STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34497.1.2	1	50

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34497.1.2 (R-2707B) F.A. PROJ. NHF-74(14)

COUNTY CLEVELAND

PROJECT DESCRIPTION US 74 (SHELBY BYPASS) FROM WEST OF SR 1314 TO WEST OF NC 226

SITE DESCRIPTION DUAL BRIDGES OVER BRUSHY CREEK

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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.

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PERSONNEL

J. Howard

J. Honeycutt

D. White

O. Smith

INVESTIGATED BY MACTEC

CHECKED BY S. Johnson

SUBMITTED BY B. Deobald

DATE 11/23/09

REVISED 12/16/09

For Letting

NORTH CAROLINA LICENSED 12-17-09 SEAL 1730 GEOLOGIST WILLIAM BRIAN DEOBALD

MACTEC

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

SIGNATURE

MACTEC NC LICENSE F-0653

DRAWN BY: R. RAHIE

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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: 34497.1.2

ID: R-2707B

PROJECT REFERENCE NO.	SHEET NO.
34497.1.2	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/FT2)
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
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF SPT REFUSAL

ABBREVIATIONS

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

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-__
- [ ] BK-51
- [ ] CME-45C
- [x] CME-55LC
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [x] CASING [ ] W/ ADVANCER
- [x] TRICONE 2 7/8" STEEL TEETH
- [ ] TRICONE __" TUNG.-CARB.
- [ ] 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.

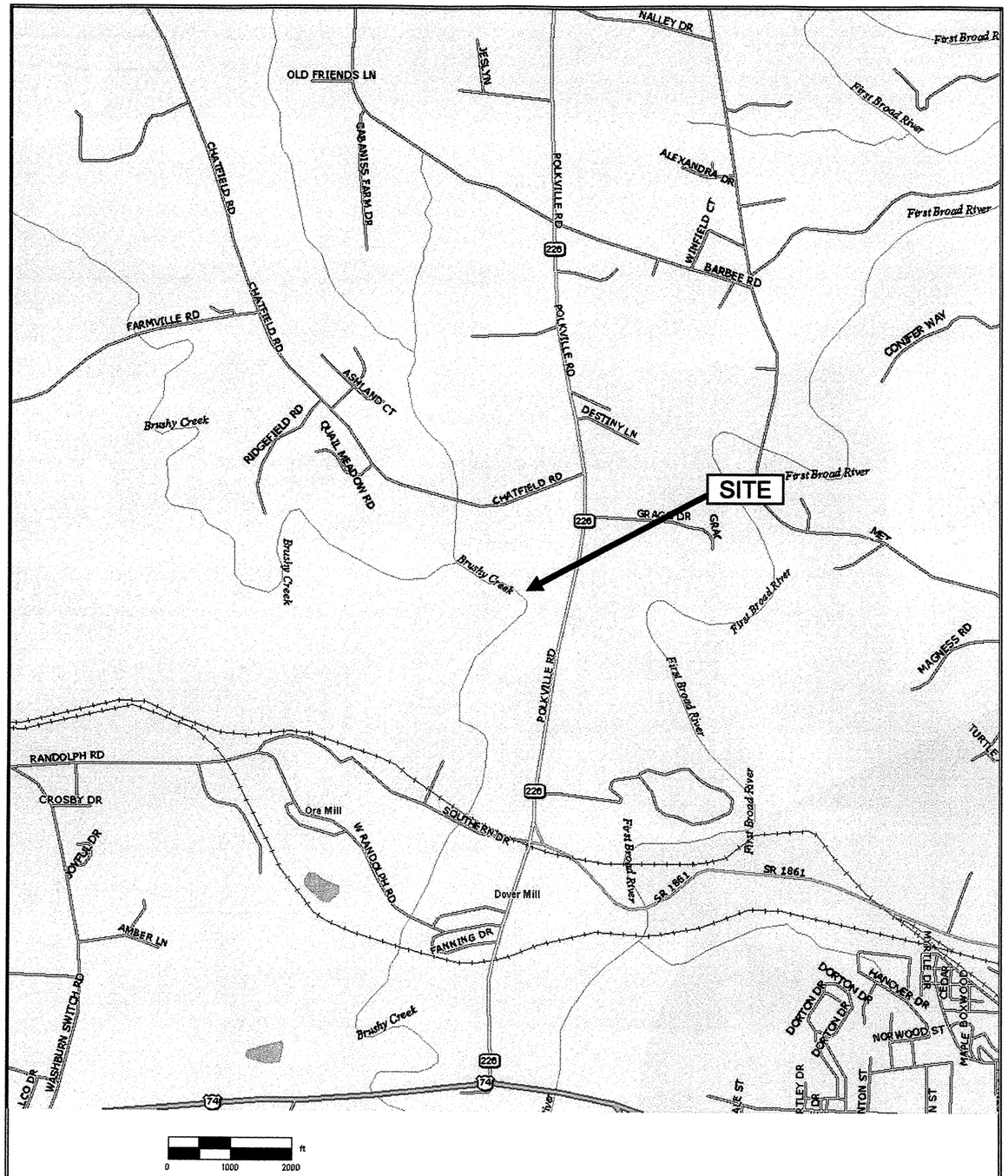
STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

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: NCDOT CAP -BL-88 ELEV: 746.27
NCDOT CAP -BL-87 ELEV: 762.11
_ ELEVATION: _ FT.

NOTES:
FIAD - FILLED IMMEDIATELY AFTER DRILLING



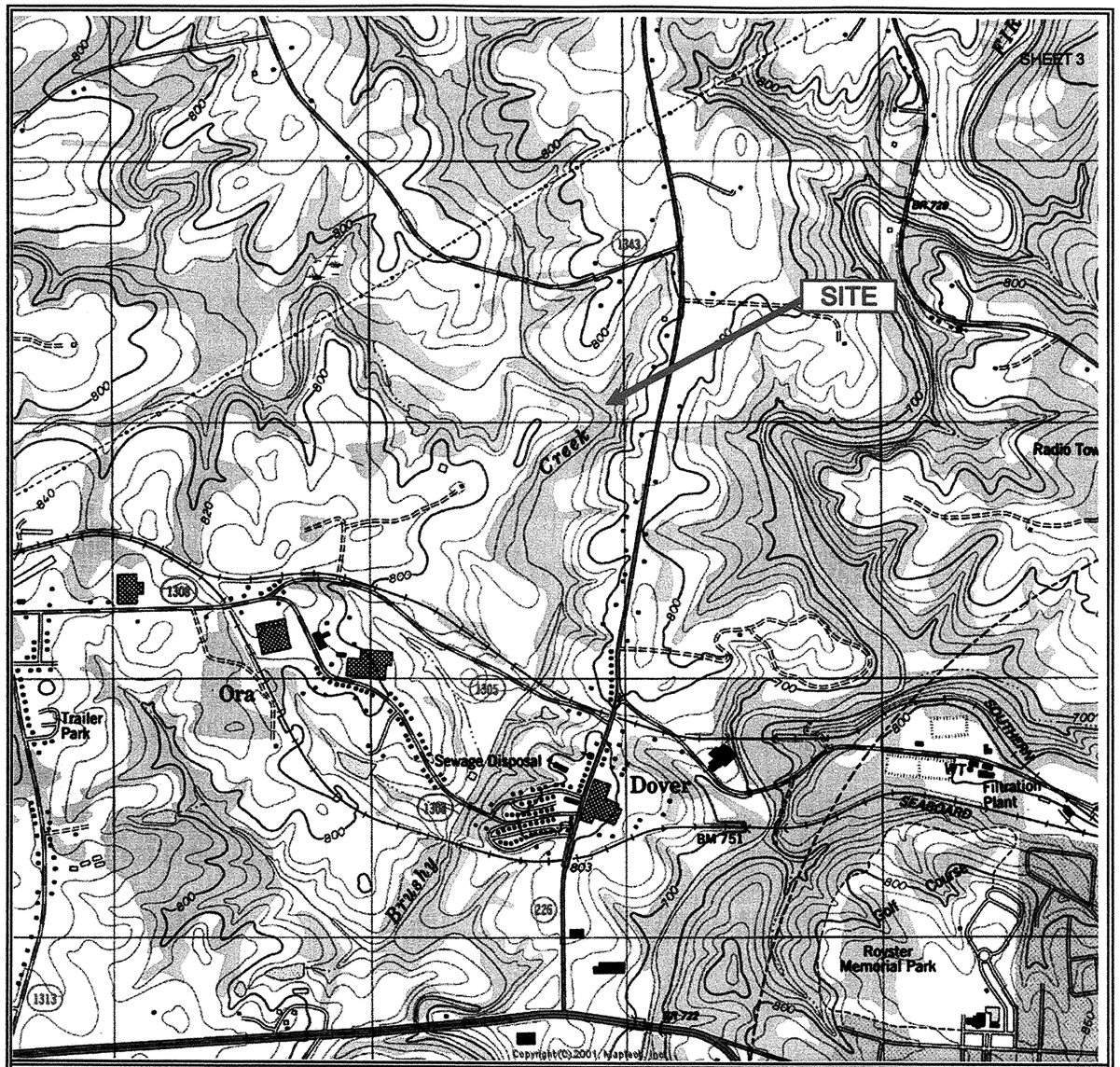
MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

SITE LOCATION MAP
DUAL BRIDGES OVER BRUSHY CREEK
(SHELBY BYPASS)
NCDOT PROJ. NO. 34497.1.2 (R-2707B)
CLEVELAND COUNTY, NORTH CAROLINA

DRAWN: JPH	DATE: December 2009	Drawing
APPROVAL: MBL	SCALE: 1"=24,000'	1
	JOB No: 6468-09-2511	

REFERENCE: MAPTECH TERRAIN NAVIGATOR



SHELBY, N.C.

SHELBY QUARDANGLE
N3515-W8130/7.5
1983
DMA 4654 SE-SERIES V842

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

GRAPHIC SCALE FEET
2000 1000 0 2000 4000

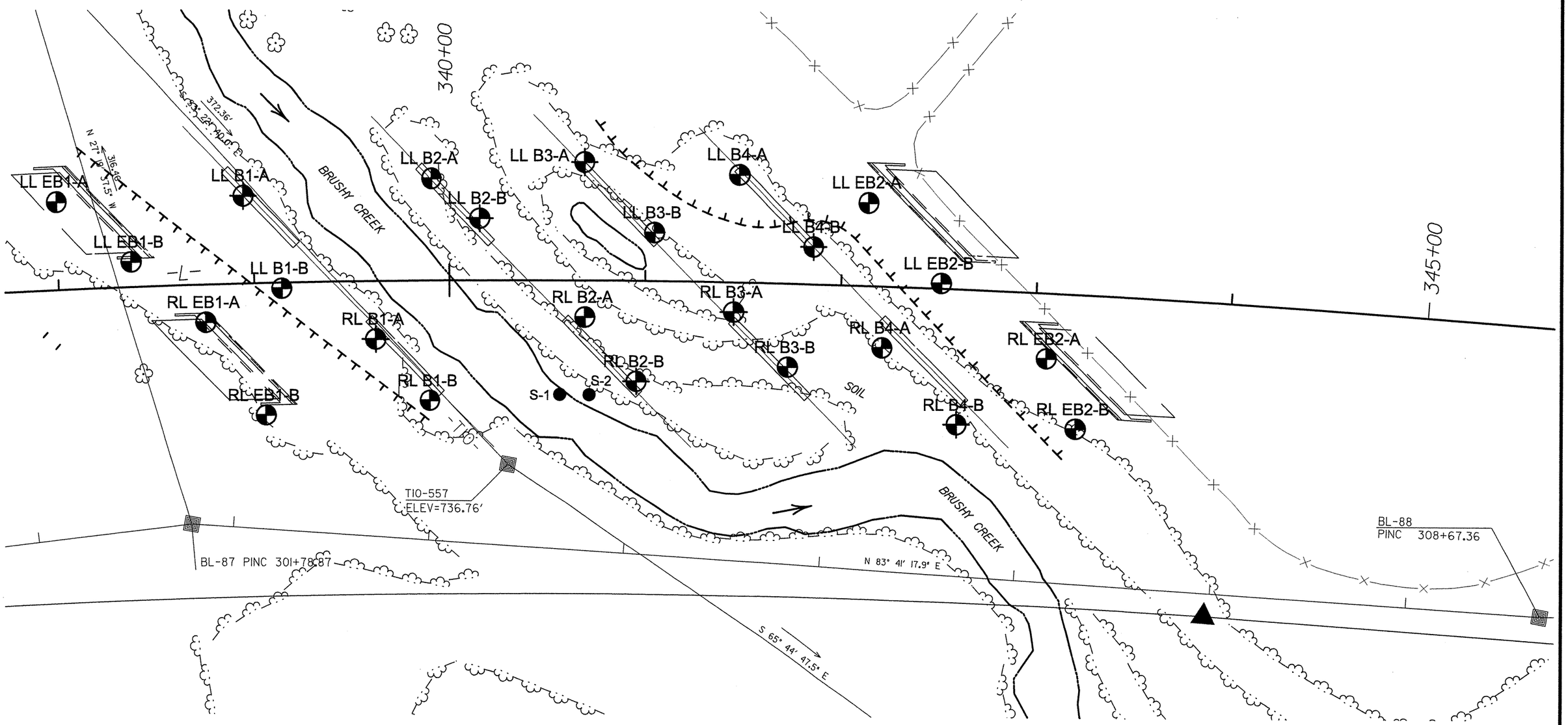
NOTE: SITE LOCATION IS APPROXIMATE

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

TOPOGRAPHIC SITE MAP
DUAL BRIDGES OVER BRUSHY CREEK
(SHELBY BYPASS)
NCDOT PROJ. NO. 34497.1.2 (R-2707B)
CLEVELAND COUNTY, NORTH CAROLINA

DRAWN: JPH	DATE: December, 2009	DRAWING
APPROVAL: MBL	SCALE: 1: 24000	2
REVISED:	JOB: 6468-09-2511	



0 25' 50' 100'

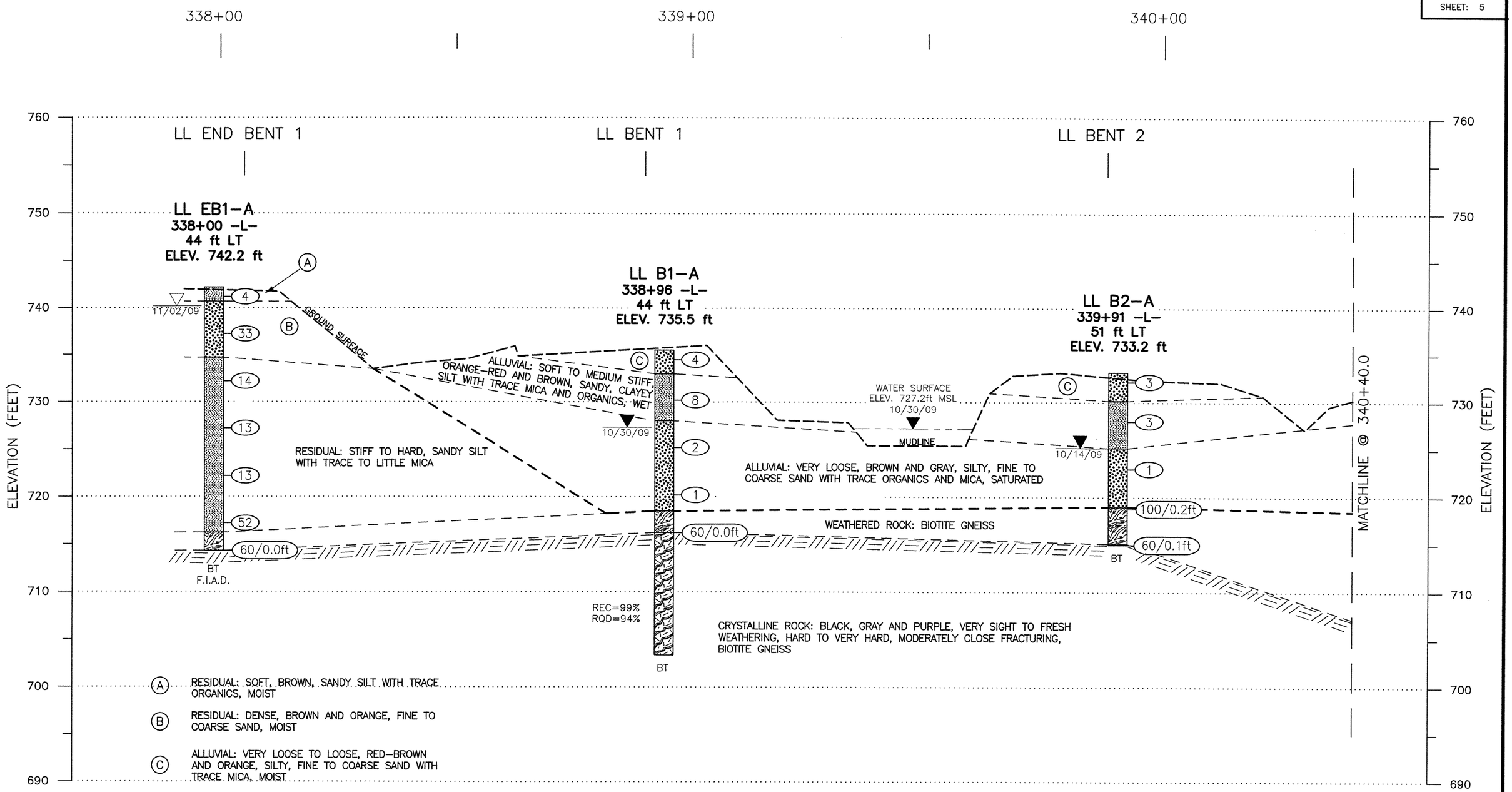
SCALE (FEET)
1" : 50'

NAD 83

BORING LOCATION PLAN
US 74 (SHELBY BYPASS) DUAL BRIDGES OVER BRUSHY CREEK
NCDOT PROJECT NO. 34497.1.2 (R-2707B)
F.A. No. NHF-74(14)
CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 11/23/09
12/16/09	DFT CHECK: W.B.D.	JOB : 6468-09-2511
	ENG CHECK: J.S.J.	DWG: 3



– GROUND LINE PROFILE SURVEYED BY MACTEC AT 54 ft LEFT OF –L– ON 10/20/2009 AND 10/30/09.

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

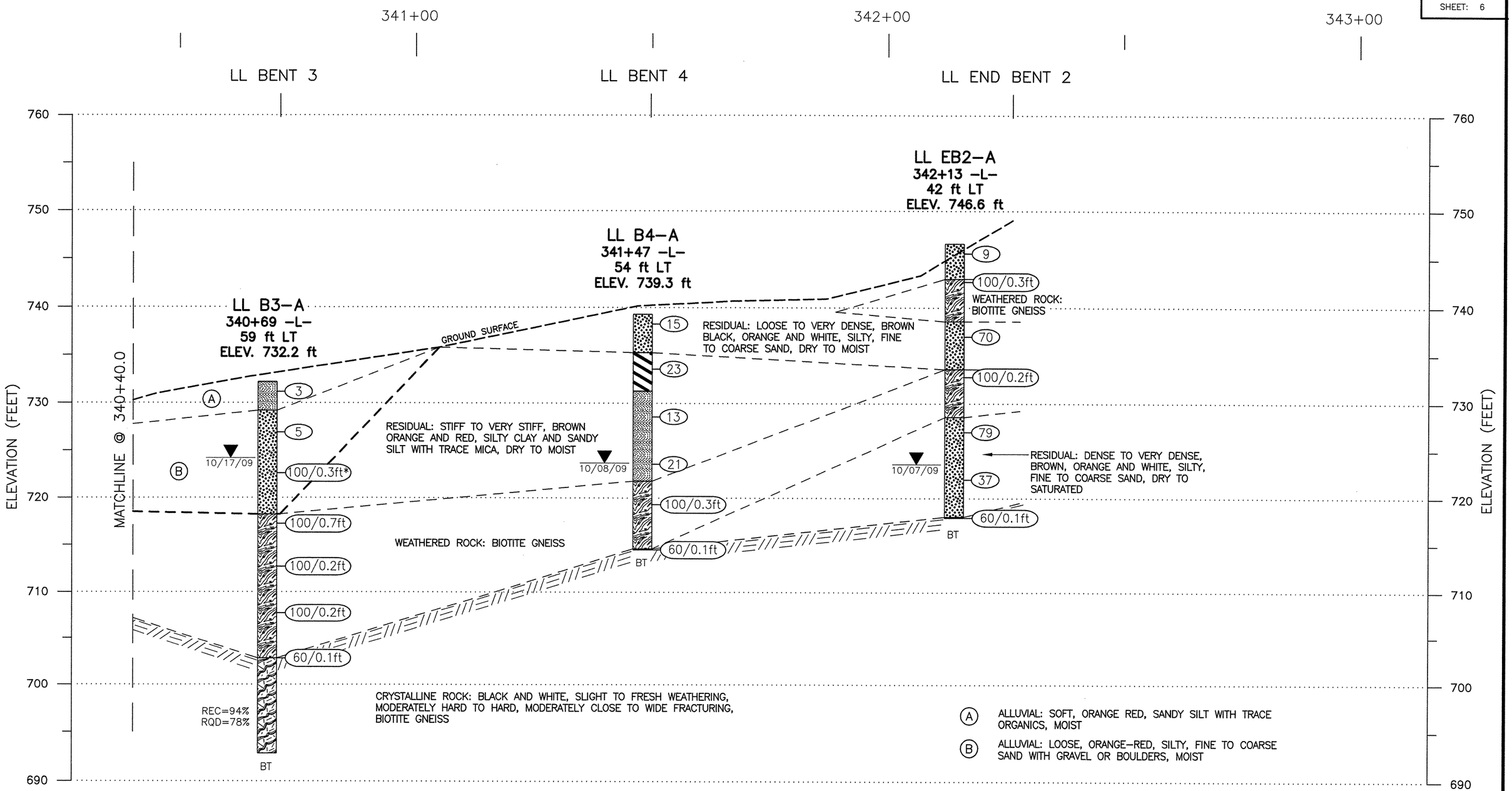
0 10' 20' 40'
HORIZONTAL SCALE IN FEET
1"=20'

0 5' 10' 20'
VERTICAL SCALE IN FEET
1"=10'

PROFILE 54 FT LEFT OF –L–
US 74 (SHELBY BYPASS) DUAL BRIDGES OVER BRUSHY CREEK
NCDOT PROJECT NO. 34497.1.2 (R-2707B)
F.A. No. NHF-74(14)
CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 11/23/09
12/16/09	DFT CHECK: W.B.D.	JOB: 6468-09-2511
01/20/10	ENG CHECK: J.S.J.	DWG: 4



– GROUND LINE PROFILE SURVEYED BY MACTEC AT 54 ft LEFT OF –L– ON 10/20/2009.

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

* NOTE: SPT NOT VALID DUE TO GRAVEL OR BOULDERS

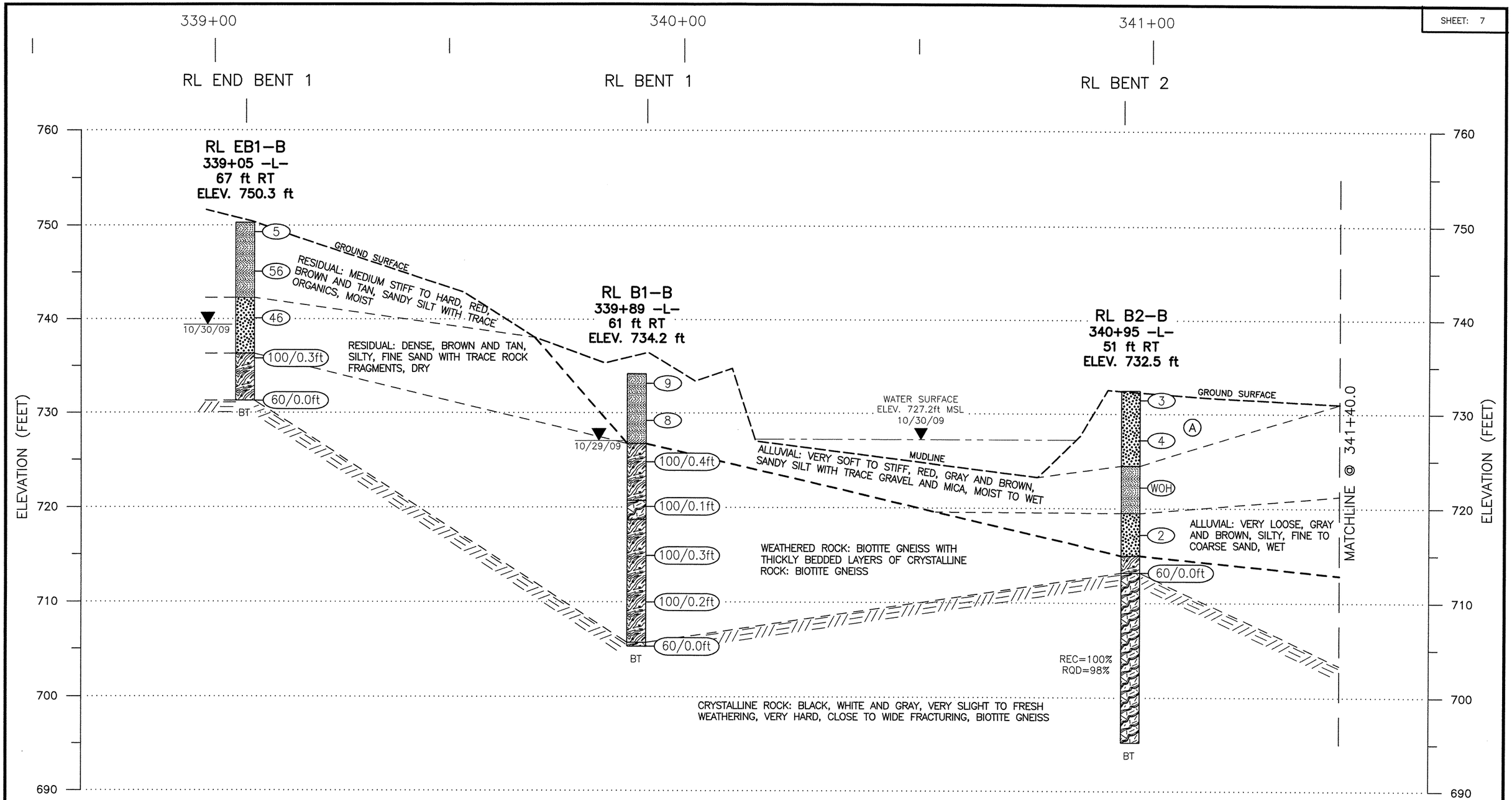
0 10' 20' 40'
HORIZONTAL SCALE IN FEET
1"=20'

0 5' 10' 20'
VERTICAL SCALE IN FEET
1"=10'

PROFILE 54 FT LEFT OF –L–
US 74 (SHELBY BYPASS) DUAL BRIDGES OVER BRUSHY CREEK
NCDOT PROJECT NO. 34497.1.2 (R-2707B)
F.A. No. NHF-74(14)
CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 11/23/09
12/16/09	DFT CHECK: W.B.D.	JOB: 6468-09-2511
01/20/10	ENG CHECK: J.S.J.	DWG: 5



– GROUND LINE PROFILE SURVEYED BY MACTEC AT 54 ft RIGHT OF –L– ON 10/20/2009 AND 10/30/09.

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

(A) ALLUVIAL: VERY LOOSE TO LOOSE, ORANGE, SILTY, FINE TO COARSE SAND, WITH TRACE MICA, MOIST

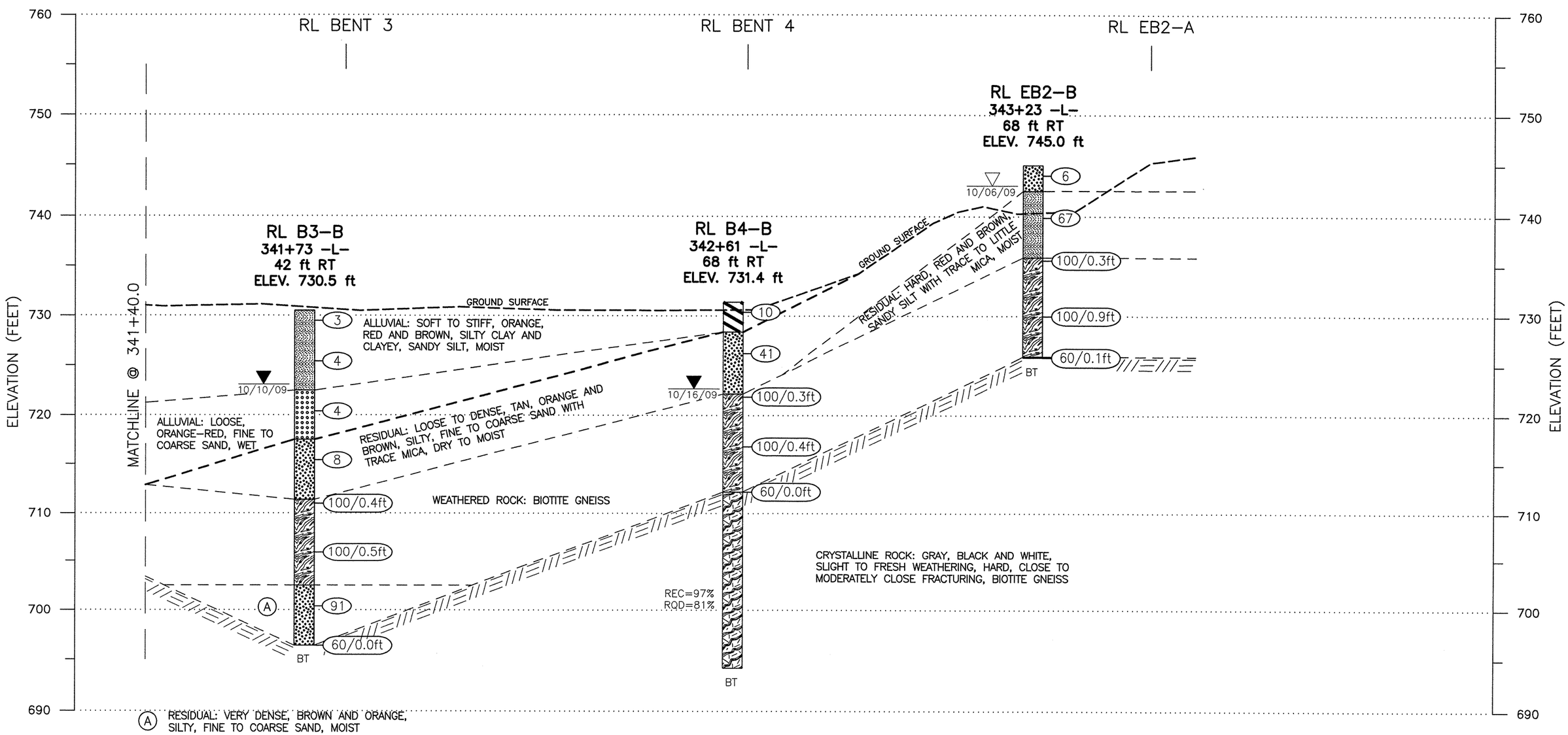
0 10' 20' 40'
HORIZONTAL SCALE IN FEET
1"=20'

0 5' 10' 20'
VERTICAL SCALE IN FEET
1"=10'

PROFILE 54 FT RIGHT OF –L–
US 74 (SHELBY BYPASS) DUAL BRIDGES OVER BRUSHY CREEK
NCDOT PROJECT NO. 34497.1.2 (R-2707B)
F.A. No. NHF-74(14)
CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 11/23/09
12/16/09	DFT CHECK: W.B.D.	JOB: 6468-09-2511
01/20/10	ENG CHECK: J.S.J.	DWG: 6



– GROUND LINE PROFILE SURVEYED BY MACTEC AT 54 ft RIGHT OF –L– ON 10/20/2009.

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

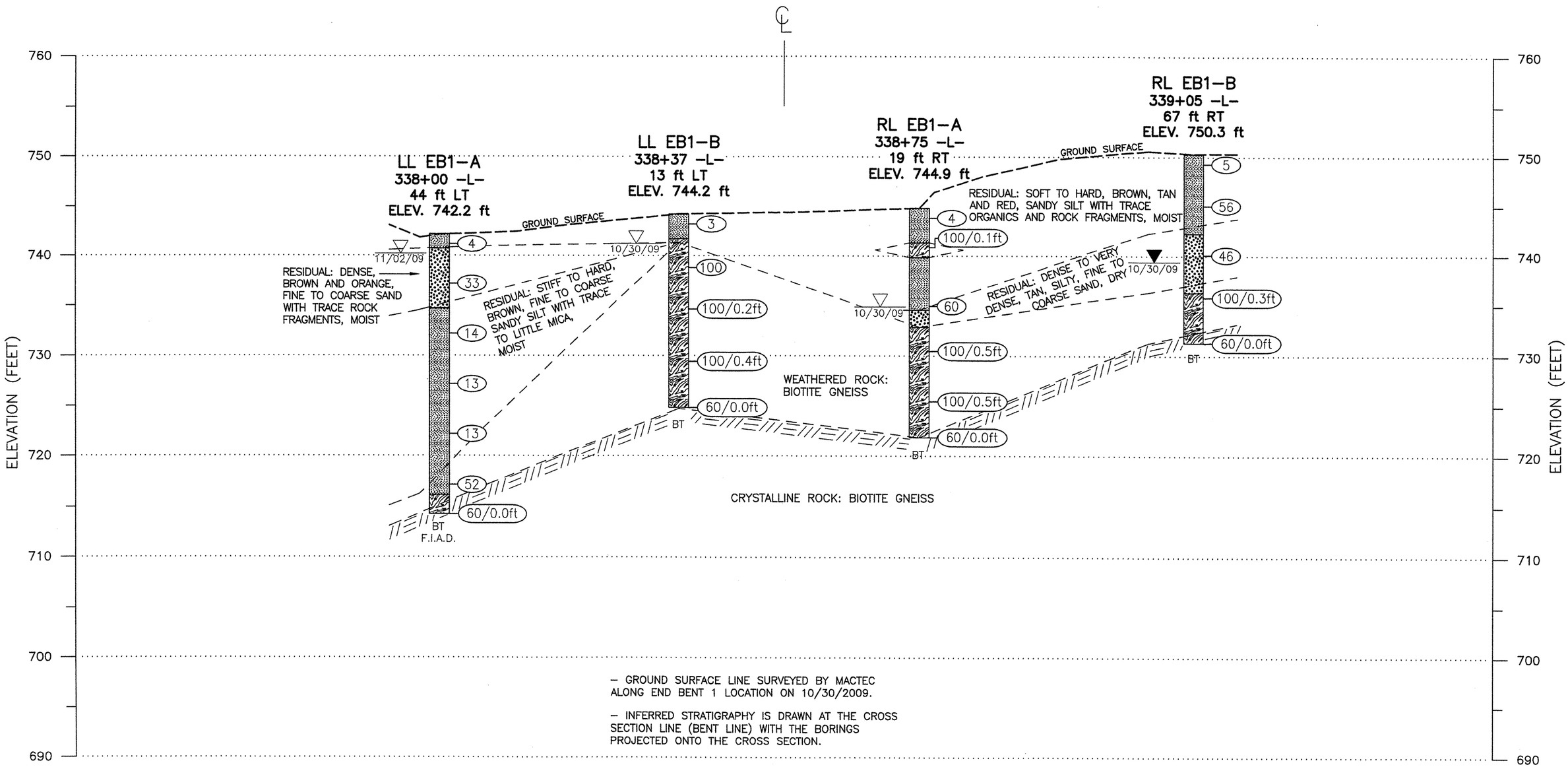
0 10' 20' 40'
HORIZONTAL SCALE IN FEET
1"=20'

0 5' 10' 20'
VERTICAL SCALE IN FEET
1"=10'

PROFILE 54 FT RIGHT OF –L–
US 74 (SHELBY BYPASS) DUAL BRIDGES OVER BRUSHY CREEK
NCDOT PROJECT NO. 34497.1.2 (R-2707B)
F.A. No. NHF-74(14)
CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 11/23/09
12/16/09	DFT CHECK: W.B.D.	JOB: 6468-09-2511
01/20/10	ENG CHECK: J.S.J.	DWG: 7



– GROUND SURFACE LINE SURVEYED BY MACTEC ALONG END BENT 1 LOCATION ON 10/30/2009.

– INFERRED STRATIGRAPHY IS DRAWN AT THE CROSS SECTION LINE (BENT LINE) WITH THE BORINGS PROJECTED ONTO THE CROSS SECTION.

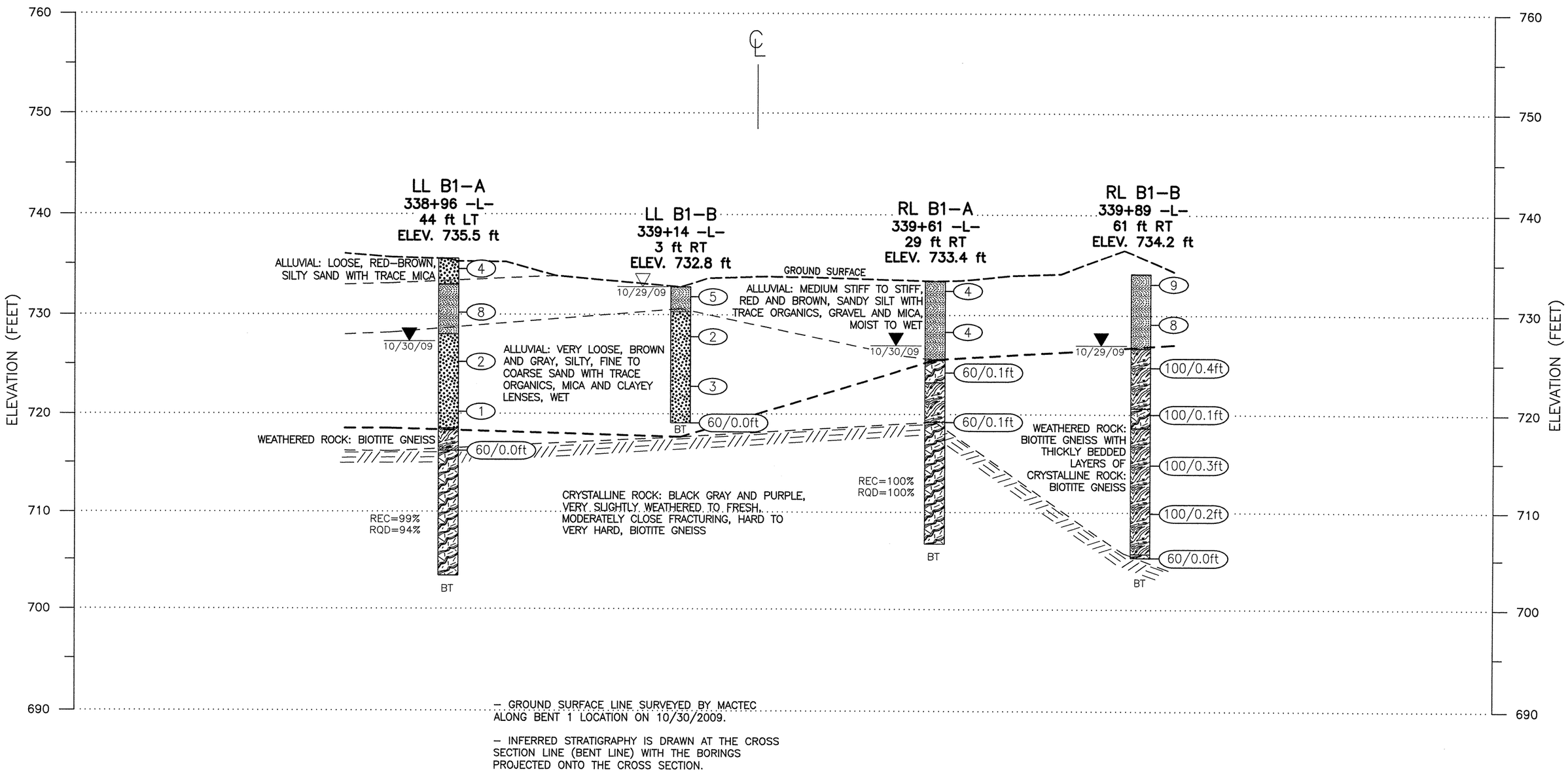
0 10' 20' 40'
HORIZONTAL SCALE IN FEET
1"=20'

0 5' 10' 20'
VERTICAL SCALE IN FEET
1"=10'

CROSS SECTION ALONG END BENT 1
US 74 (SHELBY BYPASS) DUAL BRIDGES OVER BRUSHY CREEK
NCDOT PROJECT NO. 34497.1.2 (R-2707B)
F.A. No. NHF-74(14)
CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 11/23/09
12/16/09	DFT CHECK: W.B.D.	JOB: 6468-09-2511
	ENG CHECK: J.S.J.	DWG: 8



– GROUND SURFACE LINE SURVEYED BY MACTEC ALONG BENT 1 LOCATION ON 10/30/2009.

– INFERRED STRATIGRAPHY IS DRAWN AT THE CROSS SECTION LINE (BENT LINE) WITH THE BORINGS PROJECTED ONTO THE CROSS SECTION.

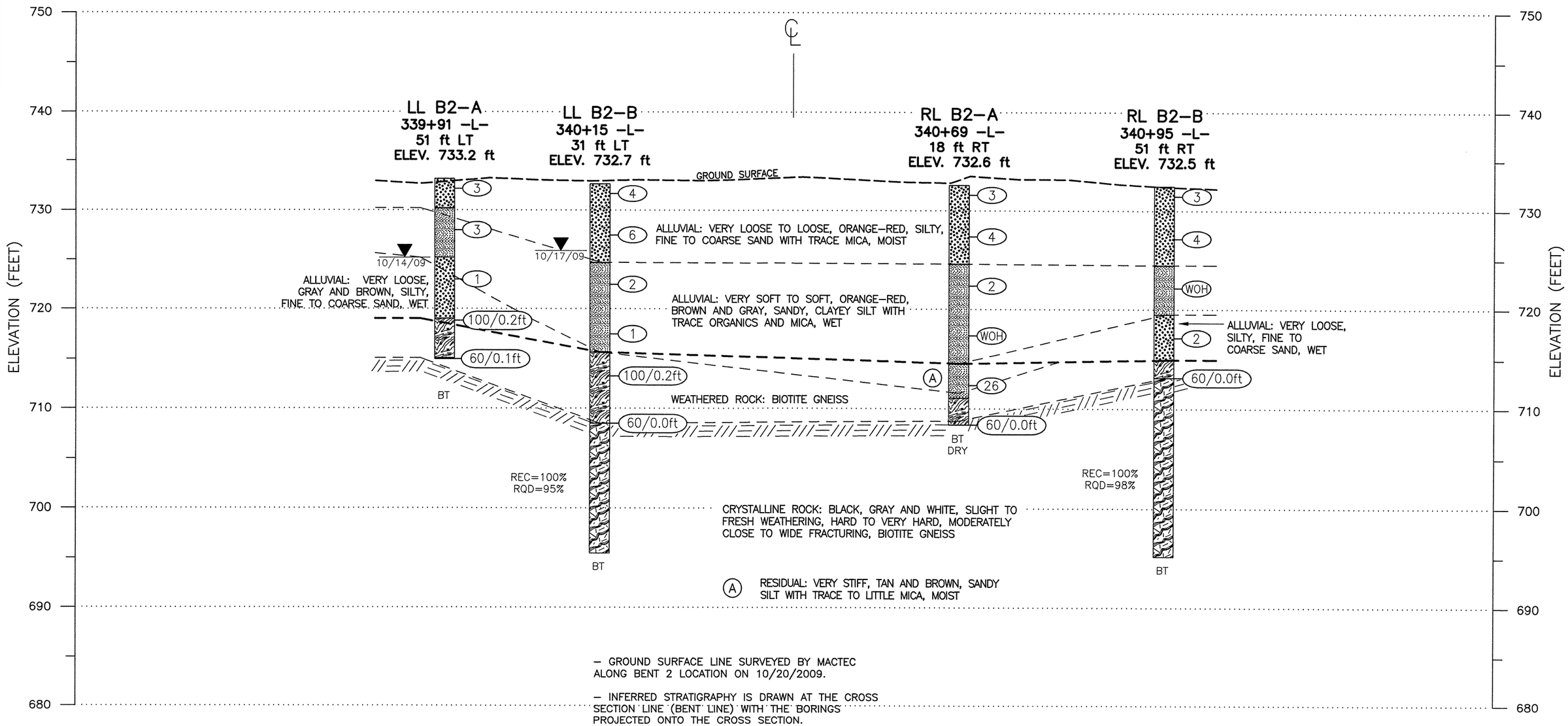
0 10' 20' 40'
HORIZONTAL SCALE IN FEET
1"=20'

0 5' 10' 20'
VERTICAL SCALE IN FEET
1"=10'

CROSS SECTION ALONG BENT 1
US 74 (SHELBY BYPASS) DUAL BRIDGES OVER BRUSHY CREEK
NCDOT PROJECT NO. 34497.1.2 (R–2707B)
F.A. No. NHF–74(14)
CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 11/23/09
12/16/09	DFT CHECK: W.B.D.	JOB: 6468–09–2511
01/20/10	ENG CHECK: J.S.J.	DWG: 9



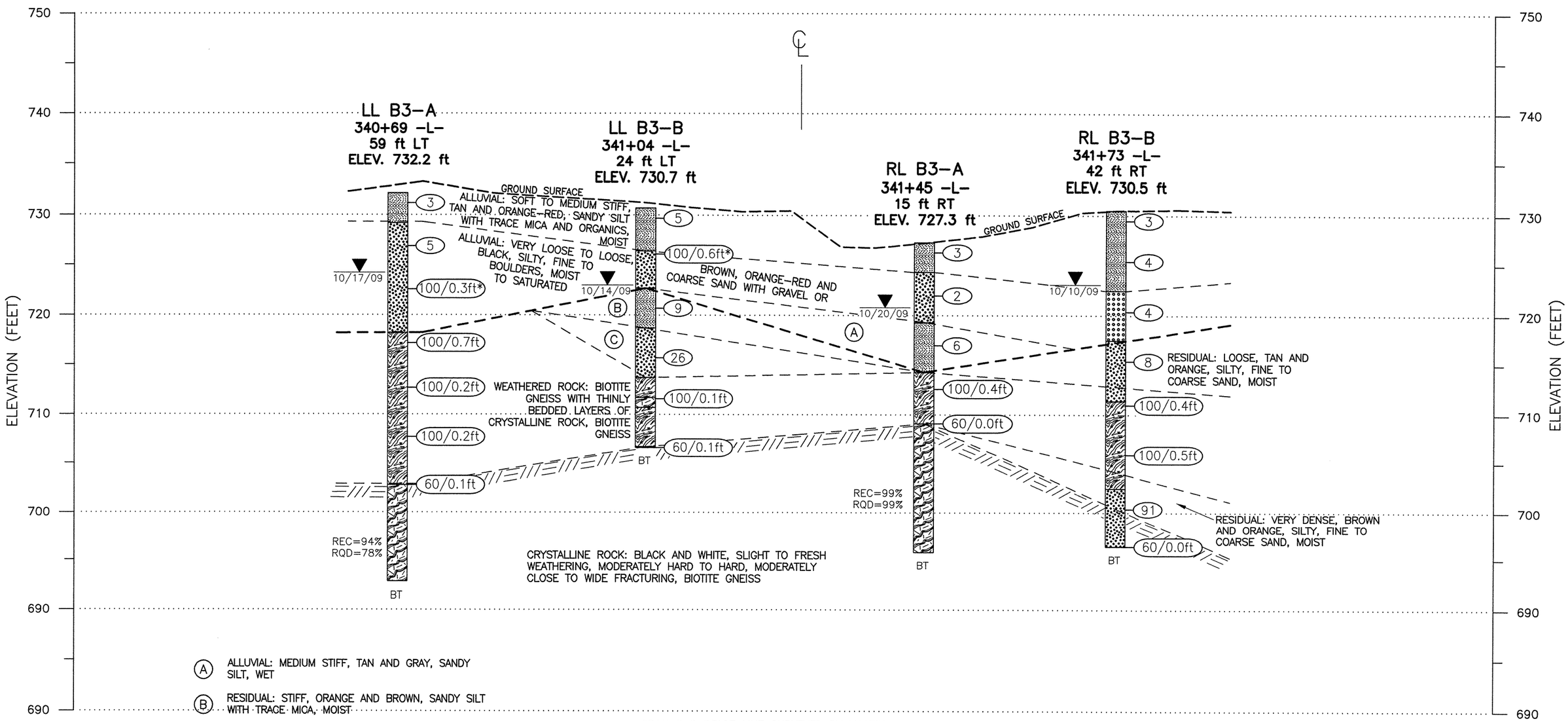
0 10' 20' 40'
HORIZONTAL SCALE IN FEET
1"=20'

0 5' 10' 20'
VERTICAL SCALE IN FEET
1"=10'

CROSS SECTION ALONG BENT 2
US 74 (SHELBY BYPASS) DUAL BRIDGES OVER BRUSHY CREEK
NCDOT PROJECT NO. 34497.1.2 (R–2707B)
F.A. No. NHF–74(14)
CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN:	R.R.	DATE:	11/23/09
12/16/09	DFT CHECK:	W.B.D.	JOB:	6468–09–2511
01/20/10	ENG CHECK:	J.S.J.	DWG:	10



(A) ALLUVIAL: MEDIUM STIFF, TAN AND GRAY, SANDY SILT, WET

(B) RESIDUAL: STIFF, ORANGE AND BROWN, SANDY SILT WITH TRACE MICA, MOIST

(C) RESIDUAL: MEDIUM DENSE, TAN, GRAY AND BROWN, SILTY, FINE TO COARSE SAND WITH TRACE MICA, MOIST

* NOTE: SPT NOT VALID DUE TO GRAVEL OR BOULDERS

– GROUND SURFACE LINE SURVEYED BY MACTEC ALONG BENT 3 LOCATION ON 10/20/2009.

– INFERRED STRATIGRAPHY IS DRAWN AT THE CROSS SECTION LINE (BENT LINE) WITH THE BORINGS PROJECTED ONTO THE CROSS SECTION.

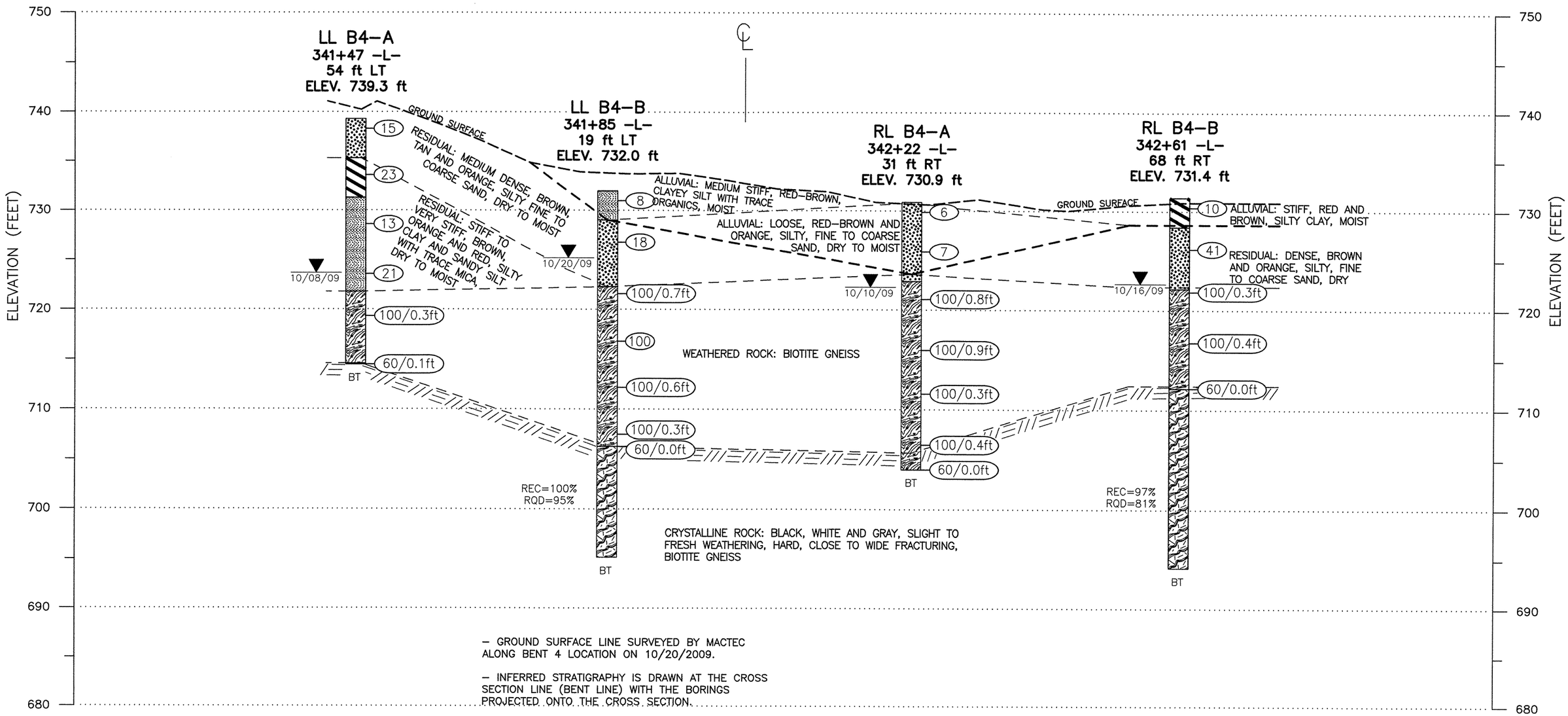
0 10' 20' 40'
HORIZONTAL SCALE IN FEET
1"=20'

0 5' 10' 20'
VERTICAL SCALE IN FEET
1"=10'

CROSS SECTION ALONG BENT 3
US 74 (SHELBY BYPASS) DUAL BRIDGES OVER BRUSHY CREEK
NCDOT PROJECT NO. 34497.1.2 (R-2707B)
F.A. No. NHF-74(14)
CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 11/23/09
12/16/09	DFT CHECK: W.B.D.	JOB: 6468-09-2511
01/20/10	ENG CHECK: J.S.J.	DWG: 11



– GROUND SURFACE LINE SURVEYED BY MACTEC ALONG BENT 4 LOCATION ON 10/20/2009.

– INFERRED STRATIGRAPHY IS DRAWN AT THE CROSS SECTION LINE (BENT LINE) WITH THE BORINGS PROJECTED ONTO THE CROSS SECTION.

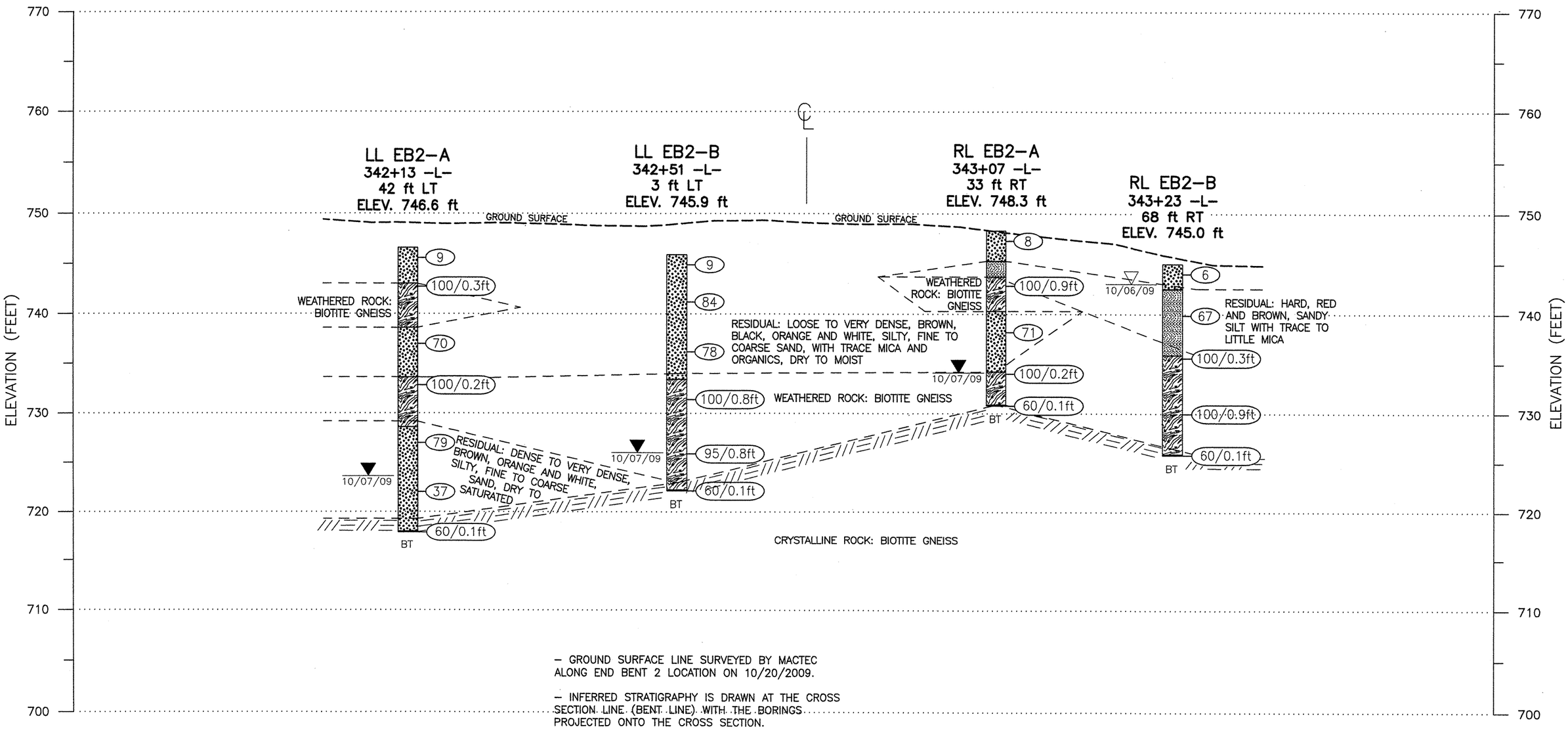
0 10' 20' 40'
HORIZONTAL SCALE IN FEET
1"=20'

0 5' 10' 20'
VERTICAL SCALE IN FEET
1"=10'

CROSS SECTION ALONG BENT 4
US 74 (SHELBY BYPASS) DUAL BRIDGES OVER BRUSHY CREEK
NCDOT PROJECT NO. 34497.1.2 (R-2707B)
F.A. No. NHF-74(14)
CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 11/23/09
12/16/09	DFT CHECK: W.B.D.	JOB: 6468-09-2511
01/20/10	ENG CHECK: J.S.J.	DWG: 12



– GROUND SURFACE LINE SURVEYED BY MACTEC ALONG END BENT 2 LOCATION ON 10/20/2009.

– INFERRED STRATIGRAPHY IS DRAWN AT THE CROSS SECTION LINE (BENT LINE) WITH THE BORINGS PROJECTED ONTO THE CROSS SECTION.

0 10' 20' 40'
HORIZONTAL SCALE IN FEET
1"=20'

0 5' 10' 20'
VERTICAL SCALE IN FEET
1"=10'

CROSS SECTION ALONG END BENT 2
US 74 (SHELBY BYPASS) DUAL BRIDGES OVER BRUSHY CREEK
NCDOT PROJECT NO. 34497.1.2 (R–2707B)
F.A. No. NHF–74(14)
CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN: R.R.	DATE: 11/23/09
12/16/09	DFT CHECK: W.B.D.	JOB: 6468–09–2511
	ENG CHECK: J.S.J.	DWG: 13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Honeycutt
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL EB1-A	**STATION** 338+00	**OFFSET** 44ft LT	**ALIGNMENT** -L-	**0 HR.** 2.0
COLLAR ELEV. 742.2 ft	**TOTAL DEPTH** 27.9 ft	**NORTHING** 580,255	**EASTING** 1,231,869	**24 HR.** FIAD
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 11/02/09	**COMP. DATE** 11/02/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 27.9 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)
745											
	742.2	0.0								742.2 GROUND SURFACE	0.0
740			2	2	2	4		M		740.7 **RESIDUAL** Brown, fine to coarse sandy SILT (A-4) with trace organics	1.5
	738.2	4.0								Brown and orange, fine to coarse SAND (A-2-4) with relict rock structure and trace rock fragments	
735			16	14	19	33		M		734.7 Brown, fine sandy SILT (A-4) with relict rock structure and trace to little mica	7.5
	733.2	9.0									
730			4	6	8	14		M			
	728.2	14.0									
725			4	5	8	13		M			
	723.2	19.0									
720			3	5	8	13		M			
	718.2	24.0									
715			4	10	42	52		M		716.2 26.0 ft: Bit chatter	26.0
	714.3	27.9	60/0.0			60/0.0				714.3 **WEATHERED ROCK** Biotite GNEISS	27.9
710										Boring Terminated with Standard Penetration Test Refusal at Elevation 714.3 ft on Crystalline Rock: Biotite Gneiss	
705										1) Bit used: 2-7/8" roller cone	
700										2) Boring offset from proposed location due to existing site conditions.	
695											
690											
685											
680											
675											
670											
665											

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Honeycutt
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL EB1-B	**STATION** 338+37	**OFFSET** 13ft LT	**ALIGNMENT** -L-	**0 HR.** 3.0
COLLAR ELEV. 744.2 ft	**TOTAL DEPTH** 19.4 ft	**NORTHING** 580,232	**EASTING** 1,231,912	**24 HR.** N/A
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/30/09	**COMP. DATE** 10/30/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 19.4 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
745										
	744.2	0.0								744.2 GROUND SURFACE 0.0
740			2	1	2	3		M		741.7 **RESIDUAL** Brown, fine to coarse sandy SILT (A-4) with trace organics and rock fragments 2.5
	739.8	4.4								2.5 ft: Bit chatter begins
735			40	60						**WEATHERED ROCK** Biotite GNEISS
	734.8	9.4								
730			100/0.2			100/0.2				
	729.8	14.4								
725			100/0.4			100/0.4				
	724.8	19.4								724.8 19.4
720			60/0.0			60/0.0				Boring Terminated with Standard Penetration Test Refusal at Elevation 724.8 ft on Crystalline Rock: Biotite Gneiss
715										1) Bit used: 2-7/8" roller cone
710										2) Boring offset from proposed location due to existing site conditions.
705										
700										
695										
690										
685										
680										
675										
670										
665										

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Honeycutt
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL B1-A	**STATION** 338+96	**OFFSET** 44ft LT	**ALIGNMENT** -L-
COLLAR ELEV. 735.5 ft	**TOTAL DEPTH** 32.1 ft	**NORTHING** 580,275	**EASTING** 1,231,962
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
START DATE 10/29/09	**COMP. DATE** 10/29/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 19.3 ft

GROUND WTR (ft)	
0 HR.	N/A
24 HR.	8.2

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)
735.5		0.0								GROUND SURFACE	0.0
			WOH	2	2	4		M		**ALLUVIAL** Red-brown, silty, fine SAND (A-2-4) with trace mica	2.5
731.2		4.3	4	4	4	8		W		Red-brown, fine sandy SILT (A-4) with trace organics	7.5
726.2		9.3	WOH	1	1	2		Sat.		Brown to gray, silty, fine SAND (A-2-4) with trace organics and mica	
721.2		14.3	1	1	WOH	1		Sat.		17.0 ft: Bit chatter to 19.3 ft	17.0
716.2		19.3	60/0.0			60/0.0	RS-1			**WEATHERED ROCK** Biotite GNEISS	19.3
										CRYSTALLINE ROCK Black, gray and purple, very slight to fresh weathering, hard to very hard, moderately close fracturing, biotite GNEISS	32.1
703.4										Boring Terminated at Elevation 703.4 ft in Crystalline Rock: Biotite Gneiss 1) Bit used: 2-7/8" roller cone 2) Boring offset from proposed location due to existing site conditions.	

NCDOT BORE SINGLE R-2707B_GEO_BRDG_BRUSHY CREEK_BORE LOGS.GPJ NC_DOT.GDT 12/16/09

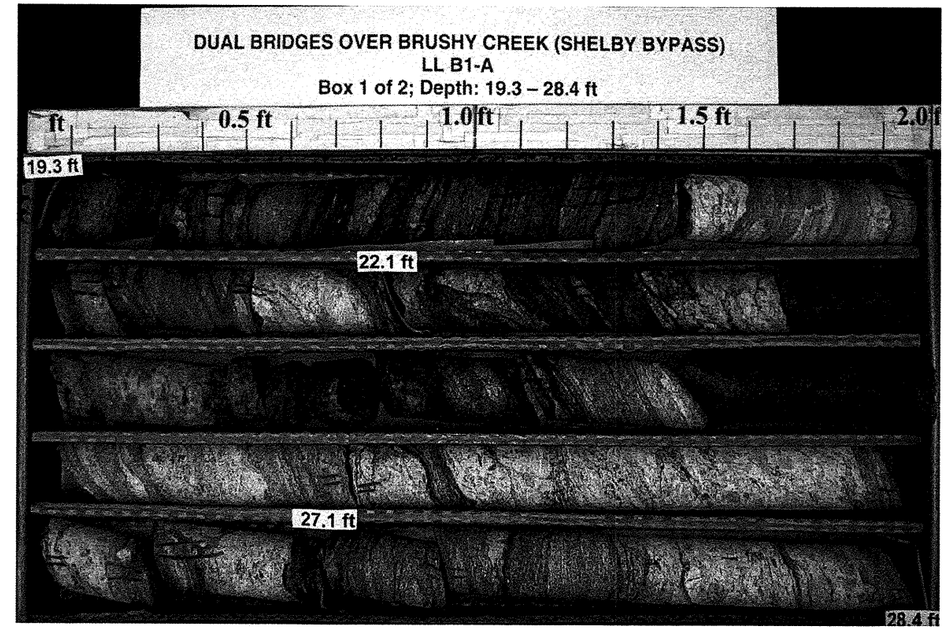
NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Honeycutt
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL B1-A	**STATION** 338+96	**OFFSET** 44ft LT	**ALIGNMENT** -L-
COLLAR ELEV. 735.5 ft	**TOTAL DEPTH** 32.1 ft	**NORTHING** 580,275	**EASTING** 1,231,962
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
START DATE 10/29/09	**COMP. DATE** 10/29/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 19.3 ft
CORE SIZE NQ	**TOTAL RUN** 12.8 ft		**DRILLER** D. White

GROUND WTR (ft)	
0 HR.	N/A
24 HR.	8.2

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)
716.17											Begin Coring @ 19.3 ft	
715	716.2	19.3	2.8	2:45	(2.8)	(2.5)		(12.7)	(12.0)		716.2 **CRYSTALLINE ROCK** Black, gray and purple, very slight to fresh weathering, hard to very hard, moderately close fracturing, biotite GNEISS	19.3
	713.4	22.1		2:00 1:45/0.8	100%	89%		99%	94%			
			5.0	1:50 2:20 2:50	(4.9) 98%	(4.5) 90%						
710	708.4	27.1		2:45 2:50			RS-1					
			5.0	3:00 2:15 2:30	(5.0) 100%	(5.0) 100%						
705	703.4	32.1		2:22 2:10							703.4	32.1
700											Boring Terminated at Elevation 703.4 ft in Crystalline Rock: Biotite Gneiss 1) Bit used: 2-7/8" roller cone 2) Boring offset from proposed location due to existing site conditions.	
695												
690												
685												
680												
675												
670												
665												
660												
655												
650												
645												
640												

NCDOT CORE SINGLE R-2707B_GEO_BRDG_BRUSHY CREEK_BORE LOGS.GPJ NC_DOT.GDT 12/16/09


DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
LL B1-A
Box 1 of 2; Depth: 19.3 – 28.4 ft
ft
0.5 ft
1.0 ft
1.5 ft
19.3 ft
22.1 ft
27.1 ft
28.4 ft

DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
LL B1-A
Box 2 of 2; Depth: 28.4 – 32.1 ft
ft
0.5 ft
1.0 ft
1.5 ft
28.4 ft
32.1 ft

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Honeycutt
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL B1-B	**STATION** 339+14	**OFFSET** 3ft RT	**ALIGNMENT** -L-	**0 HR.** 0.0
COLLAR ELEV. 732.8 ft	**TOTAL DEPTH** 13.7 ft	**NORTHING** 580,233	**EASTING** 1,231,990	**24 HR.** N/A
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/29/09	**COMP. DATE** 10/29/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 13.7 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)
735											
	732.8	0.0								732.8 GROUND SURFACE	0.0
			2	2	3	5		M		**ALLUVIAL** Red-brown, fine sandy SILT (A-4) with trace organics	
730										730.3	2.5
	728.8	4.0								Brown to gray, silty, fine to coarse SAND (A-2-4) with trace organics and clayey sand lenses	
			1	1	1	2		W			
725											
	723.8	9.0									
			2	2	1	3		W			
720											
	719.1	13.7	60/0.0			60/0.0				719.1	13.7
715										Boring Terminated with Standard Penetration Test Refusal at Elevation 719.1 ft on Crystalline Rock: Biotite Gneiss	
710										1) Bit used: 2-7/8" roller cone 2) Boring located in low area containing ponded water after drilling. 24 hr water level not determined. 3) Boring offset from proposed location due to existing site conditions.	
705											
700											
695											
690											
685											
680											
675											
670											
665											
660											
655											

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL B2-A	**STATION** 339+91	**OFFSET** 51ft LT	**ALIGNMENT** -L-	**0 HR.** 9.6
COLLAR ELEV. 733.2 ft	**TOTAL DEPTH** 18.2 ft	**NORTHING** 580,300	**EASTING** 1,232,055	**24 HR.** 8.0
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/13/09	**COMP. DATE** 10/13/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 18.1 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
735										
	733.2	0.0								733.2 GROUND SURFACE 0.0
			1	1	2	3	SS-1	D		**ALLUVIAL** Orange, silty, fine to coarse SAND (A-2-4) with trace mica
730										730.2 3.0
	729.0	4.2								Orange-red, sandy, clayey SILT (A-4) with trace mica
			1	2	1	3		M		
725										725.2 8.0
	724.0	9.2								Gray and brown, silty, fine to coarse SAND (A-2-4)
			1	WOH	1	1		W		
720										
	719.0	14.2								719.0 14.2
			100/0.2			100/0.2				**WEATHERED ROCK** Biotite GNEISS
715	715.1	18.1								715.1 18.1
			60/0.1			60/0.1				715.0 18.2 **CRYSTALLINE ROCK** Biotite GNEISS
710										Boring Terminated with Standard Penetration Test Refusal at Elevation 715.0 ft in Crystalline Rock: Biotite Gneiss
705										1) Bit used: 2-7/8" roller cone
700										
695										
690										
685										
680										
675										
670										
665										
660										
655										

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

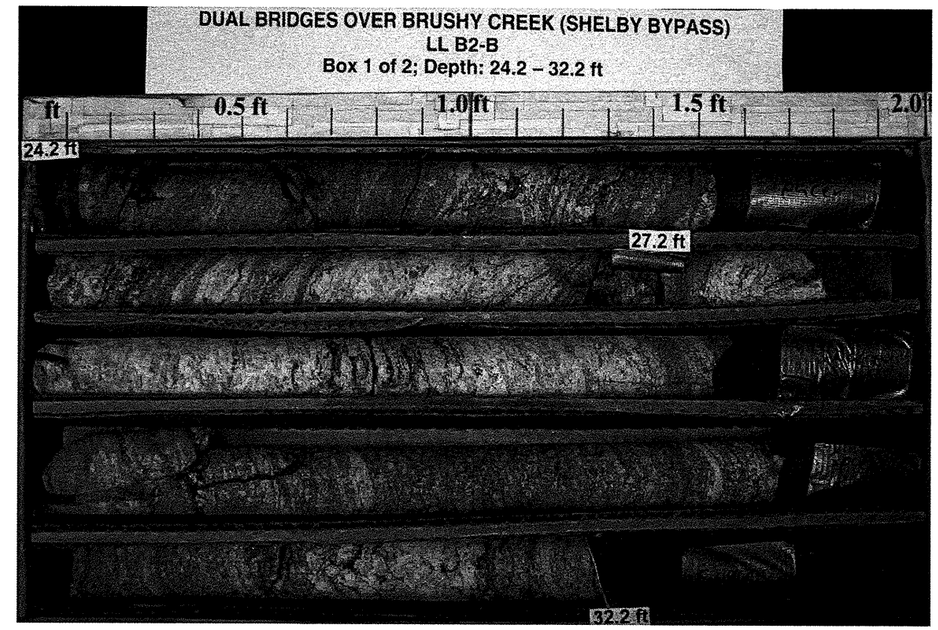
PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL B2-B	**STATION** 340+15	**OFFSET** 31ft LT	**ALIGNMENT** -L-	**0 HR.** 5.7
COLLAR ELEV. 732.7 ft	**TOTAL DEPTH** 37.2 ft	**NORTHING** 580,285	**EASTING** 1,232,083	**24 HR.** 6.8
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic	
START DATE 10/15/09	**COMP. DATE** 10/16/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 24.2 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))
735										
	732.7	0.0								732.7 — GROUND SURFACE — 0.0
			2	1	3	4		M		**ALLUVIAL** Orange-red, silty, fine to coarse SAND (A-2-4)
730										
	728.5	4.2								
			2	3	3	6		M		
725										724.7 — 8.0
	723.5	9.2								Gray, sandy, clayey SILT (A-4) with trace organics
			1	1	1	2	SS-2	36%		
720										
	718.5	14.2								
			WOH	1	WOH	1		M		715.7 — 17.0 ft: Bit chatter — 17.0
715										**WEATHERED ROCK** Biotite GNEISS
	713.5	19.2								
			100/0.2			100/0.2				
710										
	708.5	24.2								708.5 — 24.2
			60/0.0			60/0.0				**CRYSTALLINE ROCK** Black and white, very slight to fresh weathering, hard, moderately close to wide fracturing, biotite GNEISS with garnets and pyrite
705										
700										
695										695.5 — 37.2
690										Boring Terminated at Elevation 695.5 ft in Crystalline Rock: Biotite Gneiss
685										1) Bit used: 2-7/8" roller cone
680										2) Boring offset from proposed location due to existing site conditions.
675										
670										
665										
660										
655										

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL B2-B	**STATION** 340+15	**OFFSET** 31ft LT	**ALIGNMENT** -L-	**0 HR.** 5.7
COLLAR ELEV. 732.7 ft	**TOTAL DEPTH** 37.2 ft	**NORTHING** 580,285	**EASTING** 1,232,083	**24 HR.** 6.8
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic	
START DATE 10/15/09	**COMP. DATE** 10/16/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 24.2 ft	
CORE SIZE NQ	**TOTAL RUN** 13.0 ft	**DRILLER** D. White		

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))
708.5											Begin Coring @ 24.2 ft
	708.5	24.2	3.0	3:45 3:30 4:00	(3.0) 100%	(2.8) 93%		(13.0) 100%	(12.4) 95%		708.5 — 24.2 **CRYSTALLINE ROCK** Black and white, very slight to fresh weathering, hard, moderately close to wide fracturing, biotite GNEISS with garnets and pyrite
705	705.5	27.2									
			5.0	3:00 3:00 3:15 3:00 3:00	(5.0) 100%	(4.6) 92%					
700	700.5	32.2									
			5.0	3:45 3:30 3:30 3:00 4:00	(5.0) 100%	(5.0) 100%					
695	695.5	37.2									695.5 — 37.2
690											Boring Terminated at Elevation 695.5 ft in Crystalline Rock: Biotite Gneiss
685											1) Bit used: 2-7/8" roller cone
680											2) Boring offset from proposed location due to existing site conditions.
675											
670											
665											
660											
655											
650											
645											
640											
635											
630											


DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
LL B2-B
Box 1 of 2; Depth: 24.2 – 32.2 ft
ft
0.5 ft
1.0 ft
1.5 ft
2.0
24.2 ft
27.2 ft
32.2 ft

DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
LL B2-B
Box 2 of 2; Depth: 32.2 – 37.2 ft
ft
0.5 ft
1.0 ft
1.5 ft
2.0
32.2 ft
37.2 ft

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

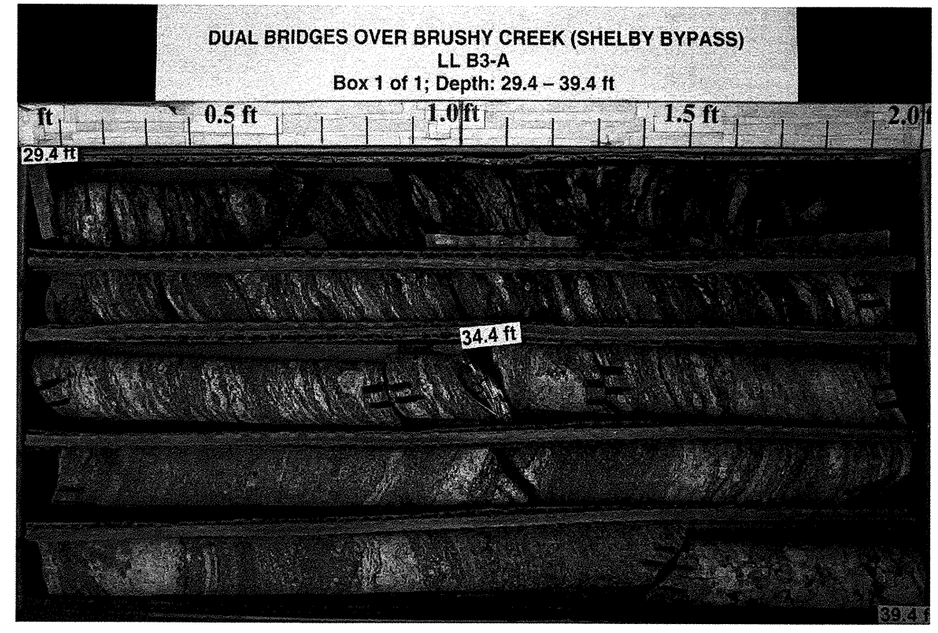
PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL B3-A	**STATION** 340+69	**OFFSET** 59ft LT	**ALIGNMENT** -L-	**0 HR.** Dry at 8.7'
COLLAR ELEV. 732.2 ft	**TOTAL DEPTH** 39.4 ft	**NORTHING** 580,322	**EASTING** 1,232,131	**24 HR.** 8.0
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
START DATE 10/16/09	**COMP. DATE** 10/16/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 29.4 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)
735											
	732.2	0.0								732.2 GROUND SURFACE	0.0
730			2	1	2	3		M		ALLUVIAL Orange-red, sandy SILT (A-4) with trace organics	
	727.9	4.3								729.2	3.0
725			3	2	3	5	SS-3	M		Orange-red, silty, fine to coarse SAND (A-2-4)	
	722.9	9.3	100/0.3			SPT not valid due to gravel and boulders				9.3 ft: Gravel or boulders	
720											
	717.9	14.3	64	36/0.2		100/0.7				718.2 WEATHERED ROCK Biotite GNEISS	14.0
715											
	712.9	19.3	100/0.2			100/0.2					
710											
	707.9	24.3	100/0.2			100/0.2					
705											
	702.9	29.3	60/0.1			60/0.1				702.8 CRYSTALLINE ROCK Black and white, slight to fresh weathering, moderately hard to hard, moderately close fracturing, biotite, GNEISS with garnets 12 fractures at 35-45 degrees	29.4
700							RS-2				
695										692.8	39.4
690										Boring Terminated at Elevation 692.8 ft in Crystalline Rock: Biotite Gneiss 1) Bit used: 2-7/8" roller cone	
685											
680											
675											
670											
665											
660											
655											

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL B3-A	**STATION** 340+69	**OFFSET** 59ft LT	**ALIGNMENT** -L-	**0 HR.** Dry at 8.7'
COLLAR ELEV. 732.2 ft	**TOTAL DEPTH** 39.4 ft	**NORTHING** 580,322	**EASTING** 1,232,131	**24 HR.** 8.0
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
START DATE 10/16/09	**COMP. DATE** 10/16/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 29.4 ft
CORE SIZE NQ	**TOTAL RUN** 10.0 ft	**DRILLER** D. White	

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)
702.8											Begin Coring @ 29.4 ft	
	702.8	29.4	5.0	1:45 1:45 2:30 3:00 2:15	(4.6) 92%	(3.0) 60%		(9.4) 94%	(7.8) 78%		702.8 CRYSTALLINE ROCK Black and white, slight to fresh weathering, moderately hard to hard, moderately close fracturing, biotite, GNEISS with garnets 12 fractures at 35-45 degrees	29.4
700												
	697.8	34.4	5.0	2:45 2:45 2:45 2:45 2:15	(4.8) 96%	(4.8) 96%	RS-2					
695												
	692.8	39.4									692.8	39.4
690											Boring Terminated at Elevation 692.8 ft in Crystalline Rock: Biotite Gneiss 1) Bit used: 2-7/8" roller cone	
685												
680												
675												
670												
665												
660												
655												
650												
645												
640												
635												
630												
625												


DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
LL B3-A
Box 1 of 1; Depth: 29.4 – 39.4 ft
ft
0.5 ft
1.0 ft
1.5 ft
29.4 ft
34.4 ft

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL B3-B	**STATION** 341+04	**OFFSET** 24ft LT	**ALIGNMENT** -L-
COLLAR ELEV. 730.7 ft	**TOTAL DEPTH** 24.1 ft	**NORTHING** 580,294	**EASTING** 1,232,173
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/13/09	**COMP. DATE** 10/13/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 19.0 ft

GROUND WTR (ft)	
0 HR.	Dry
24 HR.	7.7

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)
735											
730	730.7	0.0	1	2	3	5		M		730.7 GROUND SURFACE	0.0
										ALLUVIAL Orange-red, sandy SILT (A-4)	
725	726.7	4.0	26	74/0.1		SPT not valid due to gravel and boulders		M		726.4 Orange-red and black, silty, fine to coarse SAND (A-2-4) with gravel or boulders	4.3
720	721.7	9.0	2	4	5	9		M		722.7 **RESIDUAL** Orange and brown, sandy SILT (A-4) with trace mica, saprolitic	8.0
715	716.7	14.0	3	6	20	26		M		718.7 Tan, gray and brown, silty, fine to coarse SAND (A-2-4) with trace mica, saprolitic	12.0
										713.7 17.0 ft: rig chatter	17.0
710	711.7	19.0	100/0.1			100/0.1				711.7 **WEATHERED ROCK** Biotite GNEISS	19.0
										710.7 **CRYSTALLINE ROCK** Biotite GNEISS	20.0
										WEATHERED ROCK Biotite GNEISS	
705	706.7	24.0	60/0.1			60/0.1				706.7	24.0
										706.6 **CRYSTALLINE ROCK** Biotite GNEISS	24.1
700										Boring Terminated with Standard Penetration Test Refusal at Elevation 706.6 ft in Crystalline Rock: Biotite Gneiss	
695										1) Bit used: 2-7/8" roller cone	
690											
685											
680											
675											
670											
665											
660											
655											

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL B4-A	**STATION** 341+47	**OFFSET** 54ft LT	**ALIGNMENT** -L-
COLLAR ELEV. 739.3 ft	**TOTAL DEPTH** 24.8 ft	**NORTHING** 580,330	**EASTING** 1,232,210
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/07/09	**COMP. DATE** 10/07/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 24.7 ft

GROUND WTR (ft)	
0 HR.	15.8
24 HR.	15.6

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	
740											
	739.3	0.0	2	5	10	15		D		739.3 GROUND SURFACE	0.0
735	734.6	4.7	9	11	12	23	SS-4	29%		**RESIDUAL** Brown, orange and white, silty, fine to coarse SAND (A-2-4), saprolitic	
										735.3 Orange-red, sandy, silty CLAY (A-7-6) with trace mica, saprolitic	4.0
730	729.6	9.7	10	6	7	13		M		731.3 Brown, orange, tan and black, sandy SILT (A-4) with trace mica, saprolitic	8.0
725	724.6	14.7	16	10	11	21		D			
720	719.6	19.7	100/0.3			100/0.3				721.8 **WEATHERED ROCK** Biotite GNEISS	17.5
715	714.6	24.7	60/0.1			60/0.1				714.6	24.7
										714.5 **CRYSTALLINE ROCK** Biotite GNEISS	24.8
710										Boring Terminated with Standard Penetration Test Refusal at Elevation 714.5 ft in Crystalline Rock: Biotite Gneiss	
705										1) Bit used: 2-7/8" roller cone	
700											
695											
690											
685											
680											
675											
670											
665											
660											

NCDOT BORE DOUBLE R-2707B_GEO_BRDG_BRUSHY CREEK_BORE LOGS.GPJ NC_DOT.GDT 12/16/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL B4-B	**STATION** 341+85	**OFFSET** 19ft LT	**ALIGNMENT** -L-	**0 HR.** 4.2
COLLAR ELEV. 732.0 ft	**TOTAL DEPTH** 36.8 ft	**NORTHING** 580,302	**EASTING** 1,232,253	**24 HR.** 6.8
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic	
START DATE 10/07/09	**COMP. DATE** 10/19/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 25.7 ft	

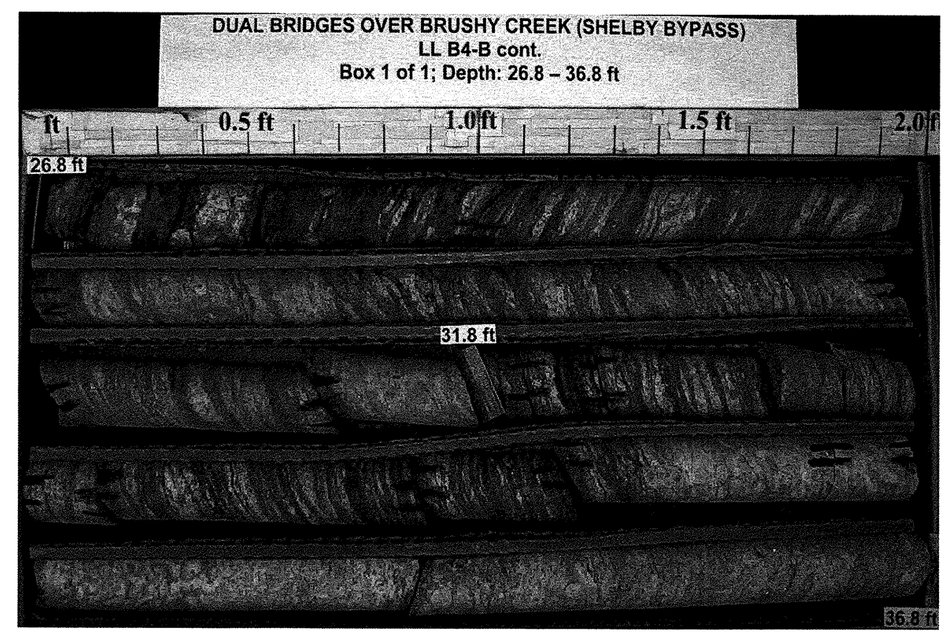
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
735											
	732.0	0.0								732.0 GROUND SURFACE	0.0
730			3	3	5	8		M		**ALLUVIAL** Red-brown, clayey SILT (A-4) with trace sand, mica and organics	
	727.8	4.2								729.0	3.0
			7	10	8	18		D		**RESIDUAL** Orange and tan, silty, fine to coarse SAND (A-2-4) with trace mica, saprolitic	
725											
	722.8	9.2								722.3	9.7
			38	59	41/0.2	100/0.7				**WEATHERED ROCK** Biotite GNEISS	
720											
	717.8	14.2									
			18	82/0.5		100/1.0					
715											
	712.8	19.2									
			75	25/0.1		100/0.6					
710											
	707.8	24.2									
			100/0.3			100/0.3					
	706.3	25.7	60/0.0			60/0.0				706.3	25.7
705										**CRYSTALLINE ROCK** Gray, black and white, very slight to fresh weathering, hard, close to wide fracturing, biotite GNEISS with garnets 4 fractures at 35-45 degrees	
700											
695										695.2	36.8
690										Boring Terminated at Elevation 695.2 ft in Crystalline Rock: Biotite Gneiss 1) Bit used: 2-7/8" roller cone 2) An 8'-long section of steel coring tools broke off in rock while advancing boring LL B4-B. The core tools were not recovered. Boring LL B4-B was continued to its termination depth in a second hole located approximately 5' away from the first hole.	
685											
680											
675											
670											
665											
660											
655											

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. LL B4-B	**STATION** 341+85	**OFFSET** 19ft LT	**ALIGNMENT** -L-	**0 HR.** 4.2
COLLAR ELEV. 732.0 ft	**TOTAL DEPTH** 36.8 ft	**NORTHING** 580,302	**EASTING** 1,232,253	**24 HR.** 6.8
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic	
START DATE 10/07/09	**COMP. DATE** 10/19/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 25.7 ft	
CORE SIZE NQ	**TOTAL RUN** 10.0 ft	**DRILLER** D. White		

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)
705.2											Begin Coring @ 26.8 ft	
	705.2	26.8	5.0	2:45 2:45 2:45 2:45 2:45	(5.0) 100%	(4.5) 90%		(10.0) 100%	(9.5) 95%		**CRYSTALLINE ROCK** *(continued)* Gray, black and white, very slight to fresh weathering, hard, close to wide fracturing, biotite GNEISS with garnets 4 fractures at 35-45 degrees	
700	700.2	31.8	5.0	2:45 2:45 2:45 3:15 2:45	(5.0) 100%	(5.0) 100%						
695	695.2	36.8									695.2	36.8
690											Boring Terminated at Elevation 695.2 ft in Crystalline Rock: Biotite Gneiss 1) Bit used: 2-7/8" roller cone 2) An 8'-long section of steel coring tools broke off in rock while advancing boring LL B4-B. The core tools were not recovered. Boring LL B4-B was continued to its termination depth in a second hole located approximately 5' away from the first hole.	
685												
680												
675												
670												
665												
660												
655												
650												
645												
640												
635												
630												

Note: An 8ft long section of steel coring tools broke off in rock while advancing boring LL B4-B. The coring tools were not recovered. Boring LL B4-B was continued to its termination depth in a second hole located approximately 5ft away from the first hole. The core recovered from the first hole is shown above. The core recovered from the second hole is shown below.



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland		**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)				**GROUND WTR (ft)**
BORING NO. LL EB2-A	**STATION** 342+13	**OFFSET** 42ft LT	**ALIGNMENT** -L-	**0 HR.** 4.8
COLLAR ELEV. 746.6 ft	**TOTAL DEPTH** 28.7 ft	**NORTHING** 580,328	**EASTING** 1,232,278	**24 HR.** 23.0
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary			**HAMMER TYPE** Automatic
START DATE 10/06/09	**COMP. DATE** 10/06/09	**SURFACE WATER DEPTH** N/A		**DEPTH TO ROCK** 28.6 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)
	746.6	0.0								746.6 GROUND SURFACE	0.0
			3	4	5	9		M		**RESIDUAL** Brown to orange-red, silty, fine to coarse SAND (A-2-4), saprolitic	
	743.0	3.6	100/0.3			100/0.3				743.0 **WEATHERED ROCK** Biotite GNEISS	3.6
	738.0	8.6	24	42	28	70		D		738.6 **RESIDUAL** Brown, black and white, silty, fine to coarse SAND (A-2-4)	8.0
	733.0	13.6	100/0.2			100/0.2				733.6 **WEATHERED ROCK** Biotite GNEISS	13.0
	728.0	18.6	23	36	43	79		D		728.6 **RESIDUAL** Brown, orange and white, silty, fine to coarse SAND (A-2-4)	18.0
	723.0	23.6	16	20	17	37					
	718.0	28.6	60/0.1			60/0.1				718.0 717.9 **CRYSTALLINE ROCK** Biotite GNEISS	28.6 28.7

Boring Terminated with Standard Penetration Test Refusal at Elevation 717.9 ft in Crystalline Rock: Biotite Gneiss

1) Bit used: 2-7/8" roller cone

2) Boring offset from proposed location due to existing site conditions.

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland		**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)				**GROUND WTR (ft)**
BORING NO. LL EB2-B	**STATION** 342+51	**OFFSET** 3ft LT	**ALIGNMENT** -L-	**0 HR.** 18.6
COLLAR ELEV. 745.9 ft	**TOTAL DEPTH** 23.8 ft	**NORTHING** 580,295	**EASTING** 1,232,321	**24 HR.** 19.9
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary			**HAMMER TYPE** Automatic
START DATE 10/06/09	**COMP. DATE** 10/06/09	**SURFACE WATER DEPTH** N/A		**DEPTH TO ROCK** 23.7 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
	745.9	0.0								745.9 GROUND SURFACE 0.0
			2	2	7	9	SS-5	M		**RESIDUAL** Brown, orange, white and gray, silty, fine to coarse SAND (A-2-4), saprolitic
	742.2	3.7	25	30	54	84		D		
	737.2	8.7	16	36	42	78	SS-6	D		
	732.2	13.7	47	53/0.3		100/0.8				733.4 12.5 **WEATHERED ROCK** Biotite GNEISS
	727.2	18.7	24	45	50	95/0.8 95				
	722.2	23.7	60/0.1			60/0.1				722.2 722.1 23.7 23.8 **CRYSTALLINE ROCK** Biotite GNEISS

Boring Terminated with Standard Penetration Test Refusal at Elevation 722.1 ft in Crystalline Rock: Biotite Gneiss

1) Bit used: 2-7/8" roller cone

2) Boring offset from proposed location due to existing site conditions.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Honeycutt
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL EB1-A	**STATION** 338+75	**OFFSET** 19ft RT	**ALIGNMENT** -L-	**0 HR.** 10.0
COLLAR ELEV. 744.9 ft	**TOTAL DEPTH** 23.0 ft	**NORTHING** 580,209	**EASTING** 1,231,955	**24 HR.** N/A
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 10/30/09	**COMP. DATE** 10/30/09	**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)
745											
	744.9	0.0	2	2	2	4		M		744.9 GROUND SURFACE	0.0
										RESIDUAL Brown, fine to coarse sandy SILT (A-4) with trace organics and roots	
	741.4	3.5								741.4	3.5
740			100/0.1			100/0.1				**WEATHERED ROCK** Biotite GNEISS 3.5 ft: Bit chatter to 5.0 ft	
	739.9	5.0								739.9	5.0
										RESIDUAL Tan, fine to coarse sandy SILT (A-4) with relict rock structure	
735	736.0	8.9	17	22	38	60		M		734.6	10.3
										Tan, silty, fine to coarse SAND (A-2-4) with relict rock structure 12.0 ft: Bit chatter begins	
	732.9	12.0									
730	731.0	13.9	100/0.5			100/0.5				**WEATHERED ROCK** Biotite GNEISS	
725	726.0	18.9	100/0.5			100/0.5					
	721.9	23.0	60/0.0			60/0.0				721.9 Boring Terminated with Standard Penetration Test Refusal at Elevation 721.9 ft on Crystalline Rock: Biotite Gneiss	23.0
720										1) Bit used: 2-7/8" roller cone	
715										2) Boring offset from proposed location due to existing site conditions.	
710											
705											
700											
695											
690											
685											
680											
675											
670											
665											

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Honeycutt
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL EB1-B	**STATION** 339+05	**OFFSET** 67ft RT	**ALIGNMENT** -L-	**0 HR.** 1.0
COLLAR ELEV. 750.3 ft	**TOTAL DEPTH** 19.0 ft	**NORTHING** 580,168	**EASTING** 1,231,993	**24 HR.** 10.9
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic	
START DATE 10/29/09	**COMP. DATE** 10/29/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 19.0 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	
755											
750	750.3	0.0								750.3 GROUND SURFACE	0.0
			2	3	2	5		M		**RESIDUAL** Red, brown and tan, fine sandy SILT (A-4) with trace roots, relict rock structure	
	746.1	4.2									
745			21	25	31	56		M			
	742.3	8.0								Brown to tan, silty, fine SAND (A-2-4) with relict rock structure and trace rock fragments	
	741.1	9.2									
740			37	30	16	46		D			
	736.3	14.0								**WEATHERED ROCK** Biotite GNEISS	
735	736.1	14.2	100/0.3			100/0.3					
	731.3	19.0	60/0.0			60/0.0				731.3 Boring Terminated with Standard Penetration Test Refusal at Elevation 731.3 ft on Crystalline Rock: Biotite Gneiss	19.0
730										1) Bit used: 2-7/8" roller cone	
725										2) Boring offset from proposed location due to existing site conditions.	
720											
715											
710											
705											
700											
695											
690											
685											
680											
675											

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Honeycutt
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL B1-A	**STATION** 339+61	**OFFSET** 29ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 733.4 ft	**TOTAL DEPTH** 26.7 ft	**NORTHING** 580,216	**EASTING** 1,232,041
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
START DATE 10/28/09	**COMP. DATE** 10/29/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 8.0 ft

GROUND WTR (ft)	
0 HR.	8.0
24 HR.	6.5

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)
735											
	733.4	0.0								733.4 GROUND SURFACE	0.0
			2	2	2	4		M		**ALLUVIAL** Red and brown, sandy, clayey SILT (A-4) with trace organics, roots and mica	
730	729.3	4.1									
			2	2	2	4		M			
725										725.4	8.0
	724.3	9.1								**CRYSTALLINE ROCK** Biotite GNEISS 9.2 ft: Bit chatter to 10.2 ft	
			60/0.1			60/0.1				723.2	10.2
720	719.3	14.1								**WEATHERED ROCK** 10.2 ft: Alternating zones of hard and softer drilling to 14.1 ft	
			60/0.1			60/0.1				719.2	14.2
715										**CRYSTALLINE ROCK** Black, gray and purple, fresh, very hard, very wide fracturing, biotite GNEISS	
710										706.7	26.7
705										Boring Terminated at Elevation 706.7 ft in Crystalline Rock: Biotite Gneiss 1) Bit used: 2-7/8" roller cone 2) Boring offset from proposed location due to existing site conditions.	
700											
695											
690											
685											
680											
675											
670											
665											
660											
655											

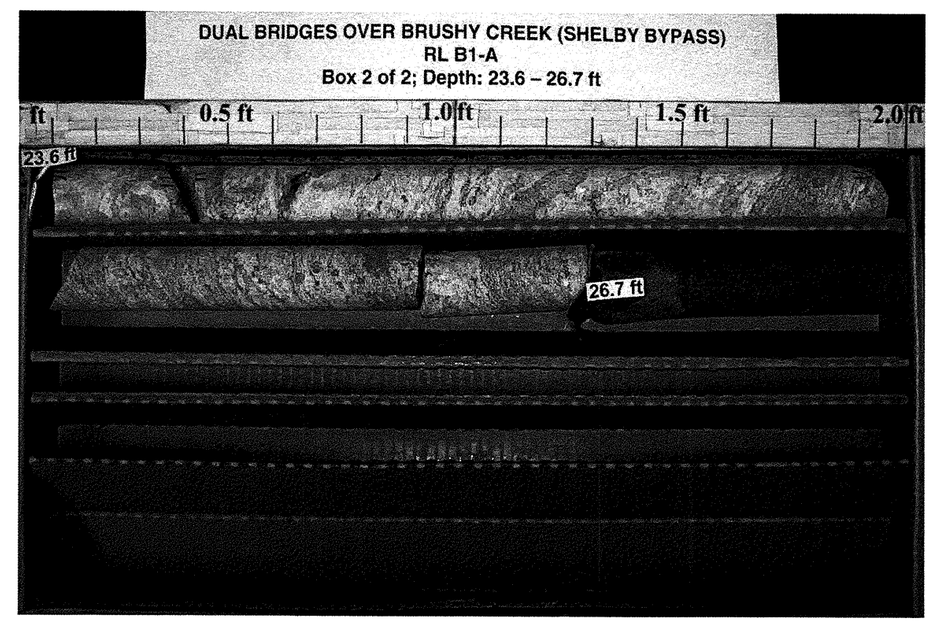
NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Honeycutt
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL B1-A	**STATION** 339+61	**OFFSET** 29ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 733.4 ft	**TOTAL DEPTH** 26.7 ft	**NORTHING** 580,216	**EASTING** 1,232,041
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
START DATE 10/28/09	**COMP. DATE** 10/29/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 8.0 ft
CORE SIZE NQ	**TOTAL RUN** 12.5 ft	**DRILLER** D. White	

GROUND WTR (ft)	
0 HR.	8.0
24 HR.	6.5

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)
719.21											Begin Coring @ 14.2 ft	
	719.2	14.2	2.5	2:45	(2.5)	(2.5)		(12.5)	(12.5)		719.2 **CRYSTALLINE ROCK** Black, gray and purple, fresh, very hard, very wide fracturing, biotite GNEISS	14.2
				2:35	100%	100%		100%	100%			
	716.7	16.7		1:29/0.5								
715			5.0	3:00	(5.0)	(5.0)						
				3:01	100%	100%						
				3:04								
				2:43								
	711.7	21.7		2:58								
710			5.0	2:50	(5.0)	(5.0)						
				2:26	100%	100%						
				2:50								
				3:22								
	706.7	26.7		3:00							706.7	26.7
705											Boring Terminated at Elevation 706.7 ft in Crystalline Rock: Biotite Gneiss 1) Bit used: 2-7/8" roller cone 2) Boring offset from proposed location due to existing site conditions.	
700												
695												
690												
685												
680												
675												
670												
665												
660												
655												
650												
645												
640												

DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
RL B1-A
Box 1 of 2; Depth: 14.2 – 23.6 ft
ft
0.5 ft
1.0 ft
1.5 ft
2.0 ft
14.2 ft
16.7 ft
21.7 ft
23.6 ft


DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
RL B1-A
Box 2 of 2; Depth: 23.6 – 26.7 ft
ft
0.5 ft
1.0 ft
1.5 ft
2.0 ft
23.6 ft
26.7 ft

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Honeycutt
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL B1-B	**STATION** 339+89	**OFFSET** 61ft RT	**ALIGNMENT** -L-	**0 HR.** Dry at 4.9'
COLLAR ELEV. 734.2 ft	**TOTAL DEPTH** 28.9 ft	**NORTHING** 580,190	**EASTING** 1,232,074	**24 HR.** 7.2
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/28/09	**COMP. DATE** 10/28/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 13.5 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)
735											
	734.2	0.0								734.2 GROUND SURFACE	0.0
			2	3	6	9		M		**ALLUVIAL** Red and brown, fine sandy SILT (A-4) with trace gravel and mica	
730	730.2	4.0									
			3	3	5	8		M			
725	725.2	9.0								726.7	7.5
			100/0.4			100/0.4				**WEATHERED ROCK** Biotite GNEISS	
720	720.2	14.0								720.7	13.5
			100/0.1			100/0.1				**CRYSTALLINE ROCK** Biotite GNEISS	
										718.7	15.5
										WEATHERED ROCK Biotite GNEISS	
715	715.2	19.0									
			100/0.3			100/0.3					
710	710.2	24.0									
			100/0.2			100/0.2					
										705.7	28.5
705	705.3	28.9								705.3 **CRYSTALLINE ROCK** Biotite GNEISS	28.9
			60/0.0			60/0.0					
700											
695											
690											
685											
680											
675											
670											
665											
660											
655											

Boring Terminated with Standard Penetration Test Refusal at Elevation 705.3 ft in Crystalline Rock: Biotite Gneiss

1) Bit used: 2-7/8" roller cone

2) Boring offset from proposed location due to existing site conditions.

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL B2-A	**STATION** 340+69	**OFFSET** 18ft RT	**ALIGNMENT** -L-	**0 HR.** Dry at 5.3'
COLLAR ELEV. 732.6 ft	**TOTAL DEPTH** 24.2 ft	**NORTHING** 580,246	**EASTING** 1,232,145	**24 HR.** Dry at 5.8'
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/13/09	**COMP. DATE** 10/13/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 24.2 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
735										
	732.6	0.0								732.6 GROUND SURFACE 0.0
			1	1	2	3		M		**ALLUVIAL** Orange-red, silty, fine to coarse SAND (A-2-4) with trace mica
730	728.4	4.2								
			2	2	2	4		M		
725	723.4	9.2								724.6 8.0
			1	1	1	2		M		Gray and brown, sandy SILT (A-4) with trace mica
720	718.4	14.2								
			WOH	WOH	WOH	0	SS-7	31%		
715	713.4	19.2								714.6 18.0
			2	13	13	26		M		**RESIDUAL** Tan and brown, sandy SILT (A-4) with trace to little mica 21.5 ft: Bit chatter
710	708.4	24.2								711.1 21.5
			60/0.0			60/0.0				708.4 24.2 **WEATHERED ROCK** Biotite GNEISS
705										
700										
695										
690										
685										
680										
675										
670										
665										
660										
655										

Boring Terminated with Standard Penetration Test Refusal at Elevation 708.4 ft on Crystalline Rock: Biotite Gneiss

1) Bit used: 2-7/8" roller cone

2) Boring offset from proposed location due to existing site conditions.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

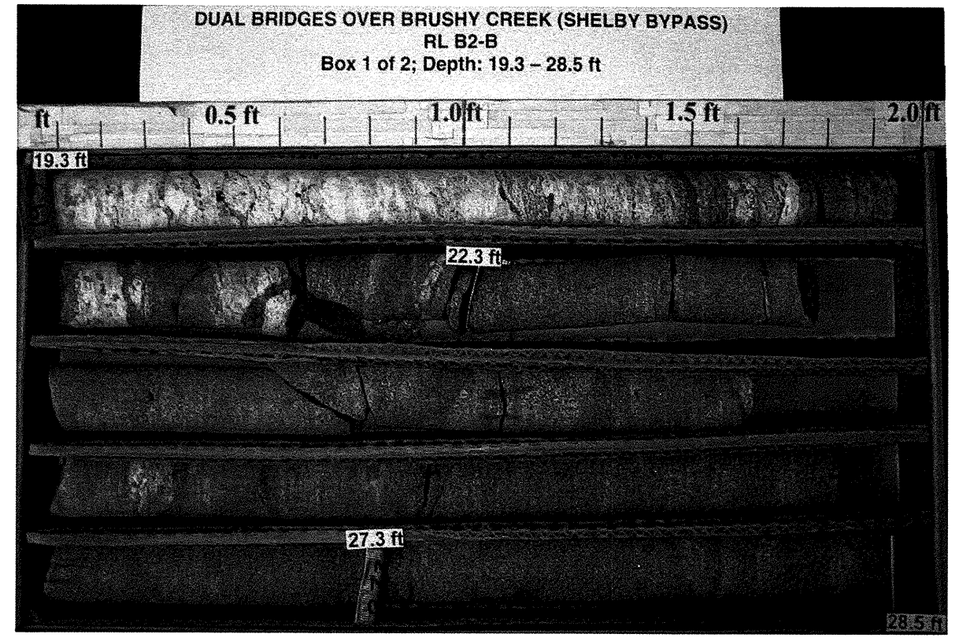
PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL B2-B	**STATION** 340+95	**OFFSET** 51ft RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 732.5 ft	**TOTAL DEPTH** 37.3 ft	**NORTHING** 580,219	**EASTING** 1,232,177 — **24 HR.** N/A
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
START DATE 10/13/09	**COMP. DATE** 10/15/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 19.3 ft

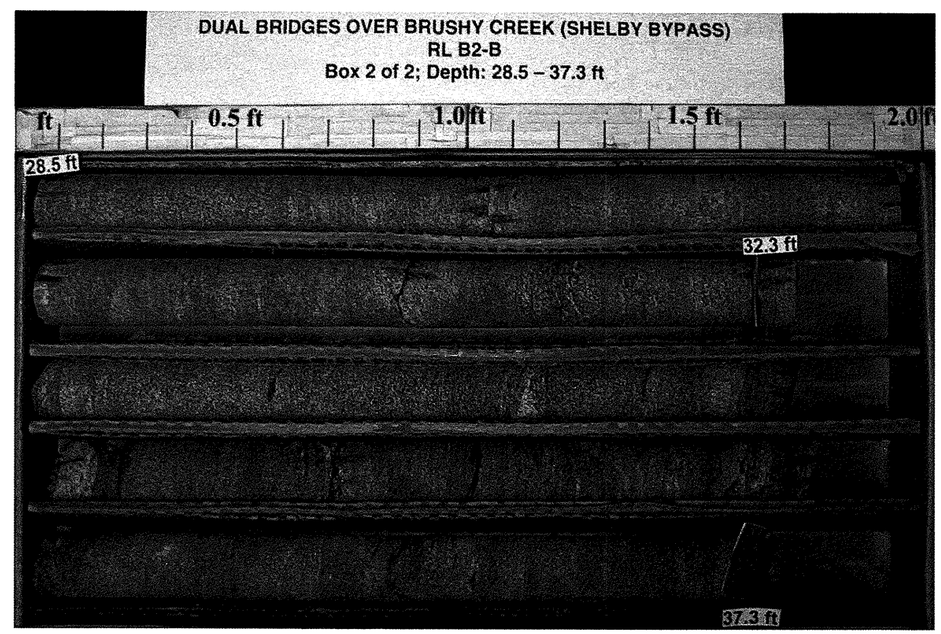
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
735										
	732.5	0.0								732.5 GROUND SURFACE 0.0
			2	1	2	3		M		**ALLUVIAL** Orange, silty, fine to coarse SAND (A-2-4) with trace mica
730										
	728.2	4.3								
			2	2	2	4	SS-8	M		
725										724.5 8.0
	723.2	9.3								Gray and brown, sandy SILT (A-4) with trace mica
			WOH	WOH	WOH	0		W		
720										719.5 13.0
	718.2	14.3								Gray and brown, silty, fine to coarse SAND (A-2-4)
			WOH	1	1	2		W		
715										715.0 17.5 — 17.5 ft: Bit chatter to 19.3 ft
	713.2	19.3								713.2 **WEATHERED ROCK** Biotite GNEISS 19.3
			60/0.0			60/0.0				**CRYSTALLINE ROCK** Black, white and gray, very slight to fresh weathering, very hard, close to wide fracturing, biotite GNEISS
710										2 fractures at 45 degrees
705										
700										
695							RS-3			695.2 37.3
690										Boring Terminated at Elevation 695.2 ft in Crystalline Rock: Biotite Gneiss
685										1) Bits used: 2-7/8" and 3-7/8" roller cones
680										
675										
670										
665										
660										
655										

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL B2-B	**STATION** 340+95	**OFFSET** 51ft RT	**ALIGNMENT** -L- — **0 HR.** N/A
COLLAR ELEV. 732.5 ft	**TOTAL DEPTH** 37.3 ft	**NORTHING** 580,219	**EASTING** 1,232,177 — **24 HR.** N/A
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
START DATE 10/13/09	**COMP. DATE** 10/15/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 19.3 ft
CORE SIZE NQ	**TOTAL RUN** 18.0 ft	**DRILLER** D. White	

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))
713.2											Begin Coring @ 19.3 ft
	713.2	19.3	3.0	4:00 4:30 3:15	(3.0) 100%	(3.0) 100%		(18.0) 100%	(17.6) 98%		713.2 **CRYSTALLINE ROCK** 19.3 Black, white and gray, very slight to fresh weathering, very hard, close to wide fracturing, biotite GNEISS
710	710.2	22.3									
			5.0	3:00 3:15 4:00 2:00 3:00	(5.0) 100%	(4.6) 92%					2 fractures at 45 degrees
705	705.2	27.3									
			5.0	2:15 2:45 2:30 2:30 2:45	(5.0) 100%	(5.0) 100%					
700	700.2	32.3									
			5.0	2:30 3:00 2:45 2:45 2:45	(5.0) 100%	(5.0) 100%					
695	695.2	37.3					RS-3				695.2 37.3
690											Boring Terminated at Elevation 695.2 ft in Crystalline Rock: Biotite Gneiss
685											1) Bits used: 2-7/8" and 3-7/8" roller cones
680											
675											
670											
665											
660											
655											
650											
645											
640											
635											


DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
RL B2-B
Box 1 of 2; Depth: 19.3 – 28.5 ft
ft
0.5 ft
1.0 ft
1.5 ft
2.0 ft
19.3 ft
22.3 ft
27.3 ft
28.5 ft


DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
RL B2-B
Box 2 of 2; Depth: 28.5 – 37.3 ft
ft
0.5 ft
1.0 ft
1.5 ft
2.0 ft
28.5 ft
32.3 ft
37.3 ft

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL B3-A	**STATION** 341+45	**OFFSET** 15ft RT	**ALIGNMENT** -L-	**0 HR.** 6.2
COLLAR ELEV. 727.3 ft	**TOTAL DEPTH** 31.5 ft	**NORTHING** 580,262	**EASTING** 1,232,219	**24 HR.** 6.5
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
START DATE 10/19/09	**COMP. DATE** 10/19/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 18.2 ft

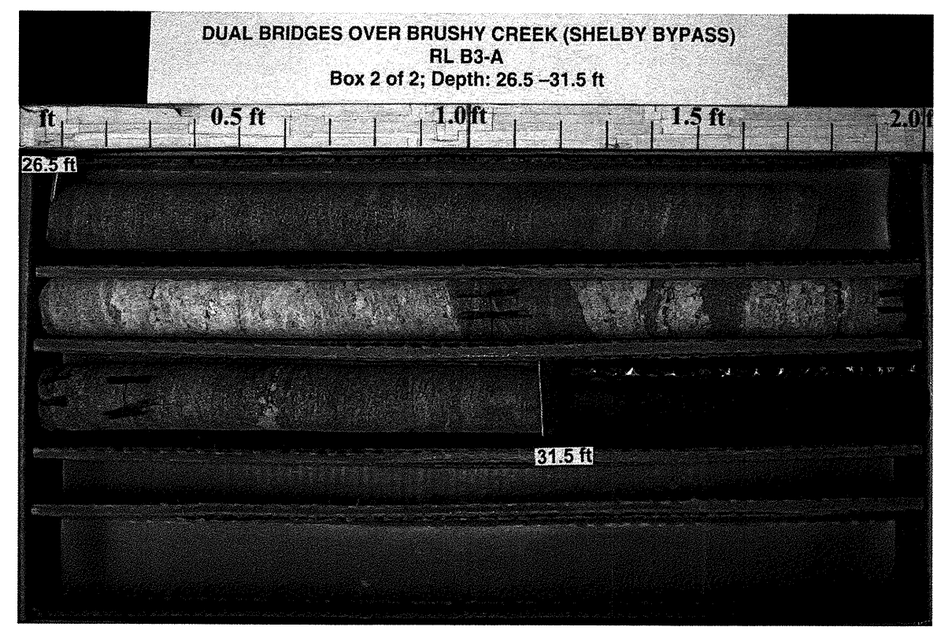
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
730											
	727.3	0.0								727.3 GROUND SURFACE	0.0
725			2	1	2	3		M		ALLUVIAL Tan and orange, sandy SILT (A-4) with trace mica and organics	
	723.0	4.3								724.3	3.0
720			2	1	1	2		W		Brown, silty, fine to coarse SAND (A-2-4)	
	718.0	9.3								719.3	8.0
715			2	2	4	6		W		Tan and gray, sandy SILT (A-4)	
	713.0	14.3								714.3	13.0
710			100/0.4			100/0.4				WEATHERED ROCK Biotite GNEISS	
	709.1	18.2	60/0.0			60/0.0				709.1	18.2
705										CRYSTALLINE ROCK Black and white, very slight to fresh weathering, hard, wide fracturing, biotite GNEISS with garnets 1 fracture at 45 degrees	
700											
695										695.8	31.5
690										Boring Terminated at Elevation 695.8 ft in Crystalline Rock: Biotite Gneiss 1) Bit used: 2-7/8" roller cone 2) Boring offset from proposed location due to existing site conditions.	
685											
680											
675											
670											
665											
660											
655											
650											

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL B3-A	**STATION** 341+45	**OFFSET** 15ft RT	**ALIGNMENT** -L-	**0 HR.** 6.2
COLLAR ELEV. 727.3 ft	**TOTAL DEPTH** 31.5 ft	**NORTHING** 580,262	**EASTING** 1,232,219	**24 HR.** 6.5
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
START DATE 10/19/09	**COMP. DATE** 10/19/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 18.2 ft
CORE SIZE NQ	**TOTAL RUN** 13.3 ft	**DRILLER** D. White	

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)
709.1											Begin Coring @ 18.2 ft	
	709.1	18.2	3.3	2:45 3:15 2:45	(3.3) 100%	(3.3) 100%		(13.2) 99%	(13.2) 99%		709.1 CRYSTALLINE ROCK Black and white, very slight to fresh weathering, hard, wide fracturing, biotite GNEISS with garnets 1 fracture at 45 degrees	18.2
705	705.8	21.5	5.0	1:00/0.3 2:30 2:30 2:45 2:45 2:45	(5.0) 100%	(5.0) 100%						
700	700.8	26.5	5.0	3:00 3:00 3:15 3:00 3:15	(4.9) 98%	(4.9) 98%						
695	695.8	31.5									695.8	31.5
690											Boring Terminated at Elevation 695.8 ft in Crystalline Rock: Biotite Gneiss 1) Bit used: 2-7/8" roller cone 2) Boring offset from proposed location due to existing site conditions.	
685												
680												
675												
670												
665												
660												
655												
650												
645												
640												
635												
630												

DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
RL B3-A
Box 1 of 2; Depth: 18.2 – 26.5 ft
ft
0.5 ft
1.0 ft
1.5 ft
2.0 ft
18.2 ft
21.5 ft
26.5 ft


DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
RL B3-A
Box 2 of 2; Depth: 26.5 –31.5 ft
ft
0.5 ft
1.0 ft
1.5 ft
26.5 ft
31.5 ft

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL B3-B	**STATION** 341+73	**OFFSET** 42ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 730.5 ft	**TOTAL DEPTH** 34.1 ft	**NORTHING** 580,240	**EASTING** 1,232,251
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/09/09	**COMP. DATE** 10/09/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 34.1 ft

GROUND WTR (ft): 0 HR. Dry at 8.0'; 24 HR. 7.4

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))
730	730.5	0.0								GROUND SURFACE 0.0
	726.4	4.1	2	1	2	3		M		**ALLUVIAL** Orange-red, sandy, clayey SILT (A-4) with trace mica
725	721.4	9.1	1	2	2	4		M		722.5 / 8.0 Orange-red, fine to coarse SAND (A-3) with trace silt
720	716.4	14.1	2	2	2	4	SS-9	W		717.5 / 13.0 **RESIDUAL** Tan and orange, silty, fine to coarse SAND (A-2-4) with trace mica
715	711.4	19.1	2	3	5	8		M		711.4 / 19.1 **WEATHERED ROCK** Biotite GNEISS
710	706.4	24.1	100/0.4			100/0.4				
705	701.4	29.1	100/0.5			100/0.5				702.5 / 28.0 **RESIDUAL** Brown and orange, silty, fine to coarse SAND (A-2-4)
700	696.4	34.1	50	46	45	91		M		696.4 / 34.1 Boring Terminated with Standard Penetration Test Refusal at Elevation 696.4 ft on Crystalline Rock: Biotite Gneiss
695			60/0.0			60/0.0				1) Bit used: 2-7/8" roller cone 2) Boring offset from proposed location due to existing site conditions.
690										
685										
680										
675										
670										
665										
660										
655										

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL B4-A	**STATION** 342+22	**OFFSET** 31ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 730.9 ft	**TOTAL DEPTH** 26.9 ft	**NORTHING** 580,258	**EASTING** 1,232,297
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/09/09	**COMP. DATE** 10/09/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 26.9 ft

GROUND WTR (ft): 0 HR. 10.2; 24 HR. 8.6

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))
730	730.9	0.0								GROUND SURFACE 0.0
	726.9	4.0	2	3	3	6		D		**ALLUVIAL** Red, brown and orange, silty, fine to coarse SAND (A-2-4) with trace organics
725	721.9	9.0	4	3	4	7		M		722.9 / 8.0 **WEATHERED ROCK** Biotite GNEISS
720	716.9	14.0	30	70/0.3		100/0.8				
715	711.9	19.0	27	73/0.4		100/0.9				
710	706.9	24.0	100/0.3			100/0.3				
705	704.0	26.9	100/0.4			100/0.4				704.0 / 26.9 Boring Terminated with Standard Penetration Test Refusal at Elevation 704.0 ft on Crystalline Rock: Biotite Gneiss
700			60/0.0			60/0.0				1) Bit used: 2-7/8" roller cone 2) Boring offset from proposed location due to existing site conditions.
695										
690										
685										
680										
675										
670										
665										
660										
655										

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL B4-B	**STATION** 342+61	**OFFSET** 68ft RT	**ALIGNMENT** -L-	**0 HR.** 8.8
COLLAR ELEV. 731.4 ft	**TOTAL DEPTH** 37.2 ft	**NORTHING** 580,226	**EASTING** 1,232,341	**24 HR.** 8.7
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
START DATE 10/13/09	**COMP. DATE** 10/15/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 19.2 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)
731.4		0.0								GROUND SURFACE	0.0
			2	4	6	10	SS-10	29%		**ALLUVIAL** Red and brown, silty CLAY (A-7-6)	
728.4		3.0								**RESIDUAL** Brown, tan and orange, silty, fine to coarse SAND (A-2-4)	
727.2		4.2									
			10	12	29	41		D			
722.2		9.2								**WEATHERED ROCK** Biotite GNEISS	
			100/0.3			100/0.3					
717.2		14.2									
			100/0.4			100/0.4					
712.2		19.2								**CRYSTALLINE ROCK** Black, white and gray, slight to fresh weathering, hard, close to moderately close fracturing, biotite GNEISS with garnets 14 fractures at 25-35 degrees	
			60/0.0			60/0.0					
							RS-4				
694.2		37.2								Boring Terminated at Elevation 694.2 ft in Crystalline Rock: Biotite Gneiss 1) Bit used: 2-7/8" roller cone 2) Boring offset from proposed location due to existing site conditions.	

NCDOT BORE SINGLE R-2707B_GEO_BRDG_BRUSHY CREEK_BORE LOGS.GPJ NC_DOT.GDT 12/16/09

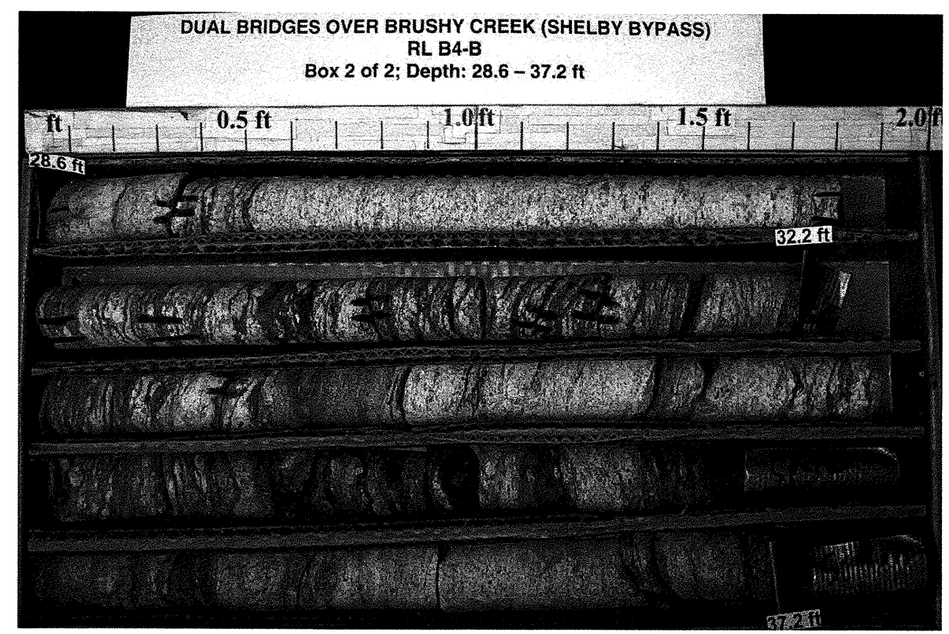
NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL B4-B	**STATION** 342+61	**OFFSET** 68ft RT	**ALIGNMENT** -L-	**0 HR.** 8.8
COLLAR ELEV. 731.4 ft	**TOTAL DEPTH** 37.2 ft	**NORTHING** 580,226	**EASTING** 1,232,341	**24 HR.** 8.7
DRILL MACHINE CME 55LC	**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
START DATE 10/13/09	**COMP. DATE** 10/15/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 19.2 ft
CORE SIZE NQ	**TOTAL RUN** 18.0 ft	**DRILLER** D. White	

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)
712.2											Begin Coring @ 19.2 ft	
	712.2	19.2	3.0	2:15 3:15 3:15	(2.5) 83%	(1.5) 50%		(17.5) 97%	(14.6) 81%		712.2 **CRYSTALLINE ROCK** Black, white and gray, slight to fresh weathering, hard, close to moderately close fracturing, biotite GNEISS with garnets 14 fractures at 25-35 degrees	19.2
	709.2	22.2	5.0	2:15 2:45 2:30 2:30 2:30	(5.0) 100%	(4.5) 90%						
	704.2	27.2	5.0	3:15 3:00 3:00 3:00 3:15	(5.0) 100%	(4.6) 92%	RS-4					
	699.2	32.2	5.0	3:00 3:00 3:15 4:15 3:15	(5.0) 100%	(4.0) 80%						
	694.2	37.2									694.2 Boring Terminated at Elevation 694.2 ft in Crystalline Rock: Biotite Gneiss 1) Bit used: 2-7/8" roller cone 2) Boring offset from proposed location due to existing site conditions.	37.2

NCDOT CORE SINGLE R-2707B_GEO_BRDG_BRUSHY CREEK_BORE LOGS.GPJ NC_DOT.GDT 12/16/09

DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
RL B4-B
Box 1 of 2; Depth: 19.2 – 28.6 ft
ft
0.5 ft
1.0 ft
1.5 ft
2.0 ft
19.2 ft
22.2 ft
27.2 ft
28.6 ft


DUAL BRIDGES OVER BRUSHY CREEK (SHELBY BYPASS)
RL B4-B
Box 2 of 2; Depth: 28.6 – 37.2 ft
ft
0.5 ft
1.0 ft
1.5 ft
2.0 ft
28.6 ft
32.2 ft
37.2 ft

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL EB2-A	**STATION** 343+07	**OFFSET** 33ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 748.3 ft	**TOTAL DEPTH** 17.5 ft	**NORTHING** 580,268	**EASTING** 1,232,381
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/06/09	**COMP. DATE** 10/06/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 17.4 ft

GROUND WTR (ft): 0 HR. 14.5; 24 HR. 14.2

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											
	748.3	0.0								748.3 GROUND SURFACE	0.0
			2	3	5	8		M		**RESIDUAL** Red and brown, silty, fine to coarse SAND (A-2-4) with trace mica, saprolitic	
745										745.3	3.0
	744.2	4.1								Red, brown and tan, sandy SILT (A-4) with trace to little mica	
			43	38	62/0.4	100/0.9		D		743.7	4.6
										WEATHERED ROCK Biotite GNEISS	
740										740.3	8.0
	739.2	9.1								**RESIDUAL** Gray and brown, silty, fine to coarse SAND (A-2-4) with trace mica	
			21	49	22	71					
735											
	734.2	14.1								734.2	14.1
			100/0.2			100/0.2				**WEATHERED ROCK** Biotite GNEISS	
	730.9	17.4								730.9	17.4
730			60/0.1			60/0.1				730.8 **CRYSTALLINE ROCK** Biotite GNEISS	17.5
725										Boring Terminated with Standard Penetration Test Refusal at Elevation 730.8 ft in Crystalline Rock: Biotite Gneiss	
720										1) Bit used: 2-7/8" roller cone	
715										2) Boring offset from proposed location due to existing site conditions.	
710											
705											
700											
695											
690											
685											
680											
675											
670											

PROJECT NO. 34497.1.2	**ID.** R-2707B	**COUNTY** Cleveland	**GEOLOGIST** J. Howard
SITE DESCRIPTION US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (MACTEC Project No. 6468-09-2511)			**GROUND WTR (ft)**
BORING NO. RL EB2-B	**STATION** 343+23	**OFFSET** 68ft RT	**ALIGNMENT** -L-
COLLAR ELEV. 745.0 ft	**TOTAL DEPTH** 19.2 ft	**NORTHING** 580,235	**EASTING** 1,232,401
DRILL MACHINE CME 55LC	**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
START DATE 10/06/09	**COMP. DATE** 10/06/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 19.1 ft

GROUND WTR (ft): 0 HR. 2.0; 24 HR. Dry at 4.0'

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
750										
745	745.0	0.0								745.0 GROUND SURFACE 0.0
			2	3	3	6		M7		**RESIDUAL** Red and brown, silty, fine to coarse SAND (A-2-4) with relict rock structure and trace organics
										742.5 2.5
740	740.9	4.1								Red and brown, sandy SILT (A-4) with trace to little mica
			25	32	35	67	SS-11	18%		
735	735.9	9.1								735.9 9.1
			100/0.3			100/0.3				**WEATHERED ROCK** Biotite GNEISS
730	730.9	14.1								
			26	74/0.4		100/0.9				
725	725.9	19.1								725.9 19.1
			60/0.1			60/0.1				725.8 19.2 **CRYSTALLINE ROCK** Biotite GNEISS
720										Boring Terminated with Standard Penetration Test Refusal at Elevation 725.8 ft in Crystalline Rock: Biotite Gneiss
715										1) Bit used: 2-7/8" roller cone
710										2) Boring offset from proposed location due to existing site conditions.
705										
700										
695										
690										
685										
680										
675										
670										

NCDOT BORE DOUBLE R-2707B_GEO_BRDG_BRUSHY CREEK_BORE LOGS.GPJ NC_DOT.GDT 12/16/09

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: US 74 (Shelby Bypass) Dual Bridges Over Brushy Creek (6468-09-2511)

NCDOT PROJ. NO.: 34497.1.2 (R-2707B) Cleveland **OWNER: N.C.D.O.T.**

DATE SAMPLED: October 2009 RECEIVED: 10/19/2009 **REPORTED BY:** MACTEC

SAMPLED FROM: LL B2-A, LL B2-B, LL B3-A, LL B4-A, LL EB2-B

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Retained No. 4 Sieve	(%)	0.0	1.2	26.8	0.0	5.8	0.1
Passing No. 10 Sieve	(%)	99.9	98.6	67.9	98.6	90.9	98.2
Passing No. 40 Sieve	(%)	92.8	96.6	55.0	92.5	68.5	78.0
Passing No. 200 Sieve	(%)	14.3	70.7	27.5	55.8	31.2	34.4

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand	(%)	30.2	5.0	31.2	12.8	37.7	33.4
Fine Sand	(%)	58.9	31.6	34.2	37.5	34.1	39.3
Silt	(%)	1.4	31.9	16.6	15.4	12.2	17.3
Clay	(%)	9.5	31.4	18.0	34.3	16.0	10.0

Moisture Content	(%)	ND	36.3	ND	28.9	ND	ND
Liquid Limit, L.L.		NV	29	22	43	29	27
Plasticity Index, P.I.		NP	5	3	14	1	1
AASHTO Classification		A-2-4(0)	A-4(2)	A-2-4(0)	A-7-6(6)	A-2-4(0)	A-2-4(0)
Organic Content	(%)	ND	ND	ND	ND	ND	ND

Boring No.		LL B2-A	LL B2-B	LL B3-A	LL B4-A	LL EB2-B	LL EB2-B
Station		339+91	340+15	340+69	341+47	342+51	342+51
Offset		51 LT	31 LT	59 LT	54 LT	3 LT	3 LT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (FT)	From	0.0	9.2	4.3	4.7	0.0	8.7
	to	1.5	10.7	5.8	6.2	1.5	10.2

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value

Tested By Chana Savanapridi; Cert. No. 104-04-0504 Chana Savanapridi 11/23/09
Signature

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: US 74 (Shelby Bypass) Dual Bridges over Brushy Creek (6468-09-2511)

NCDOT PROJ. NO.: 34497.1.2 (R-2707B) COUNTY: Cleveland **OWNER: N.C.D.O.T.**

DATE SAMPLED: October 2009 RECEIVED: 10/19/2009-10/26/2009 **REPORTED BY:** MACTEC

SAMPLED FROM: RL B2-A, RL B2-B, RL B3-B, RL B4-B, RL EB2-B, Channel

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-7	SS-8	SS-9	SS-10	SS-11	S-1
Retained No. 4 Sieve	(%)	0.0	0.5	3.4	4.1	1.7	6.3
Passing No. 10 Sieve	(%)	100.0	99.5	89.0	95.1	95.5	79.8
Passing No. 40 Sieve	(%)	98.3	67.4	53.7	90.1	84.3	30.7
Passing No. 200 Sieve	(%)	49.5	20.6	7.7	73.8	45.6	3.2

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand	(%)	8.0	53.0	66.9	8.0	20.6	83.8
Fine Sand	(%)	51.3	30.2	26.0	18.4	41.7	13.2
Silt	(%)	16.8	3.6	1.2	28.3	23.7	0.0
Clay	(%)	23.9	13.3	6.0	45.3	14.0	3.0

Moisture Content	(%)	31.0	ND	ND	29.1	18.1	ND
Liquid Limit, L.L.		23	17	NV	44	29	NV
Plasticity Index, P.I.		3	1	NP	16	5	NP
AASHTO Classification		A-4(0)	A-2-4(0)	A-3(0)	A-7-6(12)	A-4(0)	A-1-b(0)
Organic Content	(%)	ND	ND	ND	ND	ND	ND

Boring No.		RL B2-A	RL B2-B	RL B3-B	RL B4-B	RL EB2-B	Channel
Station		340+69	340+95	341+73	342+61	343+23	340+56
Offset		18 RT	51 RT	42 RT	68 RT	68 RT	58 RT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (FT)	From	14.2	4.3	9.1	0.0	4.1	0.0
	to	15.7	5.8	10.6	1.5	5.6	0.5

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value

Tested By Chana Savanapridi; Cert. No. 104-04-0504 Chana Savanapridi 11/23/09
Signature

MACTEC

MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: US 74 (Shelby Bypass) Dual Bridges over Brusyy Creek (6468-09-2511)

NCDOT PROJ. NO.: 34497.1.2 (R-2707B) COUNTY: Cleveland OWNER: N.C.D.O.T.

DATE SAMPLED: October 2009 RECEIVED: 10/26/2009 REPORTED BY: MACTEC

SAMPLED FROM: Bank

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		S-2					
Retained No. 4 Sieve	(%)	0.2					
Passing No. 10 Sieve	(%)	99.7					
Passing No. 40 Sieve	(%)	52.8					
Passing No. 200 Sieve	(%)	1.0					

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand	(%)	85.0					
Fine Sand	(%)	14.7					
Silt	(%)	0.2					
Clay	(%)	0.1					

Moisture Content	(%)	ND					
Liquid Limit, L.L.		NV					
Plasticity Index, P.I.		NP					
AASHTO Classification		A-3(0)					

Boring No.		Bank					
Station		340+71					
Offset		58 RT					
Alignment		-L-					
Depth (FT)	From	0.0					
	to	0.5					

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value

Tested By Chana Savanapridi; Cert. No. 104-04-0504 Chana Savanapridi 11/23

Signature

SHEET 41

Laboratory Summary Sheet for Rock Core Samples

MACTEC Project No.: 6468-09-2511
Project No.: 34497.1.2 (R-2707B)
F.A. No.: NHF-74(14)
County: Cleveland
Dual Bridges Over Brushy Creek – Shelby Bypass

Sample #	Boring #	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (in)	Diameter (in)	Unit Weight (pcf)	Unconfined Compressive Strength	Young's Modulus (psi)	Splitting Tensile Strength (psi)	Remarks
RS-1	LL B1-A	25.3-25.9	Gneiss	CZbg	90%	3.81	1.76	163.5	4670	NA	NA	
RS-2	LL B3-A	32.4-33.3	Gneiss	CZbg	60%	3.78	1.73	164.2	2050	NA	NA	
RS-3	RL B2-B	35.7-36.7	Gneiss	CZbg	100%	3.73	1.75	177.6	9750	NA	NA	
RS-4	RL B4-B	29.4-30.4	Gneiss	CZbg	92%	3.79	1.75	163.6	6360	NA	NA	

Created By: DAK 11-24-09
Checked By: JHA 11-25-09
Reviewed By: MA 11-30-09

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34497.1.2 TIP: R-2707B COUNTY: Cleveland

DESCRIPTION(1): US 74 (Shelby Bypass) - Proposed Dual Bridges over Brushy Creek (NO EXISITNG BRIDGE)

EXISTING BRIDGE

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

Bridge No.: NA Length: NA Total Bents: NA Bents in Channel: NA Bents in Floodplain: NA
Foundation Type: NA

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: NA

Interior Bents: NA

Channel Bed: NA

Channel Bank: NA

EXISTING SCOUR PROTECTION

Type(3): NA

Extent(4): NA

Effectiveness(5): NA

Obstructions(6): NA

DESIGN INFORMATION

Channel Bed Material(7): Tan fine to coarse sand with trace of clay and gravel

Channel Bank Material(8): Brown, orange and gray slightly silty to silty fine to coarse sand, brown clayey fine sandy silt, and brown clayey fine sandy silty clay

Channel Bank Cover(9): Grasses, bushes, small to large deciduous and pine trees

Floodplain Width(10): 125'

Floodplain Cover(11): Grasses, bushes, small to large deciduous and pine trees

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

Channel Migration Tendency(13): Northward at Left Lane, Southward at Right Lane

Observations and Other Comments: Creek is well entrenched with steep banks and a broad, flat channel. Banks show undercutting along outside of bends in the creek.

Reported by: Jim Howard **Date:** 10/15/2009

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

	BENTS B1	B2	B3	B4							
EB Lanes	725.4	718.7	729.5	729.5							
WB Lanes	718.7	718.7	729.8	735.5							

Comparison of DSE to Hydraulics Unit theoretical scour:
The Geotechnical Unit concurs with the Hydraulics Unit's scour evaluation except at Eastbound Lane, Bent 1, as noted above.

DSE determined by: William F. Goforth, PG **Date:** 1/11/2009

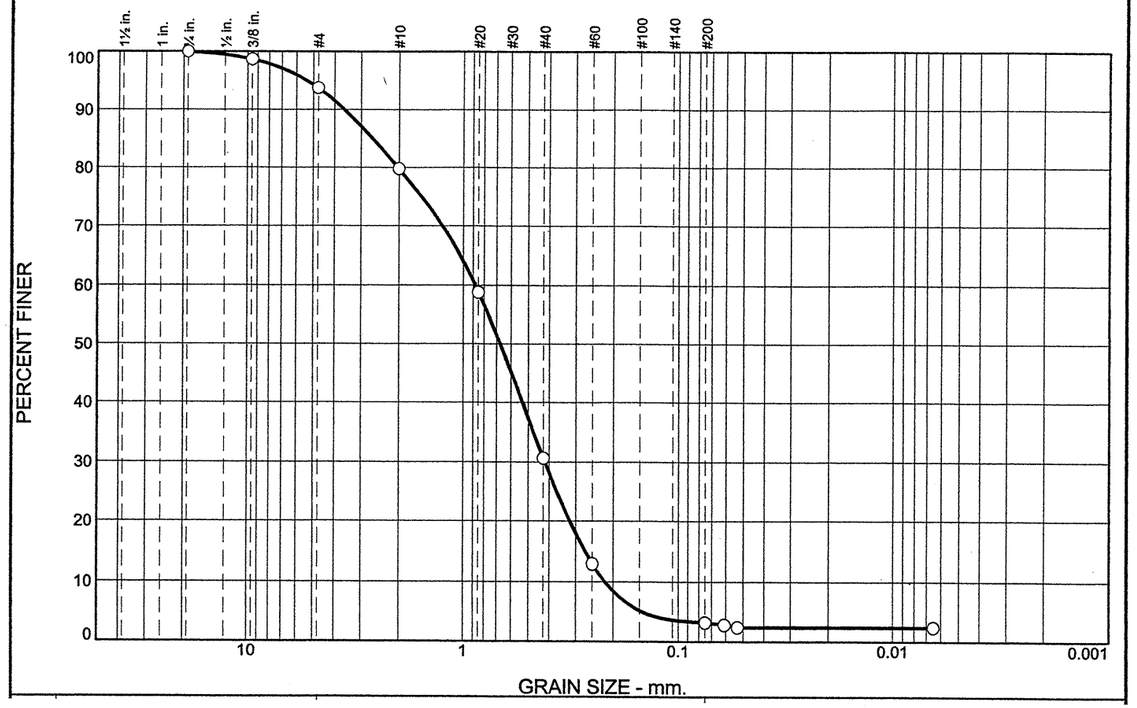
SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bed	Bank	Bank	Bank	Bank	Bank	Bank
Sample No.	S-1	S-2	SS-3	SS-7	SS-8	SS-9	SS-10
Retained #4	6.3	0.2	26.8	0	0.5	3.4	4.1
Passed #10	79.8	99.7	67.9	100	99.5	89	95.1
Passed #40	30.7	52.8	55	98.3	67.4	53.7	90.1
Passed #200	3.2	1	27.5	49.5	20.6	7.7	73.8
Coarse Sand	83.8	85	31.2	8	53	66.9	8
Fine Sand	13.2	14.7	34.2	51.3	30.2	26	18.4
Silt	0	0.2	16.6	16.8	3.6	1.2	28.3
Clay	3	0.1	18	23.9	13.3	6	45.3
LL	NV	NV	22	23	17	NV	44
PI	NP	NP	3	3	1	NP	16
AASHTO	A-1-b(0)	A-3(0)	A-2-4(0)	A-4(0)	A-2-4(0)	A-3(0)	A-7-6(12)
Station	340+56	340+71	340+69	340+69	340+95	341+73	342+61
Offset	58 RT	58 RT	59 LT	18 RT	51 RT	42 RT	68 RT
Depth	0.0-0.5	0.0-0.5	4.3-5.8	14.2-15.7	4.3-5.8	9.1-10.6	0.0-1.5

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.

Particle Size Distribution Report



SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
3/8	98.7		
#4	93.7		
#10	79.8		
#20	58.8		
#40	30.7		
#60	12.9		
#200	3.2		
#270	2.4		

* (no specification provided)

Material Description

Reddish Brown SAND

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 3.6001 D_{85}= 2.6552 D_{60}= 0.8806
D_{50}= 0.6745 D_{30}= 0.4181 D_{15}= 0.2711
D_{10}= 0.2186 C_u= 4.03 C_c= 0.91

Classification

USCS= SP AASHTO= A-1-b

Remarks

Specific Gravity is assumed
ND = Not Determined
Spatula Method as Per NCDOT Procedures

Source of Sample: Channel Grab Sample **Depth:** 0.0' to 0.5'
Sample Number: S-1 **Date:** 10/26/09

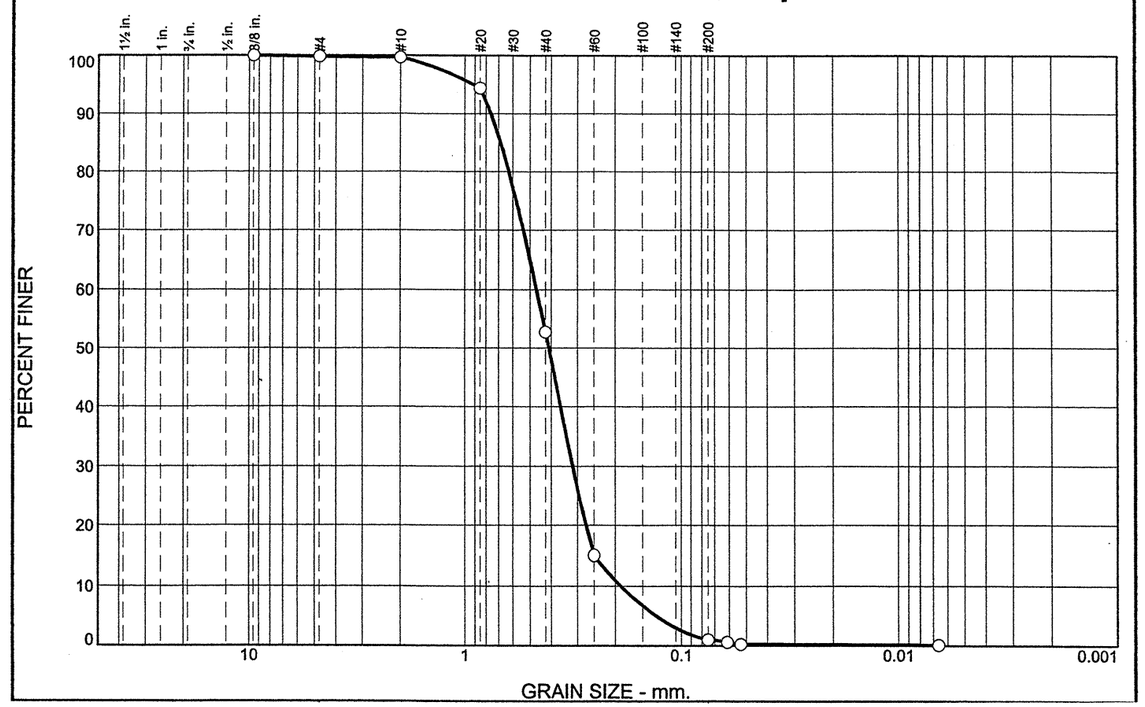
MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

Client: NCDOT
Project: US 74 (Shelby Bypass) Dual Stuctures Over Brushy Creek, Cleveland CO, NC
Project No: 6468092511 **Figure**

Tested By: CS (Cert# 104-04-0504) **Checked By:** MDC (Lab Manager) mdc

Particle Size Distribution Report

SHEET 43



SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100.0		
#4	99.8		
#10	99.7		
#20	94.3		
#40	52.8		
#60	15.0		
#200	1.0		
#270	0.3		

* (no specification provided)

Material Description

Reddish Brown SAND

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.7603 D_{85}= 0.6861 D_{60}= 0.4675
D_{50}= 0.4102 D_{30}= 0.3162 D_{15}= 0.2499
D_{10}= 0.1887 C_u= 2.48 C_c= 1.13

Classification

USCS= SP AASHTO= A-3

Remarks

ND = Not Determined
Specific Gravity is assumed
Spatula Method as Per NCDOT Procedures

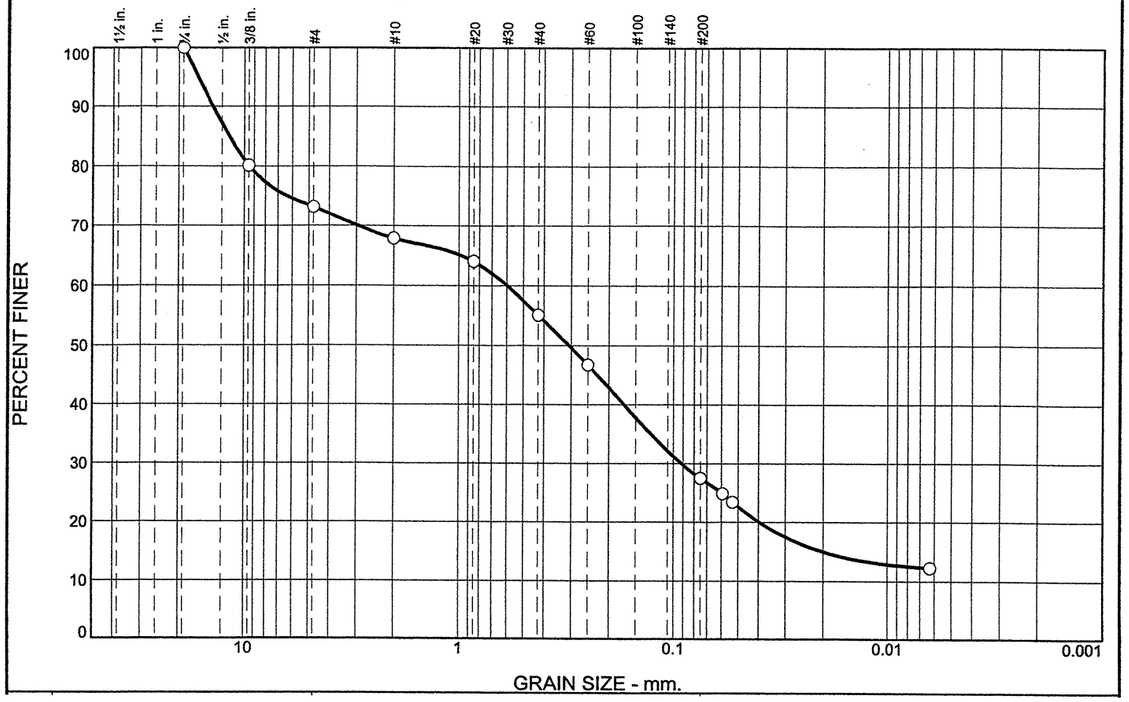
Source of Sample: Bank Grab Sample **Depth:** 0.0' to 0.5'
Sample Number: S-2 **Date:** 10/26/09

MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

Client: NCDOT
Project: US 74 (Shelby Bypass) Dual Stuctures Over Brushy Creek, Cleveland CO, NC
Project No: 6468092511 **Figure**

Tested By: CS (Cert# 104-04-0504) **Checked By:** MDC (Lab Manager) mdc

Particle Size Distribution Report



SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
3/8	80.2		
#4	73.2		
#10	67.9		
#20	64.0		
#40	55.0		
#60	46.7		
#200	27.5		
#270	23.5		

* (no specification provided)

Material Description

Reddish Brown Silty SAND

Atterberg Limits

PL= 19 LL= 22 PI= 3

Coefficients

D_{90}= 13.9969 D_{85}= 11.7564 D_{60}= 0.5966
D_{50}= 0.3065 D_{30}= 0.0915 D_{15}= 0.0201
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Specific Gravity is assumed

Source of Sample: Boring LL-B3-A **Depth:** 4.3-5.8'
Sample Number: SS-3 **Date:** 10/19/09

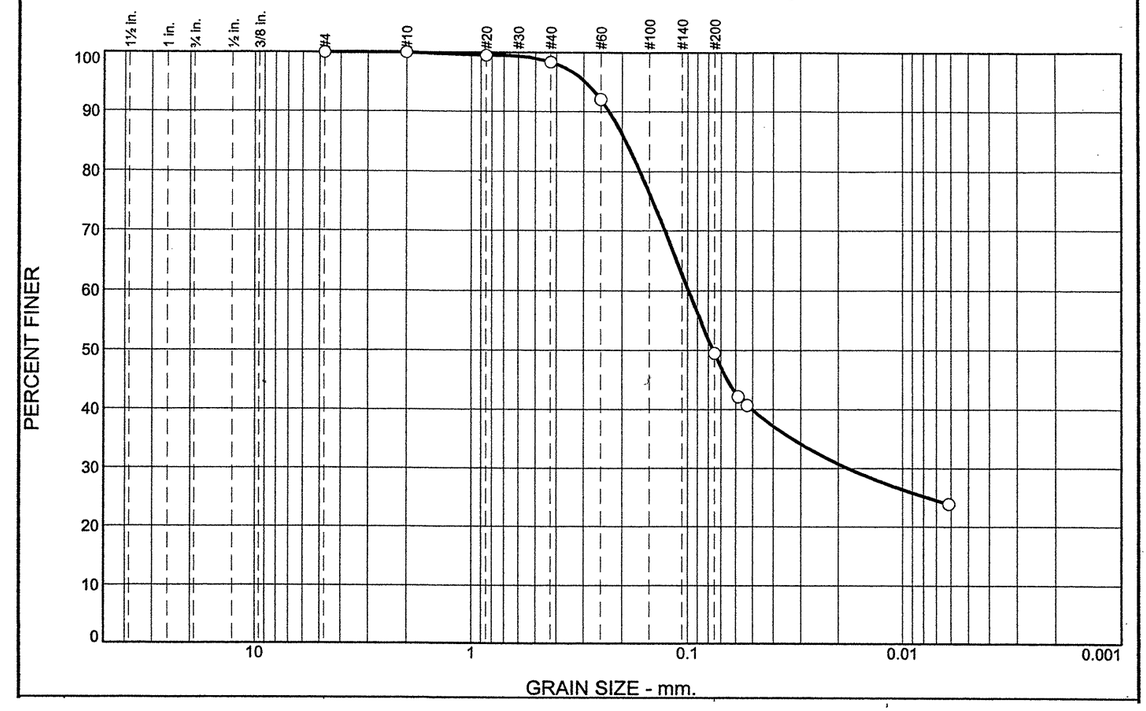
MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

Client: NC DEPARTMENT OF TRANSPORTATION
Project: US 74 (Shelby Bypass) Dual Stuctures Over Brushy Creek, Cleveland CO, NC
Project No: 6468092511 **Figure**

Tested By: CS (Cert# 104-04-0504) **Checked By:** MDC (Lab Manager) MDC

Particle Size Distribution Report

SHEET 44



SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.5		
#40	98.3		
#60	92.0		
#200	49.5		
#270	40.7		

* (no specification provided)

Material Description

Yellowish Brown Silty SAND

Atterberg Limits

PL= 20 LL= 23 PI= 3

Coefficients

D_{90}= 0.2295 D_{85}= 0.1925 D_{60}= 0.0990
D_{50}= 0.0761 D_{30}= 0.0179 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

ND = Not Determined
Specific Gravity is assumed

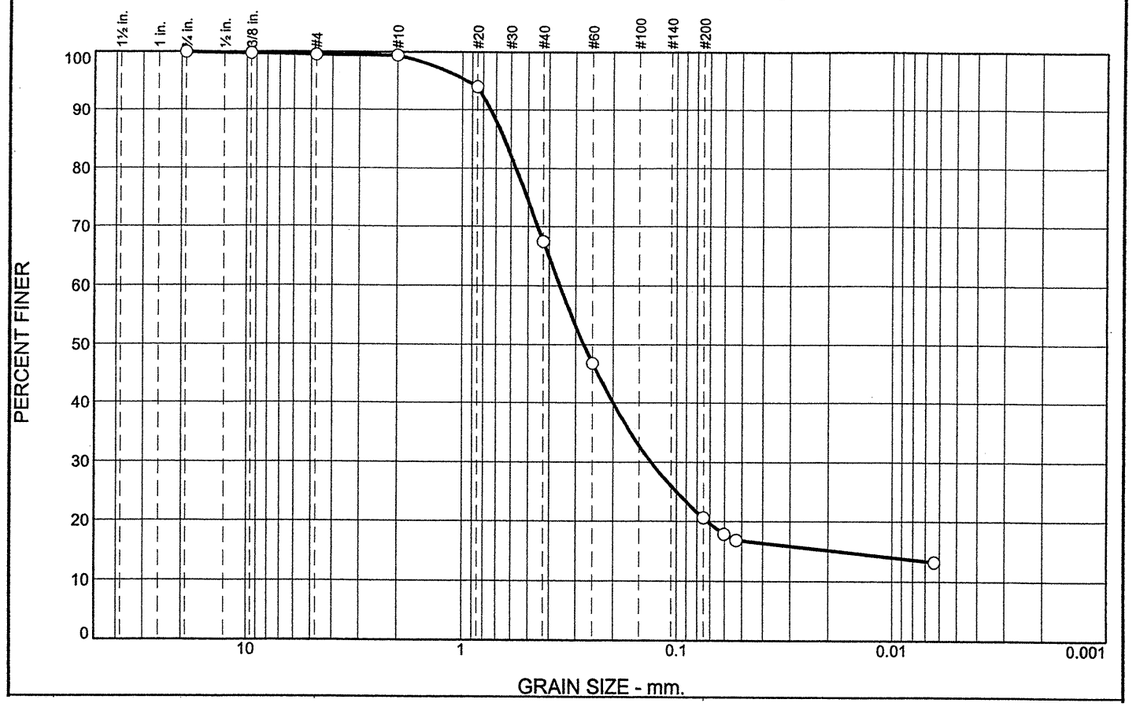
Source of Sample: Boring RL-B2-A **Depth:** 14.2-15.7'
Sample Number: SS-7 **Date:** 10/19/09

MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

Client: NC DEPARTMENT OF TRANSPORTATION
Project: US 74 (Shelby Bypass) Dual Stuctures Over Brushy Creek, Cleveland CO, NC
Project No: 6468092511 **Figure**

Tested By: CS (Cert# 104-04-0504) **Checked By:** MDC (Lab Manager) MDC

Particle Size Distribution Report



SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
3/8	99.8		
#4	99.5		
#10	99.5		
#20	93.9		
#40	67.4		
#60	46.8		
#200	20.6		
#270	16.8		

* (no specification provided)

Material Description

Reddish Brown Silty SAND

Atterberg Limits

PL= 16 LL= 17 PI= 1

Coefficients

D_{90}= 0.7406 D_{85}= 0.6436 D_{60}= 0.3563
D_{50}= 0.2744 D_{30}= 0.1316 D_{15}= 0.0181
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

ND = Not Determined
Specific gravity is assumed

Source of Sample: Boring RL-B2-B **Depth:** 4.3-5.8'
Sample Number: SS-8 **Date:** 10/19/09

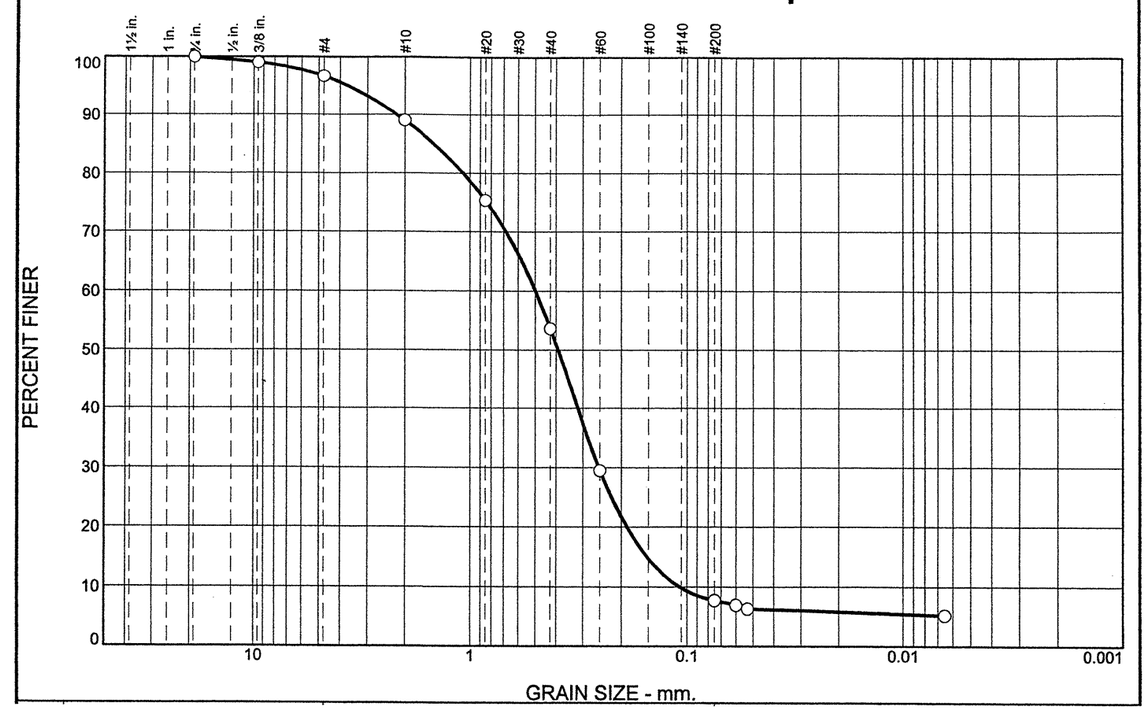
MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

Client: NC DEPARTMENT OF TRANSPORTATION
Project: US 74 (Shelby Bypass) Dual Stuctures Over Brushy Creek, Cleveland CO, NC
Project No: 6468092511 **Figure**

Tested By: CS (Cert# 104-04-0504) **Checked By:** MDC (Lab Manager) MDC

Particle Size Distribution Report

SHEET 45



SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
3/8	99.0		
#4	96.6		
#10	89.0		
#20	75.3		
#40	53.7		
#60	29.5		
#200	7.7		
#270	6.4		

* (no specification provided)

Material Description

Reddish Brown Fine SAND

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 2.1800 D_{85}= 1.4608 D_{60}= 0.4987
D_{50}= 0.3913 D_{30}= 0.2530 D_{15}= 0.1525
D_{10}= 0.1077 C_u= 4.63 C_c= 1.19

Classification

USCS= SP-SM AASHTO= A-3

Remarks

ND = Not Determined
Specific Gravity is assumed
Atterburg Limits = Spatula Method as Per NCDOT Procedures

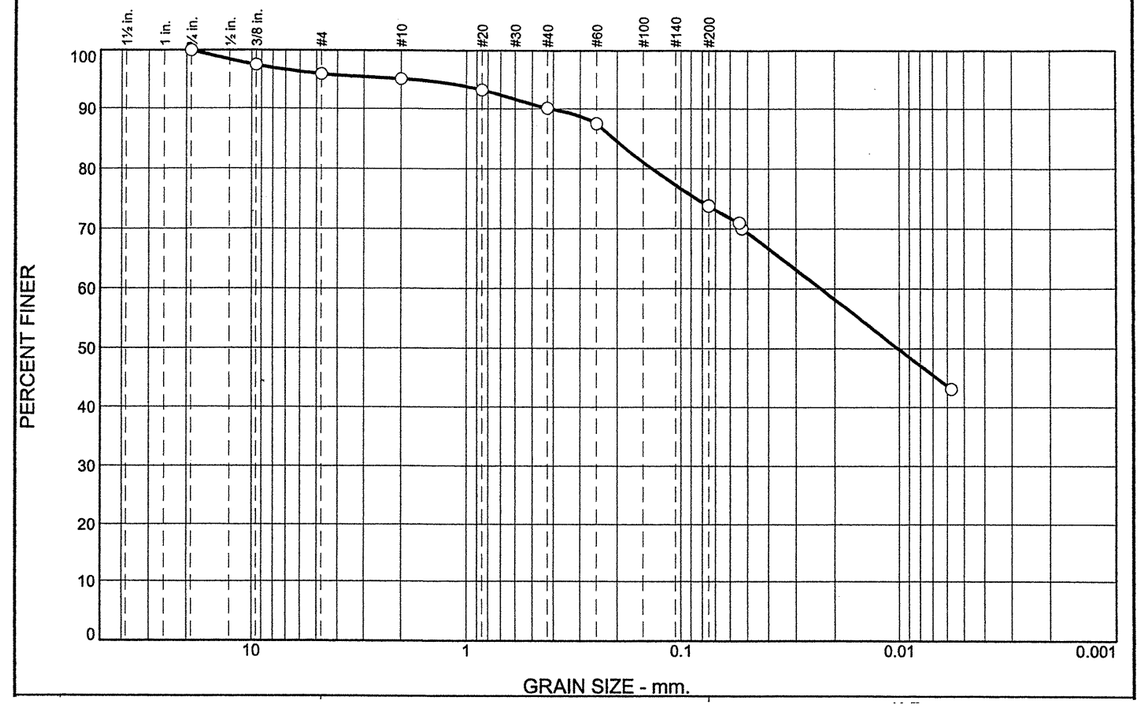
Source of Sample: Boring RL-B3-B **Depth:** 9.1-10.6'
Sample Number: SS-9 **Date:** 10/19/09

MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

Client: NC DEPARTMENT OF TRANSPORTATION
Project: US 74 (Shelby Bypass) Dual Stuctures Over Brushy Creek, Cleveland CO, NC
Project No: 6468092511 **Figure**

Tested By: CS (Cert# 104-04-0504) **Checked By:** MDC (Lab Manager) MDC

Particle Size Distribution Report



SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
3/8	97.5		
#4	95.9		
#10	95.1		
#20	93.2		
#40	90.1		
#60	87.5		
#200	73.8		
#270	70.0		

* (no specification provided)

Material Description

Dark Brown SILT with Sand

Atterberg Limits

PL= 28 LL= 44 PI= 16

Coefficients

D_{90}= 0.4134 D_{85}= 0.2064 D_{60}= 0.0232
D_{50}= 0.0101 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-7-6(12)

Remarks

Specific Gravity is assumed

Source of Sample: Boring RL-B4-B **Depth:** 0.0-1.5'
Sample Number: SS-10 **Date:** 10/19/09

MACTEC Engineering and Consulting, Inc.

Raleigh, North Carolina

Client: NC DEPARTMENT OF TRANSPORTATION
Project: US 74 (Shelby Bypass) Dual Stuctures Over Brushy Creek, Cleveland CO, NC
Project No: 6468092511 **Figure**

Tested By: CS (Cert# 104-04-0504) **Checked By:** MDC (Lab Manager)

Looking Up Station toward End Bent 1

Looking Down Station toward End Bent 2

End Bent 1: Looking Right

End Bent 1: Looking Left

Bent 1: Looking Right

Bent 2: Looking Right

Bent 1: Looking Left

Bent 2: Looking Left

Bent 3: Looking Right

Bent 4: Looking Right

Bent 3: Looking Left

Bent 4: Looking Left

End Bent 2: Looking Right

End Bent 2: Looking Left

Looking Up Stream

Looking Down Stream

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34497.1.2 (R-2707B)	1	21

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34497.1.2 (R-2707B) F.A. PROJ. NHF-74(14)

COUNTY CLEVELAND

PROJECT DESCRIPTION US 74 (SHELBY BYPASS) FROM WEST OF SR 1314 TO WEST OF NC 226

SITE DESCRIPTION DUAL STRUCTURES ON -L- (STA. 252+73.29) OVER CSX RAILROAD

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4-5	PROFILES
6-9	CROSS SECTIONS
10-20	BORE LOGS
21	SOIL TEST RESULTS

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

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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 C. B. LITTLE

SUBMITTED BY C. B. LITTLE

DATE AUGUST 2011

NORTH CAROLINA LICENSED SEAL 1104 GEOLOGIST CLINTON B. LITTLE 8-12-11

DRAWN BY: C. E. BURRIS

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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: 34497.1.2

ID: R-2707B

PROJECT REFERENCE NO.	SHEET NO.
34497.1.2 (R-2707B)	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 POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

ABBREVIATIONS

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

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

EQUIPMENT USED ON SUBJECT PROJECT

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

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 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 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: -BY7 356-
STA. 17+11.74
N 578348.7630 E 1222909.1844 ELEVATION: 890.47 FT.

NOTES:

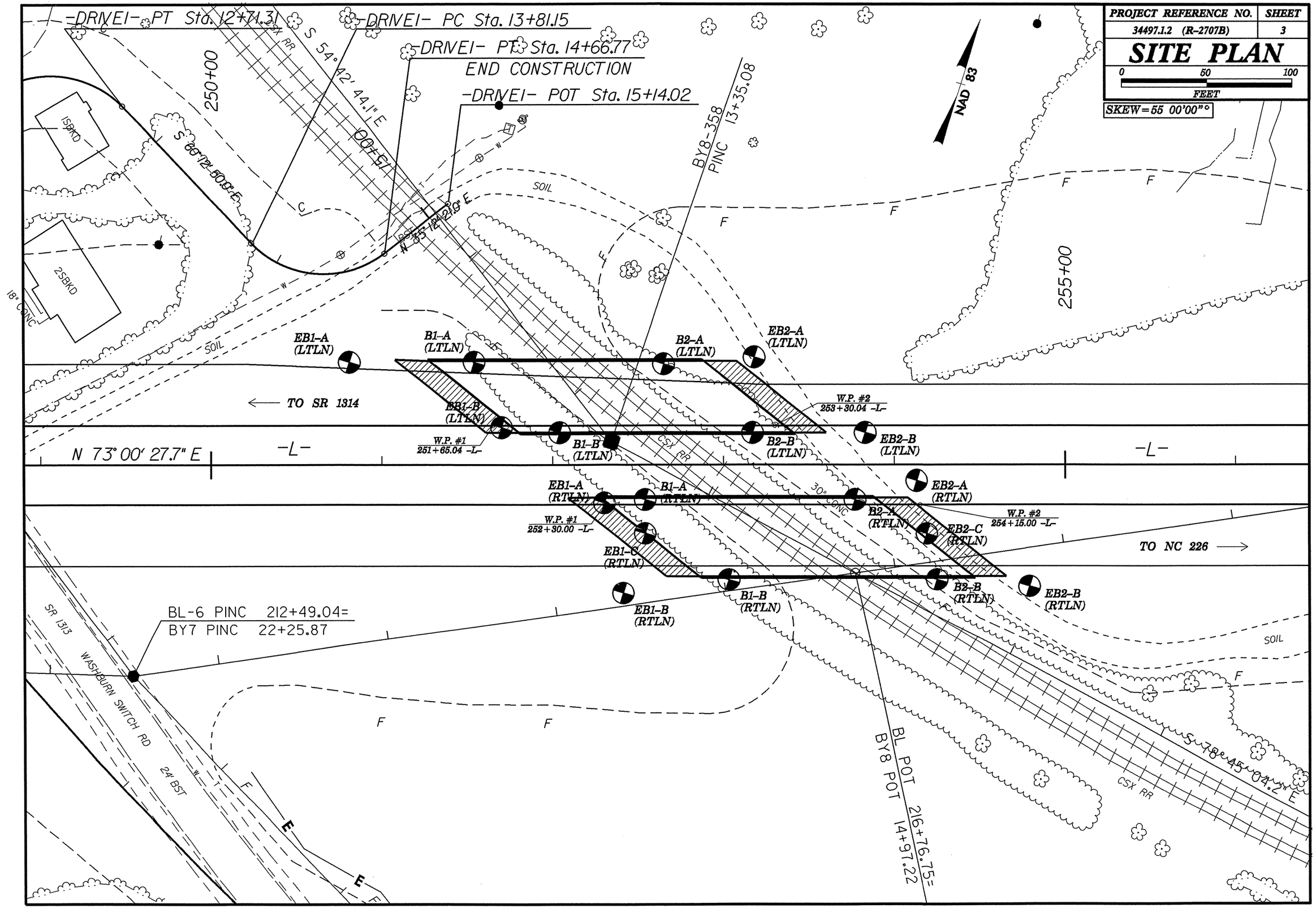
REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	3

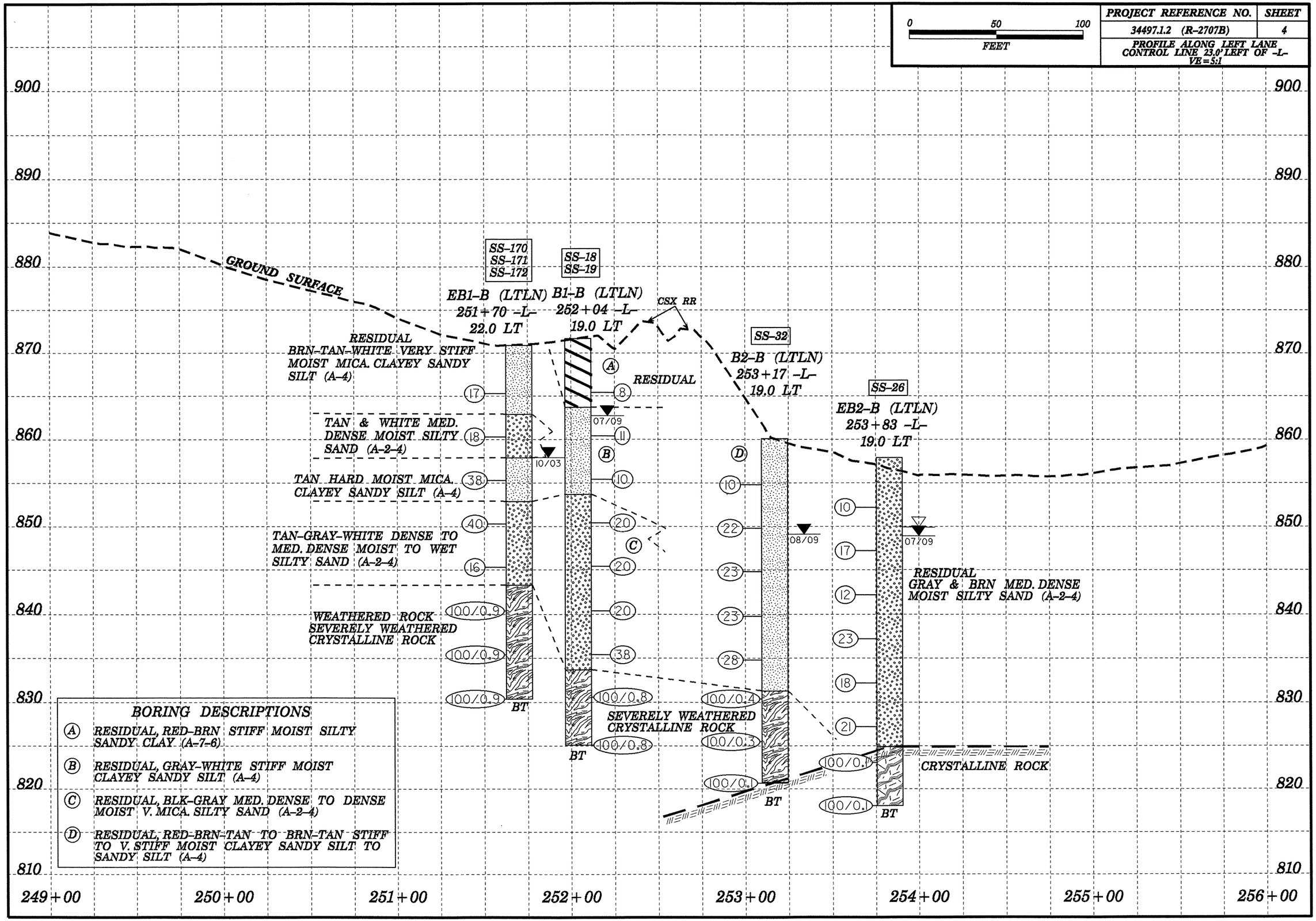
SITE PLAN

0 50 100
FEET

SKEW=55 00'00"°

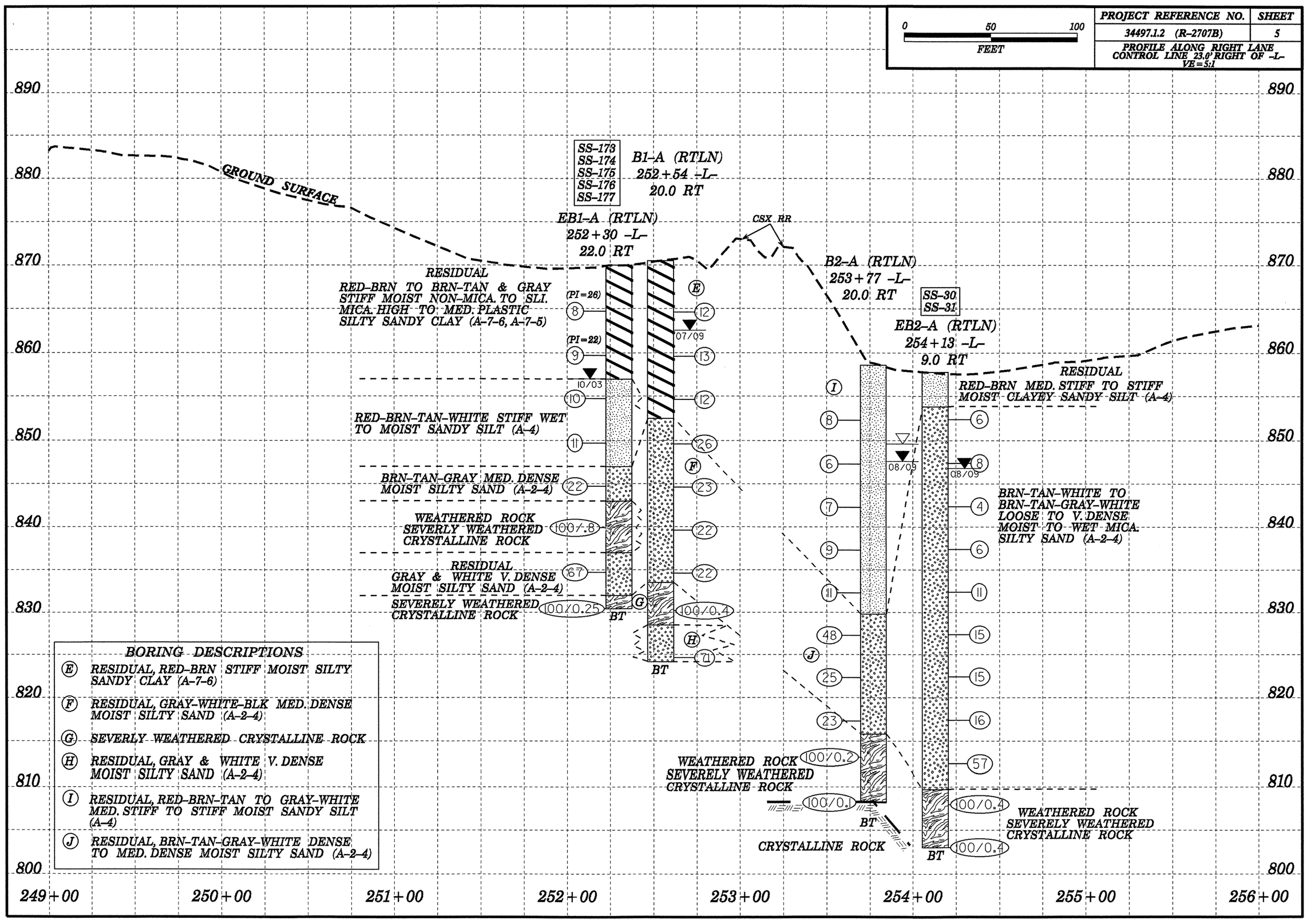


PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	4
PROFILE ALONG LEFT LANE CONTROL LINE 23.0' LEFT OF -L- VE=5:1	

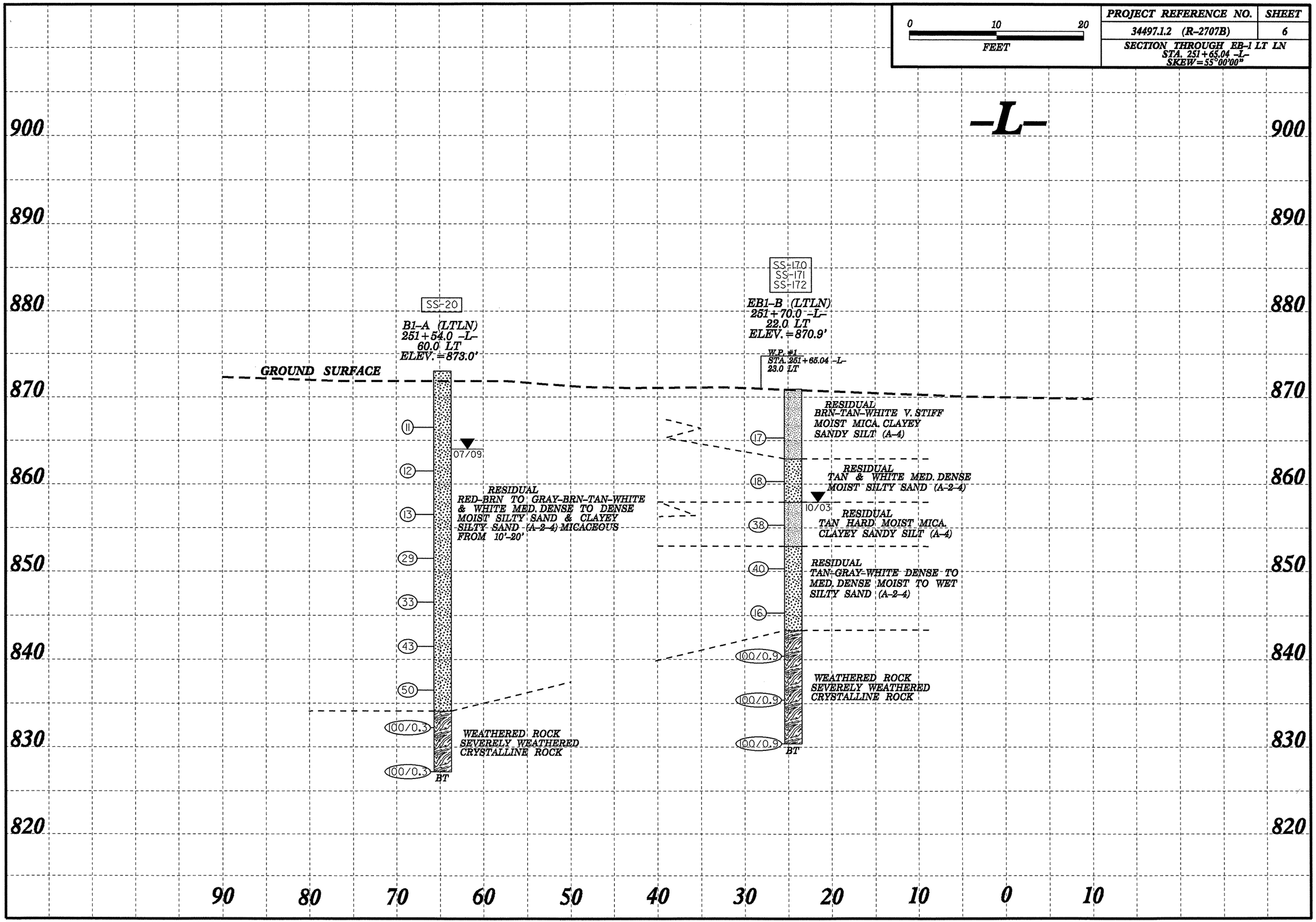


PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	5

PROFILE ALONG RIGHT LANE CONTROL LINE 23.0' RIGHT OF -L-
VE=5:1

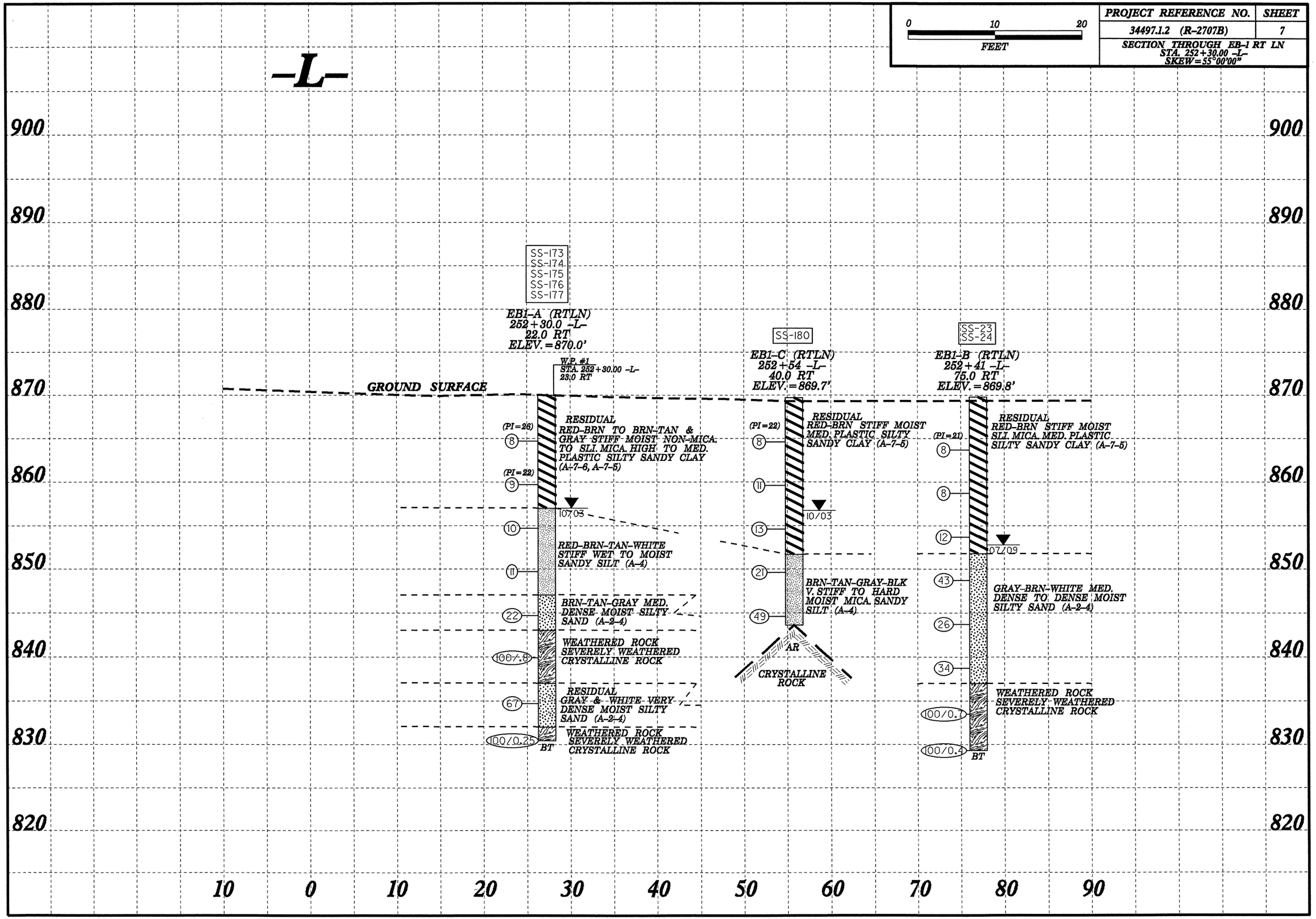


PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	6
SECTION THROUGH EB-1 LT LN STA. 251+65.04 -L- SKEW=55°00'00"	

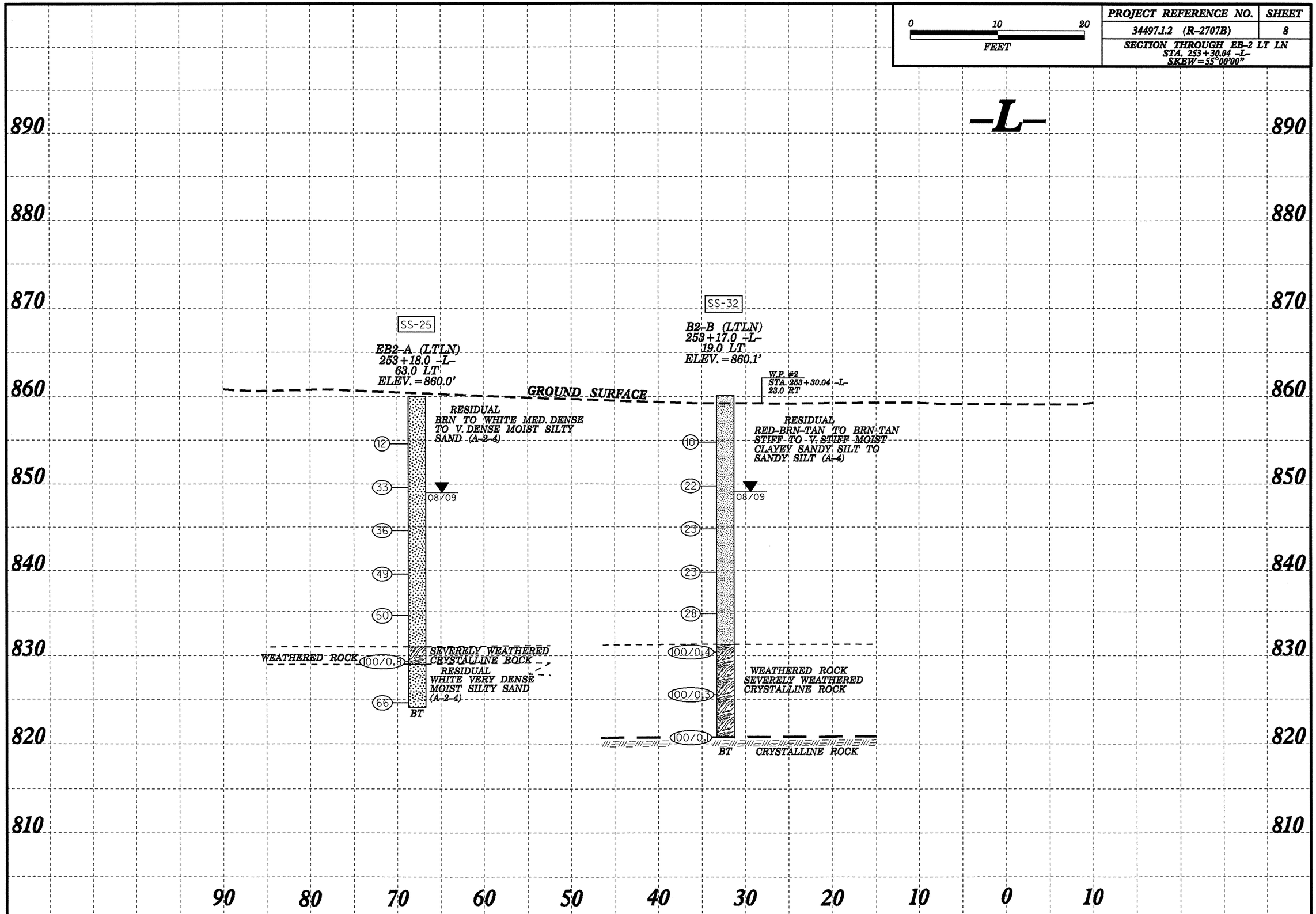


PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	7

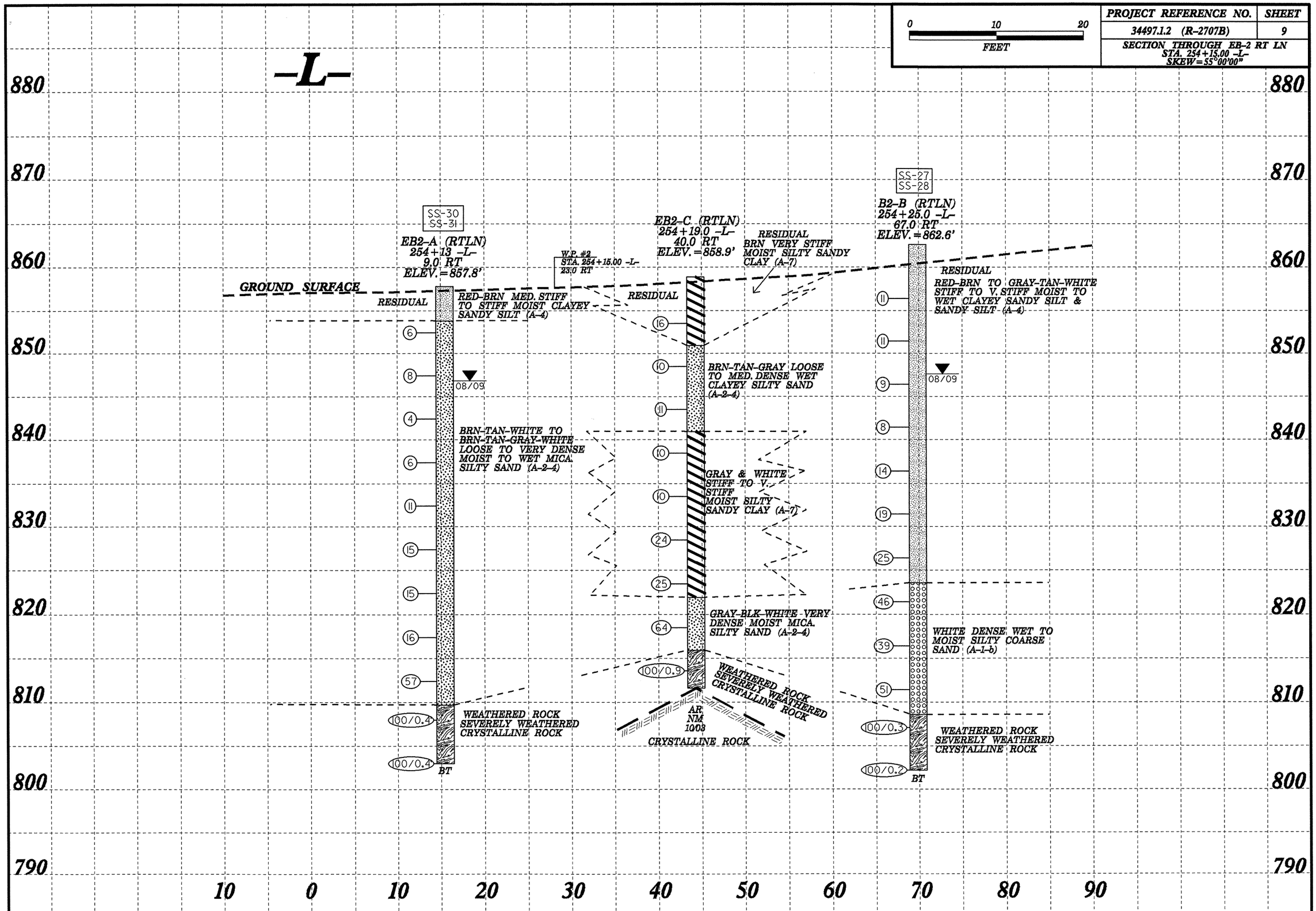
SECTION THROUGH EB-1 RT LN
STA. 252+30.00 -L-
SKEW=55°00'00"



PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	8
SECTION THROUGH EB-2 LT LN STA. 253+30.04 -L- SKEW=55°00'00"	



PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	9
SECTION THROUGH EB-2 RT LN STA. 254+15.00 -L- SKEW=55°00'00"	



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION LEFT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. EB1-B (LTLN)	**STATION** 251+70	**OFFSET** 22 ft LT	**ALIGNMENT** -L- / **0 HR.** NM
COLLAR ELEV. 870.9 ft	**TOTAL DEPTH** 40.5 ft	**NORTHING** 578,245	**EASTING** 1,223,485 / **24 HR.** 13.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 10/13/03	**COMP. DATE** 10/13/03	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
875											
870										870.9 GROUND SURFACE	0.0
										RESIDUAL BRN-TAN-WHITE V. STIFF MOIST MICA. CLAYEY SANDY SILT (A-4)	
865	866.3	4.6	4	8	9	17	SS-170	M		862.9	8.0
860	861.3	9.6	8	9	9	18	SS-171	M		**RESIDUAL** TAN & WHITE MED. DENSE MOIST SILTY SAND (A-2-4)	
										857.9	13.0
855	856.3	14.6	15	15	23	38	SS-172	M		**RESIDUAL** TAN HARD MOIST MICA. CLAYEY SANDY SILT (A-4)	
										852.9	18.0
850	851.3	19.6	15	16	24	40		M		**RESIDUAL** TAN-GRAY-WHITE DENSE TO MED. DENSE MOIST TO WET SILTY SAND (A-2-4)	
845	846.3	24.6	2	4	12	16		M		843.3	27.6
										WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK	
840	841.3	29.6	21	36	64/.4	100/0.9					
835	836.3	34.6	29	41	59/.4	100/0.9					
	831.3	39.6	31	69/.4		100/0.9				830.4	40.5
										Boring Terminated at Elevation 830.4 ft IN SEVERELY WEATHERED CRYSTALLINE ROCK	

NCDOT BORE SINGLE R2707B_GEO_BH_BRDG-L-CSX_CLEVELAND.GPJ NC_DOT.GDT 8/10/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 10

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION LEFT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. B1-A (LTLN)	**STATION** 251+54	**OFFSET** 60 ft LT	**ALIGNMENT** -L- / **0 HR.** NM
COLLAR ELEV. 873.0 ft	**TOTAL DEPTH** 45.8 ft	**NORTHING** 578,276	**EASTING** 1,223,459 / **24 HR.** 9.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 07/15/09	**COMP. DATE** 07/16/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
875											
										873.0 GROUND SURFACE	0.0
870										**RESIDUAL** RED-BRN TO GRAY-BRN-TAN-WHITE & WHITE MED. DENSE TO DENSE MOIST SILTY SAND & CLAYEY SILTY SAND (A-2-4) MICACEOUS FROM 10' - 20'	
865	867.5	5.5	2	5	6	11		M			
860	862.5	10.5	2	4	8	12		M			
855	857.5	15.5	4	5	8	13		M			
850	852.5	20.5	6	15	14	29	SS-20	M			
845	847.5	25.5	8	15	18	33		M			
840	842.5	30.5	7	13	30	43		M			
835	837.5	35.5	9	18	32	50		M			
										834.1	38.9
										WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK	
830	832.5	40.5	100/.3			100/0.3					
	827.5	45.5	100/.3			100/0.3				827.2	45.8
										Boring Terminated at Elevation 827.2 ft IN SEVERELY WEATHERED CRYSTALLINE ROCK	

NCDOT BORE SINGLE R2707B_GEO_BH_BRDG-L-CSX_CLEVELAND.GPJ NC_DOT.GDT 8/10/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION RIGHT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. EB1-B (RTLN)	**STATION** 252+41	**OFFSET** 75 ft RT	**ALIGNMENT** -L- — **0 HR.** NM
COLLAR ELEV. 869.8 ft	**TOTAL DEPTH** 40.5 ft	**NORTHING** 578,173	**EASTING** 1,223,582 — **24 HR.** 17.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 07/22/09	**COMP. DATE** 07/22/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
870										869.8 GROUND SURFACE	0.0
865	864.7	5.1	2	4	4	8	SS-23	M		**RESIDUAL** RED-BRN STIFF MOIST SLI. MICA. MED. (PI=21) PLASTIC SILTY SANDY CLAY (A-7-5)	
860	859.7	10.1	3	4	4	8		M			
855	854.7	15.1	5	5	7	12				851.8	18.0
850	849.7	20.1	8	20	23	43	SS-24	M		**RESIDUAL** GRAY-BRN-WHITE MED. DENSE TO DENSE MOIST SILTY SAND (A-2-4)	
845	844.7	25.1	9	12	14	26		M			
840	839.7	30.1	11	11	23	34		W		837.0	32.8
835	834.7	35.1	25	50	50/.2	100/0.7				**WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK	
830	829.7	40.1	100/.4			100/0.4				829.3	40.5
										Boring Terminated at Elevation 829.3 ft IN SEVERELY WEATHERED CRYSTALLINE ROCK	

NCDOT BORE SINGLE R2707B_GEO_BH_BRDG-L-CSX_CLEVELAND.GPJ NC_DOT.GDT 8/10/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 11

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION RIGHT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. EB1-A (RTLN)	**STATION** 252+30	**OFFSET** 22 ft RT	**ALIGNMENT** -L- — **0 HR.** 13.0
COLLAR ELEV. 870.0 ft	**TOTAL DEPTH** 39.6 ft	**NORTHING** 578,220	**EASTING** 1,223,556 — **24 HR.** 13.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 10/14/03	**COMP. DATE** 10/14/03	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
870										870.0 GROUND SURFACE	0.0
865	865.7	4.3	2	2	6	8	SS-173	M		**RESIDUAL** RED-BRN TO BRN-TAN & GRAY STIFF MOIST NON-MICA. TO SLI. MICA. HIGH (PI=26) TO MED. (PI=22) PLASTIC SILTY SANDY CLAY (A-7-6, A-7-5)	
860	860.7	9.3	2	4	5	9	SS-174	M		857.0	13.0
855	855.7	14.3	2	4	6	10	SS-175	W		**RESIDUAL** RED-BRN-TAN-WHITE STIFF WET TO MOIST SANDY SILT (A-4)	
850	850.7	19.3	2	5	6	11		M		847.0	23.0
845	845.7	24.3	7	7	15	22	SS-176	M		**RESIDUAL** BRN-TAN-GRAY MED. DENSE MOIST SILTY SAND (A-2-4)	
840	840.7	29.3	39	61/.3		100/.8				843.0	27.0
										WEATHERED ROCK SEVERLY WEATHERED CRYSTALLINE ROCK	
835	835.7	34.3	30	20	47	67	SS-177	M		837.0	33.0
										RESIDUAL GRAY & WHITE V. DENSE MOIST SILTY SAND (A-2-4)	
	830.7	39.3	100/.25			100/0.25				832.0	38.0
										830.5 **WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK	39.6
										Boring Terminated at Elevation 830.5 ft IN SEVERELY WEATHERED CRYSTALLINE ROCK	

NCDOT BORE SINGLE R2707B_GEO_BH_BRDG-L-CSX_CLEVELAND.GPJ NC_DOT.GDT 8/10/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION RIGHT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. EB1-C (RTLN)	**STATION** 252+54	**OFFSET** 40 ft RT	**ALIGNMENT** -L- — **0 HR.** NM
COLLAR ELEV. 869.7 ft	**TOTAL DEPTH** 26.1 ft	**NORTHING** 578,210	**EASTING** 1,223,584 — **24 HR.** 13.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 10/15/03	**COMP. DATE** 10/15/03	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
870										869.7 GROUND SURFACE	0.0
865	865.6	4.1	2	3	5	8	SS-180	M		**RESIDUAL** RED-BRN STIFF MOIST MED. (PI=22) PLASTIC SILTY SANDY CLAY (A-7-5)	
860	860.6	9.1	4	5	6	11		M			
855	855.6	14.1	4	5	8	13		M		851.7	18.0
850	850.6	19.1	4	5	16	21		M		**RESIDUAL** BRN-TAN-GRAY-BLK V. STIFF TO HARD MOIST MICA. SANDY SILT (A-4)	
845	845.6	24.1	10	18	31	49				843.6	26.1
										Boring Terminated BY AUGER REFUSAL at Elevation 843.6 ft ON CRYSTALLINE ROCK	

NCDOT GEOTECHNICAL ENGINEERING UNIT
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SHEET

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION LEFT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. B2-B (LTLN)	**STATION** 253+17	**OFFSET** 19 ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 860.1 ft	**TOTAL DEPTH** 39.4 ft	**NORTHING** 578,285	**EASTING** 1,223,627	**24 HR.** 11.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 08/10/09	**COMP. DATE** 08/10/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
865											
860										860.1 GROUND SURFACE	0.0
855	855.8	4.3	2	5	5	10		M		**RESIDUAL** RED-BRN-TAN TO BRN-TAN STIFF TO V. STIFF MOIST CLAYEY SANDY SILT TO SANDY SILT (A-4)	
850	850.8	9.3	3	10	12	22	SS-32				
845	845.8	14.3	4	9	14	23		M			
840	840.8	19.3	5	8	15	23		M			
835	835.8	24.3	5	9	19	28		M			
830	830.8	29.3	100/.4			100/0.4				831.3 **WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK	28.8
825	825.8	34.3	100/.3			100/0.3					
	820.8	39.3	100/.1			100/0.1				820.8 / 820.7 **CRYSTALLINE ROCK** Boring Terminated with Standard Penetration Test Refusal at Elevation 820.7 ft IN CRYSTALLINE ROCK	39.3 / 39.4

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SHEET 13

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION LEFT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. EB2-A (LTLN)	**STATION** 253+18	**OFFSET** 63 ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 860.0 ft	**TOTAL DEPTH** 35.9 ft	**NORTHING** 578,327	**EASTING** 1,223,615	**24 HR.** 11.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 07/31/09	**COMP. DATE** 07/31/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
860										860.0 GROUND SURFACE	0.0
855	855.6	4.4	4	5	7	12		M		**RESIDUAL** BRN TO WHITE MED. DENSE TO V. DENSE MOIST SILTY SAND (A-2-4)	
850	850.6	9.4	6	14	19	33	SS-25				
845	845.6	14.4	7	15	21	36		M			
840	840.6	19.4	9	17	32	49		M			
835	835.6	24.4	11	19	31	50		M			
830	830.6	29.4	23	53	47/.3	100/0.8		M		831.0 / 829.0 **WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK	29.0 / 31.0
825	825.6	34.4	25	23	43	66		M		824.1 **RESIDUAL** WHITE V. DENSE MOIST SILTY SAND (A-2-4) Boring Terminated at Elevation 824.1 ft IN WHITE V. DENSE MOIST SILTY SAND (A-2-4)	35.9

NCDOT BORE SINGLE R2707B_GEO_BH_BRDG-L-CSX_CLEVELAND.GPJ NC_DOT.GDT 8/10/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION RIGHT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. B2-B (RTLN)	**STATION** 254+25	**OFFSET** 67 ft RT	**ALIGNMENT** -L- — **0 HR.** NM
COLLAR ELEV. 862.6 ft	**TOTAL DEPTH** 60.4 ft	**NORTHING** 578,234	**EASTING** 1,223,755 — **24 HR.** 15.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 08/12/09	**COMP. DATE** 08/12/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
865										862.6 GROUND SURFACE 0.0
860										**RESIDUAL** RED-BRN TO GRAY-TAN-WHITE STIFF TO V. STIFF MOIST TO WET CLAYEY-SANDY SILT & SANDY SILT (A-4)
	857.4	5.2	4	5	6	11	SS-27	M		
855										
	852.4	10.2	2	4	7	11		M		
850										
	847.4	15.2	3	4	5	9		M		
845										
	842.4	20.2	2	3	5	8		W		
840										
	837.4	25.2	4	7	7	14		W		
835										
	832.4	30.2	4	7	12	19		W		
830										
	827.4	35.2	7	11	14	25		W		
825										
	822.4	40.2	18	28	18	46	SS-28	W		823.6 39.0
820										**RESIDUAL** WHITE DENSE WET TO MOIST SILTY COARSE SAND (A-1-b)
	817.4	45.2	15	20	19	39		M		
815										
	812.4	50.2	12	15	36	51		M		
810										808.6 54.0
	807.4	55.2	100/.3			100/0.3				**WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK
805										
	802.4	60.2	100/.2			100/0.2				802.2 60.4
										Boring Terminated at Elevation 802.2 ft IN SEVERELY WEATHERED CRYSTALLINE ROCK

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 14

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION RIGHT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. EB2-A (RTLN)	**STATION** 254+13	**OFFSET** 9 ft RT	**ALIGNMENT** -L- — **0 HR.** NM
COLLAR ELEV. 857.8 ft	**TOTAL DEPTH** 54.8 ft	**NORTHING** 578,286	**EASTING** 1,223,727 — **24 HR.** 11.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 08/11/09	**COMP. DATE** 08/11/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
860										857.8 GROUND SURFACE 0.0
855										**RESIDUAL** RED-BRN MED. STIFF TO STIFF MOIST CLAYEY SANDY SILT (A-4)
	853.4	4.4	2	2	4	6	SS-30	M		853.8 4.0
850										**RESIDUAL** BRN-TAN-WHITE TO BRN-TAN-GRAY-WHITE LOOSE TO V. DENSE MOIST TO WET MICA. SILTY SAND (A-2-4)
	848.4	9.4	2	4	4	8				
845										
	843.4	14.4	2	2	2	4		W		
840										
	838.4	19.4	2	2	4	6		W		
835										
	833.4	24.4	4	4	7	11		M		
830										
	828.4	29.4	3	5	10	15	SS-31	M		
825										
	823.4	34.4	4	5	10	15		M		
820										
	818.4	39.4	5	5	11	16		M		
815										
	813.4	44.4	11	17	40	57		M		809.7 48.1
810										**WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK
	808.4	49.4	100/.4			100/0.4				
805										
	803.4	54.4	100/.4			100/0.4				803.0 54.8
										Boring Terminated at Elevation 803.0 ft IN SEVERELY WEATHERED CRYSTALLINE ROCK

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION RIGHT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. EB2-C (RTLN)	**STATION** 254+19	**OFFSET** 40 ft RT	**ALIGNMENT** -L- / **0 HR.** NM
COLLAR ELEV. 858.9 ft	**TOTAL DEPTH** 47.3 ft	**NORTHING** 578,258	**EASTING** 1,223,742 / **24 HR.** NM
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 10/20/03	**COMP. DATE** 10/20/03	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. ft / DEPTH ft)
860										858.9 GROUND SURFACE 0.0
855	854.5	4.4	5	7	9	16		M		**RESIDUAL** BRN V. STIFF MOIST SILTY SANDY CLAY (A-7) — 850.9 8.0
850	849.5	9.4	2	3	7	10		W		**RESIDUAL** BRN-TAN-GRAY LOOSE TO MED. DENSE WET CLAYEY SILTY SAND (A-2-4) — 840.9 18.0
845	844.5	14.4	3	4	7	11		W		
840	839.5	19.4	3	4	6	10		W		**RESIDUAL** GRAY & WHITE STIFF TO V. STIFF MOISTSILTY SANDY CLAY (A-7)
835	834.5	24.4	2	4	6	10		M		
830	829.5	29.4	8	11	13	24		M		
825	824.5	34.4	11	12	13	25		M		821.9 37.0
820	819.5	39.4	15	24	40	64				**RESIDUAL** GRAY-BLK-WHITE V. DENSE MOIST MICA. SILTY SAND (A-2-4) — 815.9 43.0
815	814.5	44.4	27	73/.4		100/0.9				**WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK — 811.6 47.3

Boring Terminated BY AUGER REFUSAL at Elevation 811.6 ft ON CRYSTALLINE ROCK

NCDOT BORE SINGLE R2707B_GEO_BH_BRDG-L-CSX_CLEVELAND.GPJ NC_DOT.GDT 8/10/11

THE FOLLOWING BORINGS ARE FROM A PREVIOUS DESIGN AND ARE NOT SHOWN ON THE ATTACHED PROFILES AND CROSS-SECTIONS

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION LEFT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. B1-B (LTLN)	**STATION** 252+04	**OFFSET** 19 ft LT	**ALIGNMENT** -L- — **0 HR.** NM
COLLAR ELEV. 871.7 ft	**TOTAL DEPTH** 46.6 ft	**NORTHING** 578,252	**EASTING** 1,223,519 — **24 HR.** 9.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 07/15/09	**COMP. DATE** 07/15/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
875										871.7 GROUND SURFACE	0.0
870										**RESIDUAL** RED-BRN STIFF MOIST SILTY SANDY CLAY (A-7-6)	
	866.4	5.3	2	4	4	8		M		863.7	8.0
865										**RESIDUAL** GRAY-WHITE MED. DENSE MOIST CLAYEY SANDY SILT (A-4)	
	861.4	10.3	4	5	6	11	SS-18	M			
860											
	856.4	15.3	5	5	5	10		M		853.7	18.0
855										**RESIDUAL** BLK-GRAY MED. DENSE TO DENSE MOIST V. MICA. SILTY SAND (A-2-4)	
	851.4	20.3	5	8	12	20	SS-19	M			
850											
	846.4	25.3	6	9	11	20		M			
845											
	841.4	30.3	9	7	13	20		M			
840											
	836.4	35.3	11	17	21	38		M		833.7	38.0
835										**WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK	
	831.4	40.3	34	66/.3		100/0.8					
830											
	826.4	45.3	19	25	75/.3	100/0.8				825.1	46.6
										Boring Terminated at Elevation 825.1 ft IN SEVERELY WEATHERED CRYSTALLINE ROCK	

NCDOT BORE SINGLE R2707B_GEO_BH_BRDG-L-CSX_CLEVELAND.GPJ NC_DOT.GDT 8/10/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 17

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION LEFT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. EB1-A (LTLN)	**STATION** 250+81	**OFFSET** 60 ft LT	**ALIGNMENT** -L- — **0 HR.** NM
COLLAR ELEV. 875.4 ft	**TOTAL DEPTH** 45.2 ft	**NORTHING** 578,255	**EASTING** 1,223,389 — **24 HR.** 17.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 07/22/09	**COMP. DATE** 07/22/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
880											
875										875.4 GROUND SURFACE	0.0
										RESIDUAL RED-BRN STIFF MOIST MED. (PI=21) PLASTIC SILTY SANDY CLAY (A-7-5)	
870	870.9	4.5	3	4	6	10		M			
										867.4	8.0
865										**RESIDUAL** BRN-TAN-BLK MED. DENSE TO V. DENSE MOIST SILTY SAND (A-2-4)	
	865.9	9.5	8	10	15	25		M			
860	860.9	14.5	7	10	13	23		M			
855	855.9	19.5	6	11	12	23		M			
850	850.9	24.5	8	12	16	28		M			
845	845.9	29.5	12	15	17	32		M			
840	840.9	34.5	15	20	23	43		M			
835	835.9	39.5	17	20	35	55		M		831.9	43.5
	830.9	44.5	49	51/.2		100/0.7				**WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK	
										830.2	45.2
										Boring Terminated at Elevation 830.2 ft IN SEVERELY WEATHERED CRYSTALLINE ROCK	

NCDOT BORE SINGLE R2707B_GEO_BH_BRDG-L-CSX_CLEVELAND.GPJ NC_DOT.GDT 8/10/11

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BORELOG REPORT

SHEET

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION RIGHT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. B1-B (RTLN)	**STATION** 253+03	**OFFSET** 67 ft RT	**ALIGNMENT** -L- — **0 HR.** 17.0
COLLAR ELEV. 869.8 ft	**TOTAL DEPTH** 50.3 ft	**NORTHING** 578,198	**EASTING** 1,223,639 — **24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 07/13/09	**COMP. DATE** 07/14/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
870										869.8 GROUND SURFACE	0.0
										RESIDUAL RED-BRN STIFF MOIST MED. (PI=17) PLASTIC SILTY SANDY CLAY (A-7-6)	
865	864.8	5.0	3	5	6	11	SS-15	M			
860	859.8	10.0	3	5	6	11		M			
855	854.8	15.0	2	5	6	11				851.8	18.0
										RESIDUAL BRN-TAN-BLK TO GRAY-BLK-WHITE MED. DENSE TO V. DENSE MOIST TO SAT. SLI. MICA. TO NON-MICA. SILTY SAND (A-2-4)	
850	849.8	20.0	2	5	17	22	SS-16	M			
845	844.8	25.0	15	12	14	26		M			
840	839.8	30.0	19	16	31	47		M			
835	834.8	35.0	21	22	33	55	SS-17	33% Sat.			
830	829.8	40.0	30	18	37	55		W			
825	824.8	45.0	27	27	28	55		W			
										821.5	48.3
										WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK	
820	819.8	50.0	100/.3			100/0.3				819.5	50.3

Boring Terminated at Elevation 819.5 ft IN SEVERELY WEATHERED CRYSTALLINE ROCK

Other Samples:
M-17 (35.0 - 36.5)

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SHEET 18

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION RIGHT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. B1-A (RTLN)	**STATION** 252+54	**OFFSET** 20 ft RT	**ALIGNMENT** -L- — **0 HR.** NM
COLLAR ELEV. 870.5 ft	**TOTAL DEPTH** 46.4 ft	**NORTHING** 578,229	**EASTING** 1,223,578 — **24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 07/14/09	**COMP. DATE** 07/14/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
875											
870										870.5 GROUND SURFACE	0.0
										RESIDUAL RED-BRN STIFF MOIST SILTY SANDY CLAY (A-7-6)	
865	865.6	4.9	2	5	7	12		M			
860	860.6	9.9	2	5	8	13		M			
855	855.6	14.9	3	5	7	12		M		852.5	18.0
										RESIDUAL GRAY-WHITE-BLK MED. DENSE MOIST SILTY SAND (A-2-4)	
850	850.6	19.9	4	15	11	26		M			
845	845.6	24.9	4	11	12	23		M			
840	840.6	29.9	4	9	13	22		M			
835	835.6	34.9	4	9	13	22		M		833.5	37.0
										WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK	
830	830.6	39.9	100/.4			100/0.4				828.5	42.0
										RESIDUAL GRAY & WHITE V. DENSE MOIST SILTY SAND (A-2-4)	
825	825.6	44.9	25	25	46	71		M		824.1	46.4

Boring Terminated at Elevation 824.1 ft IN V. DENSE MOIST SILTY SAND (A-2-4)

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BORELOG REPORT

SHEET

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION LEFT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. EB2-B (LTLN)	**STATION** 253+83	**OFFSET** 19 ft LT	**ALIGNMENT** -L-	**0 HR.** 8.0
COLLAR ELEV. 857.9 ft	**TOTAL DEPTH** 39.8 ft	**NORTHING** 578,304	**EASTING** 1,223,690	**24 HR.** 9.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 07/30/09	**COMP. DATE** 07/30/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
860											
										857.9 GROUND SURFACE	0.0
855										**RESIDUAL** GRAY & BRN MED. DENSE MOIST SILTY SAND (A-2-4)	
	853.2	4.7	2	4	6	10	SS-26	M			
850	848.2	9.7	3	6	11	17		M			
845	843.2	14.7	6	4	8	12		M			
840	838.2	19.7	9	15	8	23		M			
835	833.2	24.7	8	8	10	18		M			
830	828.2	29.7	7	9	12	21		M			
825	823.2	34.7	100/.1			100/0.1				824.9	33.0
										CRYSTALLINE ROCK	
820	818.2	39.7	100/.1			100/0.1				818.1	39.8
										Boring Terminated with Standard Penetration Test Refusal at Elevation 818.1 ft IN CRYSTALLINE ROCK	

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SHEET 19

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION LEFT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. B2-A (LTLN)	**STATION** 252+65	**OFFSET** 59 ft LT	**ALIGNMENT** -L-	**0 HR.** 12.0
COLLAR ELEV. 862.6 ft	**TOTAL DEPTH** 30.5 ft	**NORTHING** 578,308	**EASTING** 1,223,565	**24 HR.** 15.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 08/11/09	**COMP. DATE** 08/11/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
865											
										862.6 GROUND SURFACE	0.0
860										**RESIDUAL** RED-BRN MED. STIFF TO STIFF MOIST CLAYEY SANDY SILT (A-4)	
	857.9	4.7	4	5	9	14		M		858.6	4.0
855	852.9	9.7	12	13	16	29		D		**RESIDUAL** BRN-TAN-GRAY-WHITE MED. DENSE TO V. DENSE MOIST SILTY SAND (A-2-4)	
850	847.9	14.7	14	17	21	38		D			
845	842.9	19.7	16	28	44	72		D			
840	837.9	24.7	16	28	34	62		D			
835	832.9	29.7	25	75/.3		100/0.8				834.6	28.0
										832.1	30.5
										WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK	
										Boring Terminated at Elevation 832.1 ft IN SEVERELY WEATHERED CRYSTALLINE ROCK	

NCDOT BORE SINGLE R2707B_GEO_BH_BRDG-L-CSX_CLEVELAND.GPJ NC_DOT.GDT 8/10/11

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SHEET

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION RIGHT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. EB2-B (RTLN)	**STATION** 254+79	**OFFSET** 71 ft RT	**ALIGNMENT** -L- — **0 HR.** 15.5
COLLAR ELEV. 863.6 ft	**TOTAL DEPTH** 36.2 ft	**NORTHING** 578,246	**EASTING** 1,223,808 — **24 HR.** 15.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 08/13/09	**COMP. DATE** 08/13/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
865										863.6 GROUND SURFACE	0.0
860	858.9	4.7	4	5	8	13	SS-29	M		**RESIDUAL** GRAY-WHITE STIFF TO V. STIFF MOIST SANDY SILT (A-4)	
855	853.9	9.7	4	8	12	20		M			
850	848.9	14.7	5	7	18	25		M			
845	843.9	19.7	20	57	43	100		M		844.1 **WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK	19.5
840	838.9	24.7	4	4	9	13		Sat.		842.1 **RESIDUAL** GRAY-WHITE STIFF TO HARD MOIST SANDY SILT (A-4)	21.5
835	833.9	29.7	6	5	12	17		W			
830	828.9	34.7	4	40	26	66		M		827.4 Boring Terminated at Elevation 827.4 ft IN GRAY-WHITE HARD MOIST SANDY SILT (A-4)	36.2

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SHEET 20

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Todd, R. W.
SITE DESCRIPTION RIGHT LANE BRIDGE ON US 74 (SHELBY BYPASS) OVER CSX RAILROAD			**GROUND WTR (ft)**
BORING NO. B2-A (RTLN)	**STATION** 253+77	**OFFSET** 20 ft RT	**ALIGNMENT** -L- — **0 HR.** 9.0
COLLAR ELEV. 858.6 ft	**TOTAL DEPTH** 50.4 ft	**NORTHING** 578,265	**EASTING** 1,223,696 — **24 HR.** 11.0
DRILL RIG/HAMMER EFF./DATE CME-550X		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER Smith, M. L.	**START DATE** 08/14/09	**COMP. DATE** 08/14/09	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
860										858.6 GROUND SURFACE	0.0
855	853.3	5.3	2	3	5	8		M		**RESIDUAL** RED-BRN-TAN TO GRAY-WHITE MED. STIFF TO STIFF MOIST SANDY SILT (A-4)	
850	848.3	10.3	3	3	3	6					
845	843.3	15.3	3	3	4	7		M			
840	838.3	20.3	3	5	4	9		M			
835	833.3	25.3	4	5	6	11		M			
830	828.3	30.3	9	24	24	48		M		829.8 **RESIDUAL** BRN-TAN-GRAY-WHITE DENSE TO MED. DENSE MOIST SILTY SAND (A-2-4)	28.8
825	823.3	35.3	7	8	17	25		M			
820	818.3	40.3	7	8	15	23		M		815.8 **WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK	42.8
815	813.3	45.3	100/.2			100/0.2					
810	808.3	50.3	100/.1			100/0.1				808.3 808.2 **CRYSTALLINE ROCK** Boring Terminated with Standard Penetration Test Refusal at Elevation 808.2 ft IN CRYSTALLINE ROCK	50.3 50.4

NCDOT BORE SINGLE R2707B_GEO_BH_BRDG-L-CSX_CLEVELAND.GPJ NC_DOT.GDT 8/10/11

TEST RESULTS

PROJECT: 34497.1.2 (R-2707B)
COUNTY: CLEVELAND
SITE DESCRIPTION: RIGHT AND LEFT BRIDGES ON -L-US 74 (SHELBY BYPASS) OVER CSX RAILROAD

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	ALIGNMENT
		LEFT LANE BRIDGE																	
		EB1-B (LTLN)																	
SS-170	22.00 LT	251+70	4.6-6.1	A-4(0)	17	37	NP	28.6	37.9	21.4	12.1	100	83	41	-	-			L
SS-171	22.00 LT	251+70	9.6-11.1	A-2-4(0)	18	30	NP	47.4	26.3	17.2	9.1	94	62	30	-	-			L
SS-172	22.00 LT	251+70	14.6-16.1	A-4(0)	38	34	NP	25.2	39.1	25.6	10.1	95	79	42	-	-			L
		B1-A (LTLN)																	
SS-20	60.00 LT	251+54	20.5-22.0	A-2-4(0)	29	32	NP	54.5	28.6	10.8	6.1	93	58	20	-	-			L
		B1-B (LTLN)																	
SS-18	19.00 LT	252+04	10.3-11.8	A-4(0)	11	32	4	31.6	34.7	23.6	10.1	98	80	40	-	-			L
SS-19	19.00 LT	252+04	20.3-21.8	A-2-4(0)	20	35	2	29.2	48.0	18.7	4.1	93	79	28	-	-			L
		B2-B (LTLN)																	
SS-32	19.00 LT	253+17	9.3-10.8	A-4(0)	22	29	2	27.4	37.5	26.9	8.1	90	74	39	-	-			L
		EB2-A (LTLN)																	
SS-25	63.00 LT	253+18	9.4-10.9	A-2-4(0)	33	32	NP	52.1	27.2	12.6	8.1	98	62	25	-	-			L
		EB2-B (LTLN)																	
SS-26	19.00 LT	253+83	4.7-6.2	A-2-4(0)	10	35	NP	43.1	32.0	16.8	8.1	94	67	29	-	-			L
		RIGHT LANE BRIDGE																	
		EB1-A (RTLN)																	
SS-173	22.00 RT	252+30	4.3-5.8	A-7-6(13)	8	51	26	24.8	19.4	13.5	42.3	100	89	59	-	-			L
SS-174	22.00 RT	252+30	9.3-10.8	A-7-5(13)	9	56	22	15.7	29.6	24.4	30.2	100	88	61	-	-			L
SS-175	22.00 RT	252+30	14.3-15.8	A-4(0)	10	38	NP	28.2	37.5	26.2	8.1	100	82	43	-	-			L
SS-176	22.00 RT	252+30	24.3-25.8	A-2-4(0)	22	32	NP	42.3	30.4	19.2	8.1	96	67	32	-	-			L
SS-177	22.00 RT	252+30	34.3-35.8	A-2-4(0)	67	22	NP	43.9	36.4	14.7	5.0	95	70	25	-	-			L
		EB1-C (RTLN)																	
SS-180	40.00 RT	252+54	4.1-5.6	A-7-5(12)	8	52	22	22.6	20.6	12.5	44.4	99	85	59	-	-			L
		EB1-B (RTLN)																	
SS-23	75.00 RT	252+41	5.1-6.6	A-7-5(11)	8	52	21	26.5	19.0	14.0	40.5	100	82	58	-	-			L
SS-24	75.00 RT	252+41	20.1-21.6	A-2-4(0)	43	28	2	35.6	35.4	20.9	8.1	92	71	33	-	-			L
		B1-B (RTLN)																	
SS-15	67.00 RT	253+03	5.0-6.5	A-7-6(8)	11	44	17	25.1	20.7	13.7	40.5	100	85	57	-	-			L
SS-16	67.00 RT	253+03	20.0-21.5	A-2-4(0)	22	31	NP	37.5	38.9	17.5	6.1	92	71	29	-	-			L
SS-17	67.00 RT	253+03	35.0-36.5	A-2-4(0)	55	33	NP	29.0	48.4	16.5	6.1	86	73	26	33.1	-			L
		B2-B (RTLN)																	
SS-27	67.00 RT	254+25	5.2-6.7	A-4(1)	11	40	4	21.8	35.5	32.6	10.1	98	85	51	-	-			L
SS-28	67.00 RT	254+25	40.2-41.7	A-1-b(0)	46	23	NP	66.8	17.8	9.4	6.1	83	37	15	-	-			L
		EB2-A (RTLN)																	
SS-30	9.0 RT	254+13	4.4-5.9	A-2-4(0)	6	35	4	46.0	27.4	18.5	8.1	99	68	31	-	-			L
SS-31	9.0 RT	254+13	29.4-30.9	A-2-4(0)	15	35	3	43.2	36.9	15.8	4.0	84	60	23	-	-			L
		EB2-B (RTLN)																	
SS-29	71.0 RT	254+79	4.7-6.2	A-4(0)	13	33	3	28.9	34.5	28.6	8.1	96	80	42	-	-			L

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34497.1.2 (R-2707B)	1	17

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34497.1.2 (R-2707B) F.A. PROJ. _____

COUNTY CLEVELAND

PROJECT DESCRIPTION US 74 (SHELBY BYPASS) FROM WEST SR 1314 (HOYLE ROAD) TO EAST OF NC 226

SITE DESCRIPTION BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-) (STA. 354+83.22 -L- /28+24.93 -Y1-)

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PERSONNEL
C.C. MURRAY
J.E. ESTEP
M.R. MOORE

INVESTIGATED BY J.P. ROGERS
CHECKED BY C.B. LITTLE
SUBMITTED BY C.B. LITTLE
DATE OCTOBER 2012

NORTH CAROLINA LICENSED SEAL 1104 GEOLOGIST CLINTON B. LITTLE 10-22-12

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: 34497.1.2 ID: R-2707B

PROJECT REFERENCE NO.	SHEET NO.
34497.1.2 (R-2707B)	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 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
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

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

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] 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 0/NQ
- [ ] -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.

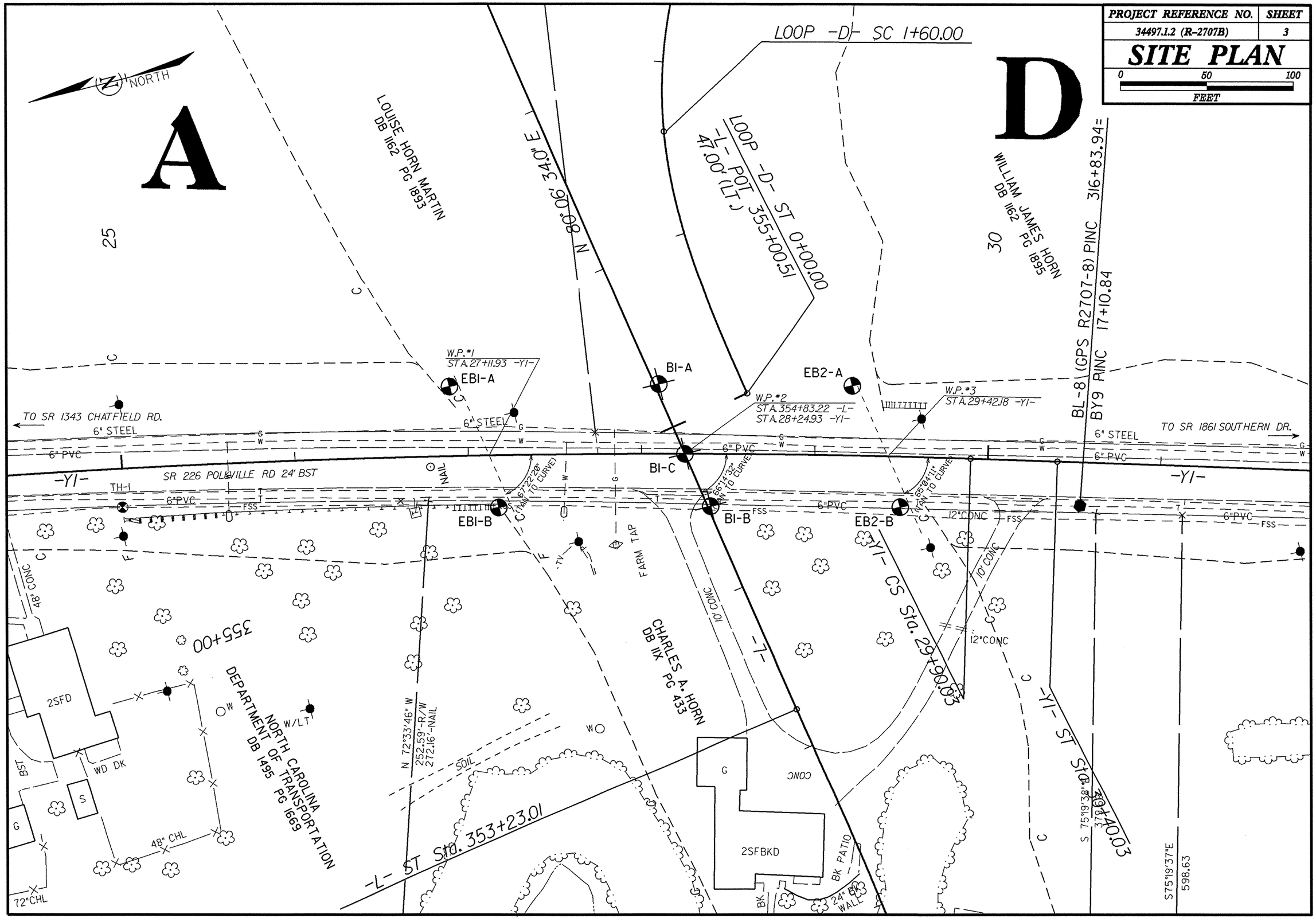
BENCH MARK: BL-8 (GPS R2707-8)
STA. 316+83.94
N 580239.3390 E 1233459.6170 ELEVATION: 811.53 FT.

NOTES:
SOIL STRATIGRAPHY IS THROUGH THE BORINGS FOR PROFILES AND CROSS-SECTIONS.

PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	3

SITE PLAN

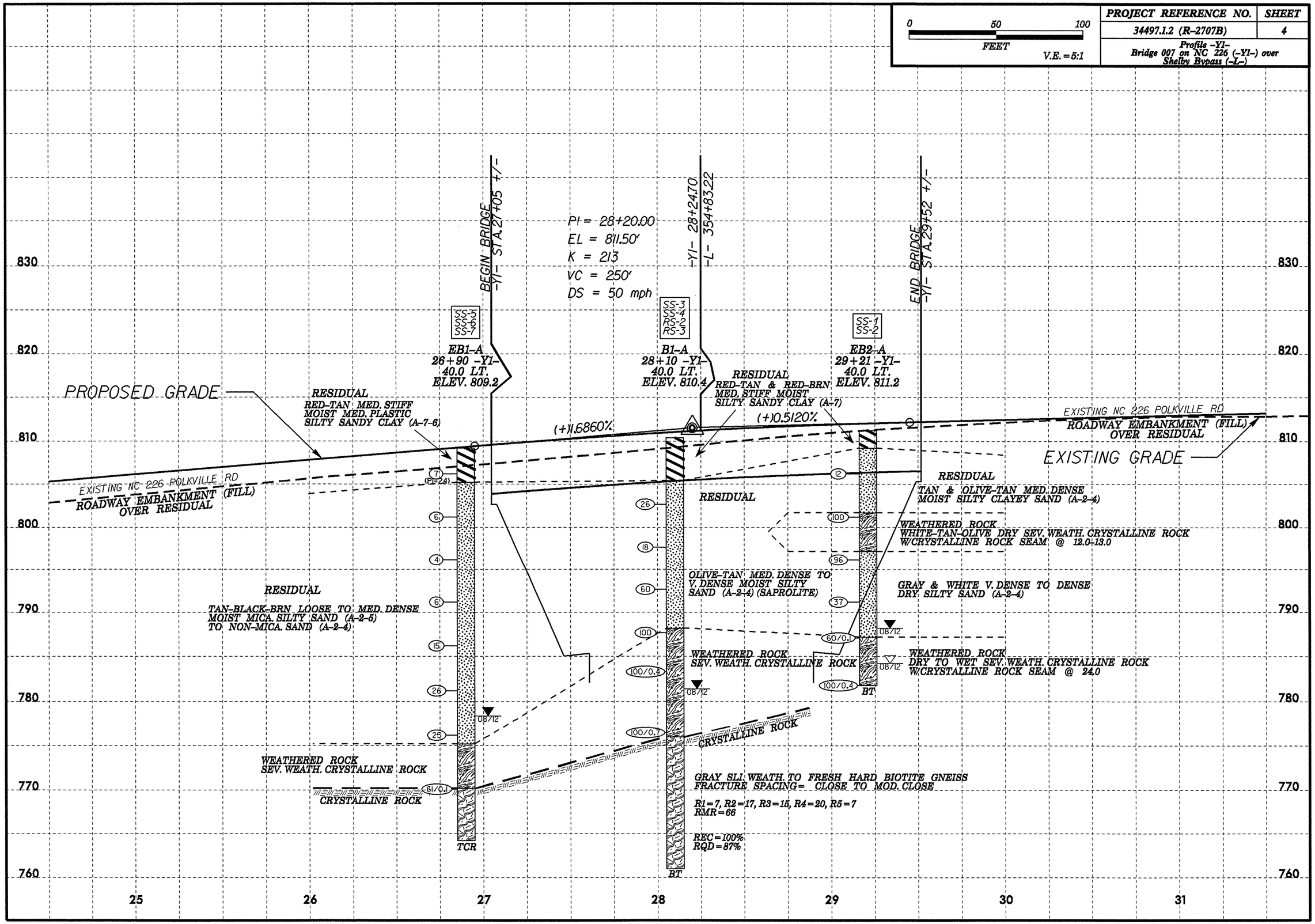
0 50 100
FEET



PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	4

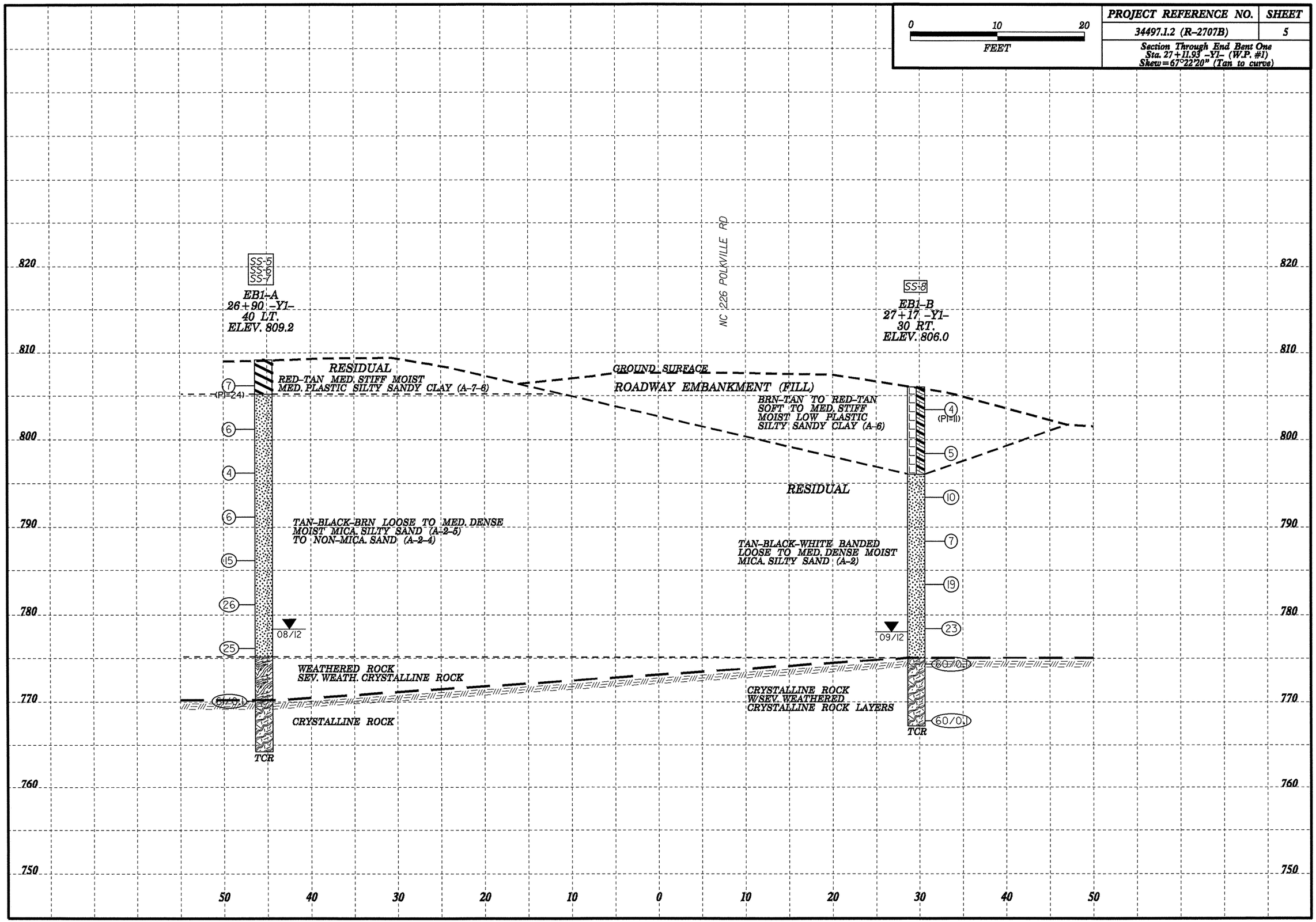
Profile -Y1-
Bridge 007 on NC 226 (-Y1-) over
Shelby Bypass (-L-)

0 50 100
FEET
V.E. = 5:1



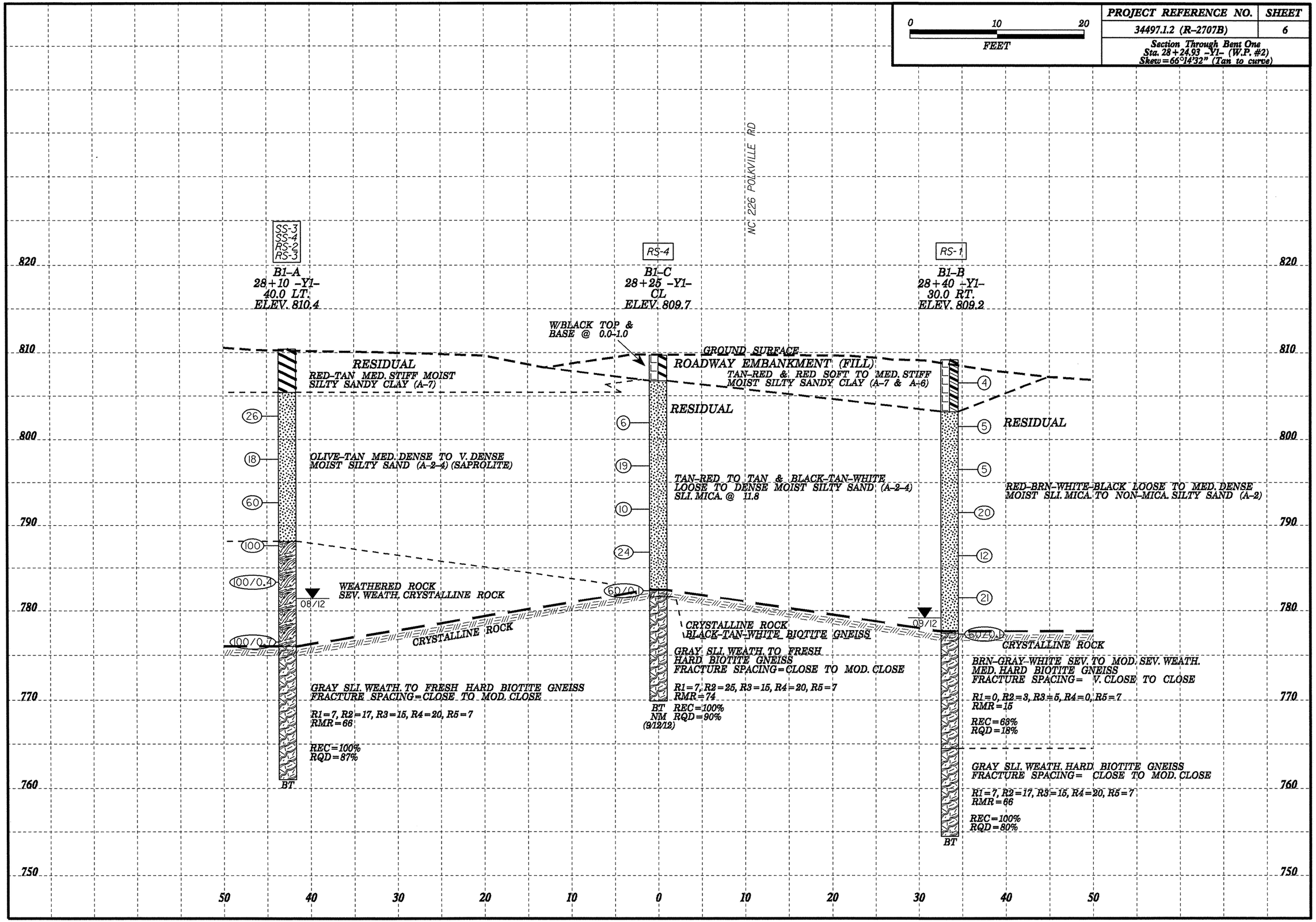
PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	5

Section Through End Bent One
Sta. 27+11.93 -Y1- (W.P. #1)
Skew=67°22'20" (Tan to curve)



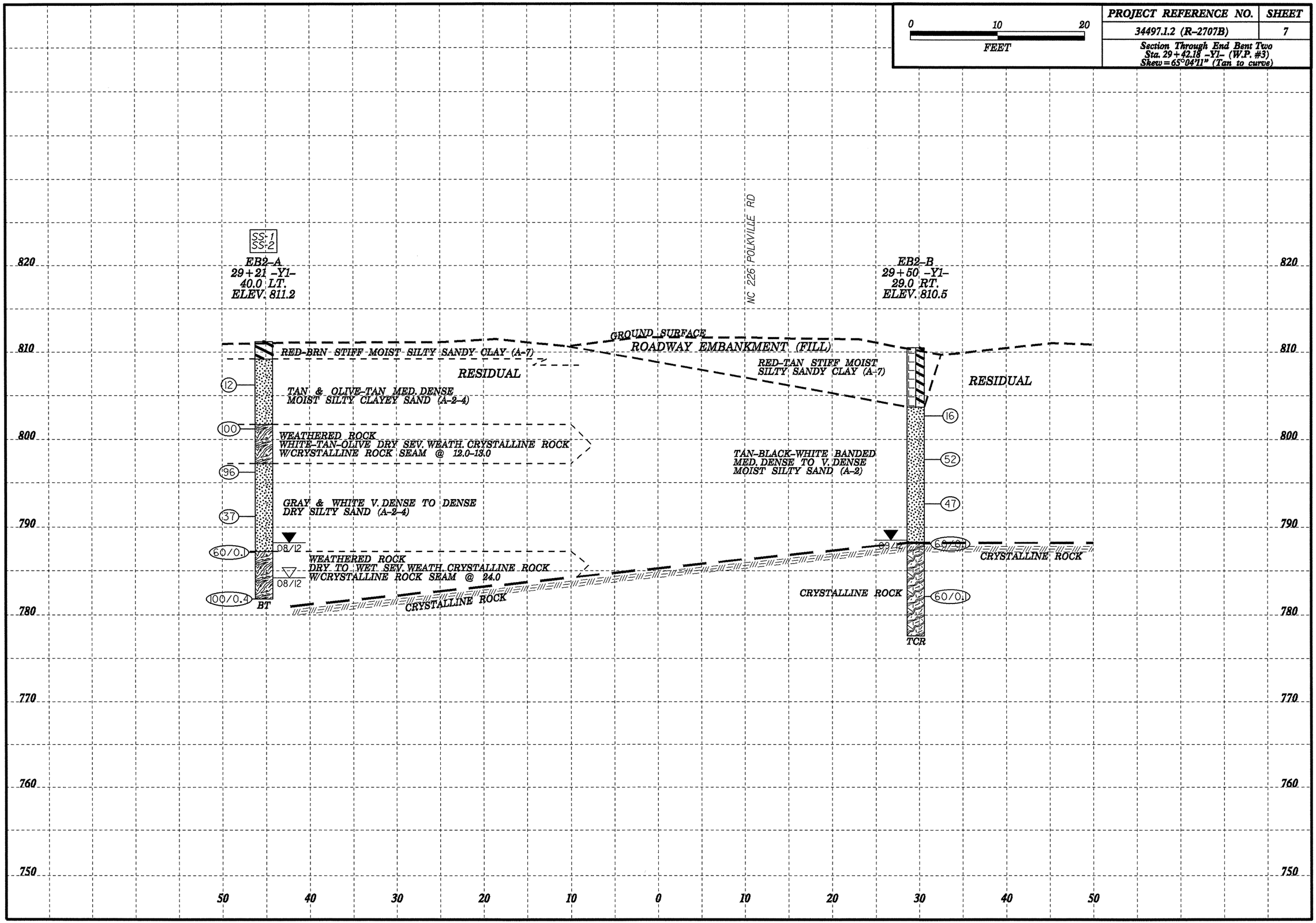
PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	6

Section Through Bent One
Sta. 28+24.93 -Y1- (W.P. #2)
Skew=66°14'32" (Tan to curve)



PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	7

Section Through End Bent Two
Sta. 29+42.18 -Y1- (W.P. #3)
Skew=65°04'11" (Tan to curve)



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Murray, C. C.
SITE DESCRIPTION BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-) (STA. 354+83.22 -L- / 28+24.93 -Y1-)			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 26+90	**OFFSET** 40 ft LT	**ALIGNMENT** -Y1- / **0 HR.** NM
COLLAR ELEV. 809.2 ft	**TOTAL DEPTH** 45.0 ft	**NORTHING** 580,577	**EASTING** 1,233,612 / **24 HR.** 30.8
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009		**DRILL METHOD** NW Casing w/ Advancer & Tri-cone	**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 08/30/12	**COMP. DATE** 08/30/12	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
810										809.2 GROUND SURFACE 0.0
	807.2	2.0	3	4	3	7	SS-5	M		**RESIDUAL** RED-TAN MED. STIFF MOIST MED. (PI=24) PLASTIC SILTY SANDY CLAY (A-7-6) 805.2 4.0
805										
	802.2	7.0	2	3	3	6	SS-6	M		**RESIDUAL** TAN-BLACK-BRN LOOSE TO MED. DENSE MOIST MICA. SILTY SAND (A-2-5) TO NON-MICA. SAND (A-2-4)
800										
	797.2	12.0	2	2	2	4		M		
795										
	792.2	17.0	3	3	3	6		M		
790										
	787.2	22.0	9	8	7	15	SS-7	M		
785										
	782.2	27.0	5	7	19	26		M		
780										
	777.2	32.0	15	11	14	25		M		775.2 34.0 **WEATHERED ROCK** SEV. WEATH. CRYSTALLINE ROCK
775										
770	770.7	38.5	61	61/0.1		61/0.1				770.2 39.0 **CRYSTALLINE ROCK**
765										764.2 45.0 Boring Terminated BY TRI-CONE REFUSAL at Elevation 764.2 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Murray, C. C.
SITE DESCRIPTION BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-) (STA. 354+83.22 -L- / 28+24.93 -Y1-)			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 27+17	**OFFSET** 30 ft RT	**ALIGNMENT** -Y1- / **0 HR.** NM
COLLAR ELEV. 806.0 ft	**TOTAL DEPTH** 38.8 ft	**NORTHING** 580,566	**EASTING** 1,233,538 / **24 HR.** 28.0
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009		**DRILL METHOD** NW Casing w/ Advancer & Tri-cone	**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 09/06/12	**COMP. DATE** 09/06/12	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
810										806.0 GROUND SURFACE 0.0
805	804.4	1.6	4	2	2	4	SS-8	M		**ROADWAY EMBANKMENT** BRN-TAN TO RED-TAN SOFT TO MED. STIFF MOIST LOW (PI=11) PLASTIC SILTY SANDY CLAY (A-6)
800	799.4	6.6	2	2	3	5		M		796.0 10.0 **RESIDUAL** TAN-BLACK-WHITE BANDED LOOSE TO MED. DENSE MOIST MICA. SILTY SAND (A-2)
795	794.4	11.6	3	4	6	10		M		
790	789.4	16.6	3	3	4	7		M		
785	784.4	21.6	9	14	5	19		M		
780	779.4	26.6	11	17	6	23				
775	774.4	31.6	60/0.1			60/0.1		M		775.0 31.0 **CRYSTALLINE ROCK** W/ SEV. WEATH. CRYSTALLINE ROCK LAYERS
770	767.9	38.1	60/0.1			60/0.1				767.2 38.8 Boring Terminated BY TRI-CONE REFUSAL at Elevation 767.2 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Murray, C. C.
SITE DESCRIPTION BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-) (STA. 354+83.22 -L- / 28+24.93 -Y1-)			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 28+10	**OFFSET** 40 ft LT	**ALIGNMENT** -Y1- / **0 HR.** NM
COLLAR ELEV. 810.4 ft	**TOTAL DEPTH** 49.4 ft	**NORTHING** 580,459	**EASTING** 1,233,585 / **24 HR.** 29.0
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009		**DRILL METHOD** NW Casing w/ Adv. / Tri-cone & Core	**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 08/29/12	**COMP. DATE** 08/29/12	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
810.4										GROUND SURFACE	0.0
805.4										**RESIDUAL** RED-TAN MED. STIFF MOIST SILTY SANDY CLAY (A-7)	5.0
	803.7	6.7	9	14	12	26	SS-3	M		**SAPROLITE** OLIVE-TAN MED. DENSE TO V. DENSE MOIST SILTY SAND (A-2-4)	
	798.7	11.7	6	9	9	18		M			
	793.7	16.7	15	23	37	60	SS-4	M			
788.2	788.7	21.7	37	46	54	100		M		**WEATHERED ROCK** SEV. WEATH. CRYSTALLINE ROCK	22.2
	783.7	26.7	100/0.4			100/0.4					
776.0	777.2	33.2	55	45/0.2		100/0.7				**CRYSTALLINE ROCK** GRAY SLI. WEATH. TO FRESH HARD BIOTITE GNEISS	34.4
							RS-2				
							RS-3				
761.0										Boring Terminated at Elevation 761.0 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)	49.4

NCDOT BORE SINGLE R2707B_GEO_BH_BRDG0007(-Y1-)_CLEVELAND.GPJ NC_DOT.GDT 10/9/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Murray, C. C.
SITE DESCRIPTION BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-) (STA. 354+83.22 -L- / 28+24.93 -Y1-)			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 28+10	**OFFSET** 40 ft LT	**ALIGNMENT** -Y1- / **0 HR.** NM
COLLAR ELEV. 810.4 ft	**TOTAL DEPTH** 49.4 ft	**NORTHING** 580,459	**EASTING** 1,233,585 / **24 HR.** 29.0
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009		**DRILL METHOD** NW Casing w/ Adv. / Tri-cone & Core	**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 08/29/12	**COMP. DATE** 08/29/12	**SURFACE WATER DEPTH** N/A
CORE SIZE NO/NQ	**TOTAL RUN** 15.0 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
											Begin Coring @ 34.4 ft	
776.0	776.0	34.4	5.0		(5.0) 100%	(4.4) 88%		(15.0) 100%	(13.0) 87%		**CRYSTALLINE ROCK** GRAY SLI. WEATH. TO FRESH HARD BIOTITE GNEISS FRACTURE SPACING= CLOSE TO MOD. CLOSE R1=7, R2=17, R3=15, R4=20, R5=7 RMR=66	34.4
	771.0	39.4	5.0		(5.0) 100%	(4.4) 88%	RS-2					
	766.0	44.4	5.0		(5.0) 100%	(4.2) 84%	RS-3					
761.0	761.0	49.4									Boring Terminated at Elevation 761.0 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)	49.4

NCDOT CORE SINGLE R2707B_GEO_BH_BRDG0007(-Y1-)_CLEVELAND.GPJ NC_DOT.GDT 10/9/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Murray, C. C.
SITE DESCRIPTION BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-) (STA. 354+83.22 -L- / 28+24.93 -Y1-)			**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 28+25	**OFFSET** CL	**ALIGNMENT** -Y1- — **0 HR.** NM
COLLAR ELEV. 809.7 ft	**TOTAL DEPTH** 39.8 ft	**NORTHING** 580,454	**EASTING** 1,233,543 — **24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009		**DRILL METHOD** NW Casing w/ Adv. / Tri-cone & Core	**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 09/11/12	**COMP. DATE** 09/11/12	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
810										809.7 GROUND SURFACE	0.0
805										**ROADWAY EMBANKMENT** TAN-RED MED. STIFF MOIST SILTY SANDY CLAY (A-7) W/ BLACK TOP & BASE @ 0.0-1.0 — 806.7	3.0
	802.9	6.8	3	4	2	6		M		**RESIDUAL** TAN-RED TO TAN & BLACK-TAN-WHITE LOOSE TO DENSE MOIST SILTY SAND (A-2-4) SLI. MICA. @ 11.8	
800											
	797.9	11.8	2	8	11	19		M			
795											
	792.9	16.8	3	5	5	10		M			
790											
	787.9	21.8	4	10	14	24		M			
785											
	782.9	26.8	50	60/0.1		60/0.1				782.4	27.3
780										781.6 **CRYSTALLINE ROCK** BLACK-TAN-WHITE BIOTITE GNEISS	28.1
							RS-4			**CRYSTALLINE ROCK** GRAY SLI. WEATH. TO FRESH HARD BIOTITE GNEISS	
775											
770										769.9	39.8
										Boring Terminated at Elevation 769.9 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)	

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Murray, C. C.
SITE DESCRIPTION BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-) (STA. 354+83.22 -L- / 28+24.93 -Y1-)			**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 28+25	**OFFSET** CL	**ALIGNMENT** -Y1- — **0 HR.** NM
COLLAR ELEV. 809.7 ft	**TOTAL DEPTH** 39.8 ft	**NORTHING** 580,454	**EASTING** 1,233,543 — **24 HR.** NM
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009		**DRILL METHOD** NW Casing w/ Adv. / Tri-cone & Core	**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 09/11/12	**COMP. DATE** 09/11/12	**SURFACE WATER DEPTH** N/A
CORE SIZE NO/NQ	**TOTAL RUN** 11.7 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
781.6											Begin Coring @ 28.1 ft	
780	781.6 / 779.9	28.1 / 29.8	1.7		(1.7) 100%	(1.7) 100%		(11.7) 100%	(10.5) 90%		781.6 **CRYSTALLINE ROCK** GRAY SLI. WEATH. TO FRESH HARD BIOTITE GNEISS FRACTURE SPACING= CLOSE TO MOD. CLOSE R1=7, R2=25, R3=15, R4=20, R5=7 RMR=74	28.1
			5.0		(5.0) 100%	(4.4) 88%	RS-4					
775	774.9	34.8										
			5.0		(5.0) 100%	(4.4) 88%						
770	769.9	39.8									769.9	39.8
											Boring Terminated at Elevation 769.9 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Murray, C. C.
SITE DESCRIPTION BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-) (STA. 354+83.22 -L- / 28+24.93 -Y1-)			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 28+40	**OFFSET** 30 ft RT	**ALIGNMENT** -Y1- / **0 HR.** NM
COLLAR ELEV. 809.2 ft	**TOTAL DEPTH** 54.7 ft	**NORTHING** 580,446	**EASTING** 1,233,510 / **24 HR.** 30.0
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009		**DRILL METHOD** NW Casing w/ Advancer & Core	**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 09/11/12	**COMP. DATE** 09/11/12	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
810										
										809.2 / 0.0 — GROUND SURFACE
	807.5	1.7	3	2	2	4		M		**ROADWAY EMBANKMENT** RED SOFT TO MED. STIFF MOIST SILTY SANDY CLAY (A-6)
805										
	802.5	6.7	1	3	2	5		M		803.2 / 6.0 — **RESIDUAL** RED-BRN-WHITE-BLACK LOOSE TO MED. DENSE MOIST SLI. MICA. TO NON-MICA. SILTY SAND (A-2)
800										
	797.5	11.7	2	2	3	5		M		
795										
	792.5	16.7	9	9	11	20		M		
790										
	787.5	21.7	4	6	6	12		M		
785										
	782.5	26.7	11	8	13	21		M		
780										
	777.5	31.7	60/0.1			60/0.1				777.7 / 31.5 — 777.5 / 31.7 **CRYSTALLINE ROCK**
775										**CRYSTALLINE ROCK** BRN-GRAY-WHITE SEV. TO MOD. SEV. WEATH. MED. HARD BIOTITE GNEISS
770										
765										764.5 / 44.7 — **CRYSTALLINE ROCK** GRAY SLI. WEATH. HARD BIOTITE GNEISS
							RS-1			
760										
755										754.5 / 54.7 — Boring Terminated at Elevation 754.5 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)

NCDOT BORE SINGLE R2707B_GEO_BH_BRDG0007(-Y1-)_CLEVELAND.GPJ NC_DOT.GDT 10/9/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

SHEET 11

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Murray, C. C.
SITE DESCRIPTION BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-) (STA. 354+83.22 -L- / 28+24.93 -Y1-)			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 28+40	**OFFSET** 30 ft RT	**ALIGNMENT** -Y1- / **0 HR.** NM
COLLAR ELEV. 809.2 ft	**TOTAL DEPTH** 54.7 ft	**NORTHING** 580,446	**EASTING** 1,233,510 / **24 HR.** 30.0
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009		**DRILL METHOD** NW Casing w/ Advancer & Core	**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 09/11/12	**COMP. DATE** 09/11/12	**SURFACE WATER DEPTH** N/A
CORE SIZE NO/NQ	**TOTAL RUN** 23.0 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft))
777.5											Begin Coring @ 31.7 ft
	777.5	31.7	3.0	N=60/0.1	(2.7) 90%	(1.2) 40%		(8.2) 63%	(2.3) 18%		777.5 / 31.7 — **CRYSTALLINE ROCK** BRN-GRAY-WHITE SEV. TO MOD. SEV. WEATH. MED. HARD BIOTITE GNEISS FRACTURE SPACING= V. CLOSE TO CLOSE R1=0,R2=3, R3=5, R4=0, R5=7 RMR=15
775	774.5	34.7									
			5.0		(2.1) 42%	(0.7) 14%					
770	769.5	39.7									
			5.0		(3.4) 68%	(0.4) 8%					
765	764.5	44.7									764.5 / 44.7
			5.0		(4.8) 96%	(3.8) 76%	RS-1	(10.0) 100%	(8.0) 80%		**CRYSTALLINE ROCK** GRAY SLI. WEATH. HARD BIOTITE GNEISS FRACTURE SPACING= CLOSE TO MOD. CLOSE R1=7, R2=17, R3=15, R4=20, R5=7 RMR=66
760	759.5	49.7									
			5.0		(5.0) 100%	(4.2) 84%					
755	754.5	54.7									754.5 / 54.7 — Boring Terminated at Elevation 754.5 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)

NCDOT CORE SINGLE R2707B_GEO_BH_BRDG0007(-Y1-)_CLEVELAND.GPJ NC_DOT.GDT 10/9/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Murray, C. C.
SITE DESCRIPTION BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-) (STA. 354+83.22 -L- / 28+24.93 -Y1-)			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 29+21	**OFFSET** 40 ft LT	**ALIGNMENT** -Y1-	**0 HR.** 27.0
COLLAR ELEV. 811.2 ft	**TOTAL DEPTH** 29.4 ft	**NORTHING** 580,351	**EASTING** 1,233,557	**24 HR.** 23.0
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 08/28/12	**COMP. DATE** 08/28/12	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
815											
810										811.2 GROUND SURFACE	0.0
										809.2 **RESIDUAL** RED-BRN STIFF MOIST SILTY SANDY CLAY (A-7)	2.0
	807.2	4.0	3	6	6	12	SS-1	M		**RESIDUAL** TAN & OLIVE-TAN MED. DENSE MOIST SILTY CLAYEY SAND (A-2-4)	
805											
	802.2	9.0	21	11	89	100		M/D		801.7 **WEATHERED ROCK** WHITE-TAN-OLIVE DRY SEV. WEATH. CRYSTALLINE ROCK W/ CRYSTALLINE ROCK SEAM @ 12.0-13.0	9.5
800											
	797.2	14.0	16	29	67	96		D		797.2 **RESIDUAL** GRAY & WHITE V. DENSE TO DENSE DRY SILTY SAND (A-2-4)	14.0
795											
	792.2	19.0	7	20	17	37	SS-2	D			
790											
	787.2	24.0	60/0.1			60/0.1				787.2 **WEATHERED ROCK** DRY TO WET SEV. WEATH. CRYSTALLINE ROCK W/ CRYSTALLINE ROCK SEAM @ 24.0	24.0
785											
	782.2	29.0	100/0.4			100/0.4		W		781.8 Boring Terminated at Elevation 781.8 ft IN SEV. WEATH. CRYSTALLINE ROCK	29.4

WBS 34497.1.2	**TIP** R-2707B	**COUNTY** CLEVELAND	**GEOLOGIST** Murray, C. C.
SITE DESCRIPTION BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-) (STA. 354+83.22 -L- / 28+24.93 -Y1-)			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 29+50	**OFFSET** 29 ft RT	**ALIGNMENT** -Y1-	**0 HR.** NM
COLLAR ELEV. 810.5 ft	**TOTAL DEPTH** 32.9 ft	**NORTHING** 580,340	**EASTING** 1,233,483	**24 HR.** 22.0
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009		**DRILL METHOD** NW Casing w/ Advancer & Tri-cone	**HAMMER TYPE** Automatic
DRILLER Estep, J. E.	**START DATE** 09/05/12	**COMP. DATE** 09/05/12	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
815										
810										810.5 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT RED-TAN STIFF MOIST SILTY SANDY CLAY (A-7)
	803.7	6.8	6	8	8	16		M		803.7 6.8
805										
	798.7	11.8	8	30	22	52		M		**RESIDUAL** TAN-BLACK-WHITE BANDED MED. DENSE TO V. DENSE MOIST SILTY SAND (A-2)
800										
	793.7	16.8	19	28	19	47		M		
795										
	788.7	21.8	48	60/0.1		60/0.1				788.2 22.3
790										**CRYSTALLINE ROCK**
785										
	782.2	28.3	60/0.1			60/0.1				777.6 32.9
780										Boring Terminated BY TRI-CONE REFUSAL at Elevation 777.6 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)

TEST RESULTS

PROJECT: 34497.1.2 (R-2707B)
COUNTY: CLEVELAND
SITE DESCRIPTION: BRIDGE NO. 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-) (STA. 354+83.22 -L- / 28+24.93 -Y1-)

SOIL SAMPLE RESULTS

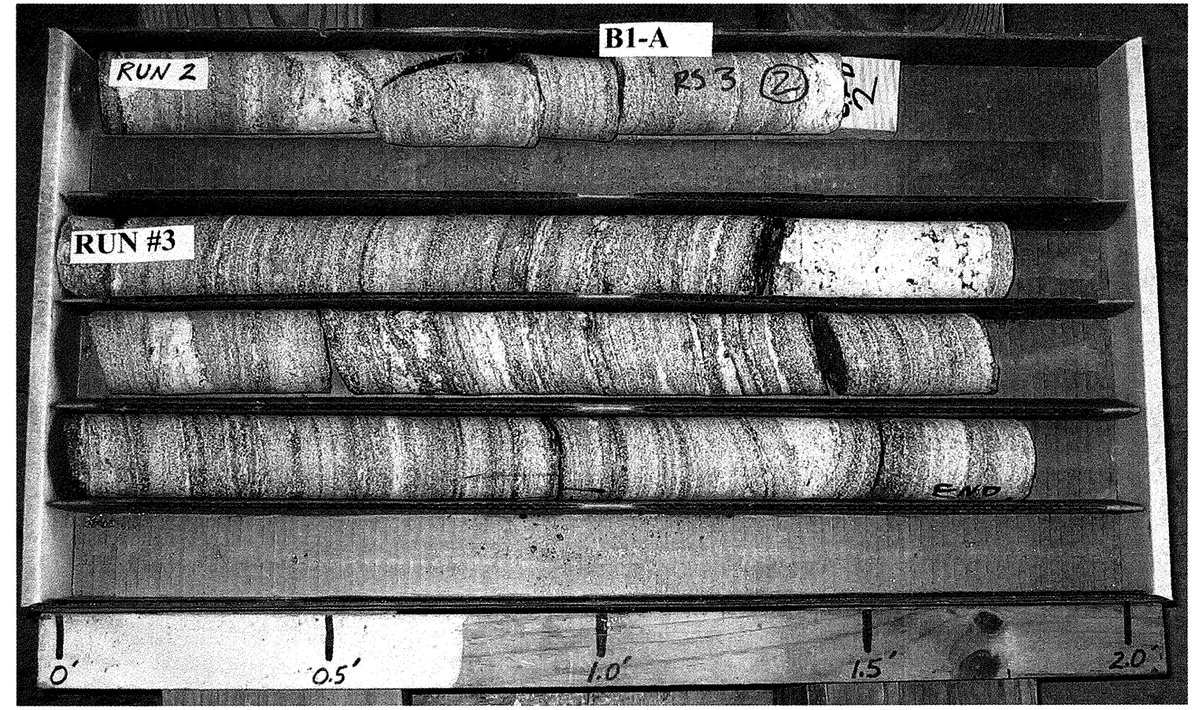
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING SIEVES 10	40	200	% MOISTURE	% ORGANIC	UNIT WT. (d)	VOID RATIO
		EB1-A																
SS-5	40 LT	26+90 -Y1-	2.0-3.5	A-7-6(12)	7	53	24	17.0	29.4	8.9	44.6	100	94	58	-	-		
SS-6	40 LT	26+90 -Y1-	7.0-8.5	A-2-5(0)	6	43	NP	26.8	56.4	10.8	6.1	98	89	24	-	-		
SS-7	40 LT	26+90 -Y1-	22.0-23.5	A-2-4(0)	15	38	NP	38.1	48.3	7.5	6.1	84	70	16	-	-		
		EB1-B																
SS-8	30 RT	27+17 -Y1-	1.6-3.1	A-6(1)	4	28	11	31.6	32.3	11.8	24.3	91	73	37	-	-		
		B1-A																
SS-3	40 LT	28+10 -Y1-	6.7-8.2	A-2-4(0)	26	36	NP	26.8	51.5	13.6	8.1	94	82	29	-	-		
SS-4	40 LT	28+10 -Y1-	16.7-18.2	A-2-4(0)	60	36	NP	37.5	46.2	10.1	6.1	71	57	15	-	-		
		EB2-A																
SS-1	40 LT	29+21 -Y1-	4.0-5.5	A-2-4(0)	12	32	NP	24.7	52.3	10.8	12.2	100	93	29	-	-		
SS-2	40 LT	29+21 -Y1-	19.0-20.5	A-2-4(0)	37	39	NP	36.5	48.7	10.8	4.1	82	68	17	-	-		

ROCK SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	RQD	UNIT WT (pcf)	Q(ksf)	E(MPsi)
		B1-A					
RS-2	40.0 LT.	28+10 -Y1-	39.4-39.8	86%	169.3	1774	3.03
RS-3			44.0-44.4	86%	163.9	1650.24	7.01
		B1-C					
RS-4	CL	28+25 -Y1-	31.2-31.7	88%	170.8	1641.6	2.82
		B1-C					
RS-1	30.0 RT.	28+40 -Y1-	44.7-45.35	80%	170.8	2158.56	3.03

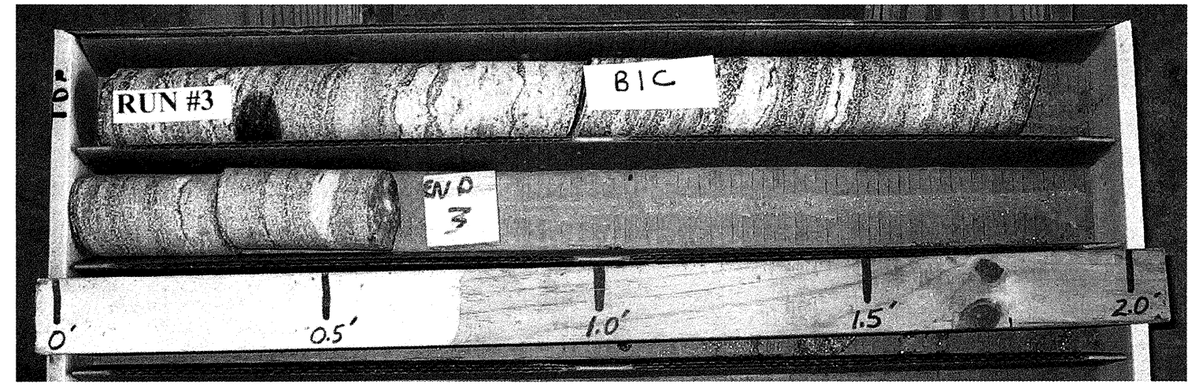
34497.1.2 (R-2707B)
CLEVELAND COUNTY
BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-)
(STA. 354+83.22 –L- / 28+24.93 –Y1-)

CORE PHOTOS



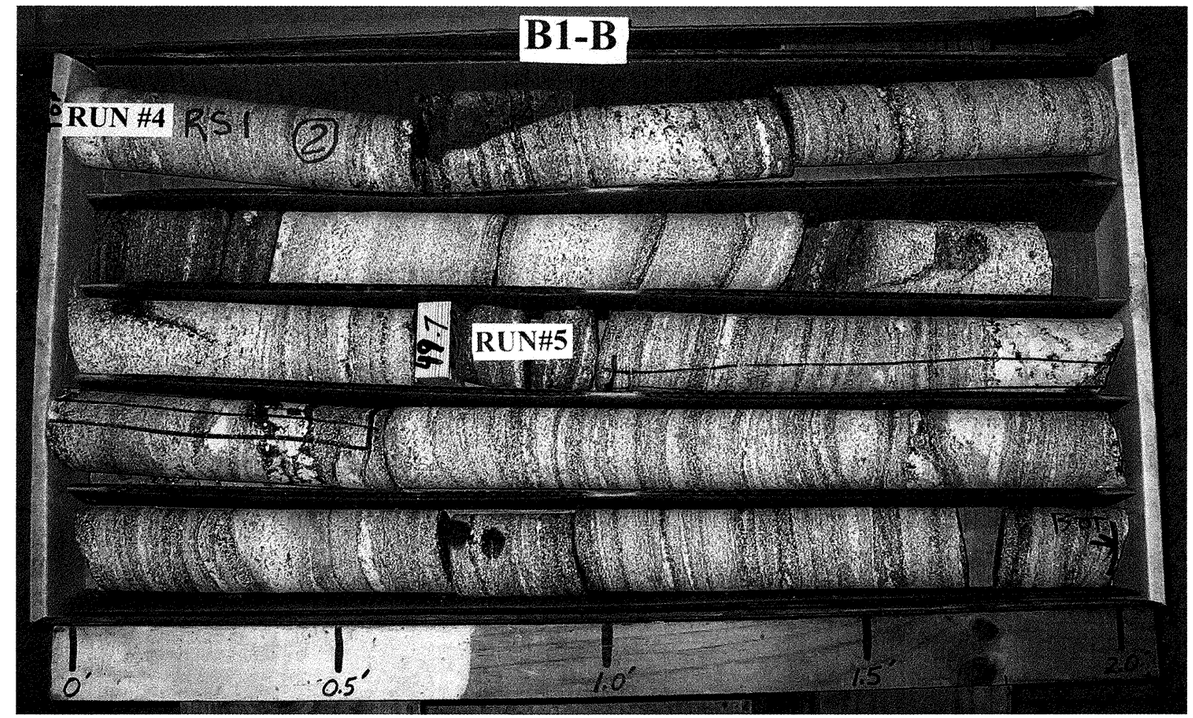
34497.1.2 (R-2707B)
CLEVELAND COUNTY
BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-)
(STA. 354+83.22 –L- / 28+24.93 –Y1-)

CORE PHOTOS



34497.1.2 (R-2707B)
CLEVELAND COUNTY
BRIDGE 007 ON NC 226 (-Y1-) OVER US 74 SHELBY BYPASS (-L-)
(STA. 354+83.22 –L- / 28+24.93 –Y1-)

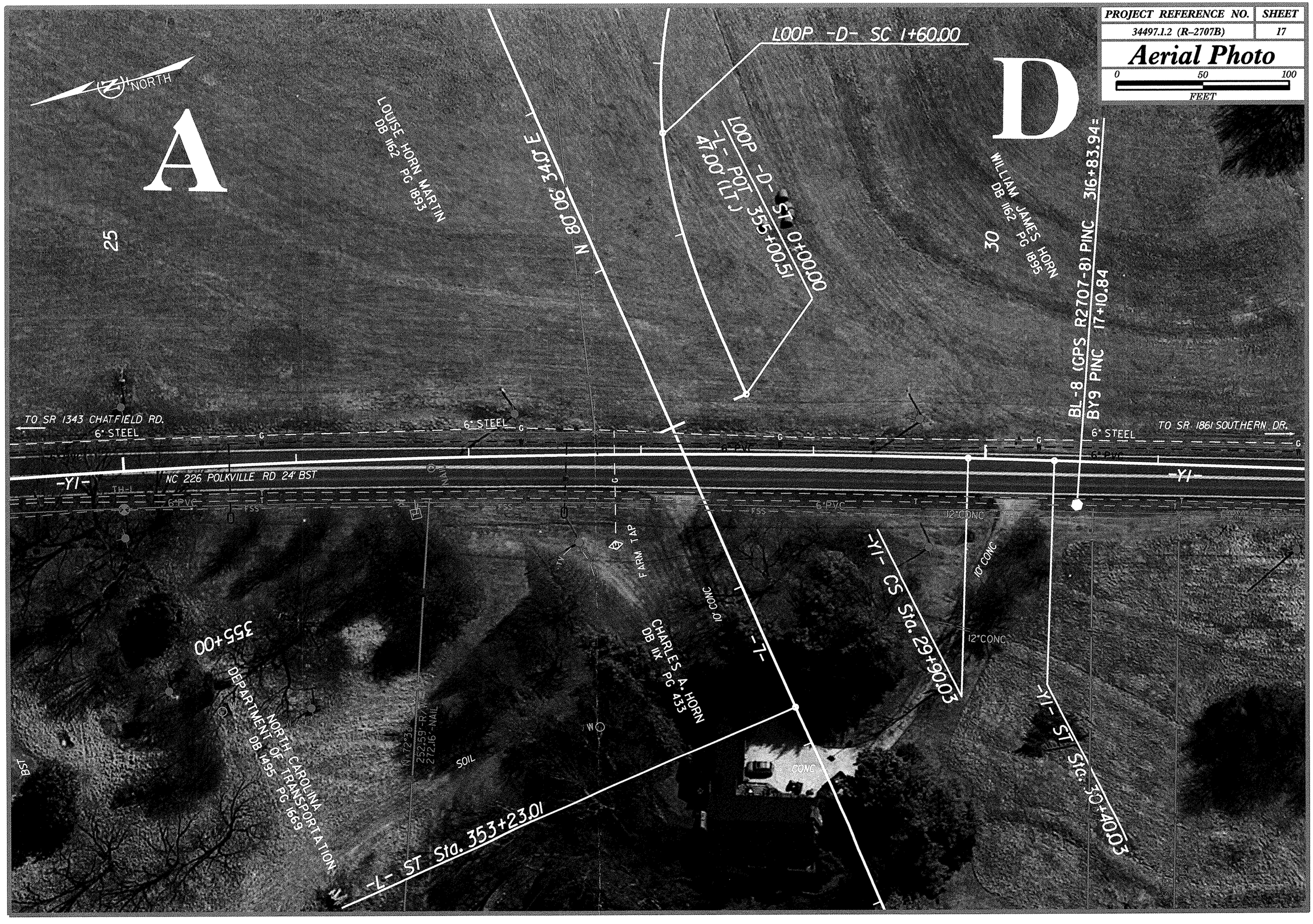
CORE PHOTOS



PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	17

Aerial Photo

0 50 100
FEET



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34497.1.2 (R2707B)	1	20

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34497.1.2 (R-2707B) F.A. PROJ. NHF-0074(107)

COUNTY CLEVELAND

PROJECT DESCRIPTION FROM WEST OF SR 1314 (HOYLE RD.) TO WEST OF NC 226.

SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH RD.)

PROJECT: 34497.1.2

ID: R-2707B

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4-5	PROFILE(S)
6-11	CROSS SECTION(S)
12-19	BORE LOGS
20	SOIL TEST RESULTS

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

R.W. TODD

M.L. SMITH

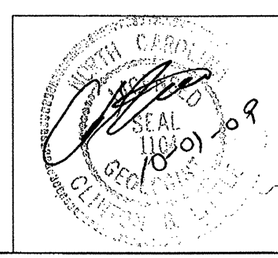
A.C. SMITH

INVESTIGATED BY J.P. ROGERS

CHECKED BY J.P. ROGERS

SUBMITTED BY C.B. LITTLE

DATE AUGUST 2009



DRAWN BY: J.P. ROGERS

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.
34497.1.2 (R-2707B)	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 POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

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

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
- [ ] TRICONE ____" 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 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: BY-7- 356, 17+11.74, -Y7-

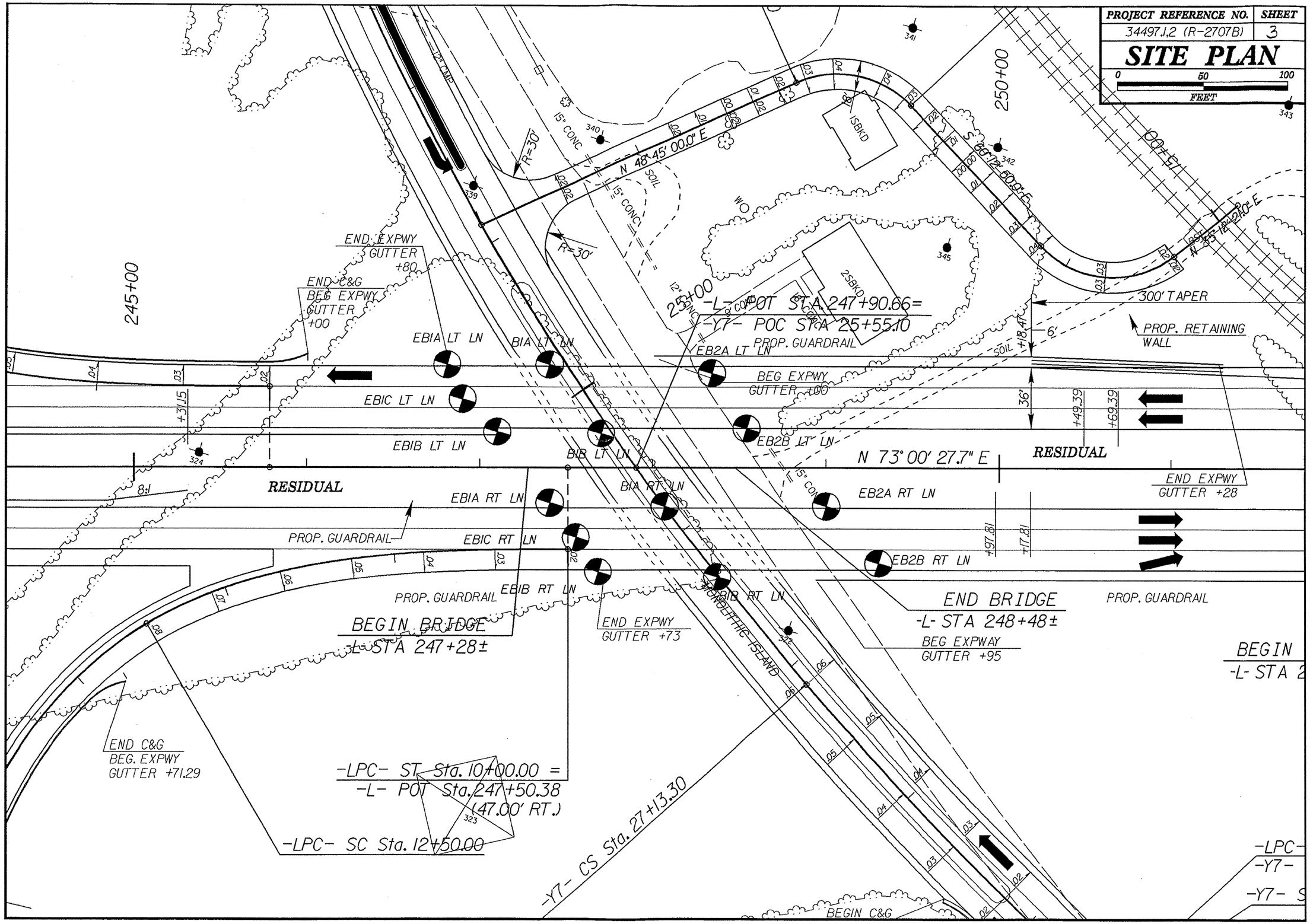
ELEVATION: 890.47 FT.

NOTES:

PROJECT REFERENCE NO.	SHEET
34497.1.2 (R-2707B)	3

SITE PLAN

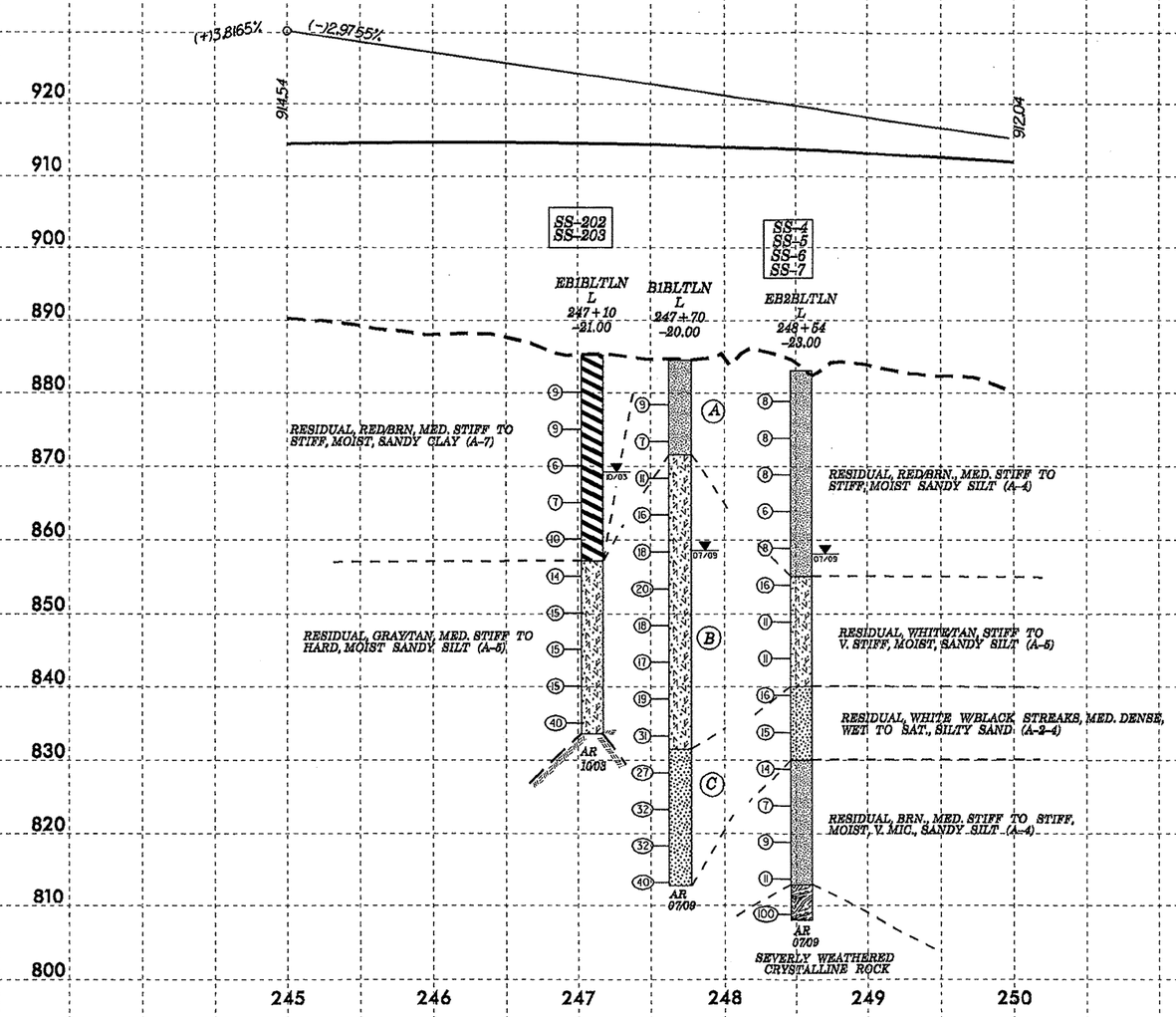
0 50 100
FEET



PROJECT REFERENCE NO.	SHEET
34497.1.3 (R-2707B)	4
-L- PROFILE 23' LEFT	

0 100 200
FEET

PROFILE THROUGH LEFT LANE

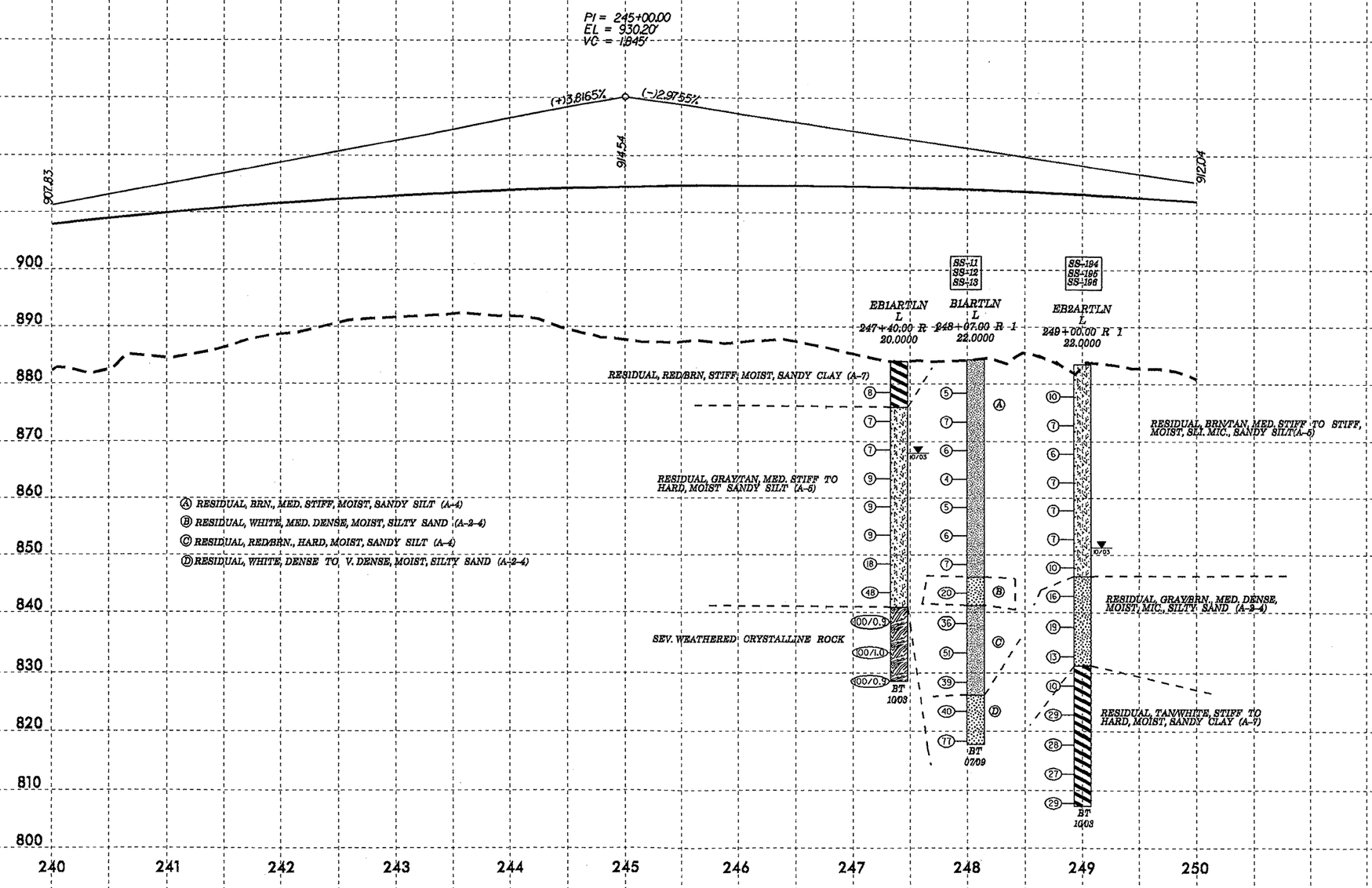


(A) RESIDUAL, TAN, MED. STIFF TO STIFF, MOIST, SANDY SILT (A-4)
(B) RESIDUAL, TAN, STIFF TO HARD, MOIST, SANDY SILT (A-5)
(C) RESIDUAL, TAN/WHITE, DENSE, MOIST, SLI. MIC., SILTY SAND (A-2-4)

PROJECT REFERENCE NO.	SHEET
34497.1.3 (R-2707B)	5
-L- PROFILE 23' RIGHT	

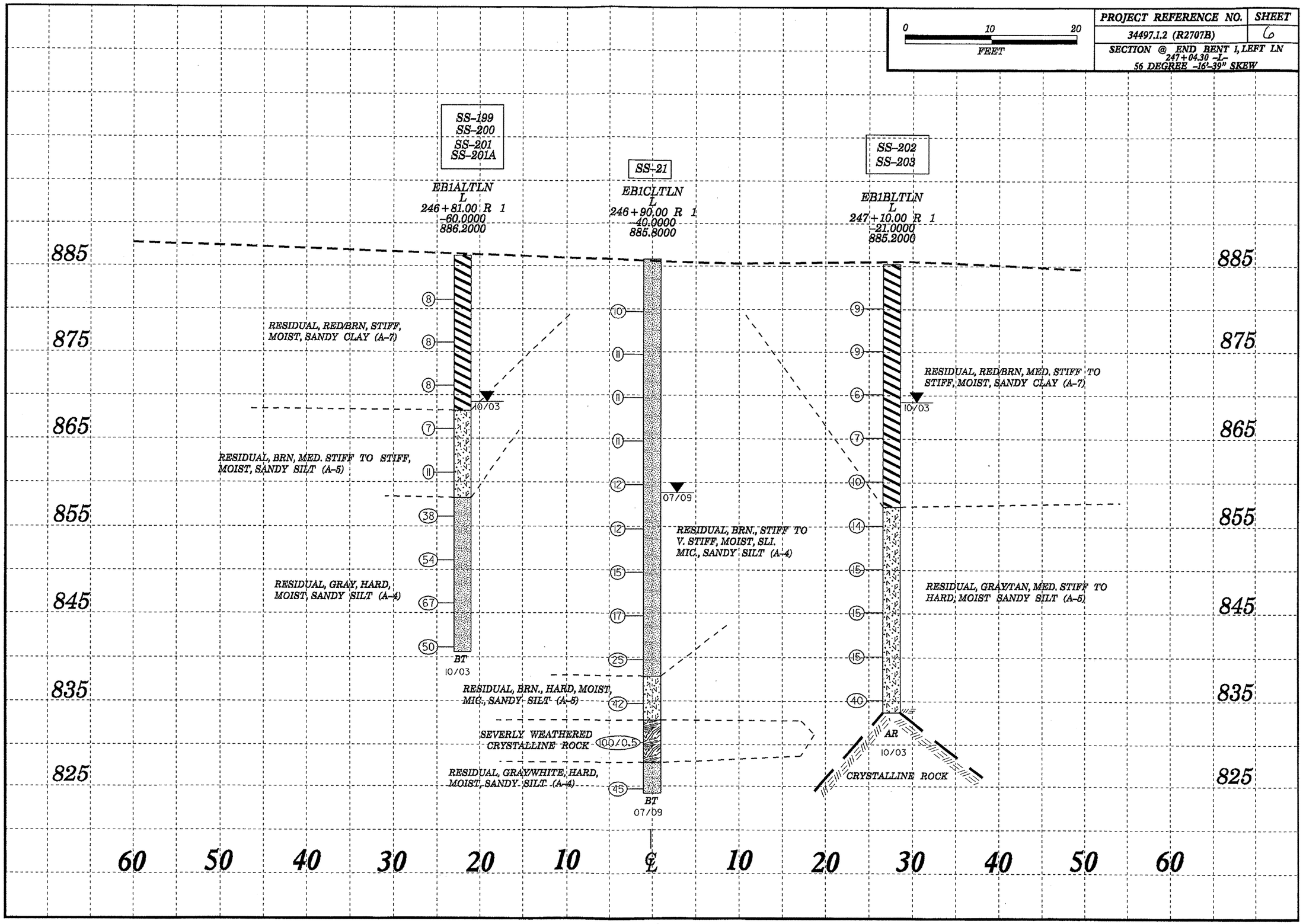
0 100 200
FEET

PROFILE THROUGH RIGHT LANE



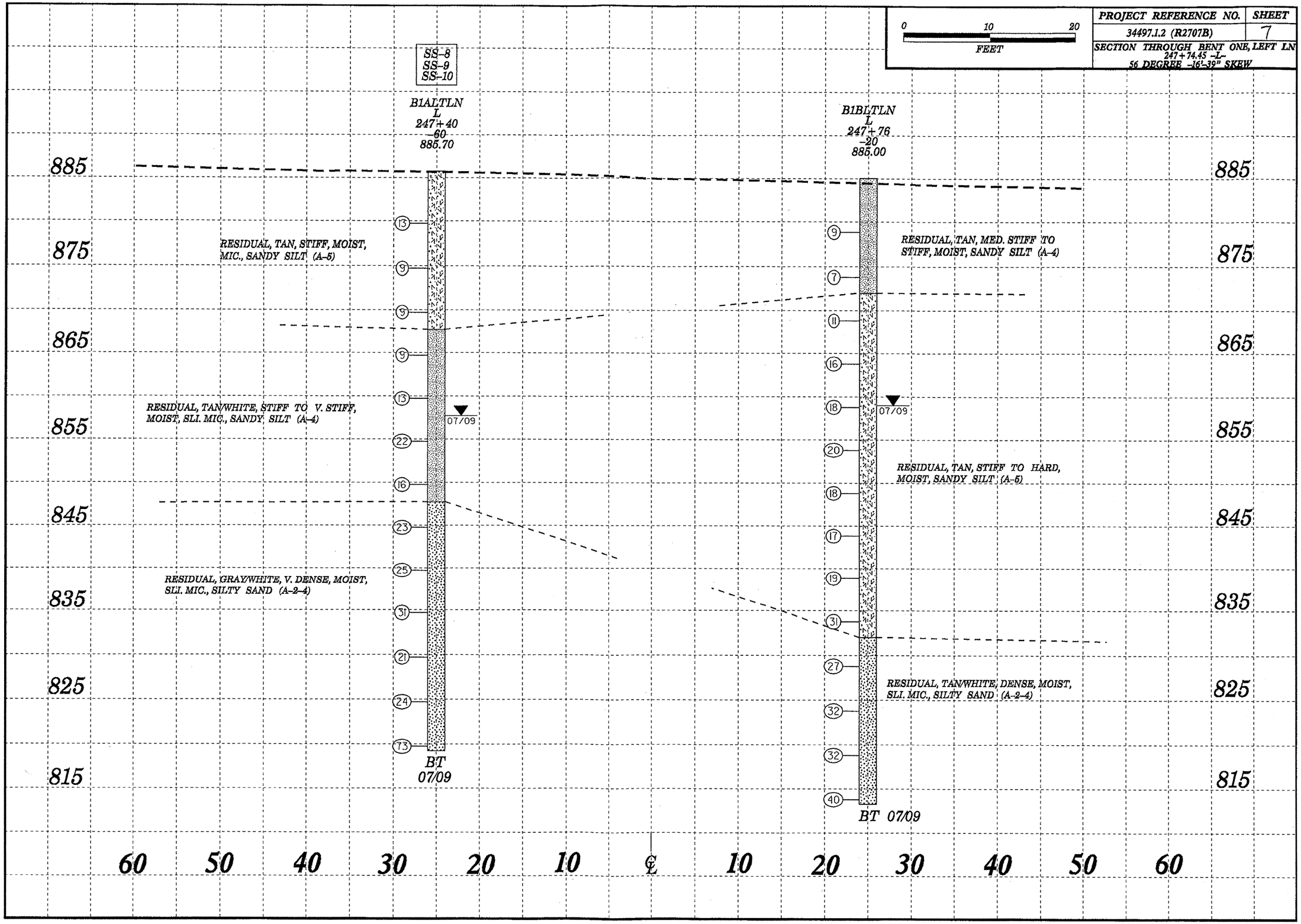
PROJECT REFERENCE NO.	SHEET
34497.1.2 (R2707B)	6

SECTION @ END BENT 1, LEFT LN
247+04.30 -L-
56 DEGREE -16'-39" SKEW

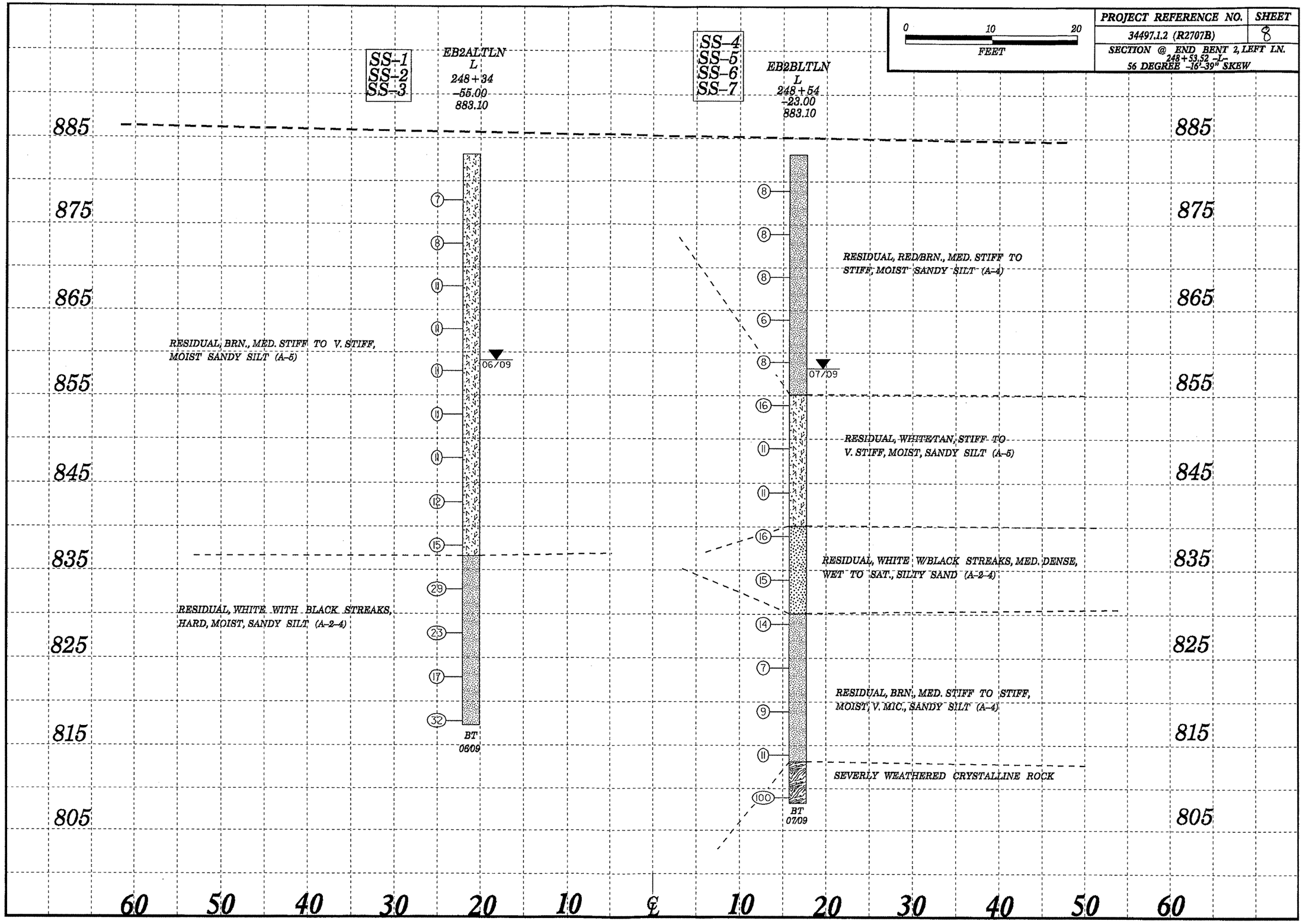


PROJECT REFERENCE NO.	SHEET
34497.1.2 (R2707B)	7

SECTION THROUGH BENT ONE, LEFT LN
247+74.45 -L-
56 DEGREE -16'-39" SKEW

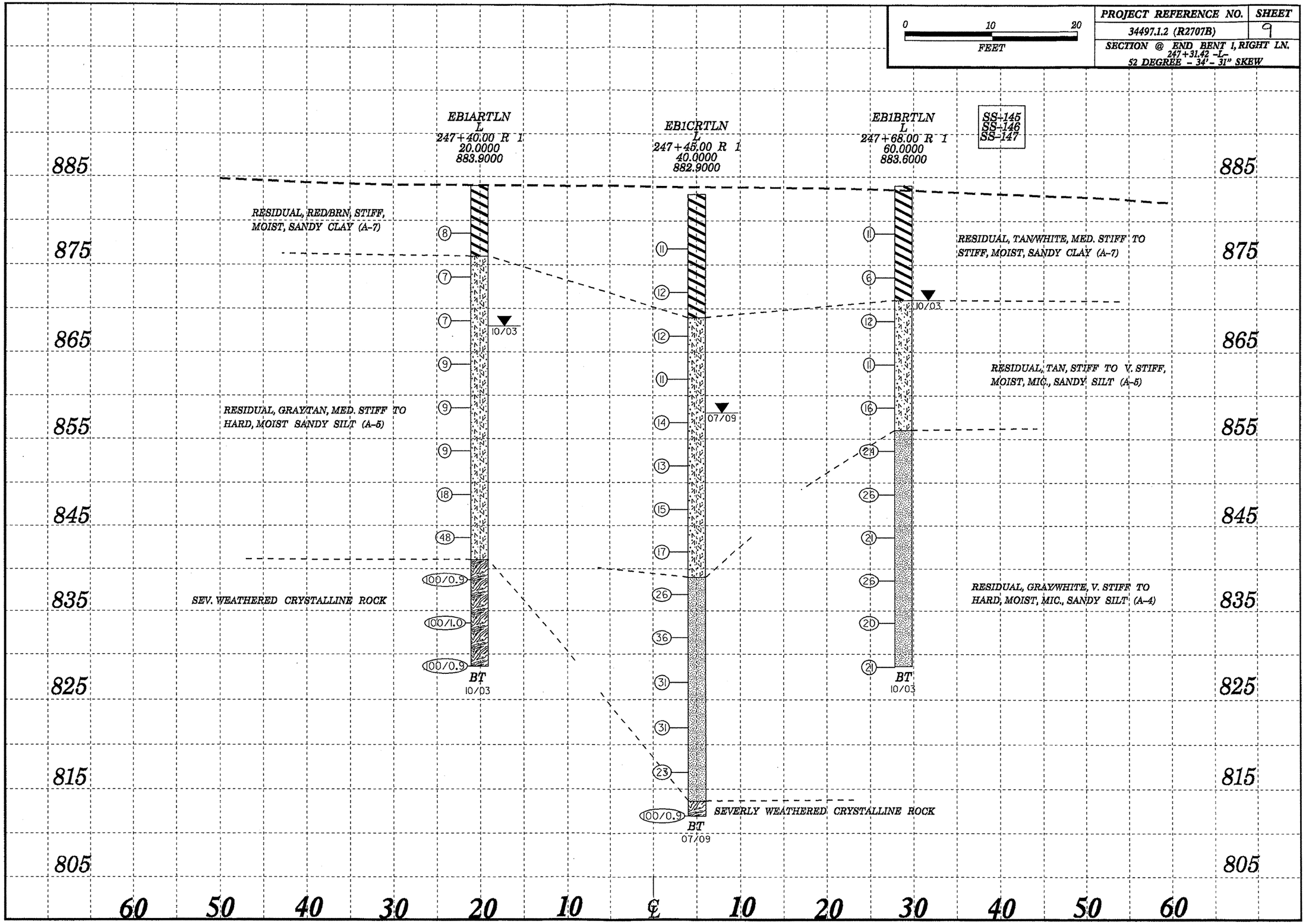


PROJECT REFERENCE NO.	SHEET
34497.1.2 (R2707B)	8
SECTION @ END BENT 2, LEFT LN. 248+53.52 -L- 56 DEGREE -16'-39" SKEW	

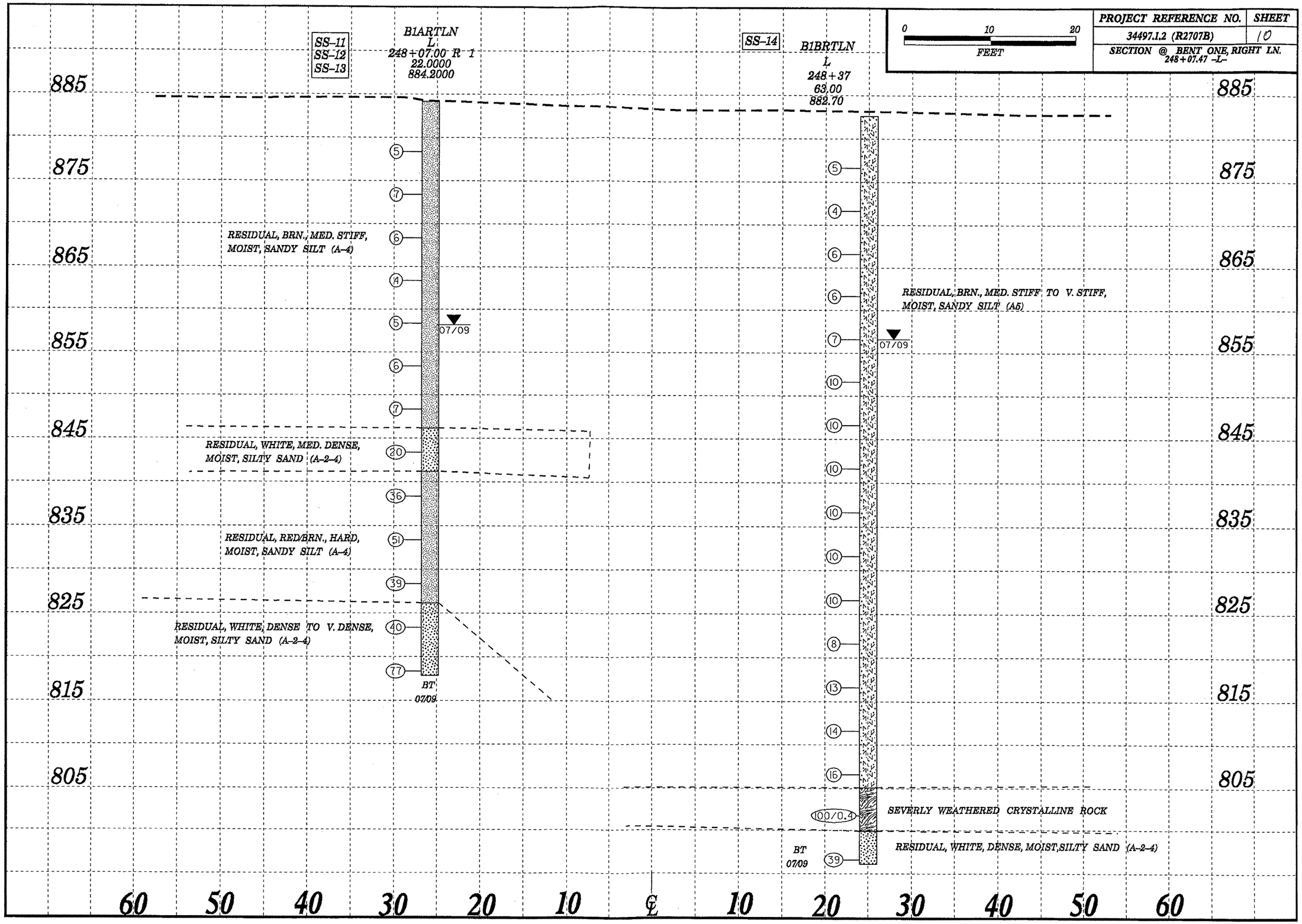


PROJECT REFERENCE NO.	SHEET
34497.1.2 (R2707B)	9

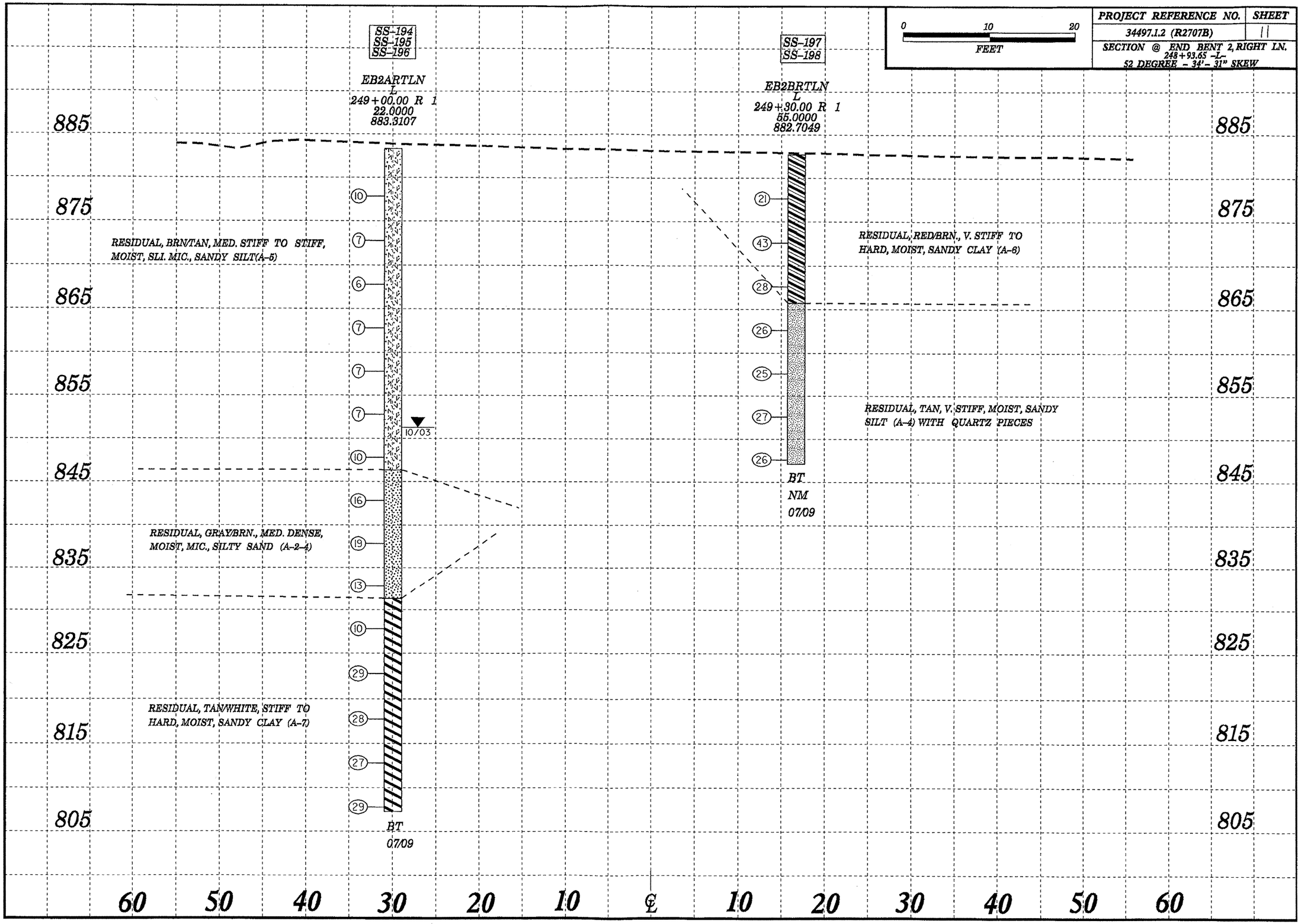
SECTION @ END BENT 1, RIGHT LN.
247+31.42 -L-
52 DEGREE - 34' - 31" SKEW



PROJECT REFERENCE NO.	SHEET
34497.1.2 (R2707B)	10
SECTION @ BENT ONE, RIGHT LN. 248+07.47 -L-	



PROJECT REFERENCE NO.	SHEET
34497.1.2 (R2707B)	11
SECTION @ END BENT 2, RIGHT LN. 248+93.65 -L- 52 DEGREE - 34' - 31" SKEW	



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. EB1ALTLN	STATION 246+81	OFFSET 60ft LT	ALIGNMENT L — 0 HR. N/A
COLLAR ELEV. 886.2 ft	TOTAL DEPTH 45.6 ft	NORTHING N/A	EASTING N/A — 24 HR. 17.0
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
START DATE 10/23/03	COMP. DATE 10/24/03	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)
886.2										GROUND SURFACE	0.0
										RESIDUAL RED/BRN, STIFF, MOIST, SANDY CLAY (A-7)	
	882.1	4.1	4	4	4	8	SS-199	M			
	877.1	9.1	2	3	5	8	SS-200	M			
	872.1	14.1	3	4	4	8		M			
868.2											18.0
										RESIDUAL BRN, MED. STIFF TO STIFF, MOIST, SANDY SILT (A-5)	
	867.1	19.1	3	3	4	7	SS-201	M			
	862.1	24.1	4	5	6	11		M			
858.2											28.0
										RESIDUAL GRAY, HARD, MOIST, SANDY SILT (A-4)	
	857.1	29.1	10	11	27	38	SS-201A	M			
	852.1	34.1	12	21	33	54		M			
	847.1	39.1	11	21	46	67		M			
	842.1	44.1	12	12	38	50		M			
840.6											45.6
										Boring Terminated at Elevation 840.6 ft GRAY, HARD, MOIST, SANDY SILT (A-4)	

NCDOT BORE SINGLE R2707B_GEO_BH_Y7.GPJ NC_DOT.GDT 08/17/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 12

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. EB1BLTLN	STATION 247+10	OFFSET 21ft LT	ALIGNMENT L — 0 HR. N/A
COLLAR ELEV. 885.2 ft	TOTAL DEPTH 51.5 ft	NORTHING N/A	EASTING N/A — 24 HR. 16.0
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
START DATE 10/24/03	COMP. DATE 10/24/03	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 51.5 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)
885.2										GROUND SURFACE	0.0
										RESIDUAL RED/BRN, MED. STIFF TO STIFF, MOIST, SANDY CLAY (A-7)	
	881.1	4.1	3	4	5	9		M			
	876.1	9.1	3	4	5	9	SS-202	M			
	871.1	14.1	4	3	3	6		M			
	866.1	19.1	5	5	2	7		M			
	861.1	24.1	4	5	5	10		M			
857.2											28.0
										RESIDUAL GRAY/TAN, MED. STIFF TO HARD, MOIST SANDY SILT (A-5)	
	856.1	29.1	3	6	8	14		M			
	851.1	34.1	5	6	9	15		M			
	846.1	39.1	3	6	9	15		M			
	841.1	44.1	3	6	9	15	SS-203	M			
	836.1	49.1	15	13	27	40		M			
833.7											51.5
										Boring Terminated BY AUGER REFUSAL at Elevation 833.7 ft CRYSTALLINE ROCK	

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. EB1CLTLN	STATION 246+90	OFFSET 40ft LT	ALIGNMENT L — 0 HR. N/A
COLLAR ELEV. 885.8 ft	TOTAL DEPTH 61.6 ft	NORTHING N/A	EASTING N/A — 24 HR. 27.0
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 07/17/09	COMP. DATE 07/17/09	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)
890											
885										885.8 GROUND SURFACE	0.0
										RESIDUAL BRN., STIFF TO V. STIFF, MOIST, SLI. MIC., SANDY SILT (A-4)	
880	880.7	5.1	2	4	6	10		M			
875	875.7	10.1	3	5	6	11		M			
870	870.7	15.1	4	5	6	11		M			
865	865.7	20.1	1	3	8	11		M			
860	860.7	25.1	2	5	7	12		M			
855	855.7	30.1	2	6	6	12		M			
850	850.7	35.1	2	6	9	15		M			
845	845.7	40.1	7	7	10	17		M			
840	840.7	45.1	5	11	14	25		M			
835	835.7	50.1	4	17	25	42		M		837.8 RESIDUAL BRN., HARD, MOIST, MIC., SANDY SILT (A-5)	48.0
830	830.7	55.1	100							832.8 WEATHERED ROCK SEVERLY WEATHERED CRYSTALLINE ROCK	53.0
825	825.7	60.1	15	20	25	45	SS-21			827.8 RESIDUAL GRAY/WHITE, HARD, MOIST, SANDY SILT (A-4)	58.0
										824.2 Boring Terminated at Elevation 824.2 ft GRAY/WHITE, HARD, MOIST, SANDY SILT (A-4)	61.6
820											
815											
810											

NCDOT BORE SINGLE R2707B_GEO_BH_Y7.GPJ NC_DOT.GDT 08/17/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 13

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. B1ALTLN	STATION 247+40	OFFSET 60ft LT	ALIGNMENT L — 0 HR. N/A
COLLAR ELEV. 885.7 ft	TOTAL DEPTH 66.5 ft	NORTHING N/A	EASTING N/A — 24 HR. 28.0
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 07/01/09	COMP. DATE 07/01/09	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)
890											
885										885.7 GROUND SURFACE	0.0
										RESIDUAL TAN, STIFF, MOIST, MIC., SANDY SILT (A-5)	
880	880.7	5.0	3	5	8	13	SS-8	M			
875	875.7	10.0	2	4	5	9		M			
870	870.7	15.0	3	4	5	9		M			
865	865.7	20.0	3	4	5	9	SS-9	M			
860	860.7	25.0	5	5	8	13		M			
855	855.7	30.0	4	9	13	22		M			
850	850.7	35.0	8	6	10	16		M			
845	845.7	40.0	3	11	12	23	SS-10	M			
840	840.7	45.0	5	11	14	25		M			
835	835.7	50.0	8	12	19	31		M			
830	830.7	55.0	9	10	11	21		M			
825	825.7	60.0	8	8	16	24		M			
820	820.7	65.0	15	30	43	73		M			
815											
810											

867.7	18.0
847.7	38.0
819.2	66.5

RESIDUAL TAN/WHITE, STIFF TO V. STIFF, MOIST, SLI. MIC., SANDY SILT (A-4)

RESIDUAL GRAY/WHITE, V. DENSE, MOIST, SLI. MIC., SILTY SAND (A-2-4)

Boring Terminated at Elevation 819.2 ft GRAY/WHITE, V. DENSE, MOIST, SLI. MIC., SILTY SAND (A-2-4)

NCDOT BORE SINGLE R2707B_GEO_BH_Y7.GPJ NC_DOT.GDT 08/17/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. B1BLTLN	STATION 247+70	OFFSET 20ft LT	ALIGNMENT L	0 HR. N/A
COLLAR ELEV. 885.0 ft	TOTAL DEPTH 71.7 ft	NORTHING N/A	EASTING N/A	24 HR. 26.0
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 07/06/09	COMP. DATE 07/06/09	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)
885										885.0 GROUND SURFACE TAN, MED. STIFF TO STIFF, MOIST, SANDY SILT (A-4)	0.0
880	879.8	5.2	3	3	6	9		M			
875	874.8	10.2	2	3	4	7		M		872.0 RESIDUAL TAN, STIFF TO HARD, MOIST, SANDY SILT (A-5)	13.0
870	869.8	15.2	4	5	6	11		M			
865	864.8	20.2	3	7	9	16		M			
860	859.8	25.2	5	7	11	18		M			
855	854.8	30.2	4	8	12	20		M			
850	849.8	35.2	3	7	11	18		M			
845	844.8	40.2	2	5	12	17		M			
840	839.8	45.2	3	7	12	19		M			
835	834.8	50.2	9	15	16	31		M		832.0 RESIDUAL TAN/WHITE, DENSE, MOIST, SLI. MIC., SILTY SAND (A-2-4)	53.0
830	829.8	55.2	27	14	13	27		M			
825	824.8	60.2	10	11	21	32		M			
820	819.8	65.2	15	15	17	32		M			
815	814.8	70.2	20	19	21	40		M		813.3 Boring Terminated at Elevation 813.3 ft TAN/WHITE, DENSE, MOIST, SLI. MIC., SILTY SAND (A-2-4)	71.7
810											
805											

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 14

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. EB2ALTLN	STATION 248+34	OFFSET 55ft LT	ALIGNMENT L	0 HR. N/A
COLLAR ELEV. 883.1 ft	TOTAL DEPTH 65.8 ft	NORTHING N/A	EASTING N/A	24 HR. 24.0
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 06/29/09	COMP. DATE 06/29/09	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)
885										883.1 GROUND SURFACE	0.0
880	878.8	4.3	2	3	4	7	SS-1	M		RESIDUAL BRN., MED. STIFF TO V. STIFF, MOIST SANDY SILT (A-5)	
875	873.8	9.3	2	4	4	8		M			
870	868.8	14.3	4	4	7	11		M			
865	863.8	19.3	4	4	7	11		M			
860	858.8	24.3	3	4	7	11		M			
855	853.8	29.3	2	4	7	11		M			
850	848.8	34.3	4	4	7	11		M			
845	843.8	39.3	3	4	8	12	SS-2	M			
840	838.8	44.3	3	4	11	15		M		836.6 RESIDUAL WHITE WITH BLACK STREAKS, HARD, MOIST, SANDY SILT (A-2-4)	46.5
835	833.8	49.3	7	11	18	29	SS-3	M			
830	828.8	54.3	6	8	15	23		M			
825	823.8	59.3	5	5	12	17		M			
820	818.8	64.3	12	13	19	32		M		817.3 Boring Terminated at Elevation 817.3 ft WHITE/BLACK, HARD, MOIST, SANDY SILT (A-2-4)	65.8
815											
810											
805											

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. EB2BLTLN	STATION 248+54	OFFSET 23ft LT	ALIGNMENT L	0 HR. N/A
COLLAR ELEV. 883.1 ft	TOTAL DEPTH 74.9 ft	NORTHING N/A	EASTING N/A	24 HR. 25.0
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 06/30/09	COMP. DATE 06/30/09	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))
885										883.1 GROUND SURFACE 0.0
880	879.9	3.2								RESIDUAL RED/BRN., MED. STIFF TO STIFF, MOIST SANDY SILT (A-4)
875	874.9	8.2	3	4	4	8	SS-4	M		
870	869.9	13.2	3	4	4	8		M		
865	864.9	18.2	3	4	4	8		M		
860	859.9	23.2	2	2	4	6		M		
855	854.9	28.2	2	3	5	8		W		855.1 28.0
850	849.9	33.2	6	10	6	16	SS-5	M		RESIDUAL WHITE/TAN, STIFF TO V. STIFF, MOIST, SANDY SILT (A-5)
845	844.9	38.2	3	4	7	11		M		
840	839.9	43.2	2	3	8	11		M		840.1 43.0
835	834.9	48.2	3	7	9	16	SS-6	M		RESIDUAL WHITE W/ BLACK STREAKS, MED. DENSE, WET TO SAT., SILTY SAND (A-2-4)
830	829.9	53.2	5	7	8	15		M		830.1 53.0
825	824.9	58.2	3	7	7	14		M		RESIDUAL BRN., MED. STIFF TO STIFF, MOIST, V. MIC., SANDY SILT (A-4)
820	819.9	63.2	1	3	4	7	SS-7	M		
815	814.9	68.2	2	4	5	9		M		
810	809.9	73.2	3	5	6	11		M		813.1 70.0 WEATHERED ROCK SEVERLY WEATHERED CRYSTALLINE ROCK
805			11	35	65					808.2 74.9 Boring Terminated at Elevation 808.2 ft SEVERLY WEATHERED CRYSTALLINE ROCK

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. EB1ARTLN	STATION 247+40	OFFSET 20ft RT	ALIGNMENT L	0 HR. N/A
COLLAR ELEV. 883.9 ft	TOTAL DEPTH 55.3 ft	NORTHING N/A	EASTING N/A	24 HR. 16.0
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
START DATE 10/24/03	COMP. DATE 10/24/03	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)
885										883.9 GROUND SURFACE	0.0
880	879.5	4.4	3	4	4	8		M		RESIDUAL RED/BRN, STIFF, MOIST, SANDY CLAY (A-7)	
875	874.5	9.4	4	3	4	7		M		875.9 RESIDUAL GRAY/TAN, MED. STIFF TO HARD, MOIST SANDY SILT (A-5)	8.0
870	869.5	14.4	3	3	4	7		W			
865	864.5	19.4	2	4	5	9		M			
860	859.5	24.4	3	4	5	9		M			
855	854.5	29.4	2	3	6	9		M			
850	849.5	34.4	5	6	12	18		M			
845	844.5	39.4	15	20	28	48		M		840.9 WEATHERED ROCK SEV. WEATHERED CRYSTALLINE ROCK	43.0
840	839.5	44.4	24	52	48/.4	100/0.9					
835	834.5	49.4	25	25	75	100/1.0					
830	829.5	54.4	38	62/.4		100/0.9				828.6 Boring Terminated at Elevation 828.6 ft SEV. WEATHERED CRYSTALLINE ROCK	55.3
825											
820											
815											
810											
805											

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 16

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. EB1BRTLN	STATION 247+68	OFFSET 60ft RT	ALIGNMENT L	0 HR. N/A
COLLAR ELEV. 883.6 ft	TOTAL DEPTH 55.3 ft	NORTHING N/A	EASTING N/A	24 HR. 13.0
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
START DATE 10/23/03	COMP. DATE 10/23/03	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)
885										883.6 GROUND SURFACE	0.0
880	879.2	4.4	5	5	6	11	SS-145	M		RESIDUAL TAN/WHITE, MED. STIFF TO STIFF, MOIST, SANDY CLAY (A-7)	
875	874.2	9.4	3	3	3	6		M		870.6 RESIDUAL TAN, STIFF TO V. STIFF, MOIST, MIC., SANDY SILT (A-5)	13.0
870	869.2	14.4	4	5	7	12	SS-146	M			
865	864.2	19.4	2	4	7	11		M			
860	859.2	24.4	3	6	10	16		M		855.6 RESIDUAL GRAY/WHITE, V. STIFF, MOIST, SANDY SILT (A-4)	28.0
855	854.2	29.4	3	9	15	24	SS-147	M			
850	849.2	34.4	4	10	16	26		M			
845	844.2	39.4	5	8	13	21		M			
840	839.2	44.4	10	13	13	26		M			
835	834.2	49.4	4	7	13	20		M			
830	829.2	54.4	3	7	14	21		M		828.3 Boring Terminated at Elevation 828.3 ft TAN/WHITE, V. STIFF, MOIST, SANDY SILT (A-4)	55.3
825											
820											
815											
810											
805											

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. EB1CRTLN	STATION 247+55	OFFSET 40ft RT	ALIGNMENT L	0 HR. N/A
COLLAR ELEV. 882.9 ft	TOTAL DEPTH 71.0 ft	NORTHING N/A	EASTING N/A	24 HR. 25.0
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 07/21/09	COMP. DATE 07/21/09	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)
882.9										GROUND SURFACE	0.0
										RESIDUAL BRN., STIFF, MOIST, SANDY CLAY (A-7)	
	877.8	5.1	4	5	6	11		M			
	872.8	10.1	4	5	7	12		M			
	867.8	15.1	4	5	7	12		M		868.9	14.0
										RESIDUAL BRN., STIFF TO V. STIFF, MOIST, MIC., SANDY SILT (A-5)	
	862.8	20.1	2	4	7	11		M			
	857.8	25.1	2	7	7	14		M			
	852.8	30.1	2	4	9	13		M			
	847.8	35.1	4	7	8	15		M			
	842.8	40.1	6	8	9	17		M		838.9	44.0
										RESIDUAL GRAY/WHITE, V. STIFF TO HARD, MOIST, MIC., SANDY SILT (A-4)	
	837.8	45.1	10	12	14	26		M			
	832.8	50.1	10	16	20	36		M			
	827.8	55.1	10	14	17	31		M			
	822.8	60.1	10	13	18	31		M			
	817.8	65.1	9	11	12	23		M		813.6	69.3
	812.8	70.1	48	52/.4	100/0.9					811.9	71.0
										WEATHERED ROCK SEVERLY WEATHERED CRYSTALLINE ROCK	

Boring Terminated at Elevation 811.9 ft
SEVERLY WEATHERED CRYSTALLINE ROCK

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BORELOG REPORT

SHEET 17

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. B1ARTLN	STATION 248+07	OFFSET 22ft RT	ALIGNMENT L	0 HR. N/A
COLLAR ELEV. 884.2 ft	TOTAL DEPTH 66.3 ft	NORTHING N/A	EASTING N/A	24 HR. N/A
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 07/07/09	COMP. DATE 07/07/09	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)
884.2										GROUND SURFACE	0.0
										RESIDUAL BRN., MED. STIFF, MOIST, SANDY SILT (A-4)	
	879.4	4.8	2	2	3	5	SS-11	M			
	874.4	9.8	2	3	4	7		M			
	869.4	14.8	2	2	4	6		M			
	864.4	19.8	2	2	2	4		M			
	859.4	24.8	2	3	2	5		M			
	854.4	29.8	2	2	4	6		M			
	849.4	34.8	2	3	4	7		M			
	844.4	39.8	6	10	10	20	SS-12	M		846.2	38.0
										RESIDUAL WHITE, MED. DENSE, MOIST, SILTY SAND (A-2-4)	
	839.4	44.8	17	18	18	36	SS-13	M		841.2	43.0
										RESIDUAL RED/BRN., HARD, MOIST, SANDY SILT (A-4)	
	834.4	49.8	20	24	27	51		M			
	829.4	54.8	15	16	23	39		M		826.2	58.0
										RESIDUAL WHITE, DENSE TO V. DENSE, MOIST, SILTY SAND (A-2-4)	
	824.4	59.8	15	17	23	40		M			
	819.4	64.8	5	30	47	77		M		817.9	66.3

Boring Terminated at Elevation 817.9 ft
WHITE, V. DENSE, MOIST, SILTY SAND (A-2-4)

NCDOT BORE SINGLE R2707B_GEO_BH_Y7.GPJ NC_DOT.GDT 08/17/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. B1BRTLN	STATION 248+37	OFFSET 63ft RT	ALIGNMENT L	0 HR. N/A
COLLAR ELEV. 882.7 ft	TOTAL DEPTH 86.5 ft	NORTHING N/A	EASTING N/A	24 HR. 26.0
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 07/08/09	COMP. DATE 07/08/09	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)
885											
										882.7 GROUND SURFACE	0.0
880										RESIDUAL BRN., MED. STIFF TO V. STIFF, MOIST, SANDY SILT (A5)	
	877.7	5.0	2	2	3	5		M			
875											
	872.7	10.0	1	2	2	4		M			
870											
	867.7	15.0	2	3	3	6		M			
865											
	862.7	20.0	2	3	3	6		M			
860											
	857.7	25.0	2	3	4	7		M			
855											
	852.7	30.0	1	3	7	10	SS-14	M			
850											
	847.7	35.0	2	3	7	10		M			
845											
	842.7	40.0	2	3	7	10		M			
840											
	837.7	45.0	2	3	7	10		M			
835											
	832.7	50.0	2	3	7	10		M			
830											
	827.7	55.0	2	3	7	10		M			
825											
	822.7	60.0	1	4	4	8		M			
820											
	817.7	65.0	4	5	8	13		M			
815											
	812.7	70.0	6	6	8	14		M			
810											
	807.7	75.0	7	7	9	16		M			
805										805.2	77.5

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 18

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. B1BRTLN	STATION 248+37	OFFSET 63ft RT	ALIGNMENT L	0 HR. N/A
COLLAR ELEV. 882.7 ft	TOTAL DEPTH 86.5 ft	NORTHING N/A	EASTING N/A	24 HR. 26.0
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic
START DATE 07/08/09	COMP. DATE 07/08/09	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)
805						Match Line					
	802.2	80.5	100/.4			100/0.4				WEATHERED ROCK SEVERLY WEATHERED CRYSTALLINE ROCK *(continued)*	
800										800.0	82.7
	797.7	85.0	11	16	23	39		M		RESIDUAL WHITE, DENSE, MOIST,SILTY SAND (A-2-4)	
										796.2	86.5
795										Boring Terminated at Elevation 796.2 ft WHITE, DENSE, MOIST,SILTY SAND (A-2-4)	
790											
785											
780											
775											
770											
765											
760											
755											
750											
745											
740											
735											
730											
725											

NCDOT BORE SINGLE R2707B_GEO_BH_Y7.GPJ NC_DOT.GDT 08/17/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. EB2ARTLN	STATION 249+00	OFFSET 22ft RT	ALIGNMENT L	0 HR. N/A
COLLAR ELEV. 884.0 ft	TOTAL DEPTH 76.0 ft	NORTHING N/A	EASTING N/A	24 HR. 32.0
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
START DATE 10/22/03	COMP. DATE 10/22/03	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)
885											
										884.0 GROUND SURFACE	0.0
										RESIDUAL BRN/TAN, MED. STIFF TO STIFF, MOIST, SLI. MIC., SANDY SILT(A-5)	
880	879.5	4.5	4	4	6	10	SS-194	M			
875	874.5	9.5	4	3	4	7		M			
870	869.5	14.5	2	2	4	6		M			
865	864.5	19.5	3	3	4	7		M			
860	859.5	24.5	2	3	4	7		M			
855	854.5	29.5	2	3	4	7		M			
850	849.5	34.5	3	4	6	10		M			
										847.0	37.0
										RESIDUAL GRAY/BRN., MED. DENSE, MOIST, MIC., SILTY SAND (A-2-4)	
845	844.5	39.5	4	6	10	16	SS-195	M			
840	839.5	44.5	4	7	12	19		M			
835	834.5	49.5	3	5	8	13		M			
										832.0	52.0
										RESIDUAL TAN/WHITE, STIFF TO HARD, MOIST, SANDY CLAY (A-7)	
830	829.5	54.5	3	5	5	10	SS-196	M			
825	824.5	59.5	11	12	17	29		M			
820	819.5	64.5	11	12	16	28		M			
815	814.5	69.5	10	12	15	27		M			
810	809.5	74.5	11	12	17	29		M			
										808.0	76.0
										Boring Terminated at Elevation 808.0 ft BRN., HARD, MOIST, SANDY CLAY	
805											

NCDOT BORE SINGLE R2707B_GEO_BH_Y7.GPJ NC_DOT.GDT 08/17/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

SHEET 19

PROJECT NO. 34497.1.2	ID. R2707b	COUNTY Cleveland	GEOLOGIST Todd, R. W.
SITE DESCRIPTION SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH ROAD).			GROUND WTR (ft)
BORING NO. EB2BRTLN	STATION 249+30	OFFSET 55ft RT	ALIGNMENT L	0 HR. N/A
COLLAR ELEV. 883.1 ft	TOTAL DEPTH 35.6 ft	NORTHING N/A	EASTING N/A	24 HR. N/A
DRILL MACHINE CME-550X	DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
START DATE 10/23/03	COMP. DATE 10/23/03	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)
885											
										883.1 GROUND SURFACE	0.0
										RESIDUAL RED/BRN., V. STIFF TO HARD, MOIST, SANDY CLAY (A-6)	
880	879.0	4.1	10	10	11	21	SS-197	M			
875	874.0	9.1	10	17	26	43		M			
870	869.0	14.1	8	14	14	28		M			
										866.1	17.0
										RESIDUAL TAN, V. STIFF, MOIST, SANDY SILT (A-4) WITH QUARTZ PIECES	
865	864.0	19.1	7	11	15	26	SS-198	M			
860	859.0	24.1	11	12	13	25		M			
855	854.0	29.1	11	13	14	27		M			
850	849.0	34.1	11	13	13	26		M			
										847.5	35.6
										Boring Terminated at Elevation 847.5 ft TAN, V. STIFF, MOIST, SANDY SILT (A-4) WITH QUARTZ PIECES	
845											
840											
835											
830											
825											
820											
815											
810											
805											

NCDOT BORE SINGLE R2707B_GEO_BH_Y7.GPJ NC_DOT.GDT 08/17/09

PROJ. NO. - 34497.1.3
ID NO. - R-2707B
COUNTY - CLEVELAND
SHELBY BYPASS OVER -Y7- (WASHBURN SWITCH RD.)

SHEET OF

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C.SAND	F.SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-1	LT LN	EB2A	4.3-5.8	A-5(3)	47	6	23.0	32.3	32.6	12.1	98	83	52	-	-
SS-2	LT LN	EB2A	39.3-40.8	A-5(2)	43	4	17.0	40.2	34.8	8.1	97	88	53	-	-
SS-3	LT LN	EB2A	49.3-50.8	A-4(0)	27	3	41.0	25.0	23.9	10.1	98	71	37	-	-
SS-4	LT LN	EB2B	3.2-4.7	A-4(3)	39	7	23.2	30.9	29.8	16.1	100	86	54	-	-
SS-5	LT LN	EB2B	28.2-29.7	A-5(0)	46	6	37.9	31.7	22.3	8.1	96	70	36	-	-
SS-6	LT LN	EB2B	43.2-44.7	A-2-4(0)	38	3	37.5	32.7	21.7	8.1	95	70	34	-	-
SS-7	LT LN	EB2B	58.2-59.7	A-5(0)	54	6	12.3	57.5	22.1	8.1	100	96	39	-	-
SS-8	LT LN	B1-A	5.0-6.5	A-5(4)	45	9	12.5	41.2	26.1	20.2	100	95	55	-	-
SS-9	LT LN	B1-A	20.0-21.5	A-4(0)	40	6	30.9	35.7	23.3	10.1	98	79	40	-	-
SS-10	LT LN	B1-A	40.0-41.5	A-2-4(0)	36	3	50.9	23.0	18.1	8.1	93	55	28	-	-
SS-11	RT LN	B1-A	4.8-6.3	A-4(0)	37	NP	32.5	38.5	22.9	6.1	99	78	37	-	-
SS-12	RT LN	B1-A	39.8-41.3	A-2-4(0)	25	NP	33.1	39.6	23.3	4.0	100	84	32	-	-
SS-13	RT LN	B1-A	44.8-46.3	A-4(1)	31	5	15.1	35.7	39.1	10.1	88	80	52	-	-
SS-14	RT LN	B1-B	30.0-31.5	A-5(2)	50	5	13.7	47.6	30.6	8.1	98	91	51	-	-
SS-21	LT LN	EB1B	60.1-61.6	A-4(0)	29	6	20.7	39.3	25.8	14.2	98	89	46		
SS-145	60' RT	247+68	4.4-5.9	A-7-6(4)	41	12	28.2	24.5	21.1	26.2	97	81	51	-	-
SS-146	60' RT	247+68	14.4-15.9	A-5(3)	45	9	21.8	32.2	23.8	22.2	95	85	52	-	-
SS-147	60' RT	247+68	29.4-30.9	A-4(0)	32	NP	29.5	40.2	18.1	12.1	100	85	39	-	-
SS-194	22.00 RT	248+90	4.5-6.0	A-5(0)	50	NP	19.7	41.9	30.3	8.1	99	88	49	-	-
SS-195	22.00 RT	248+90	39.5-41.0	A-2-4(0)	35	NP	35.2	37.9	20.8	6.0	98	76	34	-	-
SS-196	22.00 RT	248+90	54.5-56.0	A-7-5(13)	62	19	7.0	38.7	36.2	18.1	100	98	64	-	-
SS-197	55.00 RT	249+20	4.1-5.6	A-6(4)	39	14	22.4	36.1	33.5	8.1	97	84	49	-	-
SS-198	55.00 RT	249+20	19.1-20.6	A-4(2)	37	9	20.5	42.7	28.7	8.1	97	87	47	-	-
SS-199	60.00 LT	246+81	4.1-5.6	A-7-5(9)	53	21	33.6	17.3	22.9	26.2	100	75	53	-	-
SS-200	60.00 LT	246+81	9.1-10.6	A-7-5(6)	53	17	26.2	32.2	27.5	14.1	100	84	50	-	-
SS-201	60.00 LT	246+81	19.1-20.6	A-5(0)	42	6	38.9	28.8	24.3	8.1	98	68	38	-	-
SS-201A	60.00 LT	246+81	29.1-30.6	A-4(0)	38	4	39.3	30.0	20.6	10.1	99	72	37	-	-
SS-202	21.00 LT	247+10	9.1-10.6	A-7-5(3)	46	15	43.3	17.7	24.9	14.1	99	65	41	-	-
SS-203	21.00 LT	247+10	44.1-45.6	A-5(0)	42	NP	15.9	45.5	30.5	8.1	100	92	51	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-
			0.0-0.0				0.0	0.0	0.0	0.0		0	0	-	-