10.0
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Advancer/Tri-cone		**HAMMER TYPE** Automatic
START DATE 12/12/08	**COMP. DATE** 12/12/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 42.1 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
741.0										GROUND SURFACE 0.0
										ALLUVIAL BRN V. LOOSE TO LOOSE MOIST SILTY CLAYEY SAND (A-2)
	735.4	5.6	2	2	2	4		M		732.8 / 8.2
										RESIDUAL BRN & GRAY V. LOOSE TO MED. DENSE WET V. MICA. CLAYEY SAND (A-2-5)
	730.4	10.6	0	0	1	1	SS-4	W		
	725.4	15.6	2	3	13	16		W		722.8 / 18.2
										WEATHERED ROCK SEV. WEATH. CRYSTALLINE ROCK
	720.4	20.6	28	72/.5		100				
	715.4	25.6	100/.5			100/.5				
	710.4	30.6	100/.2			100/.2				
	706.5	34.5	100/.5			100/.5				
	701.5	39.5	100/.4			100/.4				698.9 / 42.1
										Boring Terminated TRI-CONE ROLLER REFUSAL at Elevation 698.9 ft ON CRYSTALLINE ROCK

745, 740, 735, 730, 725, 720, 715, 710, 705, 700, 695, 690, 685, 680, 675, 670, 665

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 NBL			**GROUND WTR (ft)**
BORING NO. EB2-A_NBL	**STATION** 281+28	**OFFSET** 21ft RT	**ALIGNMENT** -L-	**0 HR.** 41.5
COLLAR ELEV. 761.4 ft	**TOTAL DEPTH** 44.2 ft	**NORTHING** 556,895	**EASTING** 1,143,906	**24 HR.** 29.0
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Advancer/Tri-cone		**HAMMER TYPE** Automatic
START DATE 01/05/09	**COMP. DATE** 01/05/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 44.2 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										761.4 GROUND SURFACE	0.0
	758.6	2.8	1	2	3	5		D		**RESIDUAL** BRN-TAN V. LOOSE TO MED. DENSE DRY TO WET V. MICA. SILTY SAND (A-2) W/ DENSE LAYERS @ 10.9-11.8	
	753.6	7.8	2	1	2	3		D			
	748.6	12.8	1	2	3	5		M			
	743.6	17.8	4	6	6	12		M			
	738.6	22.8	2	6	8	14		M			
	733.6	27.8	7	9	4	13		M			
	728.6	32.8	6	9	7	16		M			
	723.6	37.8	9	11	17	28		W			
	718.6	42.8	100							718.6 **WEATHERED ROCK** SEV. WEATH. CRYSTALLINE ROCK	42.8
										717.2 Boring Terminated TRI-CONE ROLLER REFUSAL at Elevation 717.2 ft ON CRYSTALLINE ROCK	44.2

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BORELOG REPORT

SHEET 15

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 NBL			**GROUND WTR (ft)**
BORING NO. EB2-B_NBL	**STATION** 281+43	**OFFSET** 56ft RT	**ALIGNMENT** -L-	**0 HR.** 34.0
COLLAR ELEV. 764.1 ft	**TOTAL DEPTH** 45.1 ft	**NORTHING** 556,932	**EASTING** 1,143,912	**24 HR.** 27.0
DRILL MACHINE CME-550X	**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
START DATE 01/09/09	**COMP. DATE** 01/09/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										764.1 GROUND SURFACE	0.0
	760.5	3.6	2	2	2	4		D		**RESIDUAL** BRN-TAN & BRN TO GRAY & WHITE V. LOOSE TO V. DENSE DRY TO MOIST V. MICA. TO MICA. SILTY SAND (A-2-5 & A-2-4) W/ HARD LAYER @ 17.3-18.3 & 20.8-22.0	
	755.5	8.6	1	2	9	11	SS-19	D			
	750.5	13.6	3	3	6	9		D			
	745.5	18.6	5	5	5	10		D			
	740.5	23.6	6	7	8	15		M			
	735.5	28.6	8	13	13	26	SS-20	M			
	730.5	33.6	7	18	26	44		M			
	725.5	38.6	6	21	40	61		M			
	720.5	43.6	16	27	47	74		D		719.0 Boring Terminated at Elevation 719.0 ft IN GRAY & WHITE V. DENSE DRY MICA. SILTY SAND (A-2-4)	45.1

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BORELOG REPORT

SHEET

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 SBL			**GROUND WTR (ft)**
BORING NO. EB1-A_SBL	**STATION** 278+80	**OFFSET** 83ft LT	**ALIGNMENT** -L- — **0 HR.** NM
COLLAR ELEV. 744.4 ft	**TOTAL DEPTH** 16.6 ft	**NORTHING** 556,675	**EASTING** 1,144,061 — **24 HR.** Dry
DRILL MACHINE CME-550X	**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
START DATE 01/14/09	**COMP. DATE** 01/14/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 16.6 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
745										744.4 GROUND SURFACE	0.0
740	739.4	5.0	5	7	11	18	SS-14	D		**ALLUVIAL** BRN LOOSE DRY SILTY SAND (A-2) W/ QUARTZ LAYER @ 2.0-4.0 — 740.4	4.0
										RESIDUAL BRN MED. DENSE DRY MICA. SILTY SAND (A-2-4) — 736.9	7.5
735	734.4	10.0	45	55/.5		100		D		**WEATHERED ROCK** SEV. WEATH. CRYSTALLINE ROCK	
730	729.4	15.0	100/.2			100/.2				727.8	16.6
725										Boring Terminated BY AUGER REFUSAL at Elevation 727.8 ft ON CRYSTALLINE ROCK	
720											
715											
710											
705											
700											
695											
690											
685											
680											
675											
670											
665											

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SHEET 16

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 SBL			**GROUND WTR (ft)**
BORING NO. EB1-B_SBL	**STATION** 279+03	**OFFSET** 5ft LT	**ALIGNMENT** -L- — **0 HR.** NM
COLLAR ELEV. 747.8 ft	**TOTAL DEPTH** 17.8 ft	**NORTHING** 556,753	**EASTING** 1,144,083 — **24 HR.** Dry
DRILL MACHINE CME-550X	**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
START DATE 01/14/09	**COMP. DATE** 01/14/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 17.8 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
750										747.8 GROUND SURFACE	0.0
745	744.3	3.5	4	4	6	10				**RESIDUAL** BRN LOOSE TO MED. DENSE DRY SILTY SAND (A-2) W/ V. DENSE QUARTZ LAYER @ 1.0-3.0	
740	739.3	8.5	17	21	47	68		D		740.3	7.5
										RESIDUAL OLIVE-TAN-GRAY-BLACK HARD DRY CLAYEY SANDY SILT (A-4)	
735	734.3	13.5	17	27	49	76		D		730.0	17.8
730										Boring Terminated BY AUGER REFUSAL at Elevation 730.0 ft ON CRYSTALLINE ROCK	
725											
720											
715											
710											
705											
700											
695											
690											
685											
680											
675											
670											

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BORELOG REPORT

SHEET

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 SBL			**GROUND WTR (ft)**
BORING NO. B1-A_SBL	**STATION** 279+35	**OFFSET** 55ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 741.1 ft	**TOTAL DEPTH** 44.6 ft	**NORTHING** 556,728	**EASTING** 1,144,029	**24 HR.** 8.0
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing W/SPT & Core (NXBWL)		**HAMMER TYPE** Automatic
START DATE 01/15/09	**COMP. DATE** 01/15/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 23.0 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										741.1 GROUND SURFACE	0.0
										ALLUVIAL BRN LOOSE WET SAND & GRAVEL (A-3)	
	730.9	10.2	4	3	3	6	SS-15	W		728.1	13.0
	725.9	15.2	9	3	20	23	SS-16	W		**RESIDUAL** BRN MED. DENSE WET SILTY SAND (A-1-B) W/ V. DENSE LAYER @ 13.0-14.6	
	720.9	20.2	18	60	40/.4	100/.9		W		720.9	20.2
										WEATHERED ROCK SEV. WEATHERED CRYSTALLINE ROCK	
										718.1	23.0
										CRYSTALLINE ROCK GRAY MOD. WEATH. MOD. HARD MICA SCHIST W/ GRANITIC INTRUSIONS FS=CLOSE	
										711.1	30.0
							RS-1			**CRYSTALLINE ROCK** GRAY-WHITE MOD. WEATH. TO FRESH MOD. HARD TO HARD MICA. SCHIST W/ GRANITIC INTRUSIONS FS=CLOSE TO MOD. CLOSE	
										696.5	44.6
										Boring Terminated at Elevation 696.5 ft IN GRAY-WHITE MOD. WEATH. TO FRESH MOD. HARD TO HARD MICA SCHIST W/ GRANITIC INTRUSIONS	

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

SHEET /7

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 SBL			**GROUND WTR (ft)**
BORING NO. B1-A_SBL	**STATION** 279+35	**OFFSET** 55ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 741.1 ft	**TOTAL DEPTH** 44.6 ft	**NORTHING** 556,728	**EASTING** 1,144,029	**24 HR.** 8.0
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing W/SPT & Core (NXBWL)		**HAMMER TYPE** Automatic
START DATE 01/15/09	**COMP. DATE** 01/15/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 23.0 ft
CORE SIZE NXBWL	**TOTAL RUN** 21.6 ft	**DRILLER** Smith, M. L.	

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
											Begin Coring @ 23.0 ft	
	718.1	23.0	2.0		(2.0) 100%	(0.4) 20%		(5.7) 81%	(1.8) 26%		718.1 **CRYSTALLINE ROCK** GRAY MOD. WEATH. MOD. HARD MICA SCHIST W/ GRANITIC INTRUSIONS FS=CLOSE	23.0
	716.1	25.0	5.0	1/1.0	(3.7) 74%	(1.4) 28%						
	711.1	30.0	5.0	1/1.0	(4.2) 84%	(3.1) 62%		(13.8) 95%	(11.6) 79%		711.1 **CRYSTALLINE ROCK** GRAY-WHITE MOD. WEATH. TO FRESH MOD. HARD TO HARD MICA. SCHIST W/ GRANITIC INTRUSIONS FS=CLOSE TO MOD. CLOSE	30.0
	706.1	35.0	4.8	1.3/1.0	(4.8) 100%	(3.9) 81%	RS-1					
	701.3	39.8	4.8	1.5/1.0	(4.8) 100%	(4.6) 96%						
	696.5	44.6									696.5 Boring Terminated at Elevation 696.5 ft IN GRAY-WHITE MOD. WEATH. TO FRESH MOD. HARD TO HARD MICA SCHIST W/ GRANITIC INTRUSIONS	44.6

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 SBL			**GROUND WTR (ft)**
BORING NO. B1-B_SBL	**STATION** 279+48	**OFFSET** 20ft LT	**ALIGNMENT** -L-
COLLAR ELEV. 740.3 ft	**TOTAL DEPTH** 39.3 ft	**NORTHING** 556,764	**EASTING** 1,144,037
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing W/SPT & Core (NXBWL)		**HAMMER TYPE** Automatic
START DATE 11/24/08	**COMP. DATE** 11/24/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 23.8 ft

GROUND WTR (ft)	
0 HR.	NM
24 HR.	10.0

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
745											
740										740.3 GROUND SURFACE	0.0
										ALLUVIAL BRN & GRAY SOFT TO MED. STIFF DRY MICA. CLAYEY SANDY SILT (A-4)	
735							S-1	D			
										733.1	7.2
										RESIDUAL BRN MED. DENSE MOIST SLI. MICA. CLAYEY SAND (A-2-4)	
730	730.5	9.8	9	14	14	28	SS-2	M			
										727.3	13.0
725	725.5	14.8	100/.3			100/.3		M		**WEATHERED ROCK** SEV. WEATH, CRYSTALLINE ROCK	
720	720.5	19.8	69	31/.1		100/.6					
										716.5	23.8
715										**CRYSTALLINE ROCK** GRAY-WHITE SLI. WEATH. TO FRESH HARD MICA SCHIST W/ GRANITIC INTRUSIONS FS=CLOSE TO MOD. CLOSE	
710											
705							RS-2				
										701.0	39.3
700										Boring Terminated at Elevation 701.0 ft IN GRAY-WHITE SLI. WEATH. TO FRESH HARD MICA SCHIST W/ GRANITIC INRUSIONS	
695											
690											
685											
680											
675											
670											
665											

NCDOT BORE SINGLE R-2233AB_GEO_BR55_RUTHERFORD.GPJ NC_DOT.GDT 02/25/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

SHEET 18

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 SBL			**GROUND WTR (ft)**
BORING NO. B1-B_SBL	**STATION** 279+48	**OFFSET** 20ft LT	**ALIGNMENT** -L-
COLLAR ELEV. 740.3 ft	**TOTAL DEPTH** 39.3 ft	**NORTHING** 556,764	**EASTING** 1,144,037
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing W/SPT & Core (NXBWL)		**HAMMER TYPE** Automatic
START DATE 11/24/08	**COMP. DATE** 11/24/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 23.8 ft
CORE SIZE NXBWL	**TOTAL RUN** 15.5 ft	**DRILLER** Smith, M. L.	

GROUND WTR (ft)	
0 HR.	NM
24 HR.	10.0

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
716.5												
715	716.5	23.8	5.6	1.7/1.0	(5.4) 96%	(5.4) 96%		(14.9) 96%	(13.8) 89%		Begin Coring @ 23.8 ft	
											716.5 **CRYSTALLINE ROCK** GRAY-WHITE SLI. WEATH. TO FRESH HARD MICA SCHIST W/ GRANITIC INTRUSIONS FS=CLOSE TO MOD. CLOSE	23.8
710	710.9	29.4	5.1	1.5/1.0	(4.7) 92%	(3.9) 76%						
705	705.8	34.5	4.8	1.2/1.0	(4.8) 100%	(4.5) 94%	RS-2					
700	701.0	39.3									701.0 Boring Terminated at Elevation 701.0 ft IN GRAY-WHITE SLI. WEATH. TO FRESH HARD MICA SCHIST W/ GRANITIC INRUSIONS	39.3
695												
690												
685												
680												
675												
670												
665												
660												
655												
650												
645												
640												

NCDOT CORE SINGLE R-2233AB_GEO_BR55_RUTHERFORD.GPJ NC_DOT.GDT 02/25/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 SBL			**GROUND WTR (ft)**
BORING NO. B2-A_SBL	**STATION** 280+37	**OFFSET** 65ft LT	**ALIGNMENT** -L-
COLLAR ELEV. 743.5 ft	**TOTAL DEPTH** 51.0 ft	**NORTHING** 556,773	**EASTING** 1,143,937
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing W/SPT & Core (NXBWL)		**HAMMER TYPE** Automatic
START DATE 12/29/08	**COMP. DATE** 12/29/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 32.8 ft

GROUND WTR (ft)	
0 HR.	NM
24 HR.	12.0

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
745										743.5 GROUND SURFACE	0.0
740										**ALLUVIAL** BRN & GRAY SOFT TO MED. STIFF WET SLI. MICA. TO NON-MICA. SANDY CLAYEY SILT (A-5)	
	737.3	6.2	1	1	1	2	SS-5	W			
735											
	732.3	11.2	2	2	3	5		W			
730										729.2	14.3
	727.3	16.2	3	4	4	8	SS-6	M		**RESIDUAL** GRAY & WHITE LOOSE TO MED. DENSE MOIST MICA. SAND (A-2-4)	
725											
	722.3	21.2	3	5	5	10		M			
720											
	717.3	26.2	4	5	7	12		M			
715											
	712.3	31.2	100/.3			100/.3				712.3	31.2
710										710.7 **WEATHERED ROCK** SEV. WEATH. CRYSTALLILNE ROCK	32.8
705										707.5 **CRYSTALLINE ROCK** GRAY-WHITE MOD. WEATH. MOD. HARD MICA. SCHIST FS=CLOSE	36.0
										CRYSTALLINE ROCK GRAY-WHITE MOD. WEATH. MED. TO MOD. HARD. MICA SCHIST FS=CLOSE	
700											
695										697.5 **CRYSTALLINE ROCK** GRAY-WHITE MOD. WEATH. MOD. HARD MICA. SCHIST FS=CLOSE	46.0
690										692.5 Boring Terminated at Elevation 692.5 ft IN GRAY-WHITE MOD. WEATH. MED. TO MOD. HARD MICA SCHIST	51.0
685											
680											
675											
670											
665											

NCDOT BORE SINGLE R-2233AB_GEO_BR55_RUTHERFORD.GPJ NC_DOT.GDT 02/25/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

SHEET 19

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 SBL			**GROUND WTR (ft)**
BORING NO. B2-A_SBL	**STATION** 280+37	**OFFSET** 65ft LT	**ALIGNMENT** -L-
COLLAR ELEV. 743.5 ft	**TOTAL DEPTH** 51.0 ft	**NORTHING** 556,773	**EASTING** 1,143,937
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing W/SPT & Core (NXBWL)		**HAMMER TYPE** Automatic
START DATE 12/29/08	**COMP. DATE** 12/29/08	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 32.8 ft
CORE SIZE NXBWL	**TOTAL RUN** 18.2 ft	**DRILLER** Smith, M. L.	

GROUND WTR (ft)	
0 HR.	NM
24 HR.	12.0

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
710.7											Begin Coring @ 32.8 ft	
710	710.7	32.8	3.2	1/1.0	(3.0) 94%	(2.0) 63%		(3.0) 94%	(2.0) 63%		710.7 **CRYSTALLINE ROCK** GRAY-WHITE MOD. WEATH. MOD. HARD MICA. SCHIST FS=CLOSE	32.8
	707.5	36.0	5.0	.9/1.0	(1.7) 34%	(0.8) 16%		(5.6) 56%	(2.7) 27%		707.5 **CRYSTALLINE ROCK** GRAY-WHITE MOD. WEATH. MED. TO MOD. HARD. MICA SCHIST FS=CLOSE	36.0
705												
	702.5	41.0	5.0	1/1.0	(3.9) 78%	(1.9) 38%						
700												
	697.5	46.0	5.0	1/1.0	(4.9) 98%	(2.6) 52%		(4.9) 98%	(2.6) 52%		697.5 **CRYSTALLINE ROCK** GRAY-WHITE MOD. WEATH. MOD. HARD MICA. SCHIST FS=CLOSE	46.0
695												
	692.5	51.0									692.5 Boring Terminated at Elevation 692.5 ft IN GRAY-WHITE MOD. WEATH. MED. TO MOD. HARD MICA SCHIST	51.0
690												
685												
680												
675												
670												
665												
660												
655												
650												
645												
640												
635												

NCDOT CORE SINGLE R-2233AB_GEO_BR55_RUTHERFORD.GPJ NC_DOT.GDT 02/25/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34400.1.1	**ID.** R-2233AB	**COUNTY** RUTHERFORD	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION US 221 OVER FLOYDS CREEK BR#55 SBL			**GROUND WTR (ft)**
BORING NO. EB2-B_SBL	**STATION** 281+15	**OFFSET** 15ft LT	**ALIGNMENT** -L- — **0 HR.** 25.0
COLLAR ELEV. 757.6 ft	**TOTAL DEPTH** 36.6 ft	**NORTHING** 556,857	**EASTING** 1,143,898 — **24 HR.** 20.0
DRILL MACHINE CME-550X	**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
START DATE 01/08/09	**COMP. DATE** 01/08/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 36.6 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
757.6										GROUND SURFACE	0.0
754.4		3.2								**RESIDUAL** BRN-TAN-GRAY LOOSE TO V. DENSE DRY TO MOIST V. MICA. SILTY SAND (A-2-5, A-2-4)	
			3	3	5	8	SS-17	D			
749.4		8.2	4	9	14	23		D			
744.4		13.2	25	26	32	58		D			
739.4		18.2	9	6	45	51		▼			
734.4		23.2	12	12	10	22		▽			
729.4		28.2	1	3	5	8	SS-18	D			
724.4		33.2	4	11	16	27		M			
721.0		36.6								Boring Terminated BY AUGER REFUSAL at Elevation 721.0 ft ON CRYSTALLINE ROCK	

760 755 750 745 740 735 730 725 720 715 710 705 700 695 690 685 680

TEST RESULTS

PROJECT: 34400.1.1 (R-2233AB)
COUNTY: RUTHERFORD
SITE DESCRIPTION: BRIDGE NO. 055 (NBL & SBL) ON US 221 OVER FLOYD'S CREEK

SOIL SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING SIEVES 10	40	200	% MOISTURE	% ORGANIC	UNIT WT. (d)	VOID RATIO
		EB1-A (NBL)																
SS-10	23.0 RT.	279+02 -L-	3.10-4.60	A-2-7(0)	46	41	11	43.1	22.7	14.1	20.1	76	51	29				
SS-11	23.0 RT.	279+02 -L-	8.10-9.60	A-4(0)	30	32	5	21.9	39.0	22.9	16.1	97	89	43				
		EB1-B (NBL)																
SS-12	53.0 RT.	279+23 -L-	3.50-5.00	A-1-b(0)	55	25	NP	55.1	25.6	13.3	6.0	81	47	19				
SS-13	53.0 RT.	279+23 -L-	8.50-10.00	A-2-4(0)	17	32	NP	49.7	33.2	13.1	4.0	86	60	19				
		B1-A (NBL)																
SS-3	20.0 RT.	279+61 -L-	10.10-11.60	A-2-4(0)	27	38	NP	26.2	44.1	9.6	20.1	82	76	28				
		B2-A (NBL)																
SS-7	23.0 RT.	280+65 -L-	6.10-7.60	A-2-5(0)	5	43	NP	36.5	35.2	10.2	18.1	91	75	29				
SS-8	23.0 RT.	280+65 -L-	11.10-12.60	A-2-4(0)	28	31	NP	47.9	40.3	7.8	4.0	95	71	16				
SS-9	23.0 RT.	280+65 -L-	35.30-36.50	A-2-4(0)	100/.7	28	NP	41.3	46.7	5.9	6.0	99	83	17				
		B2-B (NBL)																
SS-4	53.0 RT.	280+80 -L-	10.60-12.10	A-2-5(0)	1	41	NP	41.9	38.7	9.4	10.1	96	76	23				
		EB2-B (NBL)																
SS-19	56.0 RT.	281+43 -L-	8.60-10.10	A-2-5(0)	11	45	3	26.4	47.7	17.9	8.0	100	90	32				
SS-20	56.0 RT.	281+43 -L-	28.60-30.10	A-2-4(0)	26	31	NP	40.2	37.0	18.7	4.0	90	66	26				
		EB1-A (SBL)																
SS-14	83.0 LT.	278+80 -L-	5.00-6.50	A-2-4(0)	18	31	NP	45.9	36.6	13.5	4.0	73	51	16				
		B1-A (SBL)																
SS-15	55.0 LT.	279+35 -L-	10.20-11.70	A-3(0)	6	21	NP	58.8	36.2	5.0	0.0	82	53	6				
SS-16	55.0 LT.	279+35 -L-	15.20-16.70	A-1-b(0)	23	27	NP	43.1	39.0	13.9	4.0	46	34	10				
		B1-B (SBL)																
S-1	20.0 LT.	279+48 -L-	0.00-7.20	A-4(0)		26	NP	19.9	49.3	12.6	18.1	100	95	36				
SS-2	20.0 LT.	279+48 -L-	9.80-11.30	A-2-4(0)	28	26	NP	32.2	46.1	9.6	12.1	74	64	20				
		B2-A (SBL)																
SS-5	65.0 LT.	280+37 -L-	0.00-0.00	A-5(0)	2	43	9	32.2	32.0	11.6	24.2	97	81	38				
SS-6	65.0 LT.	280+37 -L-	16.20-17.70	A-2-4(0)	8	35	NP	39.5	47.7	8.8	4.0	100	86	18				
		EB2-B (SBL)																
SS-17	15.0 LT.	281+15 -L-	3.20-4.70	A-2-5(0)	8	44	7	35.2	39.6	17.1	8.0	84	66	26				
SS-18	15.0 LT.	281+15 -L-	28.20-29.70	A-2-4(0)	8	35	NP	42.7	41.9	13.5	2.0	97	77	19				

ROCK SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	RQD	UNIT WT (lbf/ft3)	Qu (ksf)	E (MPsi)
		B1-A (NBL)					
RS-3	20.0 RT.	279+61 -L-	21.0-21.6	88%	167.8	1600	3.42
RS-4	20.0 RT.	279+61 -L-	25.2-25.85	86%	165	2250	2.84
		B1-B (NBL)					
RS-5	52.0 RT.	279+74 -L-	12.4-13.1	50%	163	1750	3.41
		B2-C (NBL)					
RS-7	38.0 RT.	280+75 -L-	34.1-34.9	91%	172.2	1750	2.8
RS-8	38.0 RT.	280+75 -L-	40.0-40.7	88%	165.9	2000	1.663
		B1-A (SBL)					
RS-1	55.0 LT.	279+35 -L-	35.1-35-8	81%	170	2400	2.53
		B1-B (SBL)					
RS-2	20.0 LT.	279+48 -L-	33.8-34.5	76%	184.1	1150	3.62
		B2-A (SBL)					
RS-6	65.0 LT.	280+37 -L-	43.1-43.7	38%	172.2	1150	0.733

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34400.1.1 TIP: R-2233AB COUNTY: RUTHERFORD

DESCRIPTION(1): BRIDGE NO. 55 ON US 221 OVER FLOYD'S CREEK

EXISTING BRIDGE

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

Bridge No.: 55 Length: 205' Total Bents: 4 Bents in Channel: 0 Bents in Floodplain: 2
Foundation Type: ____

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: MODERATE AT BOTH END BENTS.

Interior Bents: NO SCOUR.

Channel Bed: NO SCOUR.

Channel Bank: MODERATE SCOUR ONLY AT AREA WHERE CHANNEL MEANDERS.

EXISTING SCOUR PROTECTION

Type(3): HAND PLACED, FLAT ROCKS AND BOULDERS.

Extent(4): ALL SLOPES (LT., RT., CENTER) TO END OF BRIDGE.

Effectiveness(5): DRAINAGE FAILURES AT BOTH ENDS, BUT GENERALLY OK.

Obstructions(6): VERY LITTLE DEBRIS DUE TO FREQUENT RISE AND FALL OF CREEK LEVEL.

DESIGN INFORMATION

Channel Bed Material(7): BROWN FINE SAND (A-2-4, A-2-5).

Channel Bank Material(8): BROWN FINE SAND (A-2-4, A-2-5) AND BROWN SANDY SILT (A-4, A-5).

Channel Bank Cover(9): TREES - SOME LEANING TOWARD CHANNEL.

Floodplain Width(10): APP. 200'.

Floodplain Cover(11): WOODS.

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

Channel Migration Tendency(13): SLIGHT TO MODERATE EASTERLY MIGRATION.

Observations and Other Comments: CREEK LEVEL ROSE APP. 3' DURING INVESTIGATION. OVERTOPPED BANKS. POOR DRAINAGE AT END BENTS CAUSING EROSION.

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

	BENTS B1	B2									
SB Lanes	732	738.5									
NB Lanes	735	736.5									

Comparison of DSE to Hydraulics Unit theoretical scour:
DSE MATCHES THE HYDRAULICS UNIT THEORETICAL SCOUR ACROSS SITE.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank							
Sample No.			SEE	SAMPLE	RESULTS		
Retained #4							
Passed #10							
Passed #40							
Passed #200							
Coarse Sand							
Fine Sand							
Silt							
Clay							
LL							
PI							
AASHTO							
Station							
Offset							
Depth							

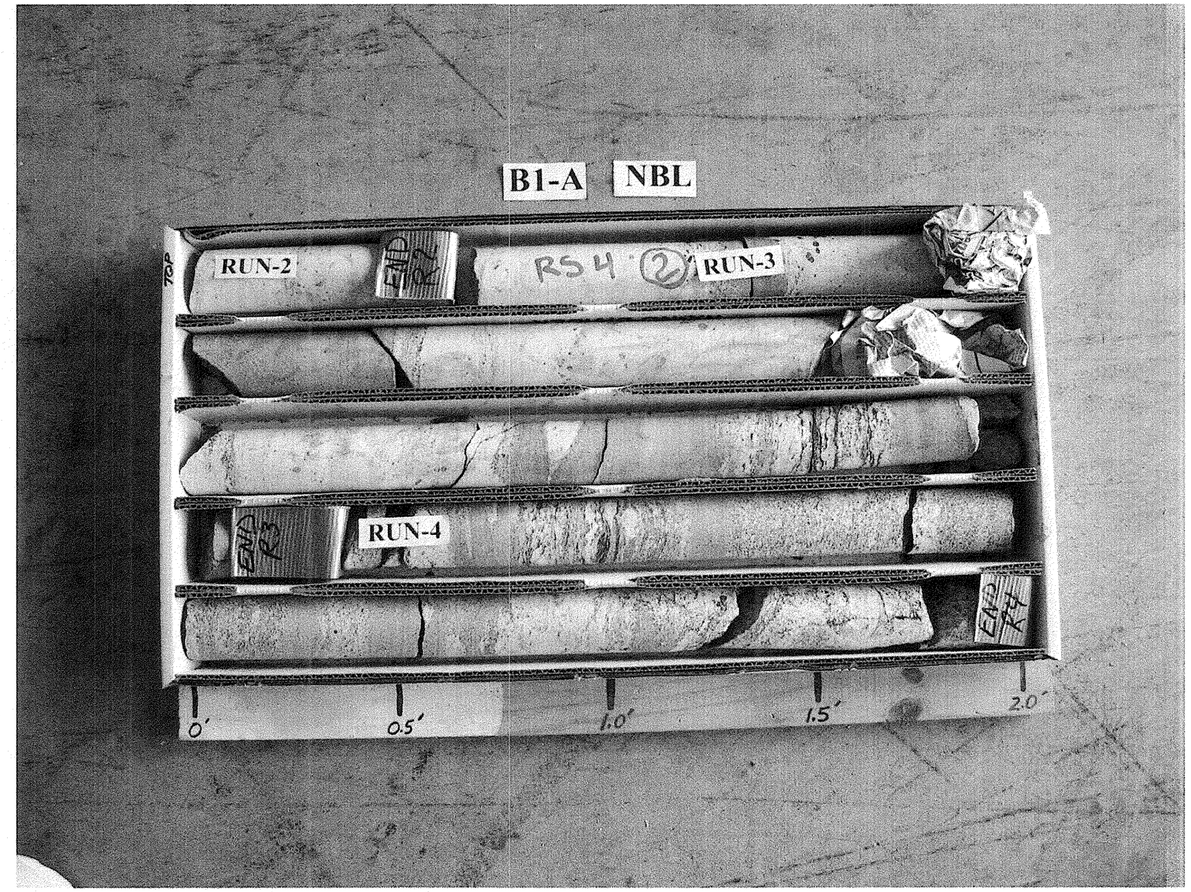
Template Revised 02/07/06

Reported by: RW TODD **Date:** 1/1/2009

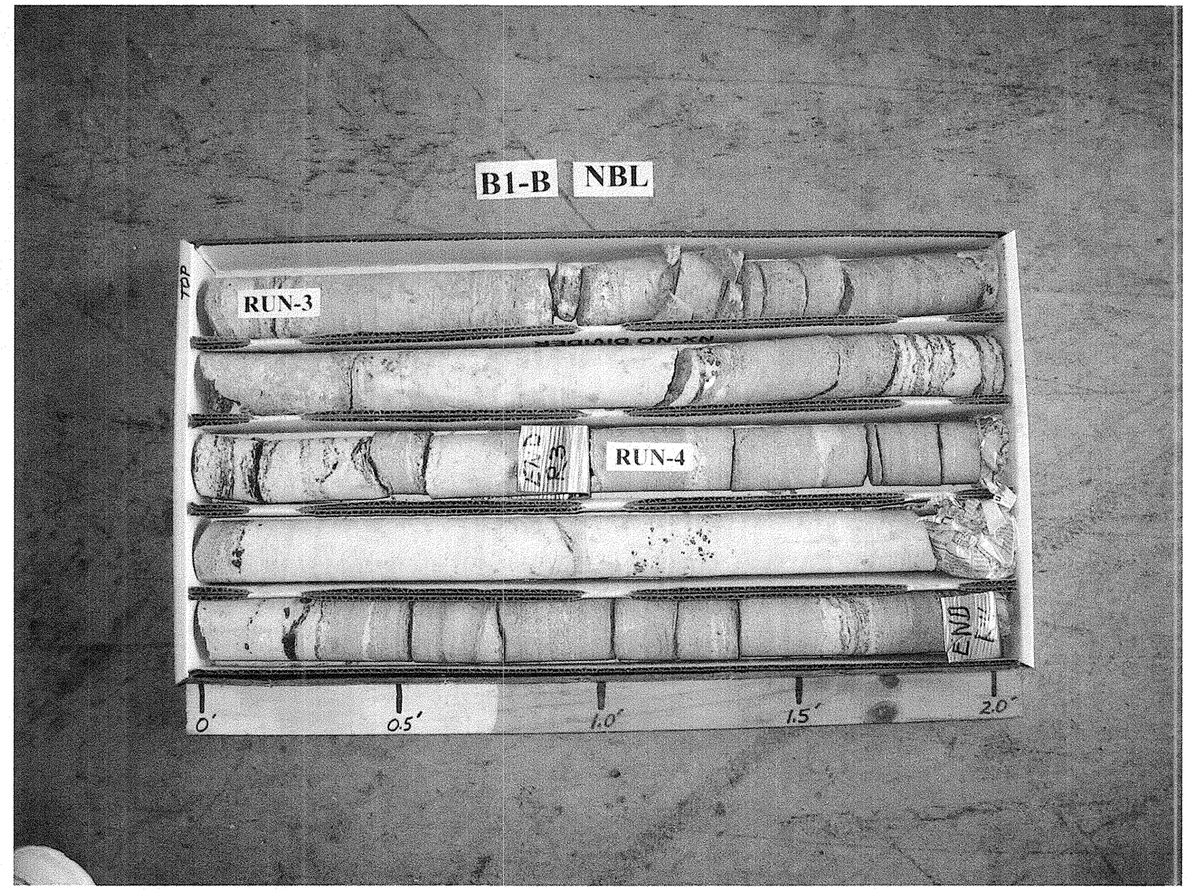
INSTRUCTIONS

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.

34400.1.1 R-2233AB
BRIDGE NO. 55 ON US 221 OVER FLOYD'S CREEK
B1A - NBL

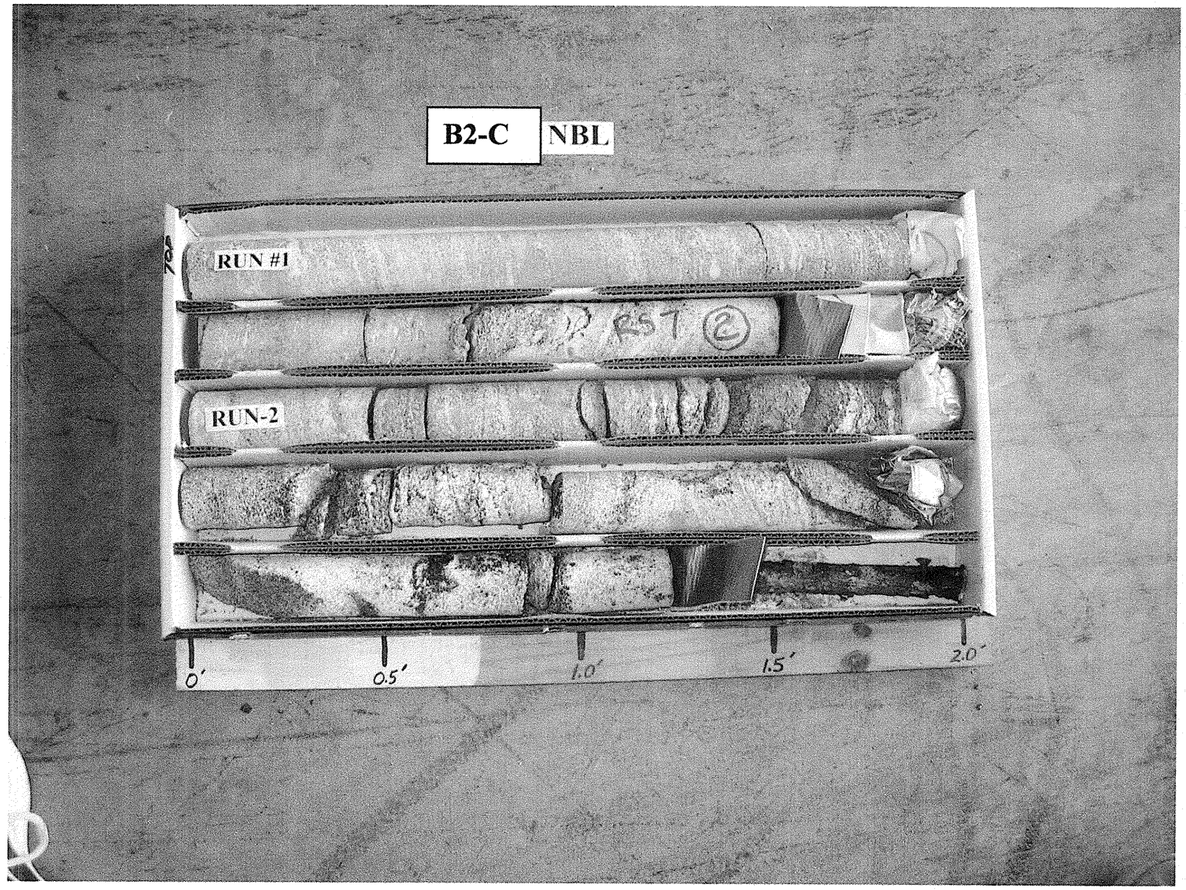


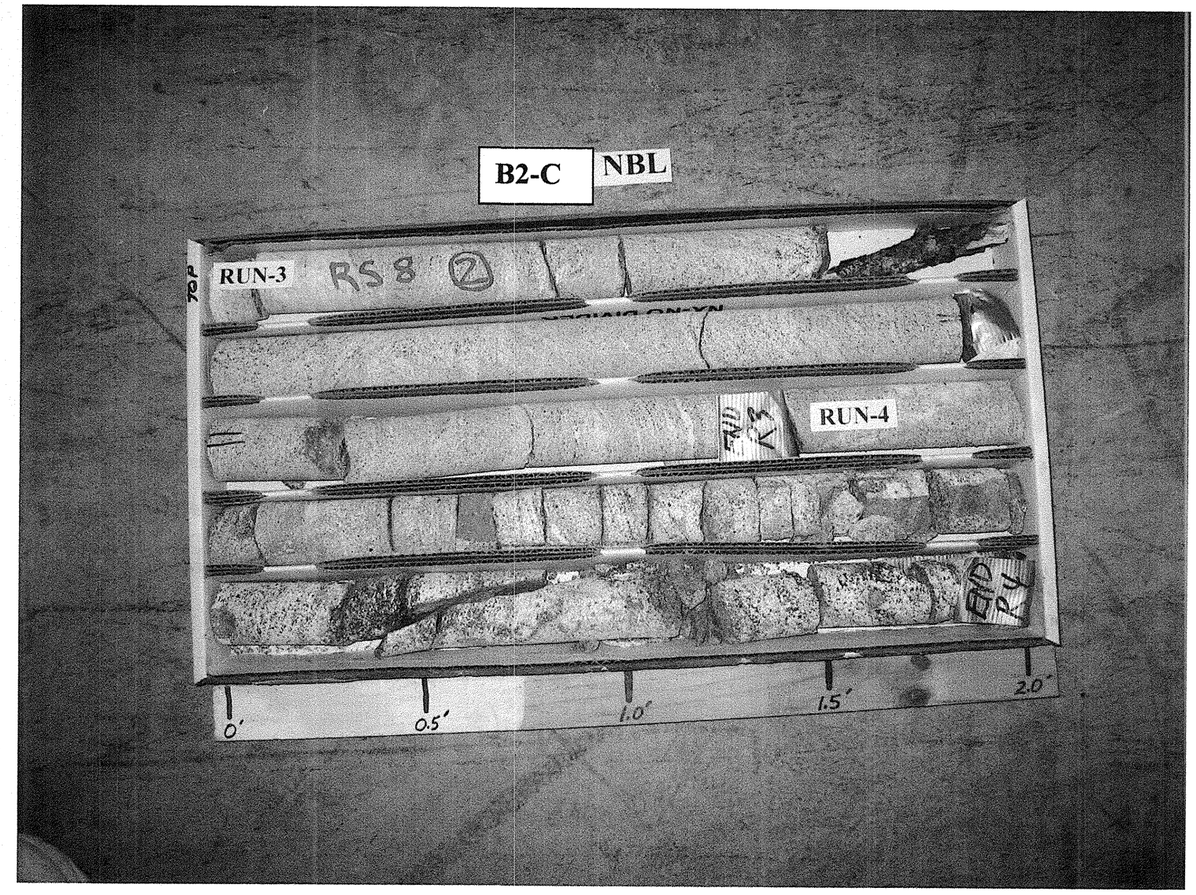
34400.1.1 R-2233AB
BRIDGE NO. 55 ON US 221 OVER FLOYD'S CREEK
B1B - NBL



34400.1.1 R-2233AB
BRIDGE NO. 55 ON US 221 OVER FLOYD'S CREEK
B1B - NBL

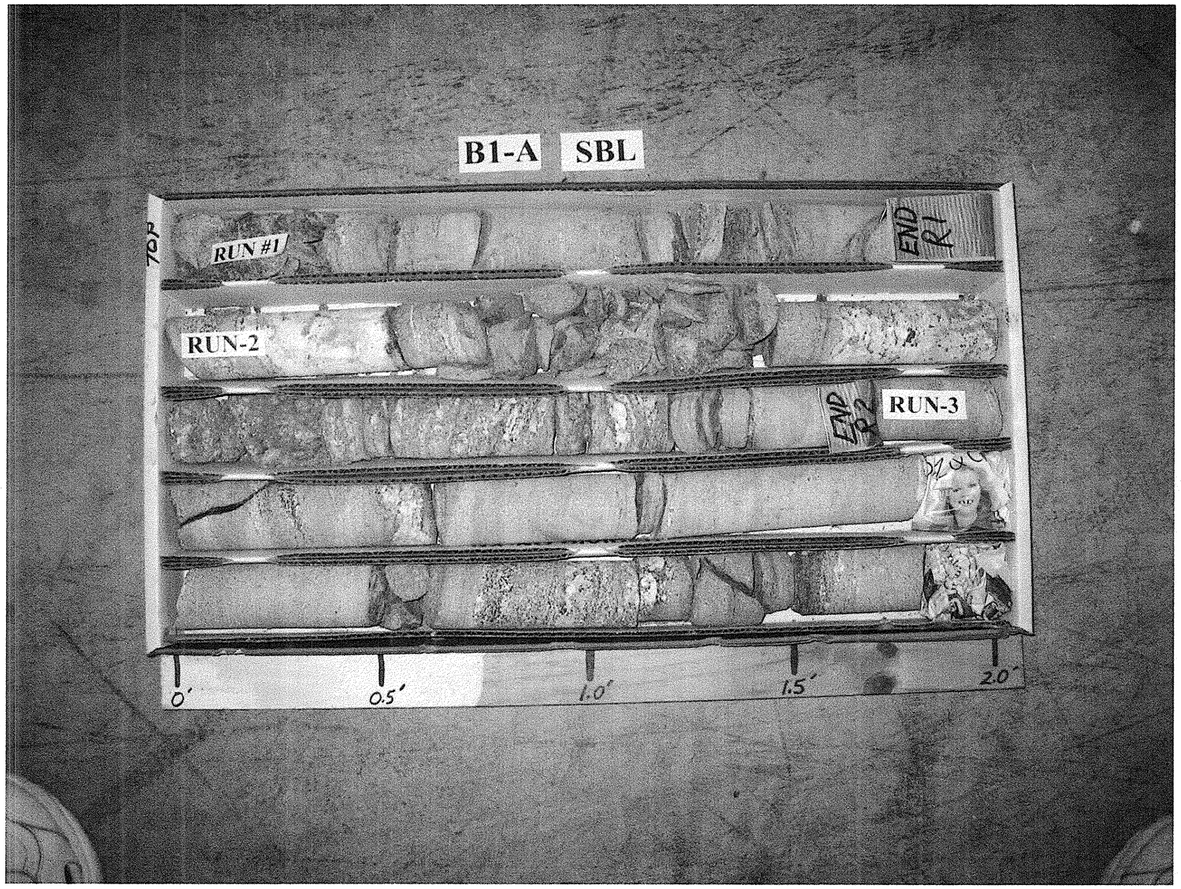
34400.1.1 R-2233AB
BRIDGE NO. 55 ON US 221 OVER FLOYD'S CREEK
B2C - NBL

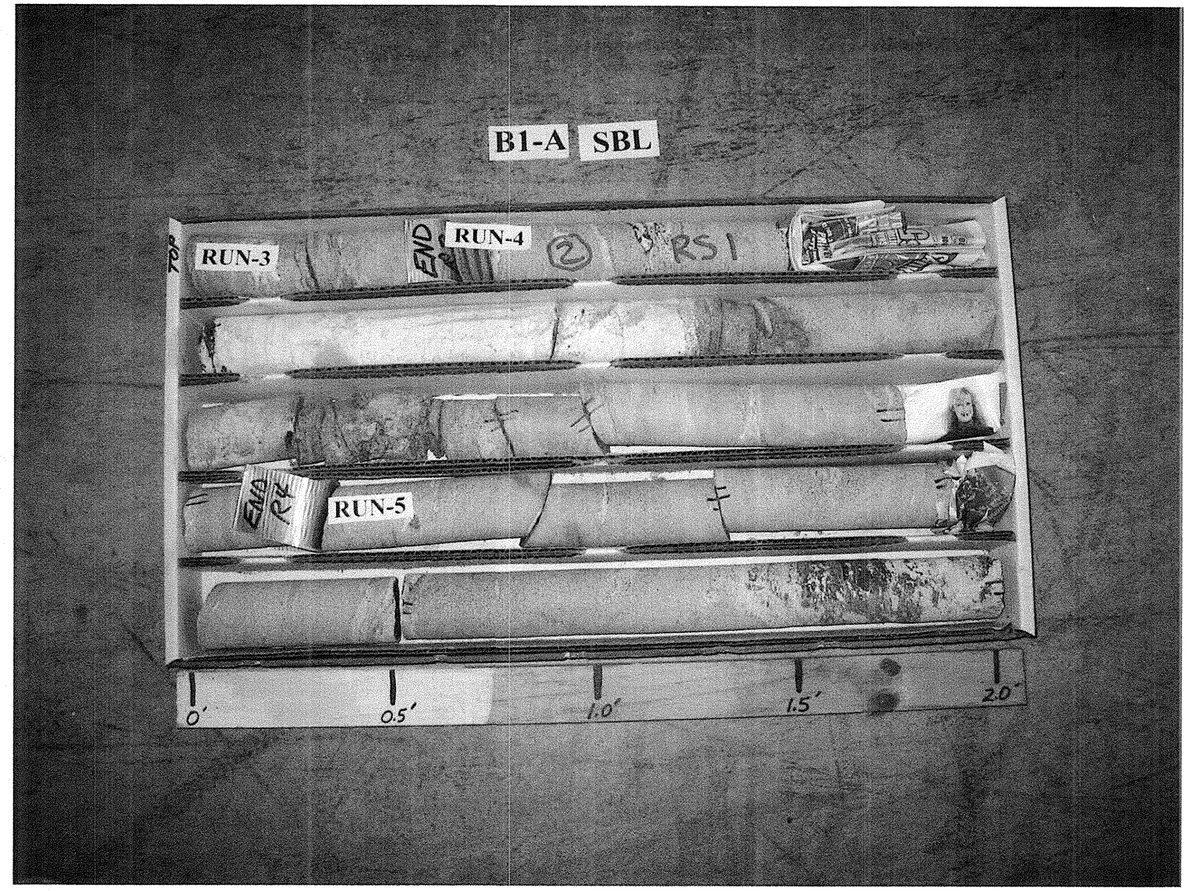




34400.1.1 R-2233AB
BRIDGE NO. 55 ON US 221 OVER FLOYD'S CREEK
B2C - NBL

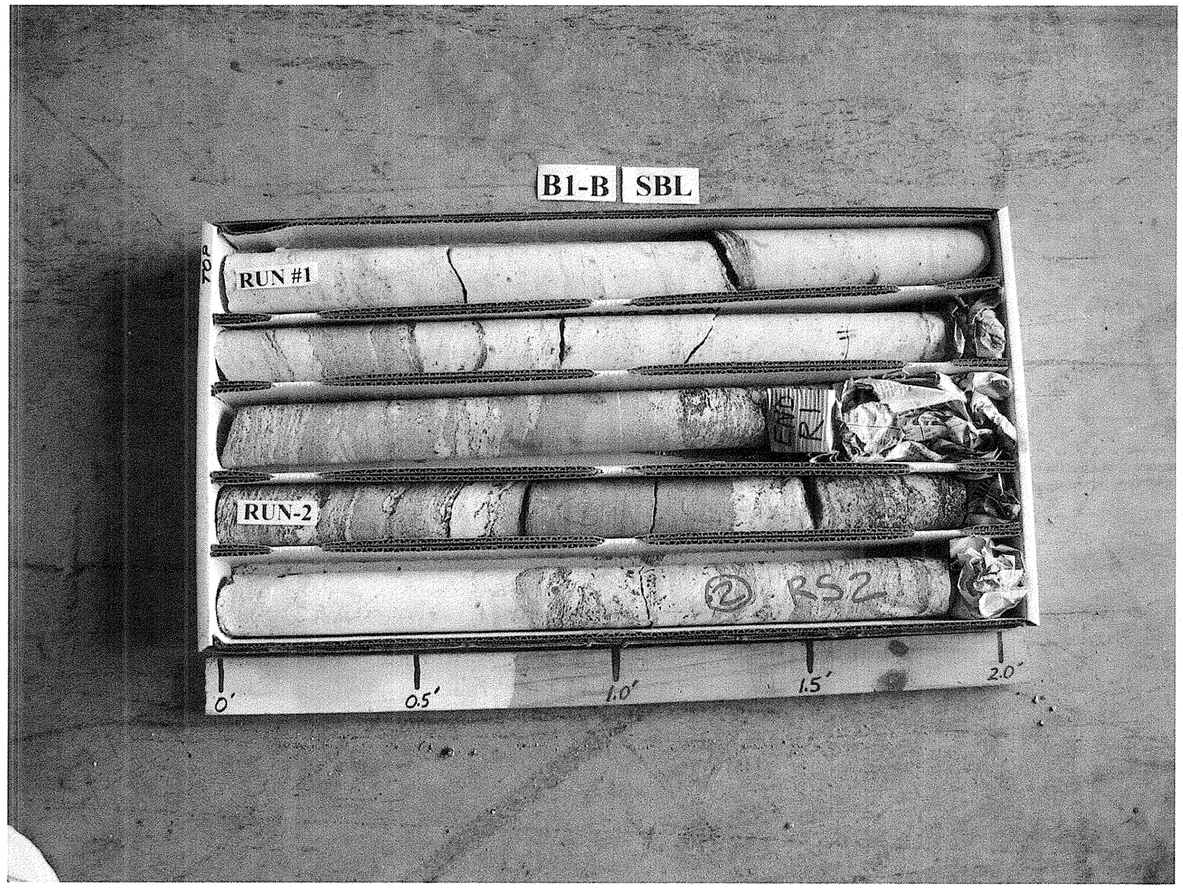
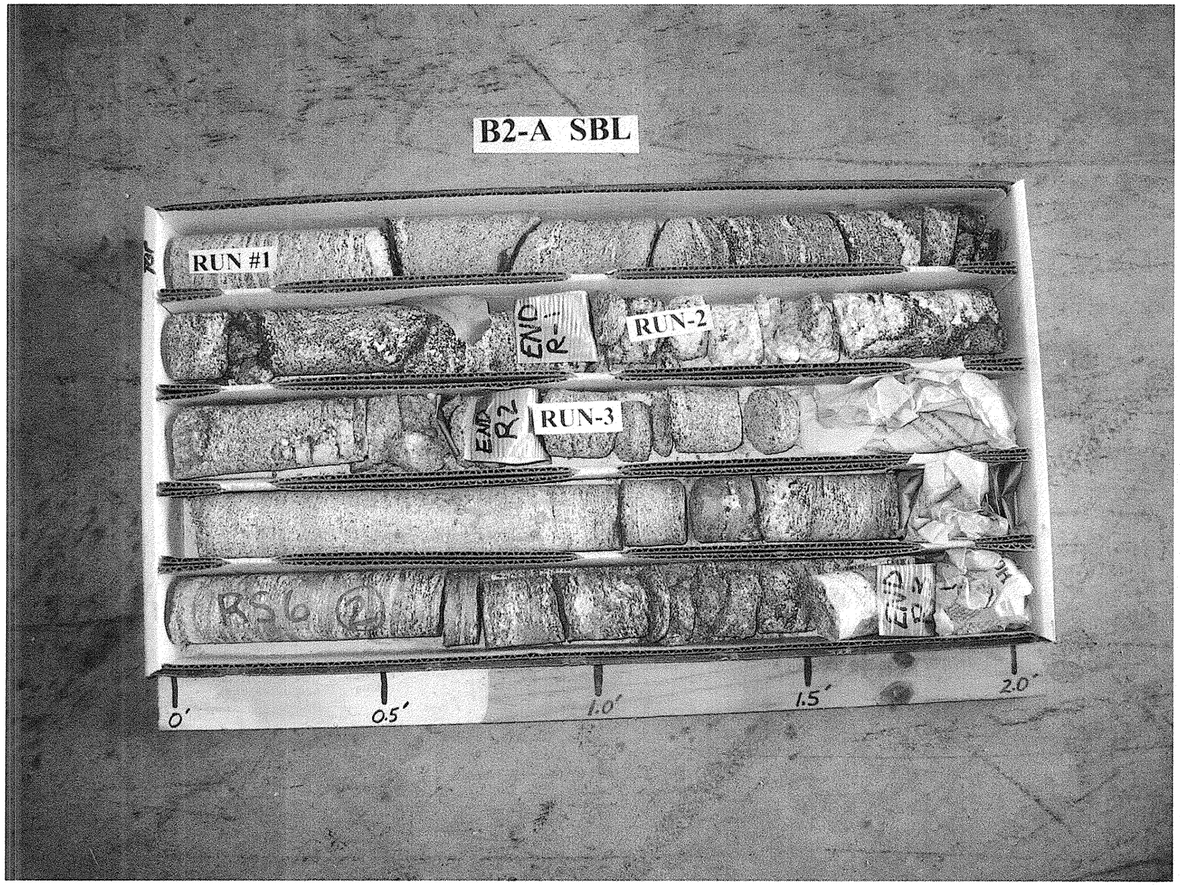
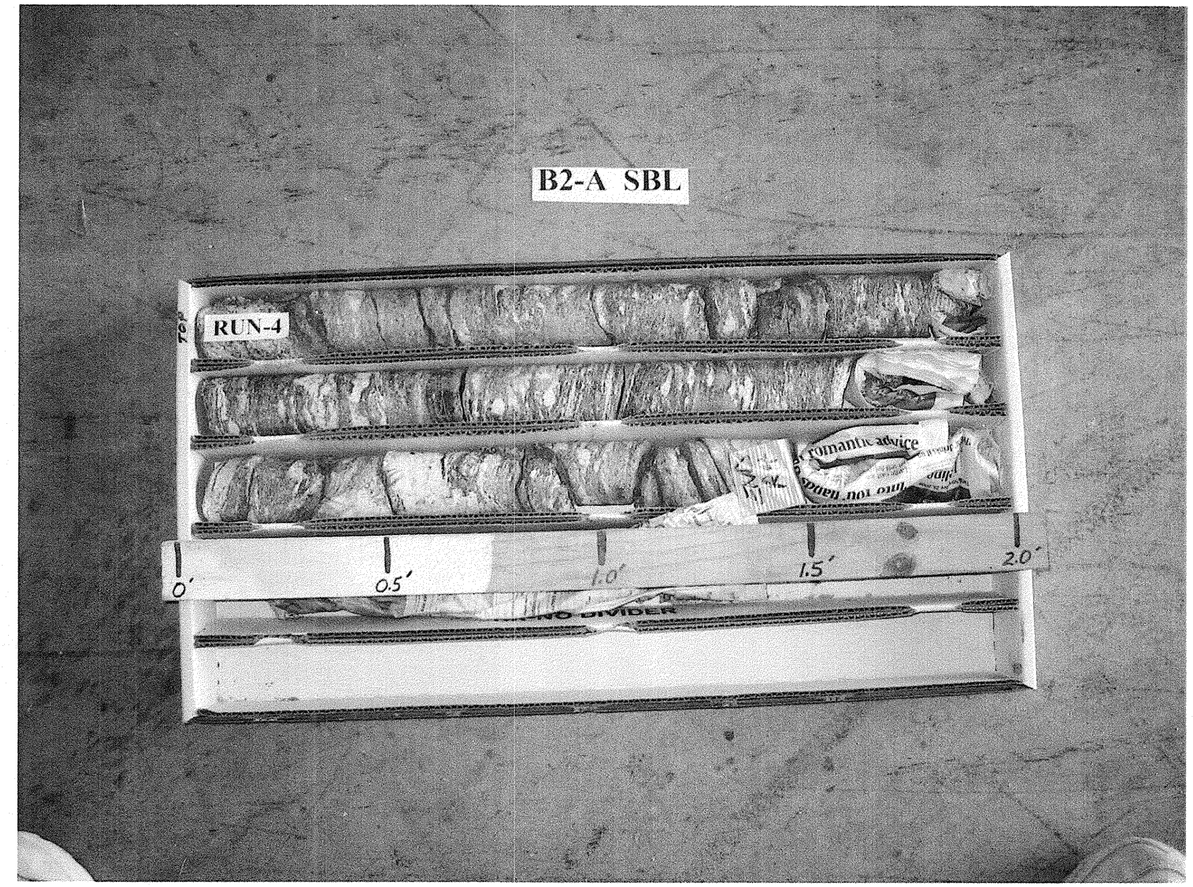
34400.1.1 R-2233AB
BRIDGE NO. 55 ON US 221 OVER FLOYD'S CREEK
B1A - SBL





34400.1.1 R-2233AB
BRIDGE NO. 55 ON US 221 OVER FLOYD'S CREEK
B1A - SBL

34400.1.1 R-2233AB
BRIDGE NO. 55 ON US 221 OVER FLOYD'S CREEK
B1B - SBL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BRIDGE NO. 55 ON US 221 OVER FLOYD'S CREEK
B2A - SBL