

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	33790.1.1 (B-4592)	1	12

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33790.1.1 (B-4592) F.A. PROJ. BRZ-1561(5)
COUNTY ORANGE
PROJECT DESCRIPTION BRIDGE NO. 64 OVER THE ENO RIVER
ON SR 1561 (LAWRENCE RD.) AT -L- STA. 23+85.0

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CAUTION NOTICE

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

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

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

PERSONNEL

N.D. MOHS

H.R. CONLEY

D.W. DIXON

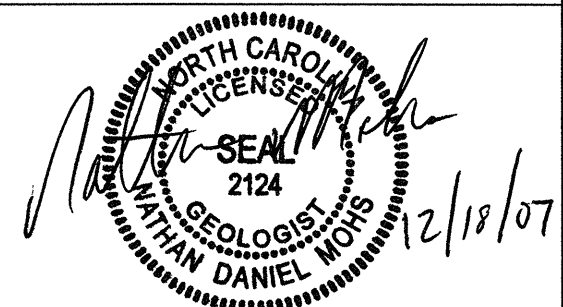
M.L. REEDER

INVESTIGATED BY N.D. MOHS

CHECKED BY K.B. MILLER

SUBMITTED BY N.T. ROBERSON

DATE DECEMBER 2007



PROJECT: 33790.1.1 ID: B-4592

DRAWN BY: N.D. MOHS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.





NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

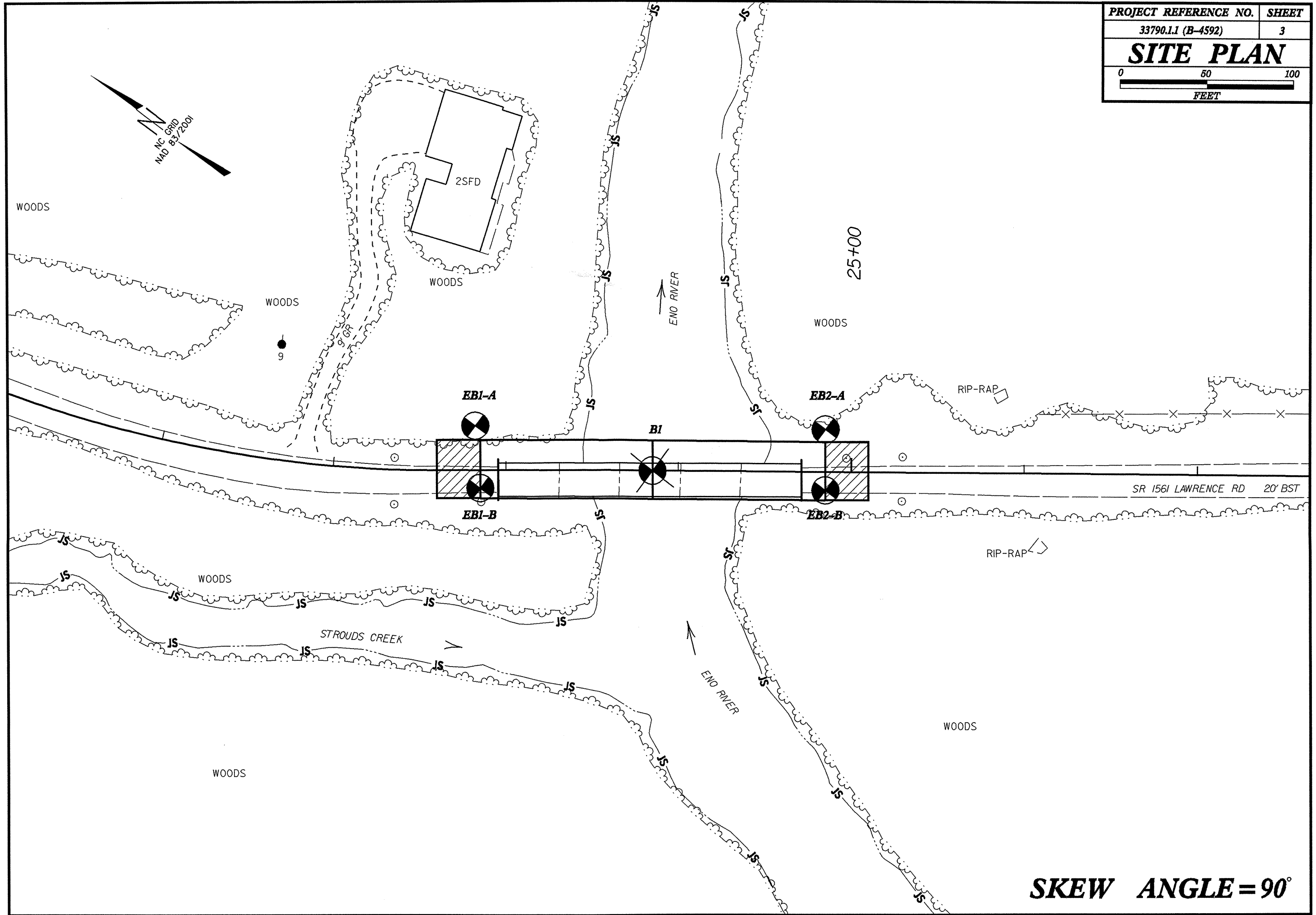
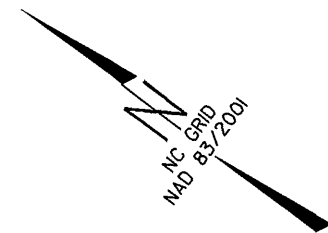
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO. 33790.IJ (B-4592)	SHEET NO. 2
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SUBSURFACE INVESTIGATION

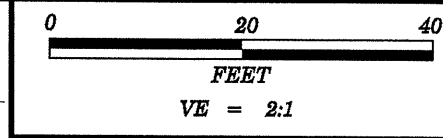
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
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 (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: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGH PLASTIC, A-7-6</i>	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) POORLY GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR , SUBANGULAR , SUBROUNDED , OR ROUNDED .	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 YIELD 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.	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 (IN 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.
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION	WEATHERING	
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SL.) - 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 (SL.) - 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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> 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. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF</i> 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. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i> COMPLETE - ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIXES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	
COMPRESSIONIBILITY	PERCENTAGE OF MATERIAL	GROUND WATER	
SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE	GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP	
MISCELLANEOUS SYMBOLS	ABBREVIATIONS	ROCK HARDNESS	
ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD	SPT DPT OMT VST TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL	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 PIECES 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 FINGER NAIL.	
CONSISTENCY OR DENSENESS	EQUIPMENT USED ON SUBJECT PROJECT	FRACTURE SPACING	
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)	DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 6" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING w/ ADVANCER TRICONE STEEL TEETH TRICONE TUNG-CARB. CORE BIT HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B NX-H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST	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	
TEXTURE OR GRAIN SIZE	SOIL MOISTURE - CORRELATION OF TERMS	BEDDING	
U.S. STD. SIEVE SIZE (OPENING (MM)) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053	SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL - LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PL - PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE OM - OPTIMUM MOISTURE SHRINKAGE LIMIT - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	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	
PLASTICITY	INDURATION	TERMS AND DEFINITIONS	
NONPLASTIC 0-5 VERY LOW MED. PLASTICITY 6-15 SLIGHT HIGH PLASTICITY 16-25 MEDIUM 26 OR MORE HIGH	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.	BENCH MARK: BM#-RR SPIKE IN BASE OF 15' OAK TREE AT -L- STA. 25+47.36, 365.95' LT ELEVATION: 477.34 FT.	
COLOR		NOTES:	
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.			

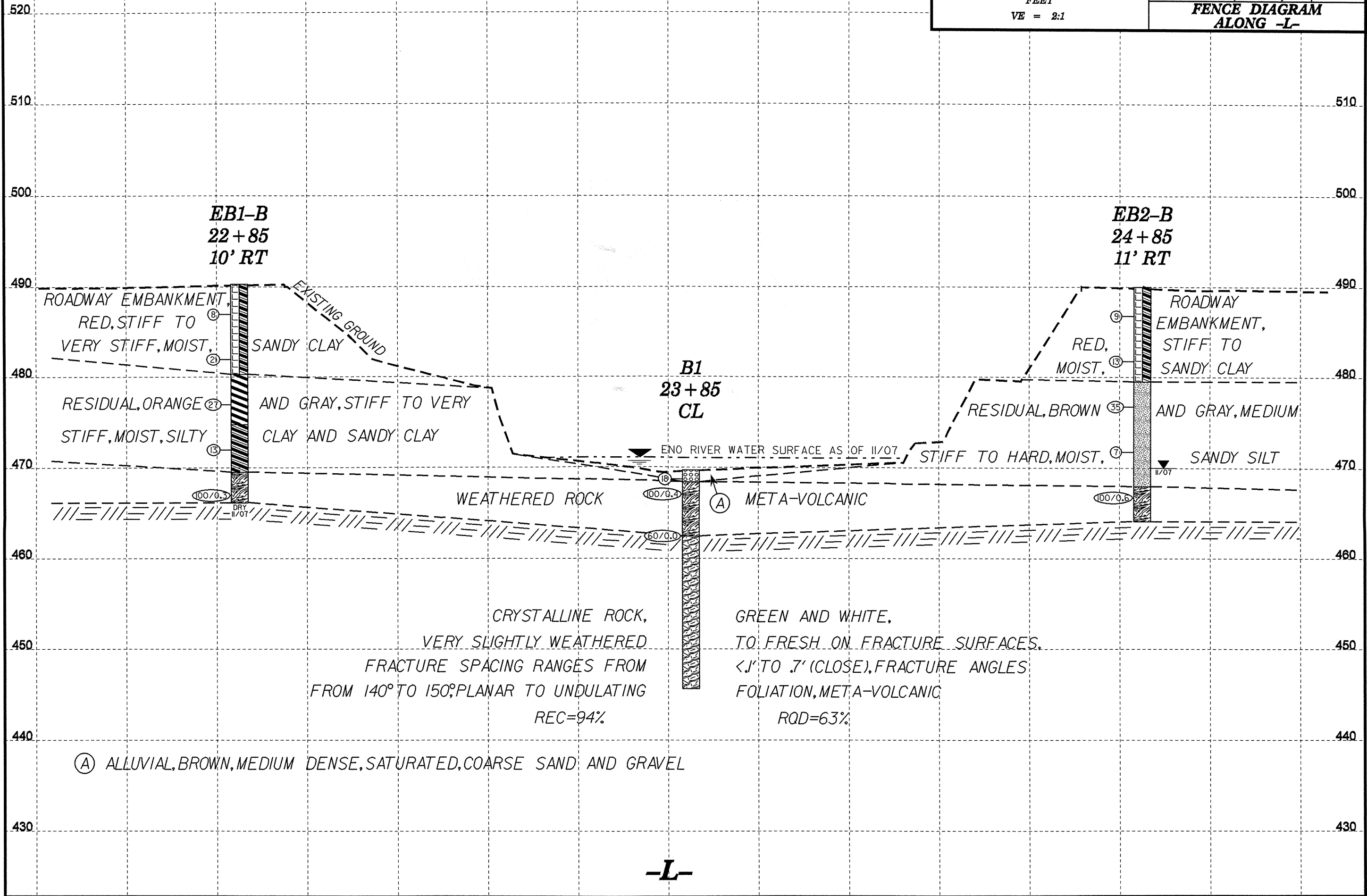


SKEW ANGLE = 90°

GROUNDLINE PROFILE AT CENTERLINE TAKEN FROM ROADWAY DESIGN PLANS AS OF 9/14/2007



PROJECT REFERENCE NO.	SHEET
33790.1.1 (B-4592)	4
FENCE DIAGRAM ALONG -L-	



EB1-B
22+85
10' RT

EB2-B
24+85
11' RT

B1
23+85
CL

ROADWAY EMBANKMENT,
RED, STIFF TO
VERY STIFF, MOIST,

EXISTING GROUND
SANDY CLAY

ROADWAY EMBANKMENT,
STIFF TO
SANDY CLAY

RESIDUAL, ORANGE
STIFF, MOIST, SILTY

AND GRAY, STIFF TO VERY
CLAY AND SANDY CLAY

RESIDUAL, BROWN
STIFF TO HARD, MOIST,

AND GRAY, MEDIUM
SANDY SILT

ENO RIVER WATER SURFACE AS OF 11/07

WEATHERED ROCK

(A) META-VOLCANIC

CRYSTALLINE ROCK,
VERY SLIGHTLY WEATHERED
FRACTURE SPACING RANGES FROM
FROM 140° TO 150°, PLANAR TO UNDULATING
REC=94%

GREEN AND WHITE,
TO FRESH ON FRACTURE SURFACES.
<.1' TO .7' (CLOSE), FRACTURE ANGLES
FOLIATION, META-VOLCANIC
RQD=63%

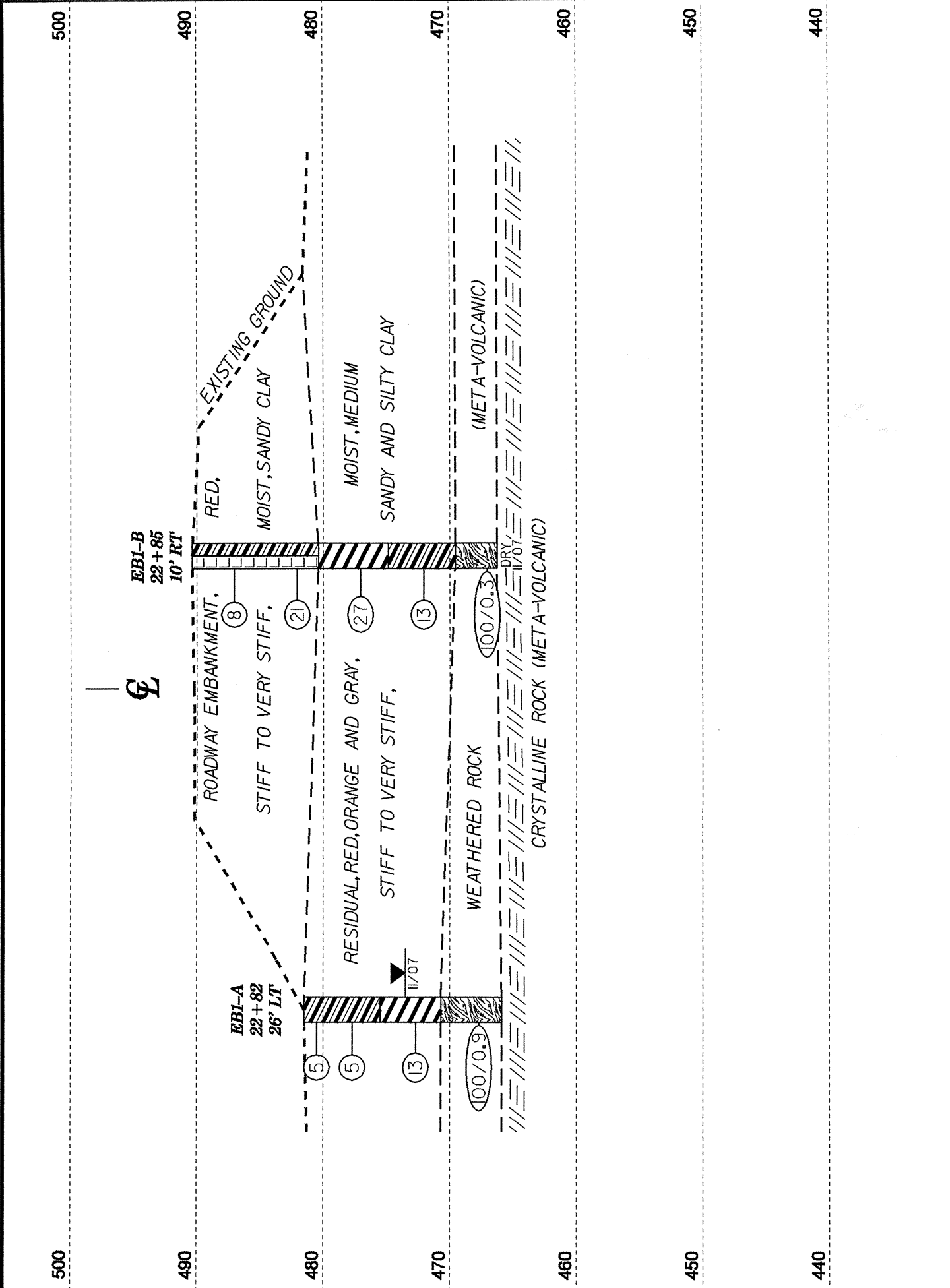
(A) ALLUVIAL, BROWN, MEDIUM DENSE, SATURATED, COARSE SAND AND GRAVEL

-L-

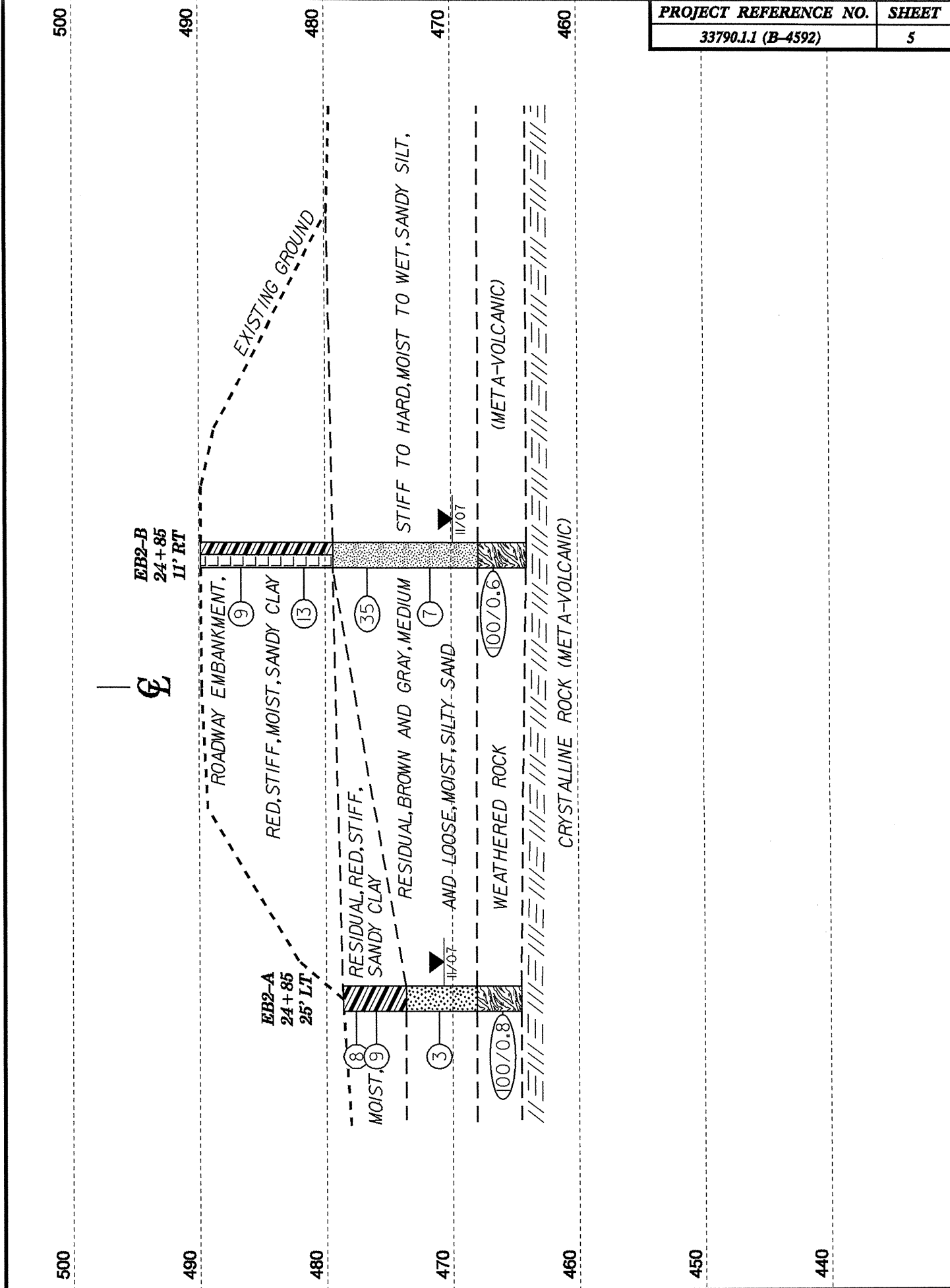
23+00

24+00

25+00



EBI CROSS SECTION



EB2 CROSS SECTION



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 33790.1.1	ID. B-4592	COUNTY ORANGE	GEOLOGIST Mohs, N. D.
SITE DESCRIPTION BRIDGE NO. 64 OVER THE ENO RIVER ON SR 1561 (LAWRENCE RD.)			GROUND WTR (ft)
BORING NO. EB1-A	STATION 22+82	OFFSET 26ft LT	ALIGNMENT -L-
COLLAR ELEV. 481.4 ft	TOTAL DEPTH 15.6 ft	NORTHING 849,996	EASTING 1,981,814
DRILL MACHINE CME-550	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 11/28/07	COMP. DATE 11/28/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 15.6 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
485															
481.4		0.0												481.4	GROUND SURFACE
480			1	2	3							SS-8	M		RESIDUAL RED AND GRAY, SANDY CLAY
478.6		2.8	1	2	3								M		
475														475.4	GRAY, SILTY CLAY
473.6		7.8	6	6	7							SS-9	M		
470														470.6	WEATHERED ROCK META-VOLCANIC
468.6		12.8	33	67/0.4										465.8	Boring Terminated BY AUGER REFUSAL at Elevation 465.8 ft ON CRYSTALLINE ROCK (META-VOLCANIC)
465															
460															
455															
450															
445															
440															
435															
430															
425															
420															
415															
410															
405															

PROJECT NO. 33790.1.1	ID. B-4592	COUNTY ORANGE	GEOLOGIST Mohs, N. D.
SITE DESCRIPTION BRIDGE NO. 64 OVER THE ENO RIVER ON SR 1561 (LAWRENCE RD.)			GROUND WTR (ft)
BORING NO. EB1-B	STATION 22+85	OFFSET 10ft RT	ALIGNMENT -L-
COLLAR ELEV. 490.3 ft	TOTAL DEPTH 24.1 ft	NORTHING 849,972	EASTING 1,981,787
DRILL MACHINE CME-550	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 11/27/07	COMP. DATE 11/27/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 24.1 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
495															
490														490.3	GROUND SURFACE
488.0		2.3	4	4	4								M		ROADWAY EMBANKMENT RED, SANDY CLAY
485														475.4	GRAY, SILTY CLAY
483.0		7.3	8	10	11									470.6	WEATHERED ROCK META-VOLCANIC
480														478.0	RESIDUAL ORANGE AND GRAY, SILTY CLAY
475												SS-6	M	474.8	GRAY, SANDY CLAY
473.0		17.3	3	6	7							SS-7	M	469.5	WEATHERED ROCK META-VOLCANIC
470														466.2	Boring Terminated BY AUGER REFUSAL at Elevation 466.2 ft ON CRYSTALLINE ROCK (META-VOLCANIC)
468.0		22.3													
465															
460															
455															
450															
445															
440															
435															
430															
425															
420															
415															

NCDOT BORE DOUBLE B4592_GEO_BH.GPJ NC DOT.GDT 12/19/07

PROJECT NO. 33790.1.1		ID. B-4592		COUNTY ORANGE		GEOLOGIST Mohs, N. D.										
SITE DESCRIPTION BRIDGE NO. 64 OVER THE ENO RIVER ON SR 1561 (LAWRENCE RD.)						GROUND WTR (ft)										
BORING NO. B1		STATION 23+85		OFFSET CL		ALIGNMENT -L-										
COLLAR ELEV. 469.7 ft		TOTAL DEPTH 24.0 ft		NORTHING 849,898		EASTING 1,981,856										
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ Core				HAMMER TYPE Automatic										
START DATE 11/29/07		COMP. DATE 11/29/07		SURFACE WATER DEPTH 1.2ft		DEPTH TO ROCK 7.2 ft										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
	469.7	0.0														469.7
	467.5	2.2	3	6	12											468.4
465		7.2	100/0.4													462.5
460		7.2	60/0.0													462.5
455																455.7
450																450.7
445																445.7
440																445.7
435																445.7
430																445.7
425																445.7
420																445.7
415																445.7
410																445.7
405																445.7
400																445.7
395																445.7
390																445.7

PROJECT NO. 33790.1.1		ID. B-4592		COUNTY ORANGE		GEOLOGIST Mohs, N. D.					
SITE DESCRIPTION BRIDGE NO. 64 OVER THE ENO RIVER ON SR 1561 (LAWRENCE RD.)						GROUND WTR (ft)					
BORING NO. B1		STATION 23+85		OFFSET CL		ALIGNMENT -L-					
COLLAR ELEV. 469.7 ft		TOTAL DEPTH 24.0 ft		NORTHING 849,898		EASTING 1,981,856					
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ Core				HAMMER TYPE Automatic					
START DATE 11/29/07		COMP. DATE 11/29/07		SURFACE WATER DEPTH 1.2ft		DEPTH TO ROCK 7.2 ft					
CORE SIZE NX-WL			TOTAL RUN 16.8 ft			DRILLER Conley, H. R.					
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	ROD (%)	REC. (%)	RQD (%)			
	462.5	7.2	1.8	1:29/1.0	(1.6)	(1.8)					
460	460.7	9.0	5.0	N=60/0.0 1:10/0.8 1:10/1.0 1:42/1.0 1:00/1.0 1:45/1.0 2:30/1.0	(1.8)	(1.9)	RS-3	(15.8)	(10.5)	462.5	
455	455.7	14.0	5.0	:48/1.0 :48/1.0 :50/1.0 :52/1.0 :59/1.0	(4.2)	(1.9)	RS-1	94%	63%	7.2	
450	450.7	19.0	5.0	1:00/1.0 1:00/1.0 :47/1.0 1:00/1.0	(5.0)	(3.2)					
445	445.7	24.0		1:00/1.0 1:02/1.0	(5.0)	(3.6)	RS-2				
440											
435											
430											
425											
420											
415											
410											
405											
400											
395											
390											
385											

NCDOT BORE DOUBLE B4592_GEO_BH.GPJ NC_DOT.GDT 12/19/07

Boring Terminated at Elevation 445.7 ft IN CRYSTALLINE ROCK (META-VOLCANIC)

Boring Terminated at Elevation 445.7 ft IN CRYSTALLINE ROCK (META-VOLCANIC)

Begin Coring @ 7.2 ft
CRYSTALLINE ROCK
GREEN AND WHITE, HARD, VERY SLIGHTLY WEATHERED TO FRESH ON FRACTURE SURFACES, FRACTURE SPACING RANGES FROM <.1' TO .7' (CLOSE), FRACTURE ANGLES FROM 140 TO 150, PLANAR TO UNDULATING FOLIATION, META-VOLCANIC
REC=94% RQD=63%



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

PROJECT NO. 33790.1.1	ID. B-4592	COUNTY ORANGE	GEOLOGIST Mohs, N. D.
SITE DESCRIPTION BRIDGE NO. 64 OVER THE ENO RIVER ON SR 1561 (LAWRENCE RD.)			GROUND WTR (ft)
BORING NO. EB2-A	STATION 24+85	OFFSET 25ft LT	ALIGNMENT -L-
COLLAR ELEV. 478.8 ft	TOTAL DEPTH 14.1 ft	NORTHING 849,833	EASTING 1,981,935
DRILL MACHINE CME-550	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 11/26/07	COMP. DATE 11/26/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 14.1 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75					
480	478.8	0.0											GROUND SURFACE	0.0
475	477.2	1.6	2	3	5						SS-4	M	RESIDUAL RED, SANDY CLAY	
470	472.2	6.6	3	2	1						SS-5	M	BROWN, SILTY SAND	5.0
465	467.2	11.6	34	48	52/0.3								WEATHERED ROCK META-VOLCANIC	10.6
460													Boring Terminated BY AUGER REFUSAL at Elevation 464.7 ft ON CRYSTALLINE ROCK (META-VOLCANIC)	14.1

PROJECT NO. 33790.1.1	ID. B-4592	COUNTY ORANGE	GEOLOGIST Mohs, N. D.
SITE DESCRIPTION BRIDGE NO. 64 OVER THE ENO RIVER ON SR 1561 (LAWRENCE RD.)			GROUND WTR (ft)
BORING NO. EB2-B	STATION 24+85	OFFSET 11ft RT	ALIGNMENT -L-
COLLAR ELEV. 490.0 ft	TOTAL DEPTH 25.8 ft	NORTHING 849,812	EASTING 1,981,907
DRILL MACHINE CME-550	DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
START DATE 11/26/07	COMP. DATE 11/26/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 25.8 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75					
490													GROUND SURFACE	0.0
485	487.8	2.2	5	4	5						SS-1	M	ROADWAY EMBANKMENT RED, SANDY CLAY	
480	482.8	7.2	3	6	7									
475	477.8	12.2	7	25	10						SS-2	M	RESIDUAL BROWN AND GRAY, SANDY SILT	10.5
470	472.8	17.2	4	5	2						SS-3	M		
465	467.8	22.2	63	37/0.1									WEATHERED ROCK META-VOLCANIC	22.0
460													Boring Terminated BY AUGER REFUSAL at Elevation 464.2 ft ON CRYSTALLINE ROCK (META-VOLCANIC)	25.8

NCDOT BORE DOUBLE B4592_GEO_BH.GPJ NC DOT.GDT 12/19/07

EB1-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-8	26' LT	22+82	0.0-1.5	A-6(12)	38	18	10.3	17.8	35.4	36.5	97	91	74	-	-
SS-9	26' LT	22+82	7.8-9.3	A-7-6(17)	44	21	6.1	13.6	39.8	40.5	94	90	80	-	-

EB1-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-6	10' RT	22+85	12.3-13.8	A-7-6(16)	42	16	1.8	14.8	36.8	46.6	100	99	88	-	-
SS-7	10' RT	22+85	17.3-18.8	A-6(10)	34	14	6.3	20.3	41.0	32.4	98	95	78	-	-

B1

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-10	CL	23+85	0.0-1.3	A-1-a(0)	22	3	56.7	21.3	13.9	8.1	44	24	11	-	-

EB2-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-4	25' LT	24+85	0.0-1.5	A-6(11)	35	14	5.9	12.6	32.9	48.6	99	96	84	-	-
SS-5	25' LT	24+85	6.6-8.1	A-2-4(0)	22	5	48.6	19.3	15.9	16.2	95	65	33	-	-

EB2-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	11' RT	24+85	2.2-3.7	A-6(13)	39	17	9.3	12.0	28.1	50.7	96	90	78	-	-
SS-2	11' RT	24+85	12.2-13.7	A-4(3)	27	7	9.3	24.9	39.4	26.3	100	96	71	-	-
SS-3	11' RT	24+85	17.2-18.7	A-4(0)	21	6	44.2	21.1	18.5	16.2	99	75	37	-	-



**FIELD
 SCOUR REPORT**

WBS: 33790.1.1 TIP: B-4592 COUNTY: Orange

DESCRIPTION(1): Bridge No. 64 over the Eno River on SR 1561 (Lawrence Rd.) at -L- Sta. 23+85

EXISTING BRIDGE

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

Bridge No.: 64 Length: 175' Total Bents: 6 Bents in Channel: 4 Bents in Floodplain: 2
 Foundation Type: _____

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Sloughing on end bent slopes, approximately 15'X20', not affecting end bents.

Interior Bents: None

Channel Bed: None

Channel Bank: Steep banks have been eroded during high water.

EXISTING SCOUR PROTECTION

Type(3): None

Extent(4): N/A

Effectiveness(5): N/A

Obstructions(6): Numerous limbs against interior bents.

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 theoretical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

DESIGN INFORMATION

Channel Bed Material(7): Coarse sand, clay, and boulders.

Channel Bank Material(8): Residual, silty clay.

Channel Bank Cover(9): Grass and trees.

Floodplain Width(10): Approximately 300'

Floodplain Cover(11): Grass, trees, shrubs.

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tendency(13): South, toward EB2.

Observations and Other Comments: Extensive boulders exposed in river bed due to shallow water.

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

BENTS

	B1	B2	B3	B4						
465.0										

Comparison of DSE to Hydraulics Unit theoretical scour:

Based on the geological conditions at the site, the Geotechnical Engineering Unit and Hydraulics Unit agree that the DSE should be raised from the theoretical scour elevation proposed in the Hydraulics report dated 3/7/07.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

	Bank	Bed				
Sample No.	SS-6	SS-10				
Retained #4		4				
Passed #10	100	44				
Passed #40	99	24				
Passed #200	88	11				
Coarse Sand	1.8	56.7				
Fine Sand	14.8	21.3				
Silt	36.8	13.9				
Clay	46.6	8.1				
LL	42	22				
PI	16	3				
AASHTO	A-7-6(16)	A-1-a(0)				
Station	22+85	23+85				
Offset	10.3' RT	CL				
Depth	12.3'-13.8'	0.0'-1.3'				

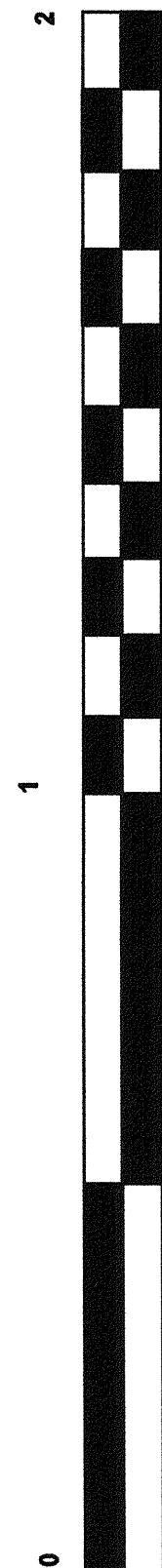
Reported by: Nathan Michs

Date: 11/27/2007

CORE PHOTOGRAPHS

B1

BOXES 1 & 2: 7.2 - 24.0 FEET



FEET



SITE PHOTO

BRIDGE NO. 64 OVER THE ENO RIVER ON SR 1561 (LAWRENCE RD.) AT -L- STA. 23+85



LOOKING NORTH