

STATE	STATE PROJECT REFERENCE NO.	SHEET	TOTAL
N.C.	38474.1.1 (B-4697)	1	19

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 38474.1.1 (B-4697) F.A. PROJ. BRZ-1600(9)
COUNTY WAKE
PROJECT DESCRIPTION BRIDGE NO. 55 ON -L- (SR 1600)
OVER WHITE OAK CREEK AT STATION 24+00

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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 1909 ZENO-4008. 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.

PROJECT: 38474.1.1 ID: B-4697

PERSONNEL

J. L. PEDRO

C. D. CZAJKA

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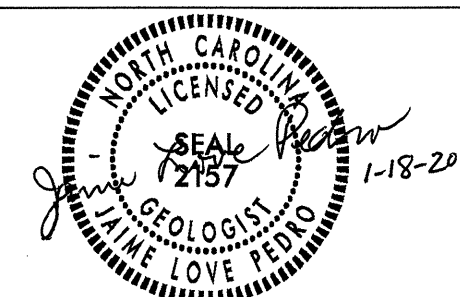
J. R. MATULA

INVESTIGATED BY J. L. PEDRO

CHECKED BY N. T. ROBERSON

SUBMITTED BY J. L. PEDRO

DATE JANUARY 2011



DRAWN BY: J. L. PEDRO

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.

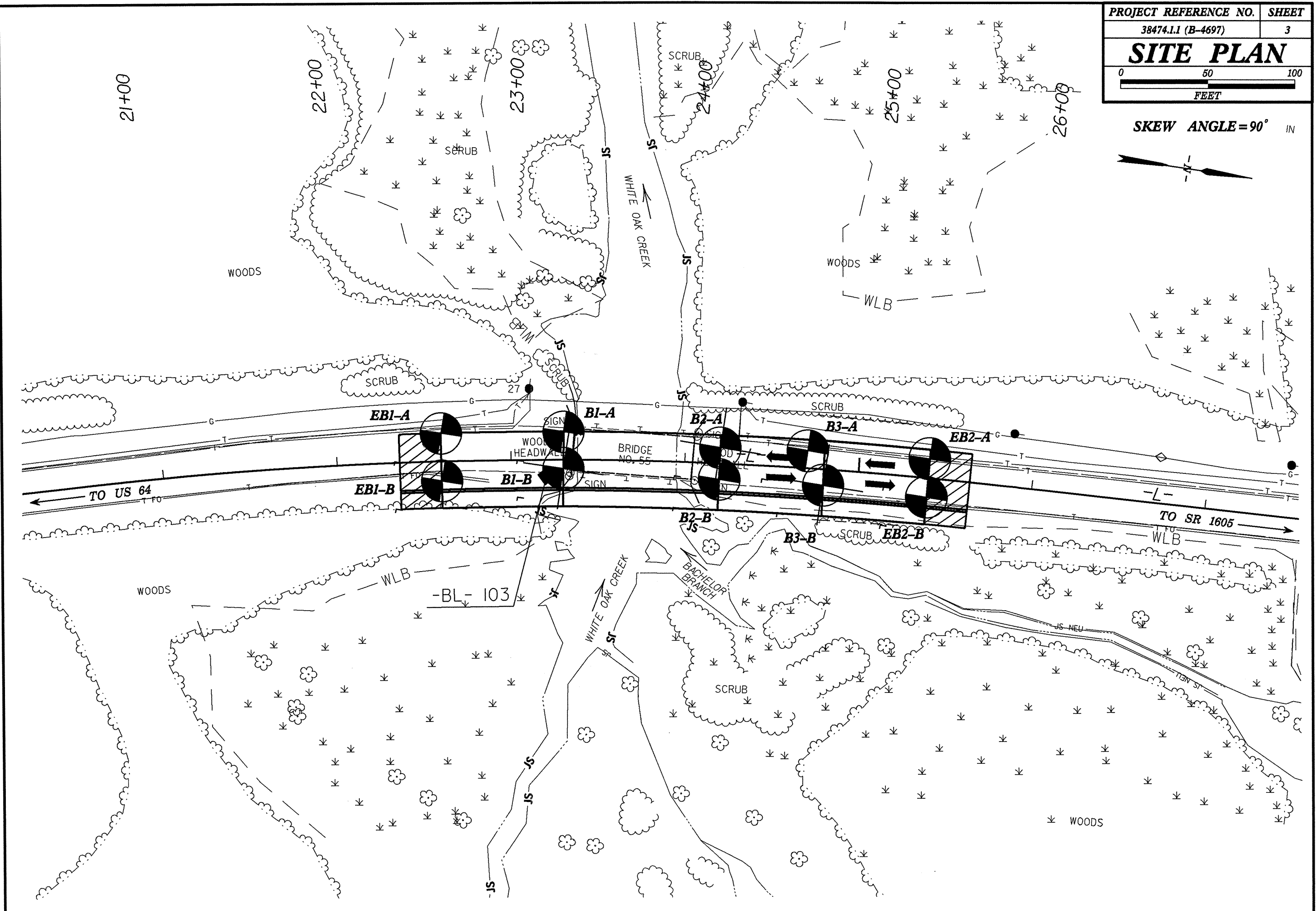
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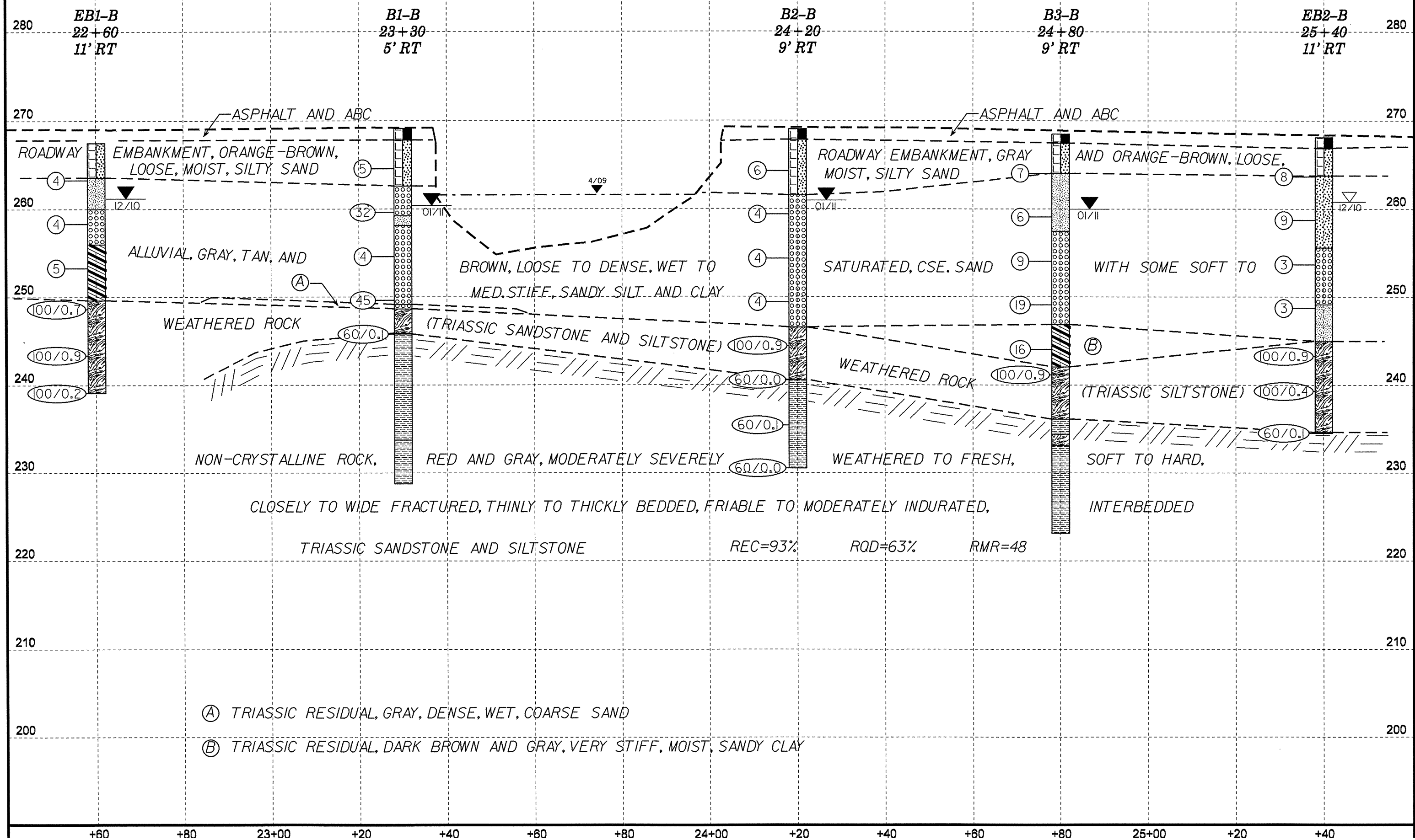
SUBSURFACE INVESTIGATION

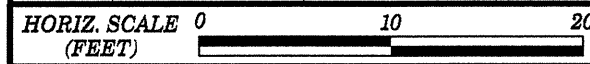
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

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 (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, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	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. 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 60 BLOWS PER FOOT 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. FLOD - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED 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 (ROD) - 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 60 BLOWS PER FOOT. 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 (SROD) - 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 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-4, A-5 A-6, A-7 SYMBOL [Symbol Grid] % PASSING [Table] LIQUID LIMIT PLASTIC INDEX [Table] GROUP INDEX [Table] USUAL TYPES OF MAJOR MATERIALS [Table] GEN. RATING AS A SUBGRADE [Table]	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 SILT - CLAY 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	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.	CONSISTENCY OR DENSENESS PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/F ²) GENERALLY GRANULAR MATERIAL (NON-COHESSIVE) 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 OPENING (MM) 4 10 40 60 200 270 4.75 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 SIZE IN. 12 3	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 DIP & DIP DIRECTION OF ROCK STRUCTURES SPT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CORE PENETROMETER TEST SOUNDING ROD	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 FINGER NAIL.	
SOIL MOISTURE - CORRELATION OF TERMS 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 - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL - SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	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 HL - 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 W - UNIT WEIGHT W _d - DRY UNIT WEIGHT SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO	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 FINGER NAIL.	
PLASTICITY NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH VERY LOW SLIGHT MEDIUM HIGH	EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" 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-N-XWL-H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST	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 FINGER NAIL.	
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.	EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" 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-N-XWL-H HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST	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 FINGER NAIL.	
		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	BENCH MARK: BL-103, -L- Sta. 23+20, Offset - 9' RT ELEVATION: 268.62 FT. NOTES:
		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.	

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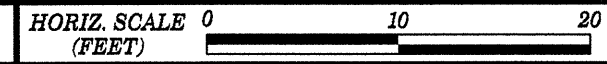
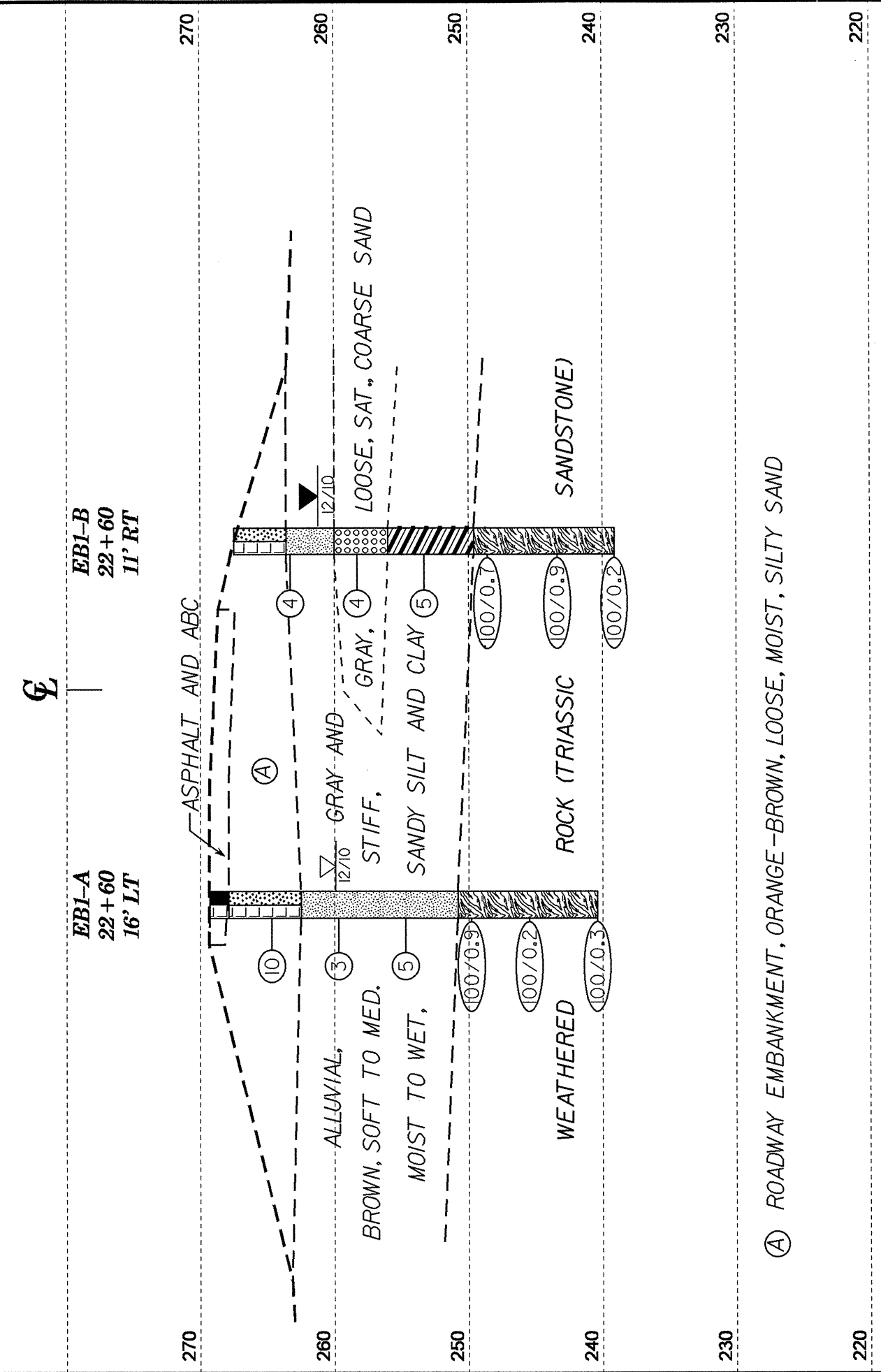






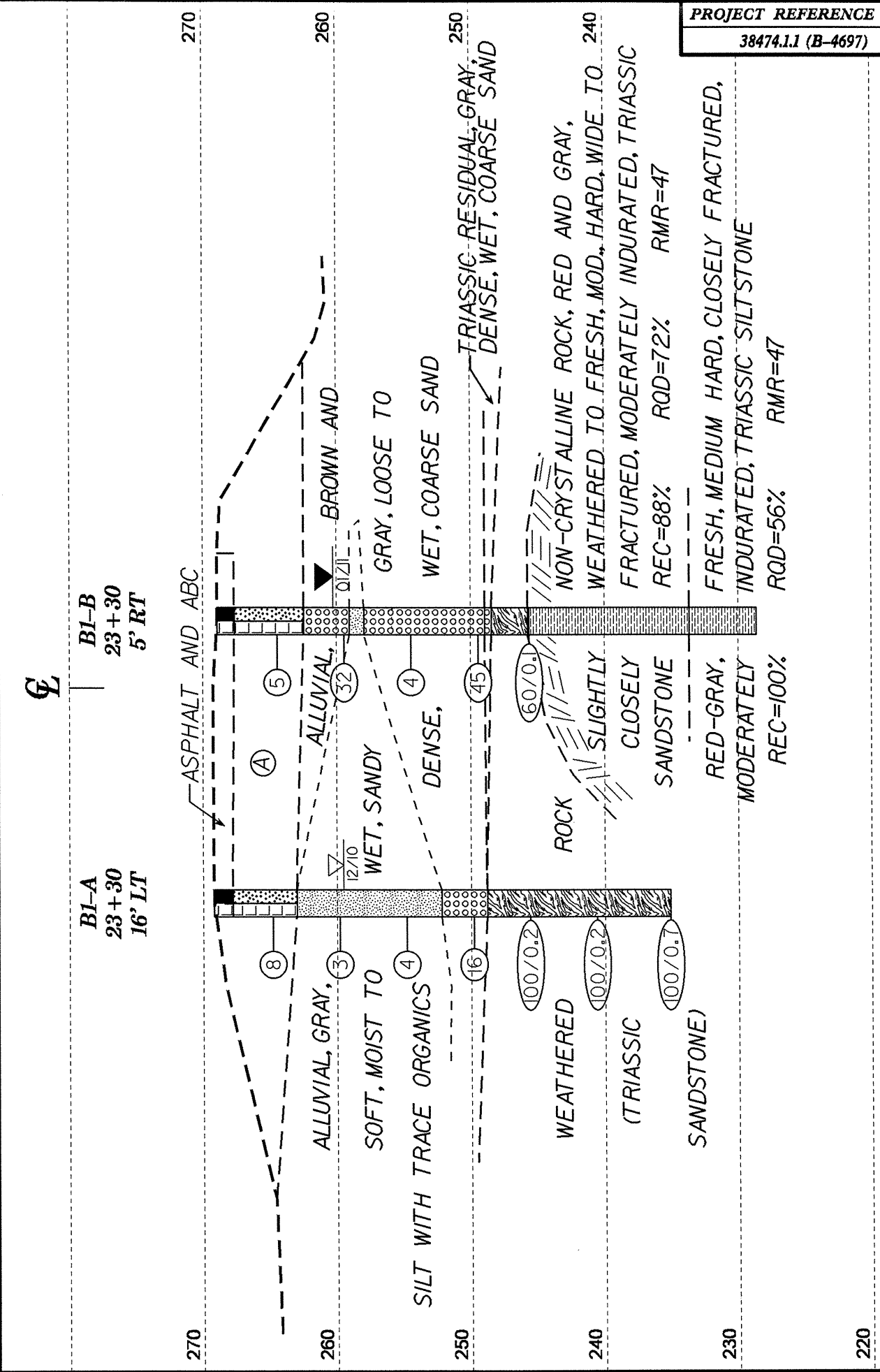
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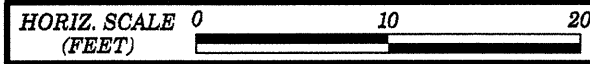
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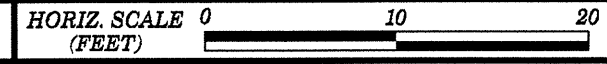
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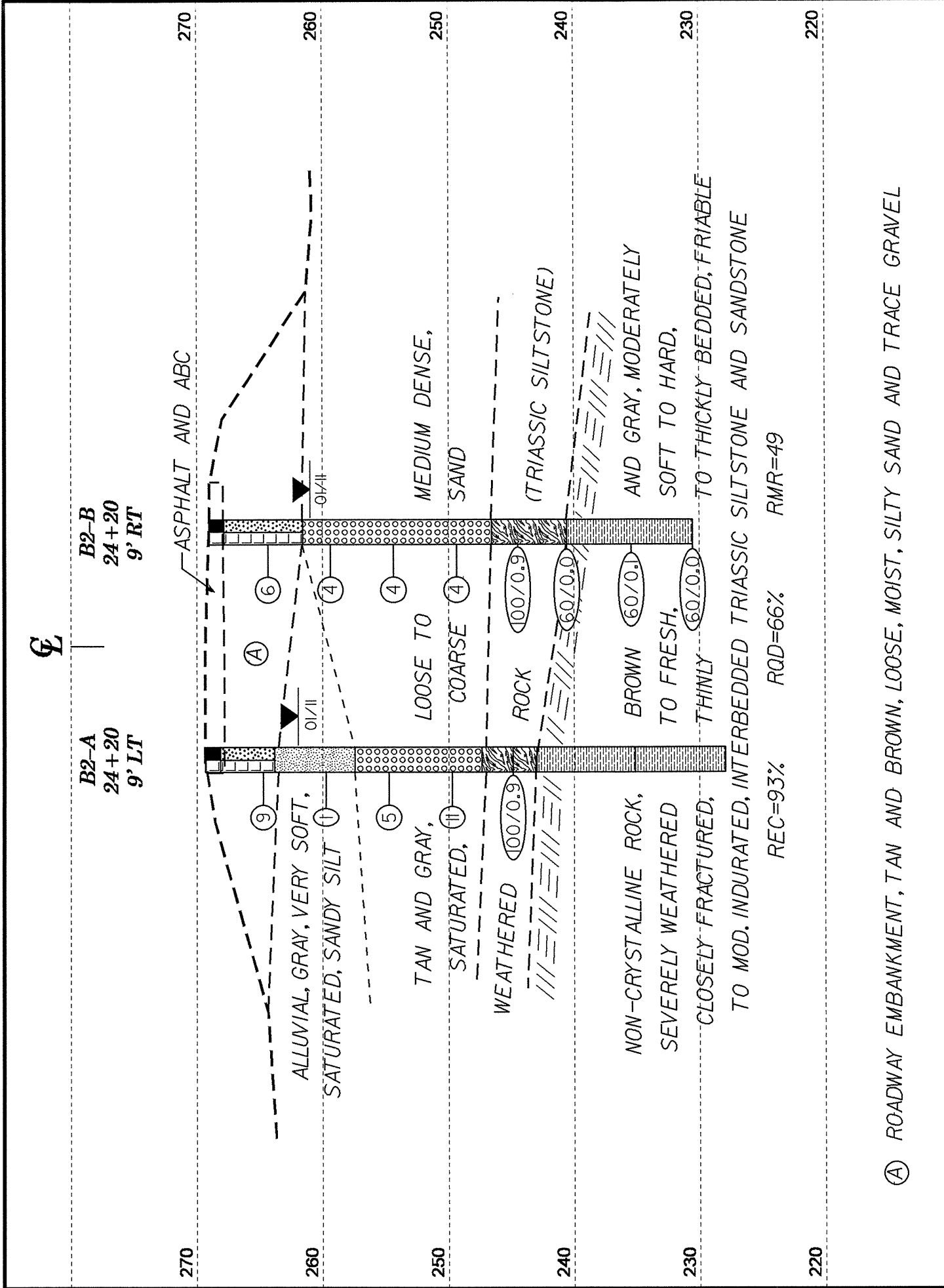
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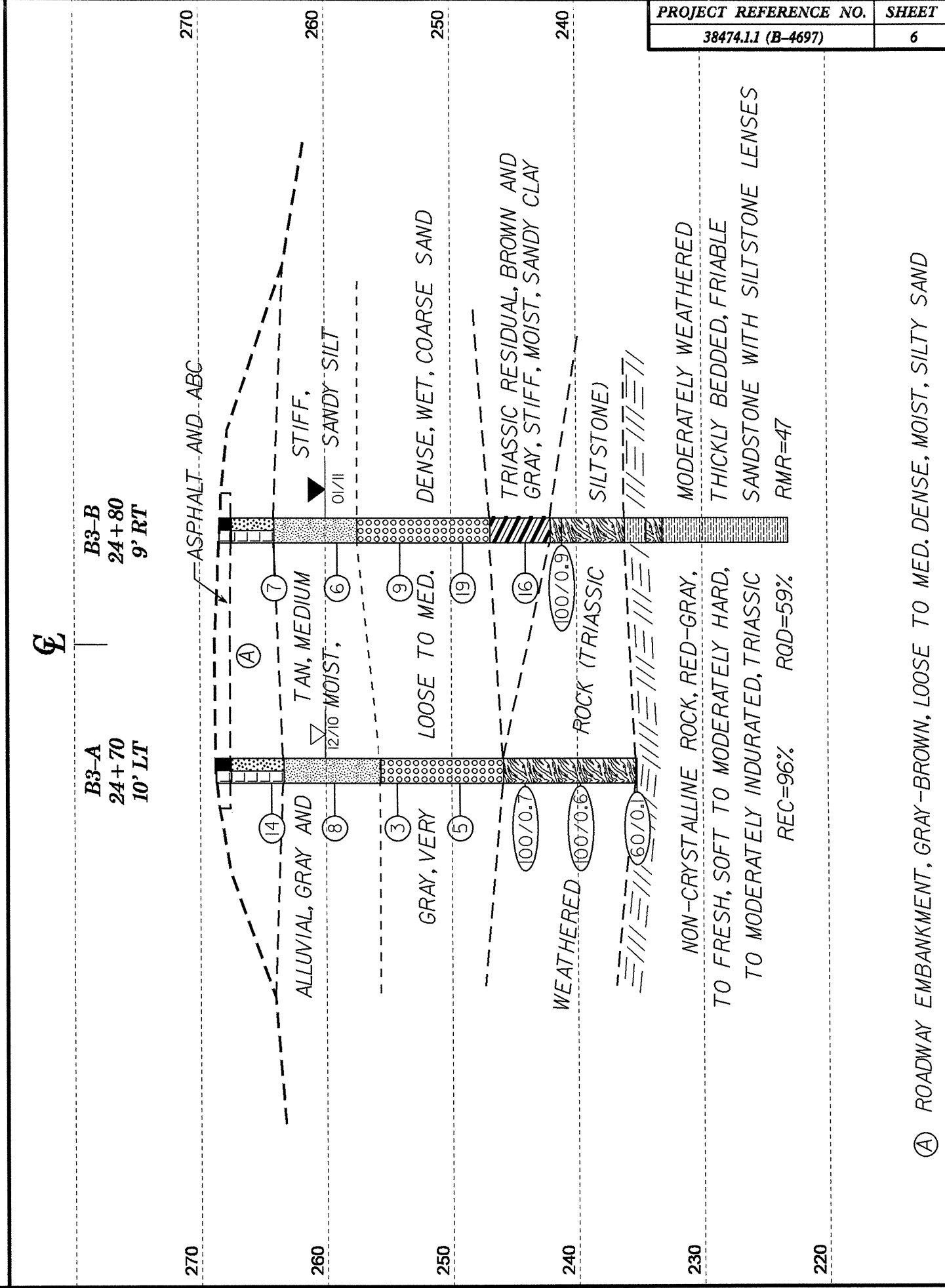


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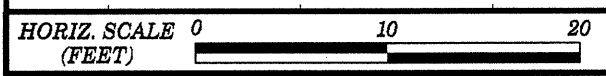
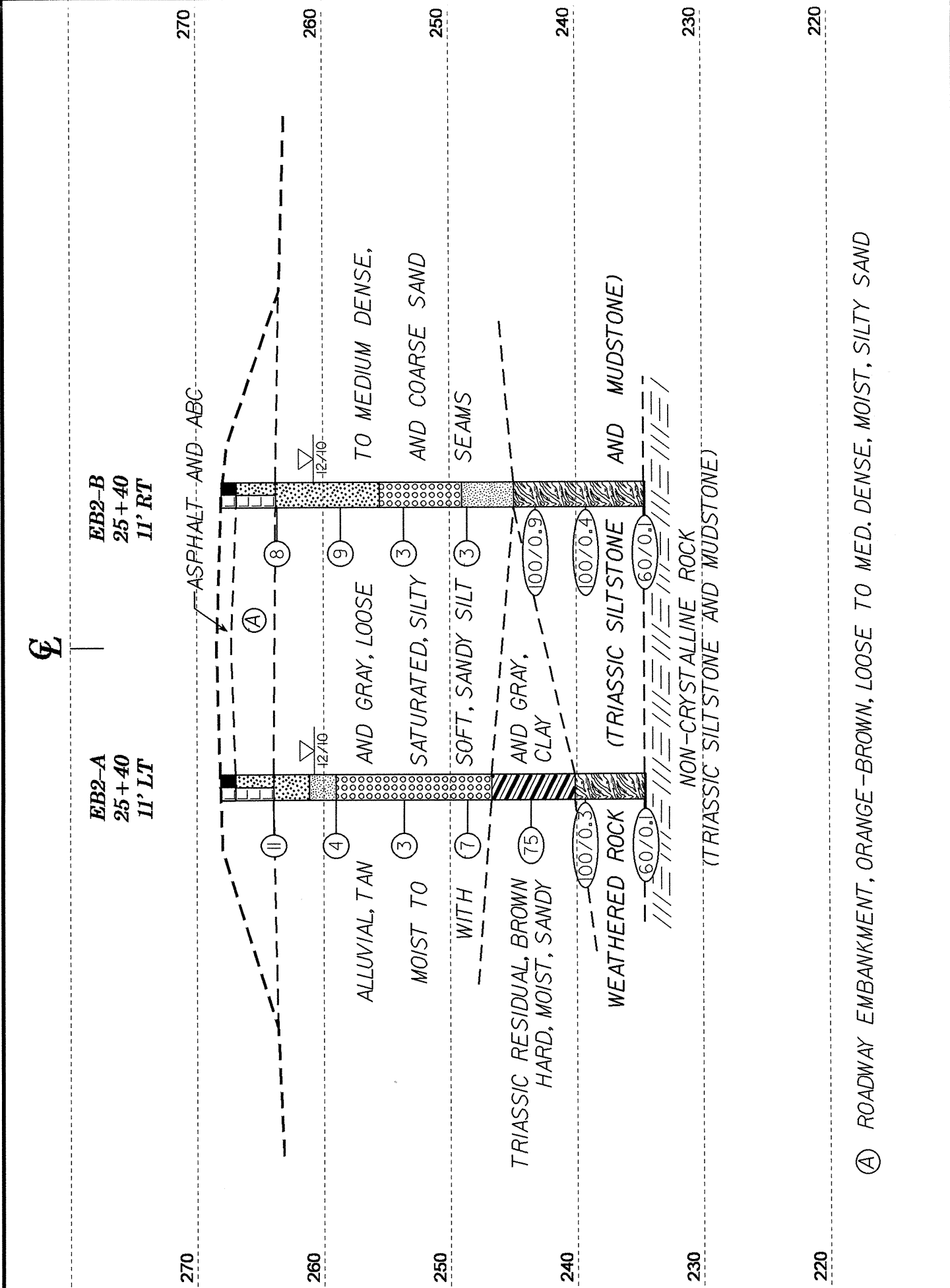
CROSS SECTION THROUGH BENT 3



Ⓐ ROADWAY EMBANKMENT, TAN AND BROWN, LOOSE, MOIST, SILTY SAND AND TRACE GRAVEL



Ⓐ ROADWAY EMBANKMENT, GRAY-BROWN, LOOSE TO MED. DENSE, MOIST, SILTY SAND

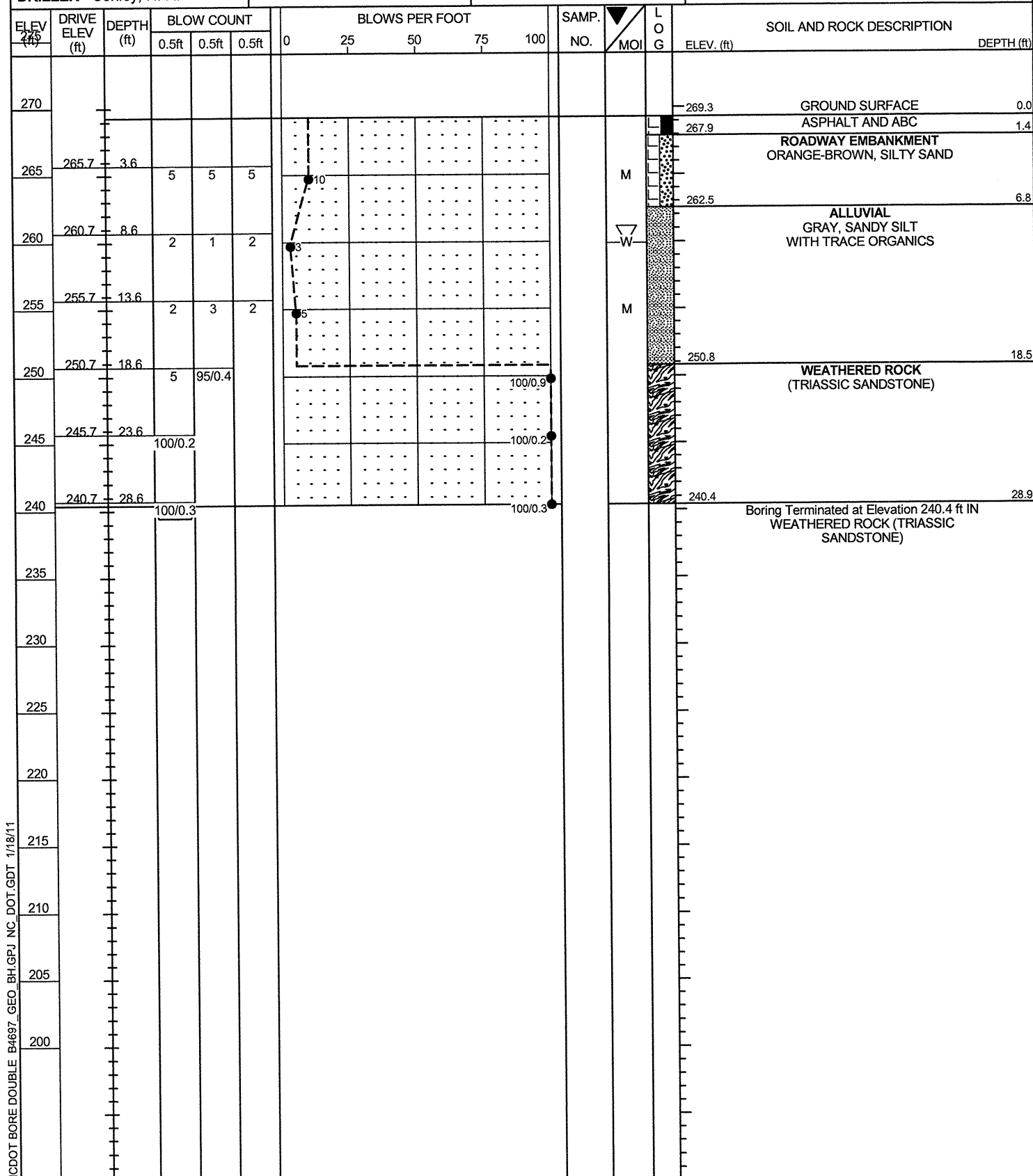


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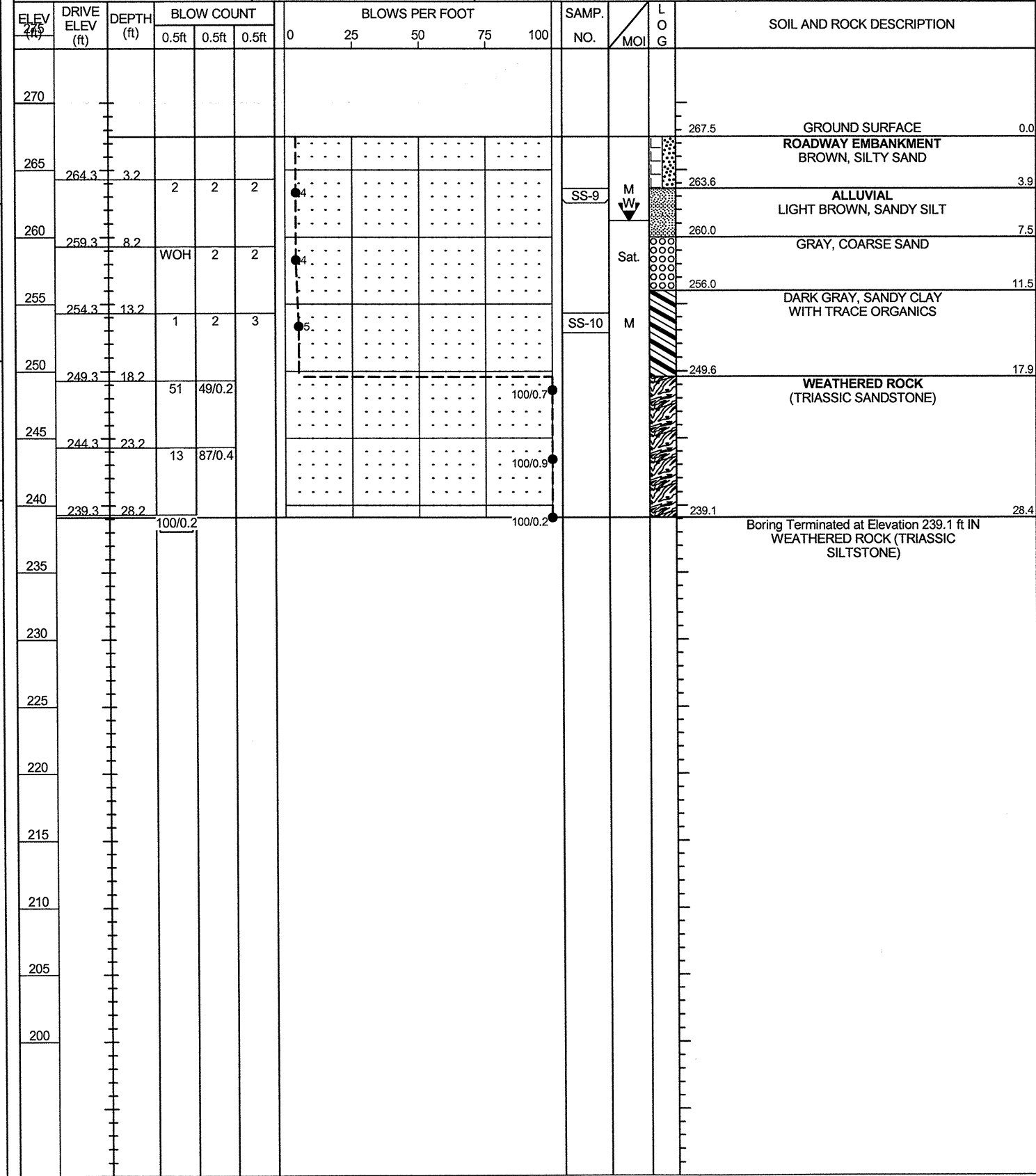
CROSS SECTION THROUGH END BENT 2

NC DOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 38474.1.1	TIP B-4697	COUNTY WAKE	GEOLOGIST Czajka, C. D.	
SITE DESCRIPTION Bridge No. 55 on -L- (SR 1600) over White Oak Creek				GROUND WTR (ft)
BORING NO. EB1-A	STATION 22+60	OFFSET 16 ft LT	ALIGNMENT -L-	0 HR. 9.4
COLLAR ELEV. 269.3 ft	TOTAL DEPTH 28.9 ft	NORTHING 737,227	EASTING 2,028,890	24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
DRILLER Conley, H. R.	START DATE 12/14/10	COMP. DATE 12/14/10	SURFACE WATER DEPTH N/A	



WBS 38474.1.1	TIP B-4697	COUNTY WAKE	GEOLOGIST Czajka, C. D.	
SITE DESCRIPTION Bridge No. 55 on -L- (SR 1600) over White Oak Creek				GROUND WTR (ft)
BORING NO. EB1-B	STATION 22+60	OFFSET 11 ft RT	ALIGNMENT -L-	0 HR. 7.5
COLLAR ELEV. 267.5 ft	TOTAL DEPTH 28.4 ft	NORTHING 737,232	EASTING 2,028,917	24 HR. 6.3
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
DRILLER Conley, H. R.	START DATE 12/14/10	COMP. DATE 12/14/10	SURFACE WATER DEPTH N/A	



NC DOT BORE DOUBLE B4697_GEO_BH.GPJ NC DOT.GDT 1/18/11



WBS 38474.1.1		TIP B-4697		COUNTY WAKE		GEOLOGIST Pedro, J. L.								
SITE DESCRIPTION Bridge No. 55 on -L- (SR 1600) over White Oak Creek							GROUND WTR (ft)							
BORING NO. B1-B		STATION 23+30		OFFSET 5 ft RT		ALIGNMENT -L-								
COLLAR ELEV. 269.1 ft		TOTAL DEPTH 40.3 ft		NORTHING 737,300		EASTING 2,028,899								
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		DRILL METHOD NW Casing w/ Core		HAMMER TYPE Automatic										
DRILLER Conley, H. R.		START DATE 01/05/11		COMP. DATE 01/05/11		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	LOG MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75					
270													269.1 GROUND SURFACE 0.0	
													267.8 ASPHALT AND ABC 1.3	
265	265.6	3.5	1	3	2								ROADWAY EMBANKMENT ORANGE-BROWN, SILTY SAND	
260	260.6	8.5	12	18	14								ALLUVIAL BROWN, COARSE SAND	
255	255.6	13.5	2	1	3								GRAY, SANDY SILT	
250	250.6	18.5	4	5	40								BROWN, COARSE SAND	
245	245.9	23.2	60/0.1										TRIASSIC RESIDUAL GRAY, COARSE SAND	20.0
240													WEATHERED ROCK (TRIASSIC SANDSTONE)	23.2
235													NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE)	23.3
230													RED AND GRAY, SLIGHTLY WEATHERED TO FRESH, MODERATELY HARD, WIDE TO CLOSELY FRACTURED, MODERATELY INDURATED, TRIASSIC SANDSTONE	
													REC=88% RQD=72%	
													RMR=47	35.3
													RED-GRAY, FRESH, MEDIUM HARD, CLOSELY FRACTURED, MODERATELY INDURATED, TRIASSIC SILTSTONE	
													REC=100% RQD=56%	40.3
													RMR=47	
													Boring Terminated at Elevation 228.8 ft IN NON-CRYSTALLINE ROCK (TRIASSIC SILTSTONE)	

WBS 38474.1.1		TIP B-4697		COUNTY WAKE		GEOLOGIST Pedro, J. L.						
SITE DESCRIPTION Bridge No. 55 on -L- (SR 1600) over White Oak Creek							GROUND WTR (ft)					
BORING NO. B1-B		STATION 23+30		OFFSET 5 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 269.1 ft		TOTAL DEPTH 40.3 ft		NORTHING 737,300		EASTING 2,028,899						
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		DRILL METHOD NW Casing w/ Core		HAMMER TYPE Automatic								
DRILLER Conley, H. R.		START DATE 01/05/11		COMP. DATE 01/05/11		SURFACE WATER DEPTH N/A						
CORE SIZE NXWL				TOTAL RUN 17.0 ft								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	RQD (%)		REC. (%)	RQD (%)			
245.8	245.8	23.3	2.0	1:59/1.0	(1.7)	(1.7)		(10.5)	(8.6)		Begin Coring @ 23.3 ft	
245	243.8	25.3	5.0	1:16/1.0	85%	85%		88%	72%		RED AND GRAY, SLIGHTLY WEATHERED TO FRESH, MODERATELY HARD, WIDE TO CLOSELY FRACTURED, MODERATELY INDURATED, TRIASSIC SANDSTONE WITH SILT SOIL ZONES	23.3
240		30.3	5.0	1:23/1.0	(4.5)	(3.9)					SOIL ZONES AT 30.3-30.6, 32.0-32.1, 34.3-34.5	
235	233.8	35.3	5.0	1:28/1.0	90%	78%	RS-3					
230	228.8	40.3	5.0	1:16/1.0	(4.3)	(3.0)						
				1:27/1.0	86%	60%						
				1:53/1.0								
				1:34/1.0								
				1:47/1.0								
				2:12/1.0								
				1:39/1.0	(5.0)	(2.8)		(5.0)	(2.8)		RED-GRAY, FRESH, MEDIUM HARD, CLOSELY FRACTURED, MODERATELY INDURATED, TRIASSIC SILTSTONE	35.3
				1:19/1.0	100%	56%		100%	56%		SOIL ZONES AT 38.4-38.6, 39.2-39.3	
				1:42/1.0								
				1:44/1.0								
				2:02/1.0							Boring Terminated at Elevation 228.8 ft IN NON-CRYSTALLINE ROCK (TRIASSIC SILTSTONE)	40.3

NCDOT BORE DOUBLE B4697_GEO_BH.GPJ NC_DOT.GDT 1/27/11



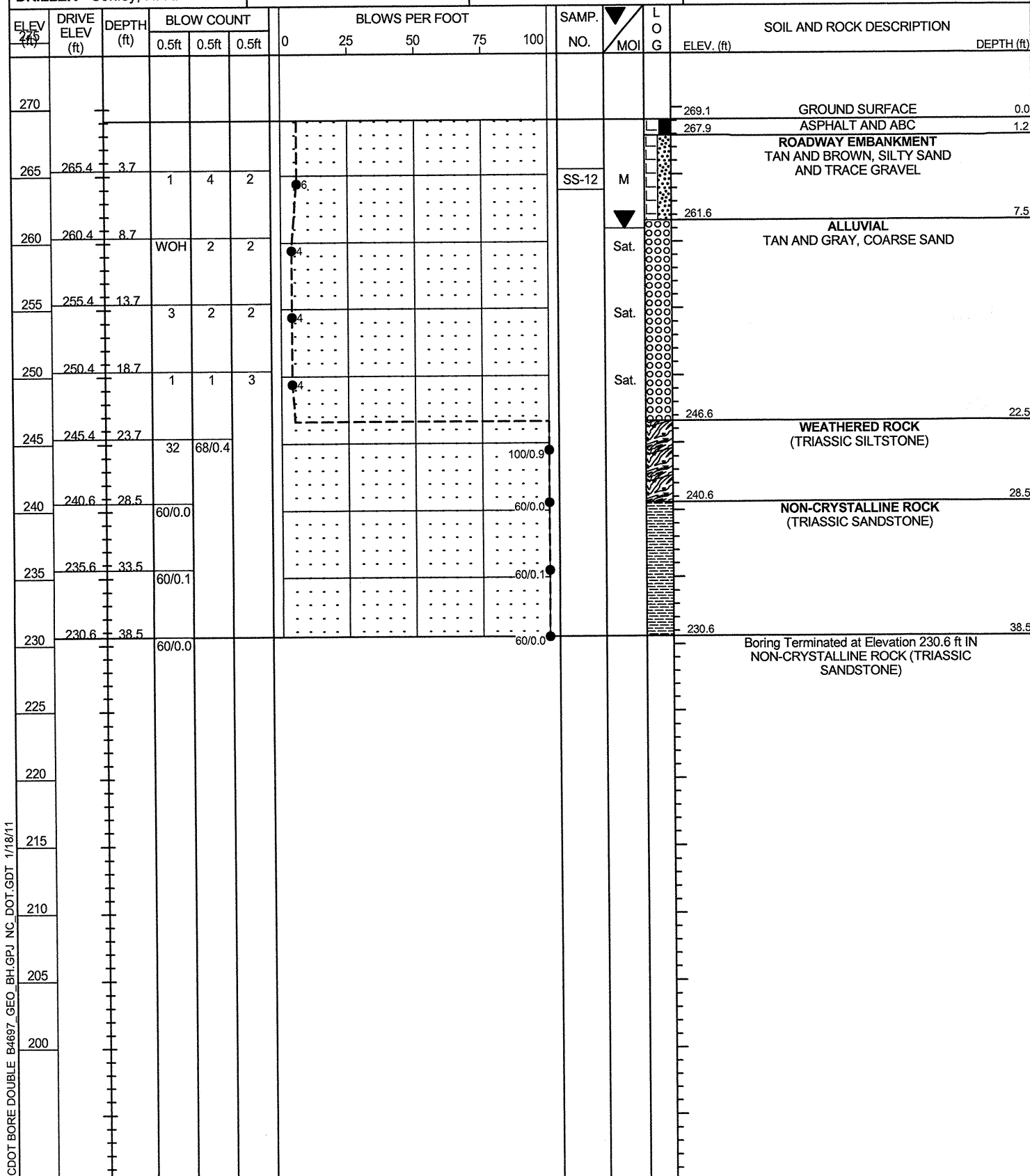
WBS 38474.1.1		TIP B-4697		COUNTY WAKE		GEOLOGIST Czajka, C. D.									
SITE DESCRIPTION Bridge No. 55 on -L- (SR 1600) over White Oak Creek							GROUND WTR (ft)								
BORING NO. B2-A		STATION 24+20		OFFSET 9 ft LT		ALIGNMENT -L-		0 HR. N/A							
COLLAR ELEV. 269.0 ft		TOTAL DEPTH 41.4 ft		NORTHING 737,387		EASTING 2,028,873		24 HR. 7.4							
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010				DRILL METHOD NW Casing w/ Core		HAMMER TYPE Automatic									
DRILLER Conley, H. R.		START DATE 01/03/11		COMP. DATE 01/03/11		SURFACE WATER DEPTH N/A									
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					
270														269.0 GROUND SURFACE 0.0	
														267.8 ASPHALT AND ABC 1.2	
														263.5 ROADWAY EMBANKMENT TAN, SILTY SAND WITH GRAVEL 5.5	
265	265.4	3.6												263.5 ALLUVIAL GRAY, SANDY SILT 5.5	
														257.1 GRAY, COARSE SAND 11.9	
260	260.4	8.6	WOH	WOH	1									247.0 WEATHERED ROCK (TRIASSIC SANDSTONE) 22.0	
														244.5 BROWN AND GRAY, SEVERELY WEATHERED, VERY SOFT, TRIASSIC SILTSTONE 24.5	
255	255.4	13.6												242.6 REC=53% NON-CRYSTALLINE ROCK BROWN AND GRAY, MODERATELY SEVERELY TO MODERATELY WEATHERED, SOFT, CLOSELY FRACTURED, THINLY BEDDED, FRIABLE, INTERBEDDED TRIASSIC SILTSTONE AND SANDSTONE 34.2	
														227.6 REC=75% RQD=39% RMR=49 BROWN AND GRAY, MODERATELY WEATHERED TO FRESH, MODERATELY HARD TO HARD, MODERATELY INDURATED, VERY THICKLY BEDDED, TRIASSIC SANDSTONE 41.4	
250	250.4	18.6												227.6 REC=100% RQD=100% RMR=49 Boring Terminated at Elevation 227.6 ft IN NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE)	
245	245.4	23.6													
240															
235															
230															

WBS 38474.1.1		TIP B-4697		COUNTY WAKE		GEOLOGIST Czajka, C. D.						
SITE DESCRIPTION Bridge No. 55 on -L- (SR 1600) over White Oak Creek							GROUND WTR (ft)					
BORING NO. B2-A		STATION 24+20		OFFSET 9 ft LT		ALIGNMENT -L-		0 HR. N/A				
COLLAR ELEV. 269.0 ft		TOTAL DEPTH 41.4 ft		NORTHING 737,387		EASTING 2,028,873		24 HR. 7.4				
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010				DRILL METHOD NW Casing w/ Core		HAMMER TYPE Automatic						
DRILLER Conley, H. R.		START DATE 01/03/11		COMP. DATE 01/03/11		SURFACE WATER DEPTH N/A						
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	TOTAL RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC (%)	ROD (%)		REC (%)	ROD (%)			
244.5	244.5	24.5	1.9	0:53/0.9	53%	0%		53%	0%		Begin Coring @ 24.5 ft	24.5
	242.6	26.4	5.0	1:42/1.0	47%	56%		96%	50%		BROWN AND GRAY, SEVERELY WEATHERED, VERY SOFT, TRIASSIC SILTSTONE	26.4
240				1:26/1.0							NON-CRYSTALLINE ROCK	
				1:26/1.0							BROWN AND GRAY, MODERATELY SEVERELY TO MODERATELY WEATHERED, SOFT, CLOSELY FRACTURED, THINLY BEDDED, FRIABLE, INTERBEDDED TRIASSIC SILTSTONE AND SANDSTONE	
				1:37/1.0								
				1:29/1.0								
				2:10/1.0								
235				1:40/1.0	50%	66%	RS-1					
				1:01/1.0								
				1:20/1.0								
				1:38/1.0								
				2:41/1.0								
230				1:07/1.0	50%	50%		7.2	7.2		BROWN AND GRAY, MODERATELY WEATHERED TO FRESH, MODERATELY HARD TO HARD, MODERATELY INDURATED, VERY THICKLY BEDDED, TRIASSIC SANDSTONE	34.2
				1:14/1.0	100%	100%						
				1:25/1.0								
				1:33/1.0								
				1:49/1.0								
											Boring Terminated at Elevation 227.6 ft IN NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE)	41.4

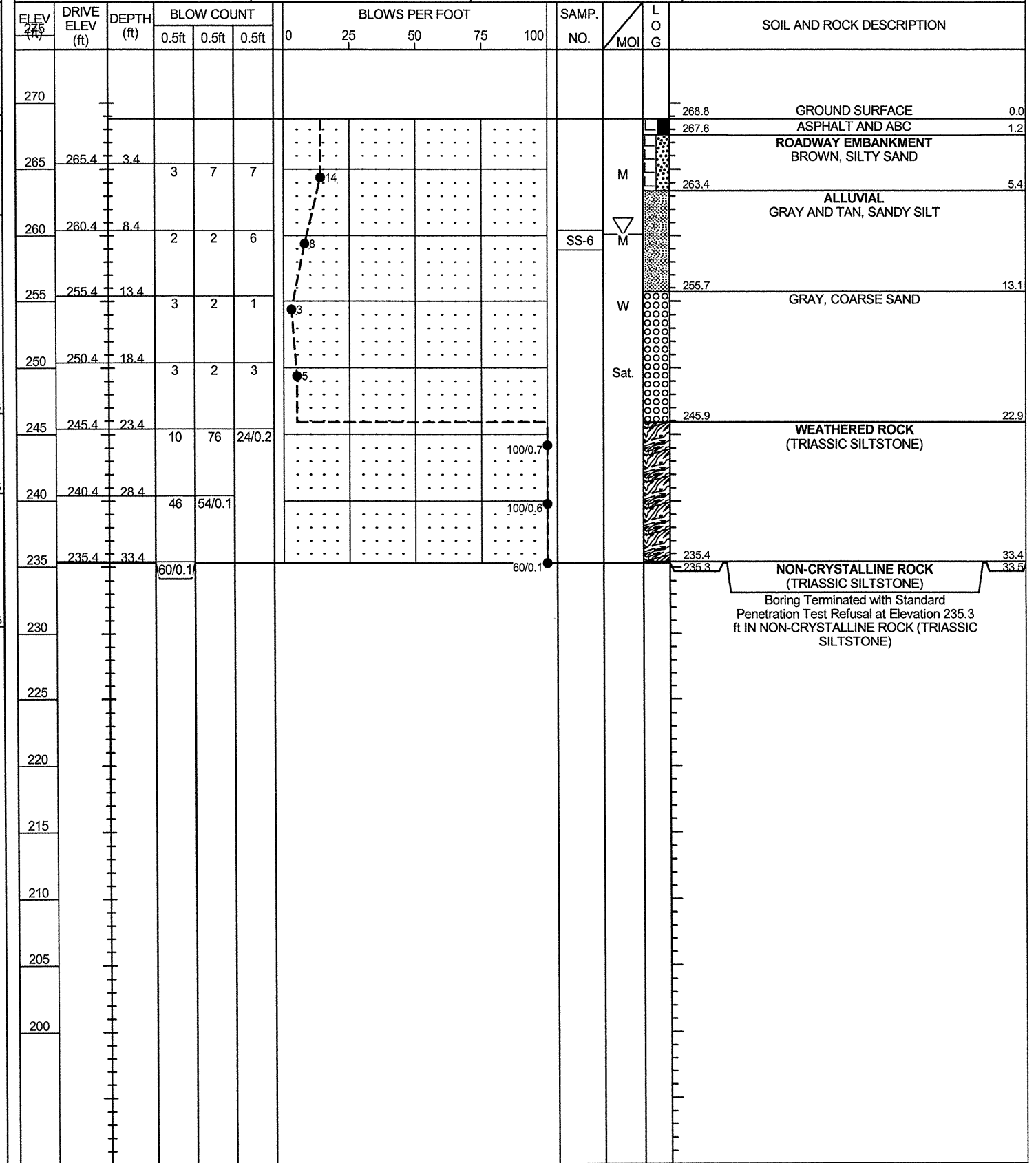
NCDOT BORE DOUBLE B4697_GEO_BH.GPJ NC_DOT.GDT 1/27/11

NC DOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 38474.1.1	TIP B-4697	COUNTY WAKE	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 55 on -L- (SR 1600) over White Oak Creek			GROUND WTR (ft)
BORING NO. B2-B	STATION 24+20	OFFSET 9 ft RT	ALIGNMENT -L-
COLLAR ELEV. 269.1 ft	TOTAL DEPTH 38.5 ft	NORTHING 737,389	EASTING 2,028,891
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Conley, H. R.	START DATE 12/15/10	COMP. DATE 01/07/11	SURFACE WATER DEPTH N/A



WBS 38474.1.1	TIP B-4697	COUNTY WAKE	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 55 on -L- (SR 1600) over White Oak Creek			GROUND WTR (ft)
BORING NO. B3-A	STATION 24+70	OFFSET 10 ft LT	ALIGNMENT -L-
COLLAR ELEV. 268.8 ft	TOTAL DEPTH 33.5 ft	NORTHING 737,437	EASTING 2,028,867
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Conley, H. R.	START DATE 12/13/10	COMP. DATE 12/13/10	SURFACE WATER DEPTH N/A



NC DOT BORE DOUBLE B4697_GEO_BH.GPJ NC_DOT.GDT 1/18/11

Boring Terminated at Elevation 230.6 ft IN NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE)

Boring Terminated with Standard Penetration Test Refusal at Elevation 235.3 ft IN NON-CRYSTALLINE ROCK (TRIASSIC SILTSTONE)



**NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT**

WBS 38474.1.1		TIP B-4697		COUNTY WAKE		GEOLOGIST Pedro, J. L.							
SITE DESCRIPTION Bridge No. 55 on -L- (SR 1600) over White Oak Creek							GROUND WTR (ft)						
BORING NO. B3-B	STATION 24+80	OFFSET 9 ft RT	ALIGNMENT -L-			0 HR.	N/A						
COLLAR ELEV. 268.5 ft	TOTAL DEPTH 45.3 ft	NORTHING 737,449	EASTING 2,028,885			24 HR.	8.5						
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010				DRILL METHOD NW Casing w/ Core		HAMMER TYPE Automatic							
DRILLER Conley, H. R.		START DATE 01/04/11	COMP. DATE 01/04/11	SURFACE WATER DEPTH N/A									
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				
270													
												GROUND SURFACE 268.5	0.0
												ASPHALT AND ABC 267.5	1.0
												ROADWAY EMBANKMENT GRAY-BROWN, SILTY SAND 264.1	4.4
265	265.1	3.4	2	3	4							ALLUVIAL TAN-GRAY, SANDY SILT	
260	260.1	8.4	WOH	2	4							GRAY, COARSE SAND	11.0
255	255.1	13.4		3	3	6							
250	250.1	18.4		6	7	12							
245	245.1	23.4		23	7	9						TRIASSIC RESIDUAL DARK BROWN AND GRAY, SANDY CLAY	21.6
	242.6	25.9		36	39	61/0.4						WEATHERED ROCK (TRIASSIC SILTSTONE) RED AND GRAY, SEVERELY WEATHERED, SOFT, TRIASSIC SILTSTONE WITH ABUNDANT MICA	26.4
240												WEATHERED ROCK (TRIASSIC SILTSTONE) RED AND GRAY, SEVERELY WEATHERED, SOFT, TRIASSIC SILTSTONE WITH ABUNDANT MICA	27.3
												NON-CRYSTALLINE ROCK RED AND GRAY, MODERATELY WEATHERED, MODERATELY HARD, THINLY BEDDED, FRIABLE, TRIASSIC SILTSTONE	32.3
235												REC=84%	34.0
												NON-CRYSTALLINE ROCK RED AND GRAY, SEVERELY WEATHERED, SOFT, TRIASSIC SILTSTONE WITH ABUNDANT MICA	35.3
230												REC=100% RQD=100% RMR=47	
												WEATHERED ROCK RED AND GRAY, SEVERELY WEATHERED, SOFT, TRIASSIC SILTSTONE WITH ABUNDANT MICA	45.3
225												REC=100%	
												NON-CRYSTALLINE ROCK RED-GRAY TO GRAY, MODERATELY WEATHERED TO FRESH, MEDIUM TO MODERATELY HARD, THICKLY BEDDED, MODERATELY INDURATED, TRIASSIC SANDSTONE	
												REC=100% RQD=90% RMR=47	
												Boring Terminated at Elevation 223.2 ft IN NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE)	

NCDOT BORE DOUBLE B4697_GEO_BH.GPJ NC_DOT.GDT 1/27/11

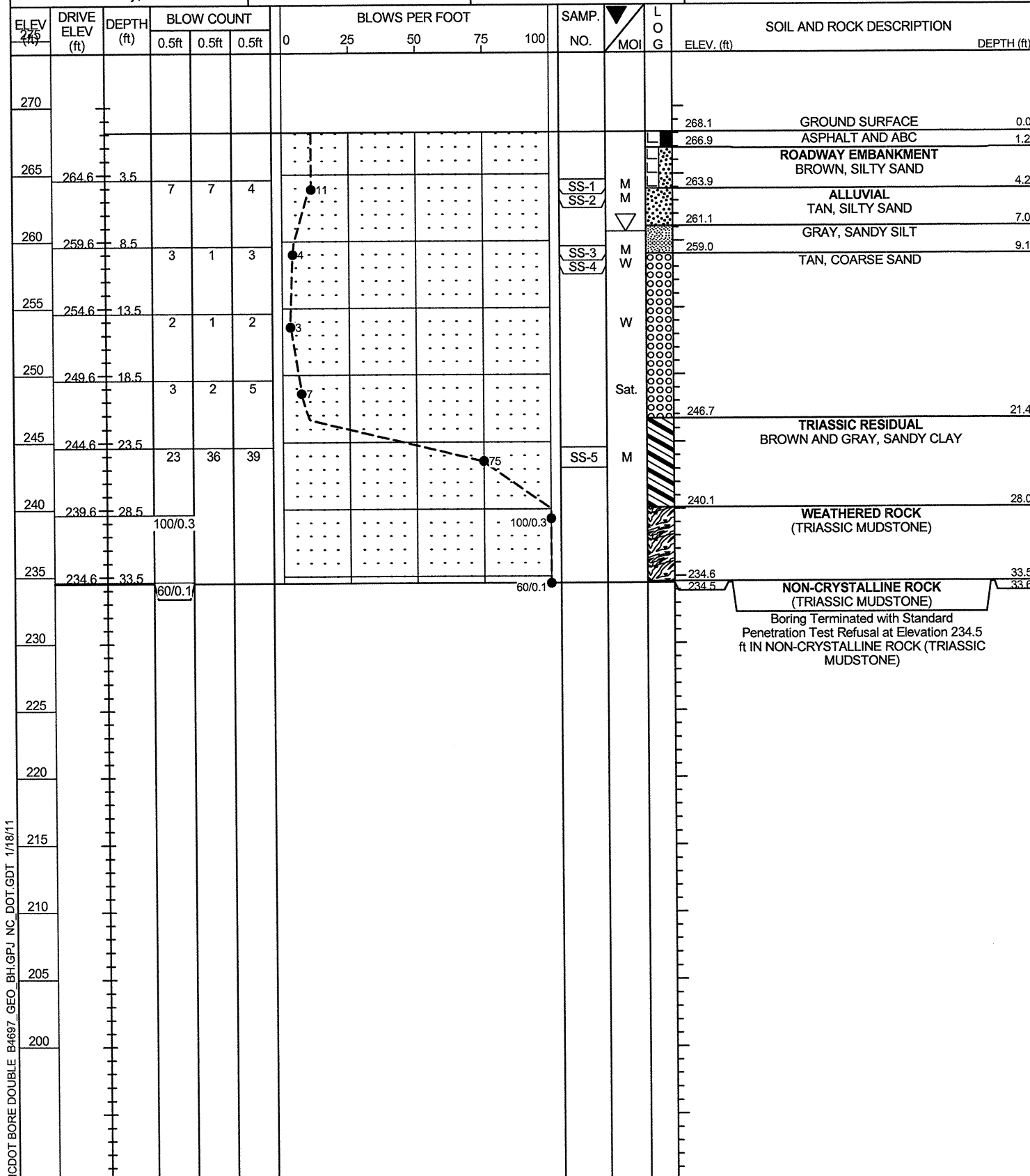


**NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT**

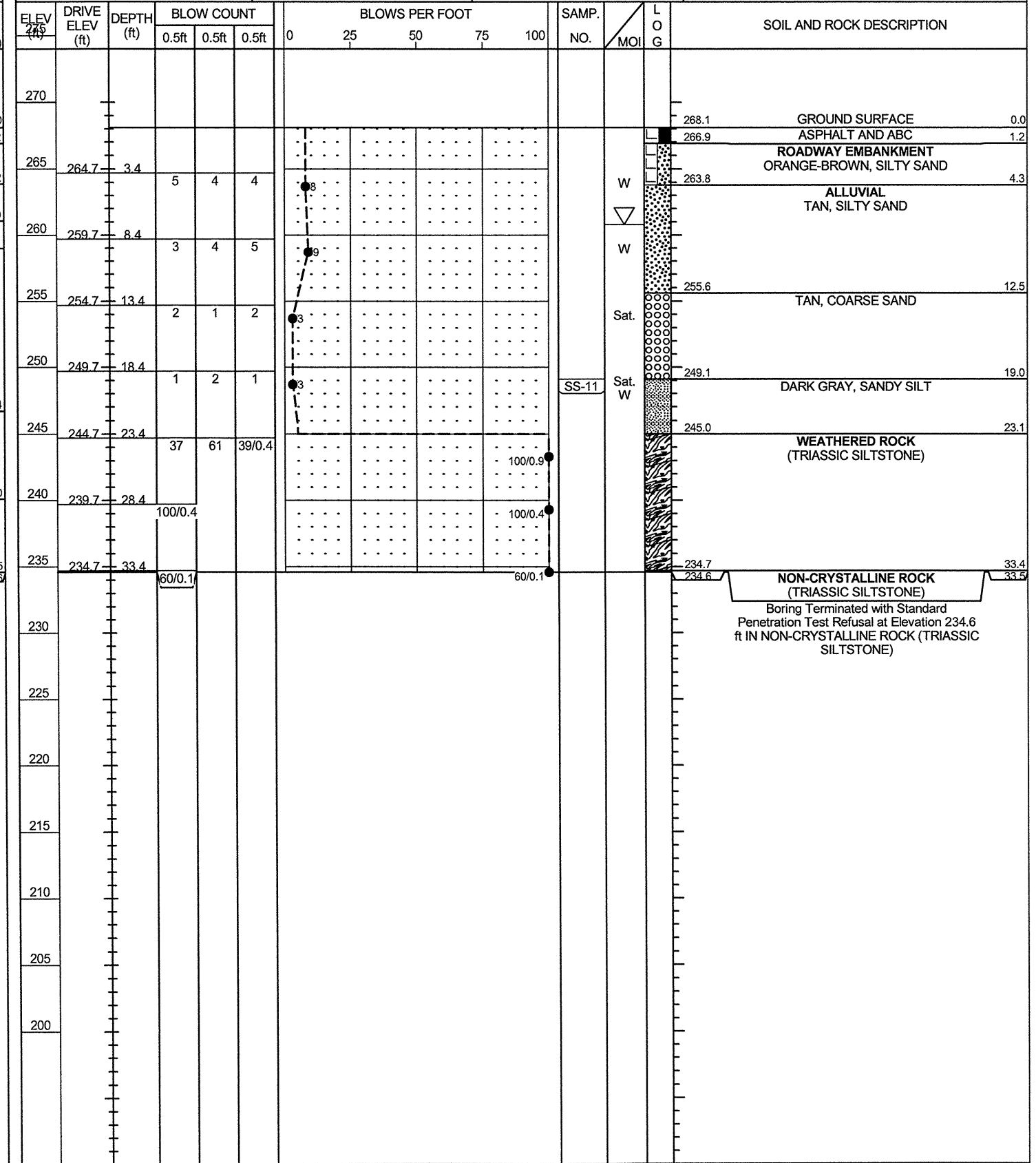
WBS 38474.1.1		TIP B-4697		COUNTY WAKE		GEOLOGIST Pedro, J. L.						
SITE DESCRIPTION Bridge No. 55 on -L- (SR 1600) over White Oak Creek							GROUND WTR (ft)					
BORING NO. B3-B	STATION 24+80	OFFSET 9 ft RT	ALIGNMENT -L-			0 HR.	N/A					
COLLAR ELEV. 268.5 ft	TOTAL DEPTH 45.3 ft	NORTHING 737,449	EASTING 2,028,885			24 HR.	8.5					
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010				DRILL METHOD NW Casing w/ Core		HAMMER TYPE Automatic						
DRILLER Conley, H. R.		START DATE 01/04/11	COMP. DATE 01/04/11	SURFACE WATER DEPTH N/A								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
241.2											Begin Coring @ 27.3 ft	
240	241.2	27.3	3.0	1:02/1.0	(2.2)	(0.0)		(4.2)	(0.0)		RED AND GRAY, SEVERELY WEATHERED, SOFT, TRIASSIC SILTSTONE WITH ABUNDANT MICA	27.3
	238.2	30.3		1:42/1.0	73%	0%		84%	0%			
			5.0	2:26/1.0	(5.0)	(1.7)						
235				1:50/1.0	100%	34%		(1.7)	(1.7)		NON-CRYSTALLINE ROCK	32.3
				1:42/1.0				100%	0%		RED AND GRAY, MODERATELY WEATHERED, MODERATELY HARD, THINLY BEDDED, FRIABLE, TRIASSIC SILTSTONE	34.0
				1:13/1.0				(1.3)	(0.0)		WEATHERED ROCK	35.3
				1:56/1.0				100%	90%		RED AND GRAY, SEVERELY WEATHERED, SOFT, TRIASSIC SILTSTONE WITH ABUNDANT MICA	
230				1:37/1.0	(5.0)	(4.0)		(10.0)	(9.0)		NON-CRYSTALLINE ROCK	
				1:27/1.0	100%	80%					RED-GRAY TO GRAY, MODERATELY WEATHERED TO FRESH, MEDIUM TO MODERATELY HARD, THICKLY BEDDED, MODERATELY INDURATED, TRIASSIC SANDSTONE	
				1:41/1.0								
				1:10/1.0								
225				1:05/1.0	(5.0)	(5.0)						
				1:01/1.0	100%	100%						
				1:19/1.0								
				1:06/1.0								
	223.2	45.3		1:12/1.0							Boring Terminated at Elevation 223.2 ft IN NON-CRYSTALLINE ROCK (TRIASSIC SANDSTONE)	45.3

NC DOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 38474.1.1	TIP B-4697	COUNTY WAKE	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 55 on -L- (SR 1600) over White Oak Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 25+40	OFFSET 11 ft LT	ALIGNMENT -L-
COLLAR ELEV. 268.1 ft	TOTAL DEPTH 33.6 ft	NORTHING 737,507	EASTING 2,028,861
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Conley, H. R.	START DATE 12/10/10	COMP. DATE 12/10/10	SURFACE WATER DEPTH N/A



WBS 38474.1.1	TIP B-4697	COUNTY WAKE	GEOLOGIST Czajka, C. D.
SITE DESCRIPTION Bridge No. 55 on -L- (SR 1600) over White Oak Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 25+40	OFFSET 11 ft RT	ALIGNMENT -L-
COLLAR ELEV. 268.1 ft	TOTAL DEPTH 33.5 ft	NORTHING 737,509	EASTING 2,028,883
DRILL RIG/HAMMER EFF./DATE RFO0067 CME-550X 77% 03/15/2010		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Conley, H. R.	START DATE 12/15/10	COMP. DATE 12/15/10	SURFACE WATER DEPTH N/A



NC DOT BORE DOUBLE B4697_GEO_BH.GPJ_NC_DOT.GDT_1/18/11

EB1-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-9	11 RT	22+60	3.9-4.7	A-4(0)	24	3	25.5	36.5	23.8	14.3	97	78	49	-	-
SS-10	11 RT	22+60	13.2-14.7	A-6(14)	36	21	7.7	26.1	27.4	38.7	100	96	74	-	-

B1-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-7	16 LT	23+30	8.4-9.9	A-4(8)	31	10	4.3	11.0	41.9	42.8	100	98	89	-	-
SS-8	16 LT	23+30	13.4-14.9	A-4(0)	21	2	22.8	43.8	21.1	12.2	100	86	42	-	-

B2-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-13	9 LT	24+20	8.6-10.1	A-4(0)	19	2	11.7	48.8	23.4	16.1	100	97	50	-	-

B2-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-12	9 RT	24+20	3.7-5.2	A-2-4(0)	24	8	48.1	23.2	14.4	14.3	78	51	25	-	-

B3-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-6	10 LT	24+70	8.4-9.9	A-4(1)	25	4	4.7	40.4	32.5	22.4	100	99	68	-	-

B3-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-14	9 RT	24+80	8.4-9.9	A-4(2)	27	5	0.6	43.3	36.0	20.1	100	100	71	-	-

EB2-A

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	11 LT	25+40	3.5-4.2	A-2-4(0)	24	5	42.6	26.5	16.6	14.3	96	67	34	-	-
SS-2	11 LT	25+40	4.2-5.0	A-2-4(0)	18	2	52.1	28.1	7.5	12.2	93	58	22	-	-
SS-3	11 LT	25+40	8.5-9.1	A-4(1)	24	5	18.3	21.8	35.4	24.5	98	84	67	-	-
SS-4	11 LT	25+40	9.1-10.0	A-1-b(0)	18	NP	90.2	6.6	1.1	2.0	96	22	4	-	-
SS-5	11 LT	25+40	23.5-25.0	A-6(16)	40	16	2.2	8.2	54.9	34.7	100	99	93	-	-

EB2-B

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-11	11 RT	25+40	19.0-19.9	A-4(0)	22	2	19.4	50.8	17.6	12.2	100	95	38	-	-



**FIELD
 SCOUR REPORT**

WBS: 38474.1.1 TIP: B-4697 COUNTY: Wake

DESCRIPTION(1): Bridge No. 55 on -L- (SR 1600) over White Oak Creek

EXISTING BRIDGE

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

Bridge No.: 55 Length: 69.5' Total Bents: 5 Bents in Channel: 5 Bents in Floodplain: 0
 Foundation Type: Timber Piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: End Bent 2 abutment wall is compromised by the water flowing parallel to the roadway and into White Oak Creek on the upstream side

Interior Bents: None visible due to water

Channel Bed: None visible

Channel Bank: None

EXISTING SCOUR PROTECTION

Type(3): Wooden wing walls

Extent(4): 15' H x 50' W

Effectiveness(5): Somewhat effective

Obstructions(6): None

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): Alluvial, gray and brown, loose, coarse sand (SS-4)

Channel Bank Material(8): Alluvial, gray, soft, sandy silt (SS-8)

Channel Bank Cover(9): Trees and brush

Floodplain Width(10): +/- 500 feet

Floodplain Cover(11): Trees, grass, and brush

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tend.(13): North towards End Bent 2

Observations and Other Comments: _____

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

BENTS

Bent 1 = 248.7 ft

Bent 2 = 248.7 ft

Bent 3 = 257.0 ft

Comparison of DSE to Hydraulics Unit theoretical scour:

The Geotechnical Engineering Unit agrees with the Hydraulics Unit's theoretical scour at all bent locations.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

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

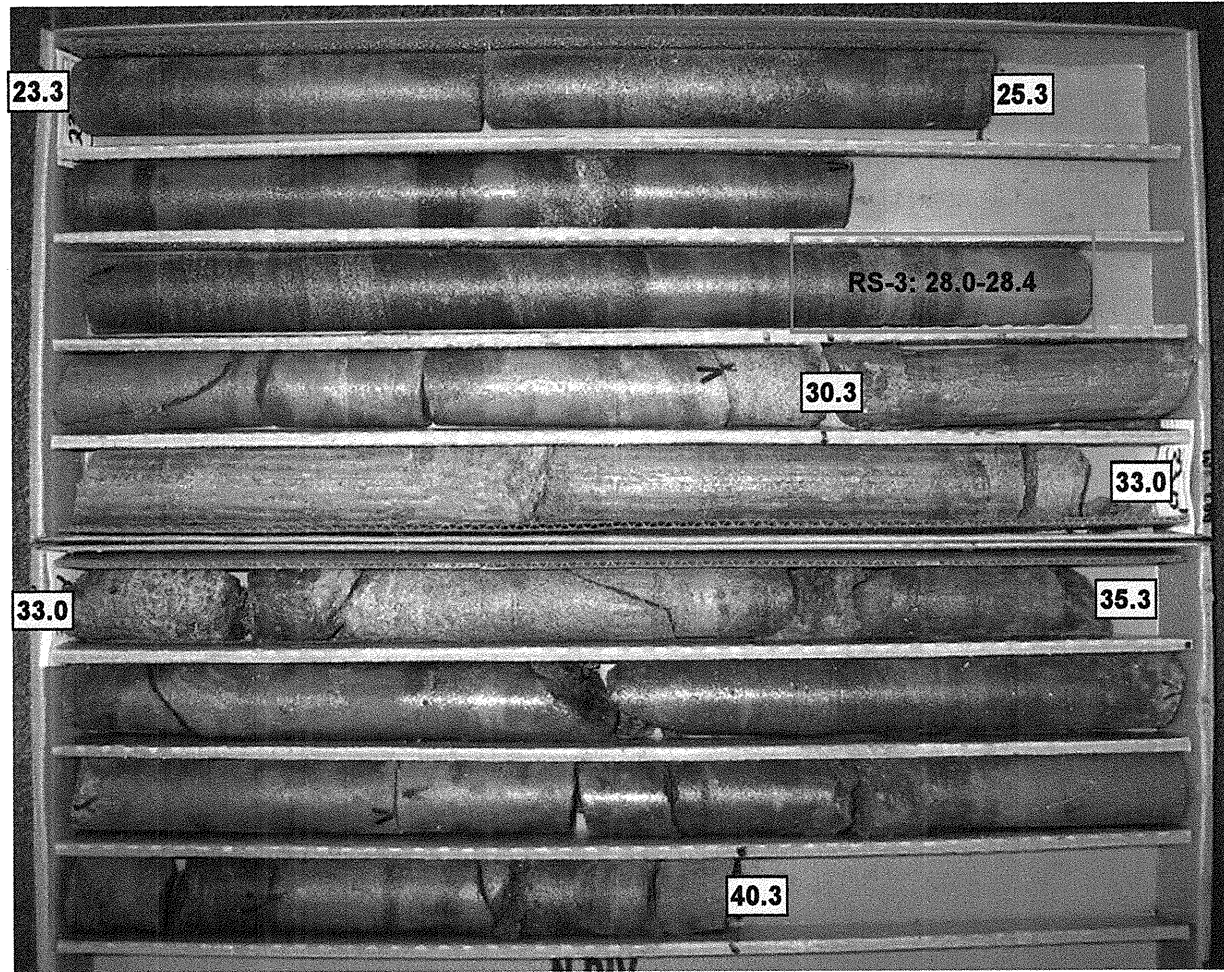
See Sheet 15,
 "Soil Test Results",
 for samples:
 SS-4
 SS-8

Reported by: J.L. Pedro Date: 1/18/2011
 J. L. Pedro

CORE PHOTOGRAPHS

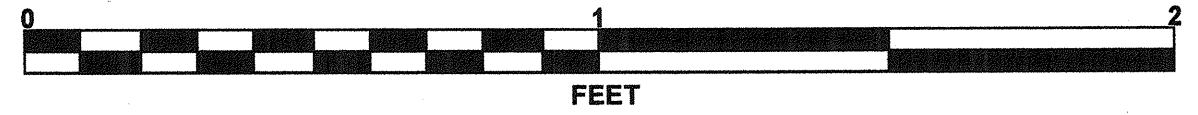
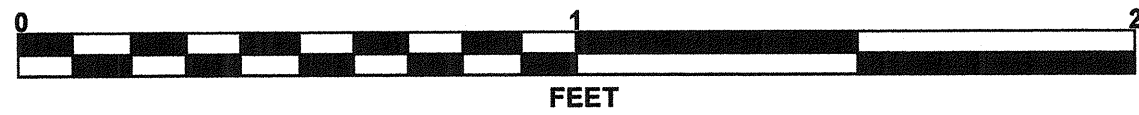
B1-B

BOXES 1 & 2: 23.3 - 40.3 FEET



B2-A

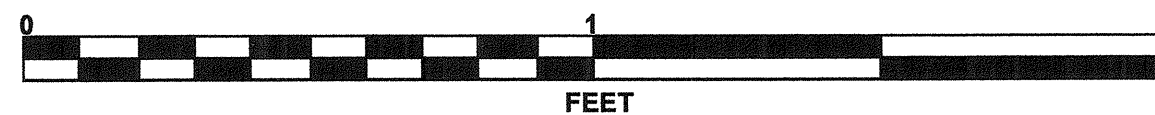
BOXES 1 & 2: 24.5 - 41.4 FEET



CORE PHOTOGRAPHS

B3-B

BOXES 1 & 2: 27.3 - 45.3 FEET



SITE PHOTOGRAPH

Bridge No. 55 on -L- (SR 1600) over White Oak Creek



Looking West Downstream