

PROJECT: 33653.1.1 ID: B-4316

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 33653.1.1 I.D. NO. B-4316
 F.A. PROJECT BRZ-1153(6)
 COUNTY WATAUGA
 PROJECT DESCRIPTION BRIDGE No. 320 OVER
BEECH CREEK ON SR 1153 (WILEY HARMON RD.)

SITE DESCRIPTION _____

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STATE	STATE PROJECT REFERENCE NO.	SHEET	TOTAL SHEETS
N.C.	B-4316	1	42
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
33653.1.1	BRZ-1153(6)	P.E.	
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CAUTION NOTICE

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

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (ON-PLACED) 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.

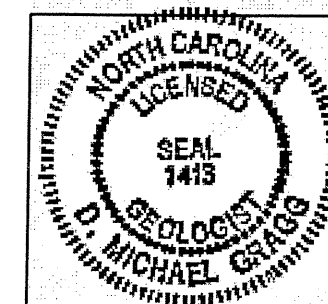
For Letting

INVESTIGATED BY D.M. Grogg PERSONNEL K. Murray
 CHECKED BY S.P. Washer D. Herfter
 SUBMITTED BY D.M. Grogg
 DATE 6-20-08

DRAWN BY: W. Shuecraft

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.



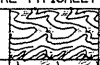
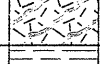
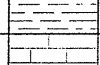
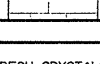
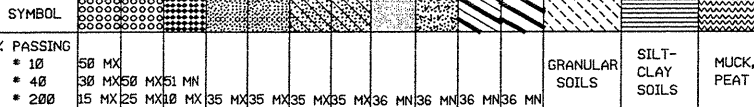
D. Michael Grogg
SIGNATURE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
B-4316	33653.I.I	2	42

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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND 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, HIGHLY 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) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: <u>ANGULAR</u> , <u>SUBANGULAR</u> , <u>SUBROUNDED</u> , OR <u>ROUNDED</u> .	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN 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:  NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.  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 SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	ALLUVIUM (ALLUV.) - SOILS WHICH 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 WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (R.Q.D.) - 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 WHICH 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, WHICH 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 B.P.F. 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 LESS THAN 0.1 FOOT PENETRATION WITH 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 (S.R.Q.D.) - 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 (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
SOIL LEGEND AND AASHTO CLASSIFICATION GENERAL CLASS. GRANULAR MATERIALS (<5% PASSING #200) SILT-CLAY MATERIALS (>5% 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 SYMBOL  % PASSING: 10, 40, 200 LIQUID LIMIT PLASTIC INDEX USUAL TYPES OF MAJOR MATERIALS GEN. RATING AS A SUBGRADE	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 MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE 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	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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> SEVERE (SEV.) ALL ROCKS 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 DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	TEXTURE OR GRAIN SIZE U.S. STD. SIEVE SIZE OPENING (MM) 4, 10, 40, 60, 200, 270 BOULDER (BLDR.), COBBLE (COB.), GRAVEL (GR.), COARSE SAND (CSE. SD.), FINE SAND (F. SD.), SILT (SL.), CLAY (CL.) GRAIN SIZE MM 305, 75, 2.0, 0.25, 0.05, 0.005 IN. 12", 3", 0.075, 0.005
CONSISTENCY OR DENSENESS PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) GENERALLY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE, LOOSE, MEDIUM DENSE, DENSE, VERY DENSE GENERALLY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT, SOFT, MEDIUM STIFF, STIFF, VERY STIFF, HARD	GROUND WATER WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. STATIC WATER LEVEL AFTER 24 HOURS. PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA SPRING OR SEEPAGE	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.	ISOTHERMAL LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT	MISCELLANEOUS SYMBOLS ROADWAY EMBANKMENT WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS INFERRED SOIL BOUNDARIES INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP/DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD SPT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL	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	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 FRAGS. - FRAGMENTS MED. - MEDIUM PMT - PRESSUREMETER TEST SD - SAND, SANDY SL - SILT, SILTY SLI - SLIGHTLY TCR - TRICONE REFUSAL γ - UNIT WEIGHT γ _d - DRY UNIT WEIGHT w - MOISTURE CONTENT v - VERY VST - VANE SHEAR TEST
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	EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: MOBILE B-____, BK-51, CME-45, CME-550, PORTABLE HOIST, OTHER 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, OTHER HAMMER TYPE: AUTOMATIC, MANUAL CORE SIZE: -B, -N, -Q2WL, -H HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST, OTHER	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.	SOIL MOISTURE - CORRELATION OF TERMS BENCH MARK: BM1 - Outside project limits 8' spike in root of a 18' gum tree. ELEVATION: 2972.0 BENCH MARK: BM2 - BL sta. 15+36 15' Lt. 8' spike in root of a 12' poplar tree. ELEVATION: 2900.32 BENCH MARK: ELEVATION: NOTES:
COLOR DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.			



July 10, 2008

Regional Design Engineer
North Carolina Department of Transportation
Raleigh, NC

Re: **Bridge No. 320 over Beech Creek on SR 1153**
Watauga County, NC
B-4316

Dear Regional Engineer:

The subsurface investigation conducted for the subject bridge project encountered considerable thickness of boulders, cobbles and coarse gravel comprising colluvial, alluvial and artificial fill units overlying crystalline rock. The encountered boulders, cobbles and coarse gravel will likely increase the difficulty of installing foundations at each bent location.

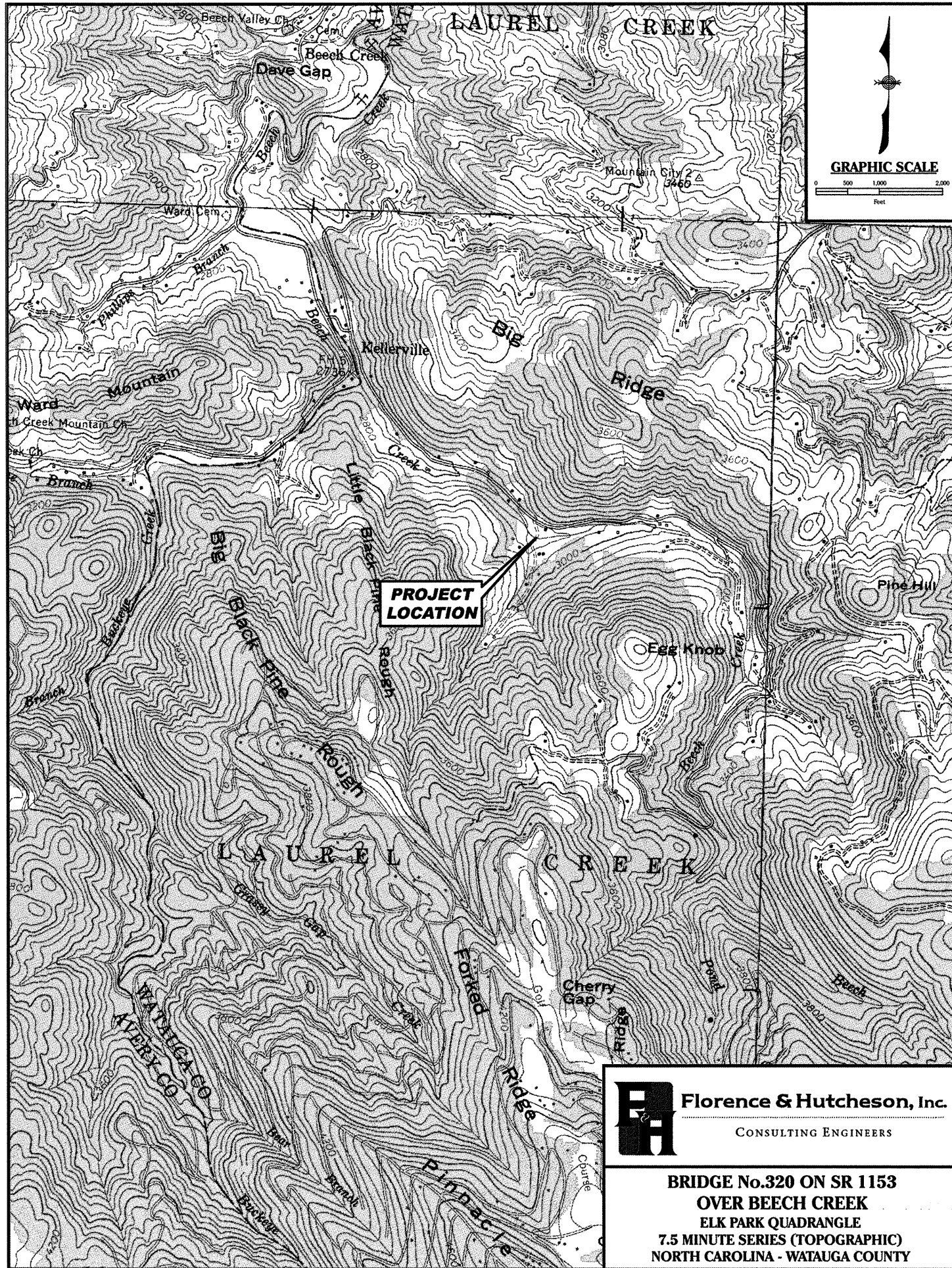
A Rock Mass Strength determination has been completed for crystalline rock underlying the subject site based upon Tables 10.4.6.4-1, 10.4.6.4-2 and 10.4.6.4-3, *Geomechanics Classification of Rock Masses*, AASHTO 2007, LRFD Bridge Design Specifications. A RMR Rating of 54 was calculated placing the site within Class No. III, Fair Rock.

Sincerely,

FLORENCE & HUTCHESON, INC.

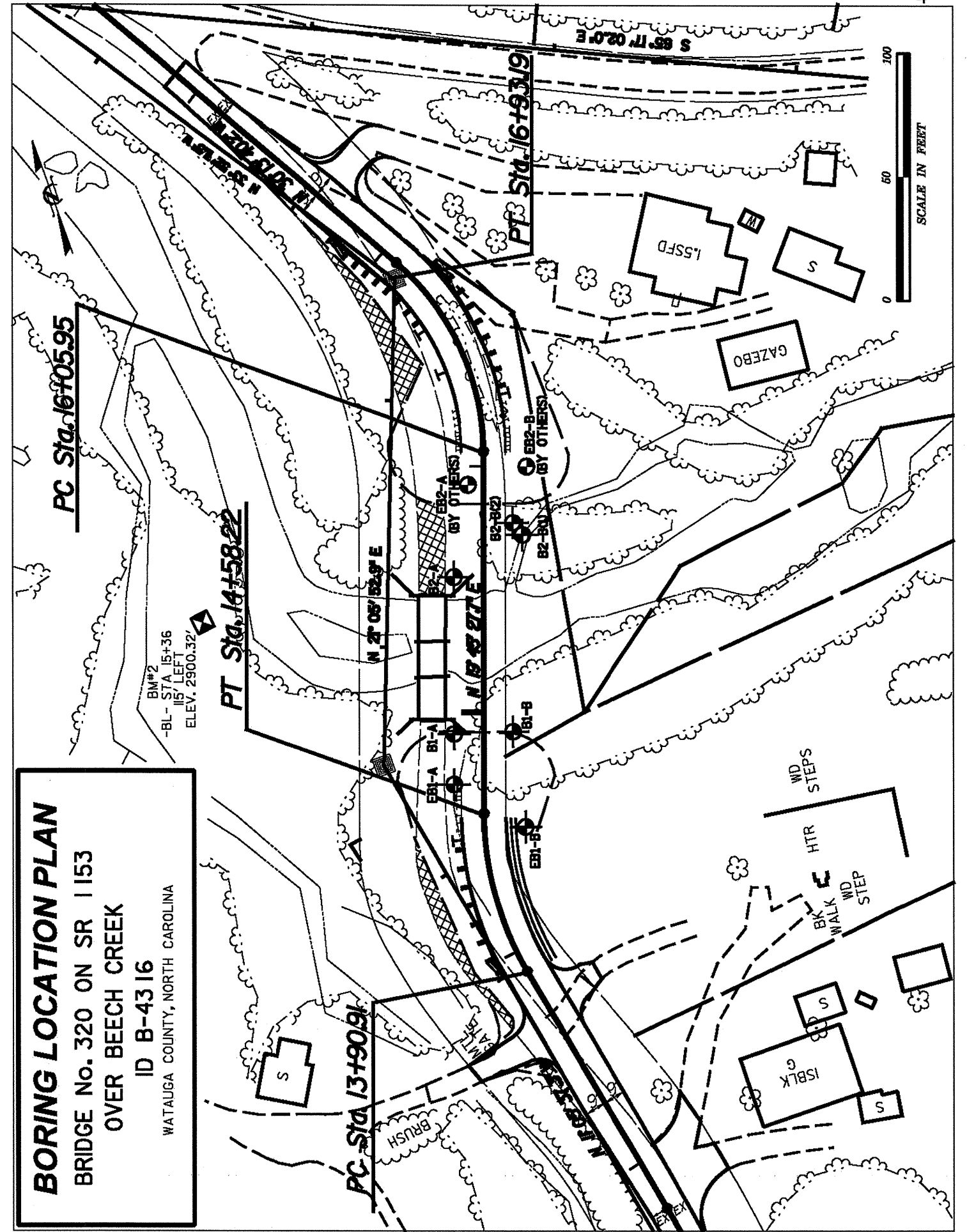


D. Michael Gragg, P.G.



Florence & Hutcheson, Inc.
CONSULTING ENGINEERS

**BRIDGE No.320 ON SR 1153
OVER BEECH CREEK
ELK PARK QUADRANGLE
7.5 MINUTE SERIES (TOPOGRAPHIC)
NORTH CAROLINA - WATAUGA COUNTY**



BORING LOCATION PLAN

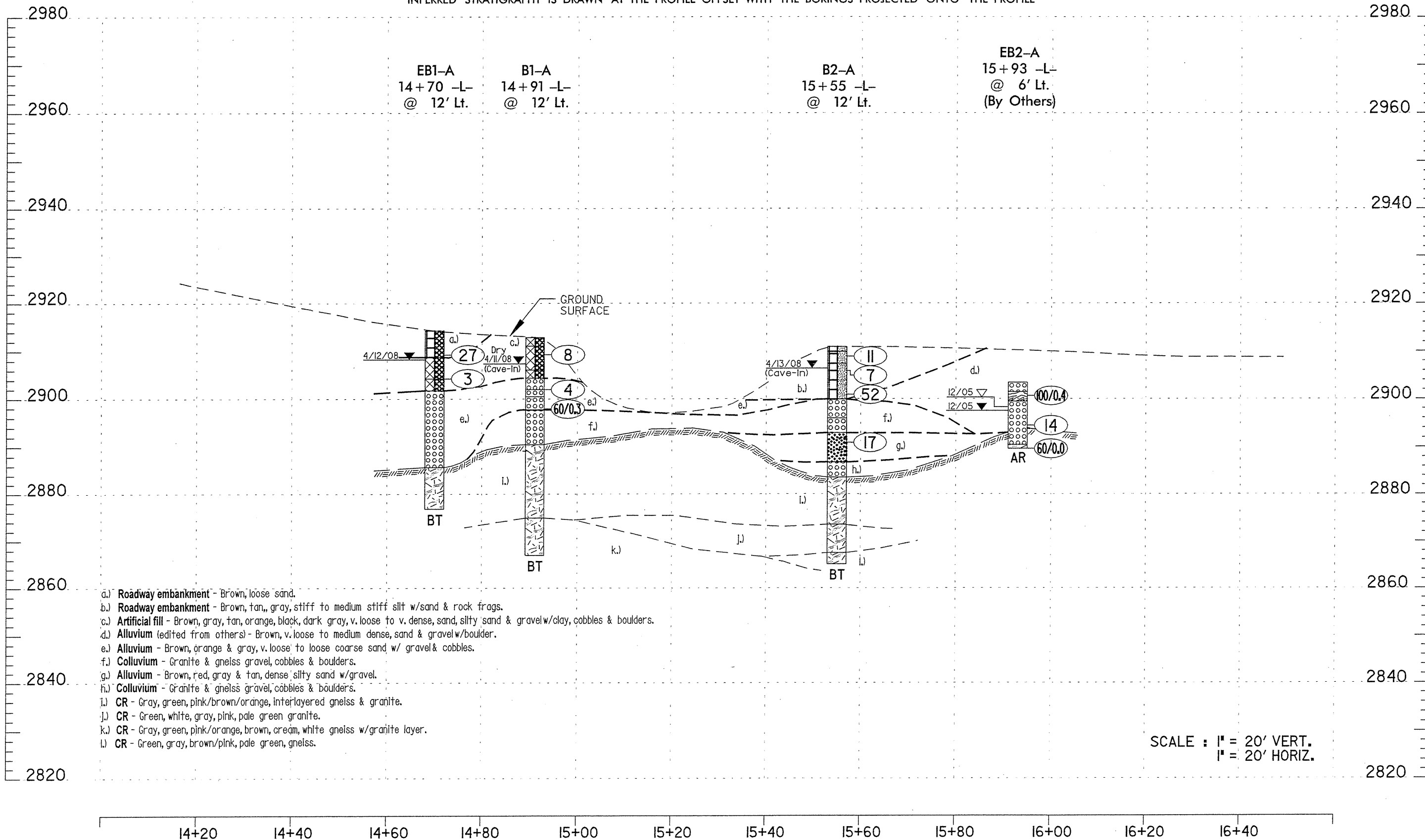
**BRIDGE No. 320 ON SR 1153
OVER BEECH CREEK**

ID B-43 16

WATAUGA COUNTY, NORTH CAROLINA

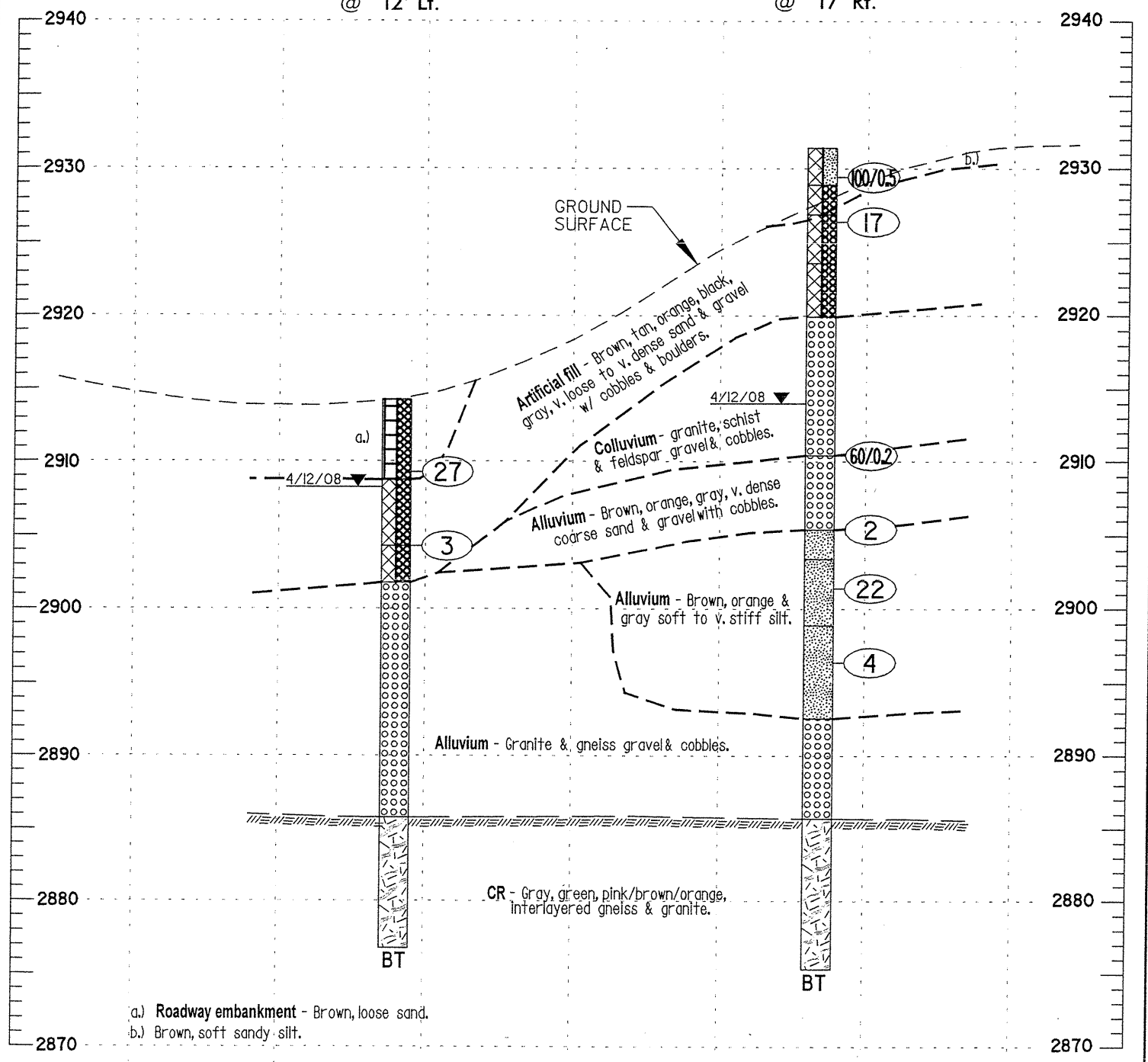
GENERALIZED SUBSURFACE PROFILE 12' Lt. of -L-

GROUNDLINE PROFILE SURVEYED BY FLORENCE & HUTCHESON, INC. AT 12' LT. OF -L- ON 4/7/08
 INFERRED STRATIGRAPHY IS DRAWN AT THE PROFILE OFFSET WITH THE BORINGS PROJECTED ONTO THE PROFILE



EB1-A
14+70 -L-
@ 12' Lt.

EB1-B
14+52 -L-
@ 17' Rt.

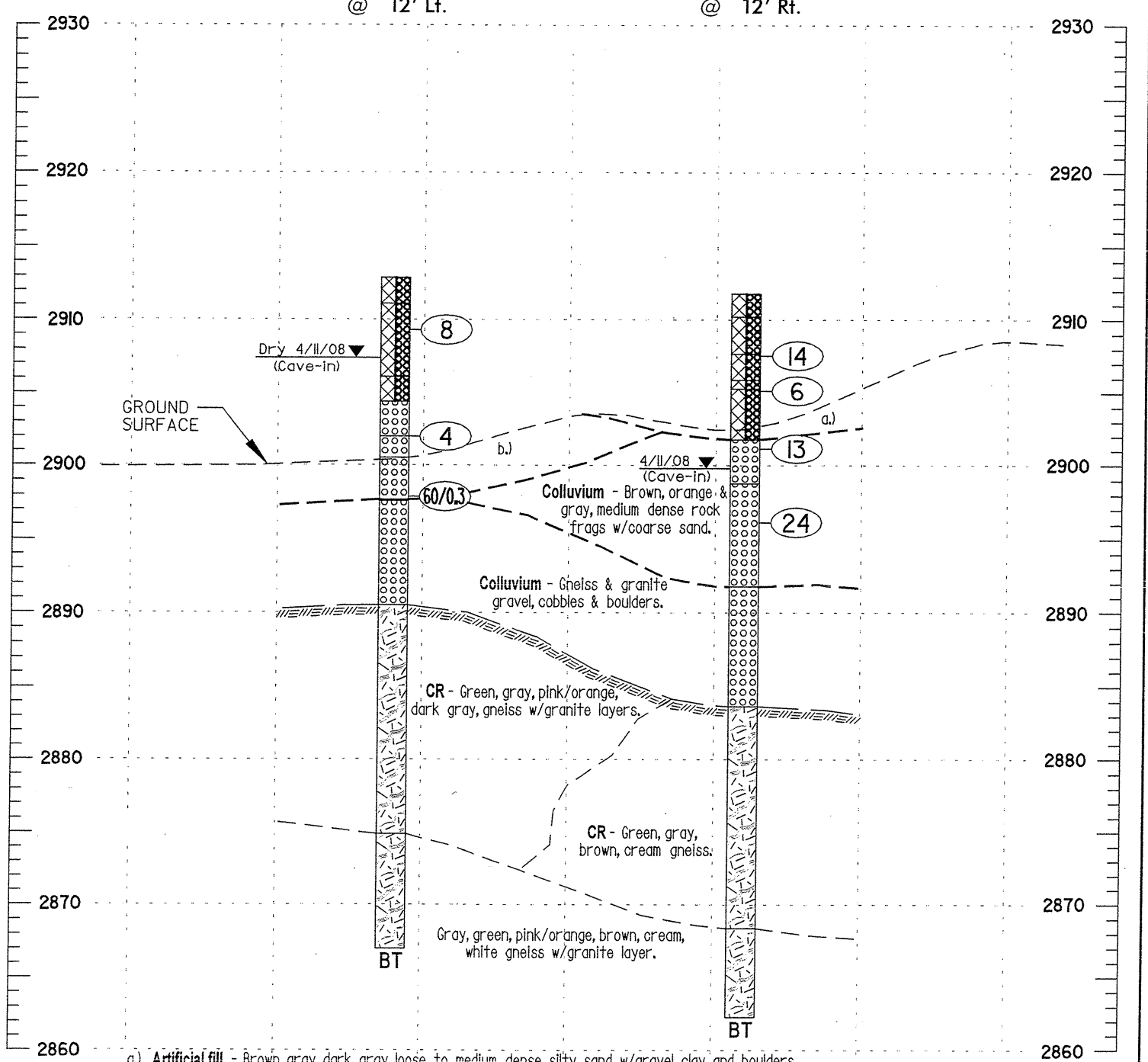


CROSS SECTION @ END BENT 1

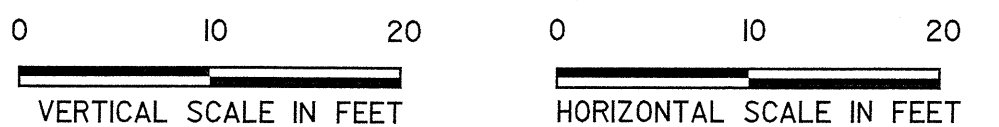


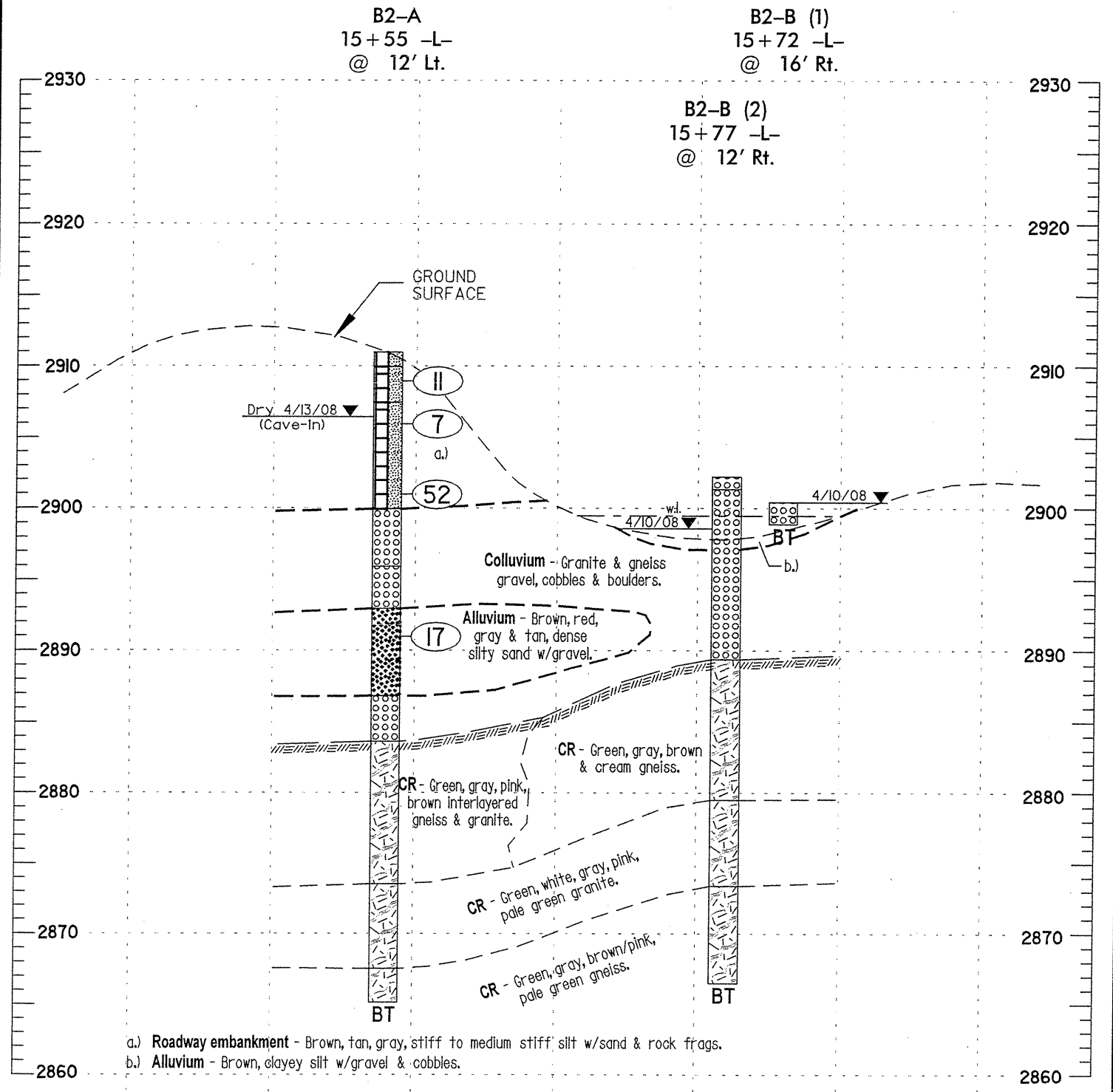
B1-A
14+91 -L-
@ 12' Lt.

B1-B
14+92 -L-
@ 12' Rt.

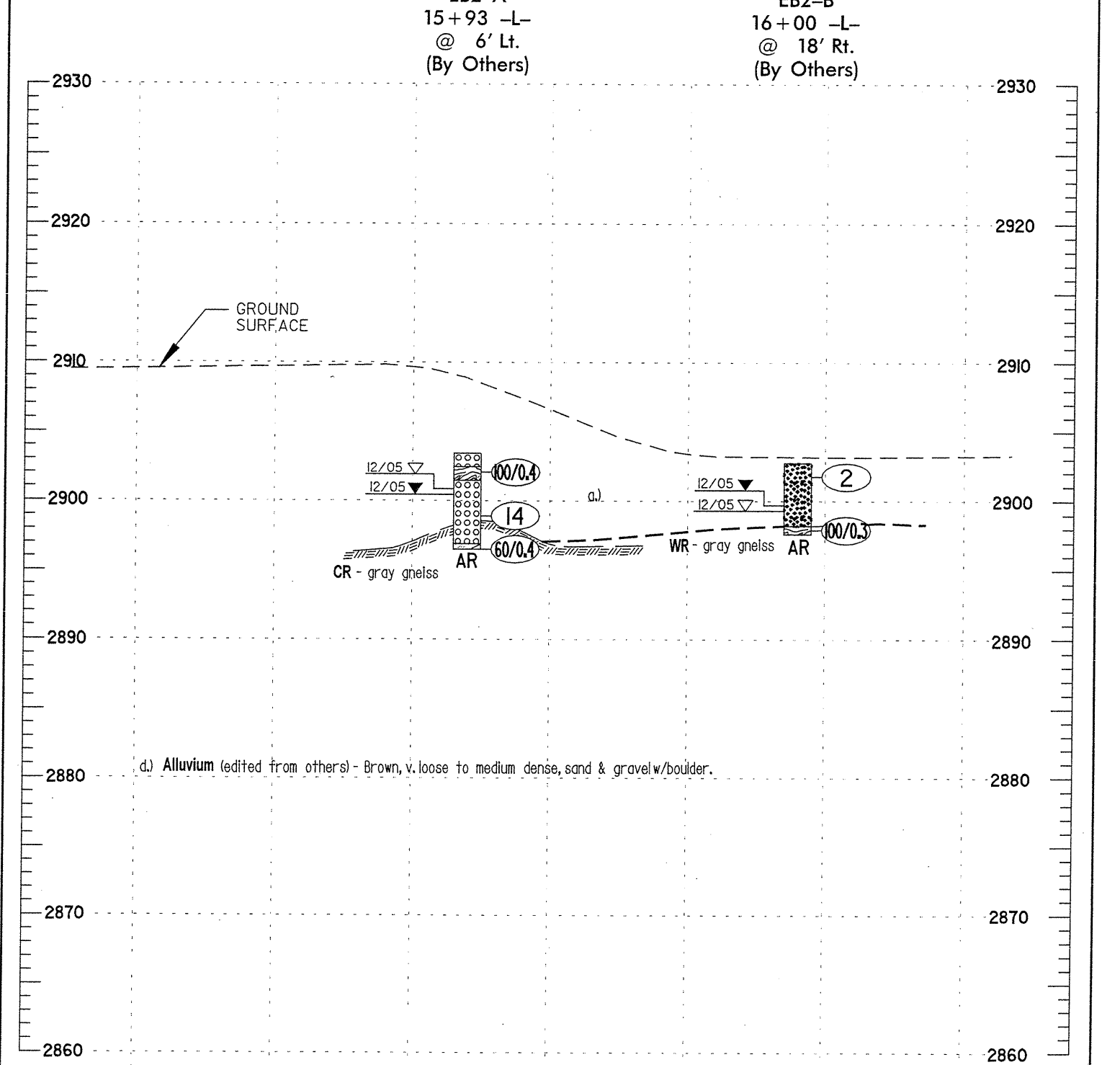
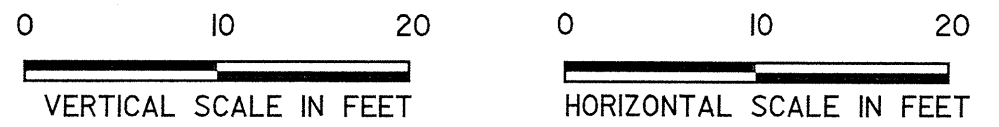


CROSS SECTION @ BENT 1

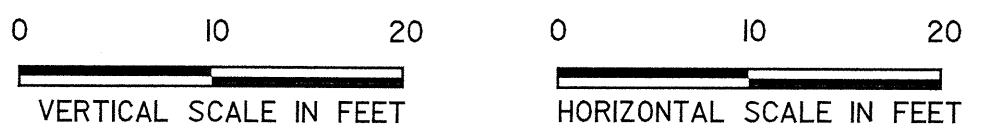




CROSS SECTION @ BENT 2



CROSS SECTION @ END BENT 2



PROJECT NO. 33653.1.1	ID. B-4316	COUNTY Watauga	GEOLOGIST Gragg, D.M.
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)			GROUND WTR (ft)
BORING NO. EB1-A	STATION 14+70	OFFSET 12ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,914.3 ft	TOTAL DEPTH 37.5 ft	NORTHING 917,251	EASTING 1,148,482
DRILL MACHINE CME-45C	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 04/11/08	COMP. DATE 04/11/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 28.5 ft

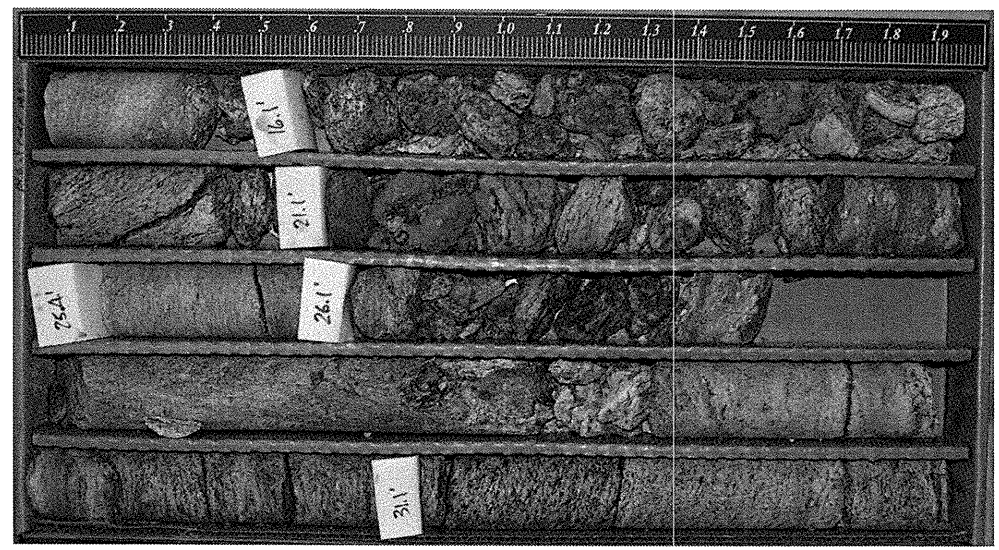
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2915														2,914.3	0.0
														2,914.3	0.0
														2,914.3	0.0
2910	2,909.3	5.0												2,908.8	5.5
														2,908.8	5.5
														2,908.8	5.5
2905	2,904.3	10.0	5	15	12									2,904.3	10.0
														2,904.3	10.0
														2,904.3	10.0
2900			4	1	2									2,901.8	12.5
														2,901.8	12.5
														2,901.8	12.5
2900														2,900.0	14.3
														2,900.0	14.3
														2,900.0	14.3
2895															
2890															
2885															
2880															
2875															
2870															
2865															
2860															
2855															
2850															
2845															
2840															
2835															

NCDOT BORE SINGLE BRIDGE 320 OVER BEECH CR.GPJ NC_DOT.GDT 6/18/08

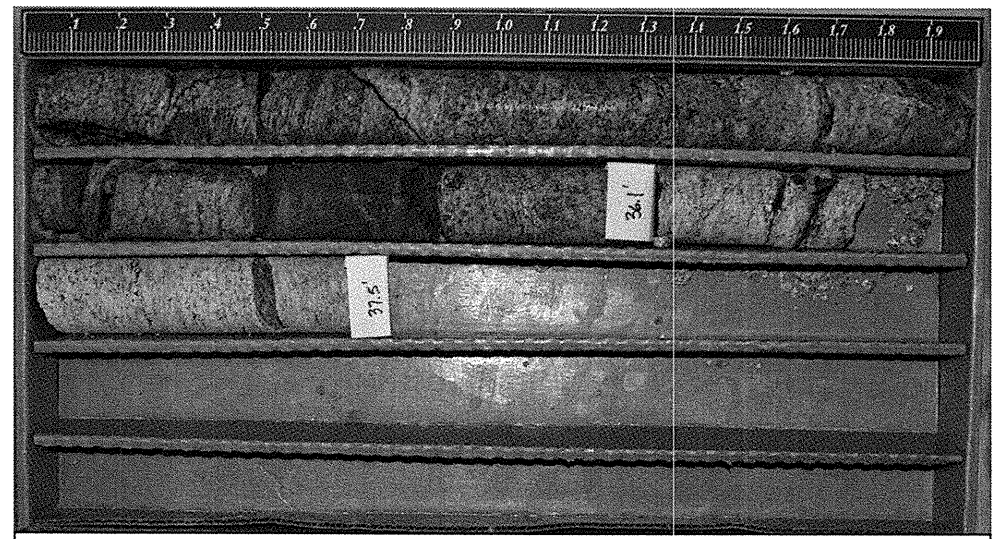
PROJECT NO. 33653.1.1	ID. B-4316	COUNTY Watauga	GEOLOGIST Gragg, D.M.
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)			GROUND WTR (ft)
BORING NO. EB1-A	STATION 14+70	OFFSET 12ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,914.3 ft	TOTAL DEPTH 37.5 ft	NORTHING 917,251	EASTING 1,148,482
DRILL MACHINE CME-45C	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 04/11/08	COMP. DATE 04/11/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 28.5 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 (%)			
2900												
	2,900.0	14.3	1.8	0:42	(0.6)	N/A		(5.0)	N/A		Begin Coring @ 14.3 ft	
	2,898.2	16.1	5.0	0:14/0.8	33%			35%			ALLUVIAL	14.3
											Brown, gray, green, red/orange, pink granite & gneiss gravel (1/2"-2") & cobbles (3"-6").	
2895												
	2,893.2	21.1	4.3	0:16	(1.9)	N/A						
2890												
	2,888.9	25.4	0.7	0:05	(1.5)	N/A						
	2,888.2	26.1	5.0	0:30	35%							
2885												
	2,883.2	31.1	5.0	0:36	(0.5)	N/A						
2880												
2875												
	2,878.2	36.1	5.0	0:48	(3.7)	28%		(8.4)	(3.9)		CRYSTALLINE ROCK	28.5
											Top in-situ rock 28.5' (Elev. 2885.8).	
											Gray, green, cream, pink/brown/orange, sil. to mod. weathered w/interval mod. sev. weathered (34.6'-35.7'), hard to v. hard w/interval med. soft, close frac. spacing, interlayered chlorite feldspar gneiss w/feldspar phenocrysts & granite.	
											18 jts @ 0°-25°, 3 jts @ 45°, 4 jts @ 70°-90°.	
2870												
	2,876.8	37.5	1.4	1:01	(4.4)	40%					Boring Terminated at Elevation 2,876.8 ft in granite (CR).	37.5
	2,875.4	38.9	1.4	1:07	(1.2)	36%					Cave-in @ 6.2'. Final casing depth = 14.3'. Drilling fluid = native water.	
2865												
2860												
2855												
2850												
2845												
2840												
2835												

NCDOT CORE SINGLE BRIDGE 320 OVER BEECH CR.GPJ NC_DOT.GDT 6/18/08



Boring EB1-A – Station 14+70 @ 12' Left - Box 1 of 2

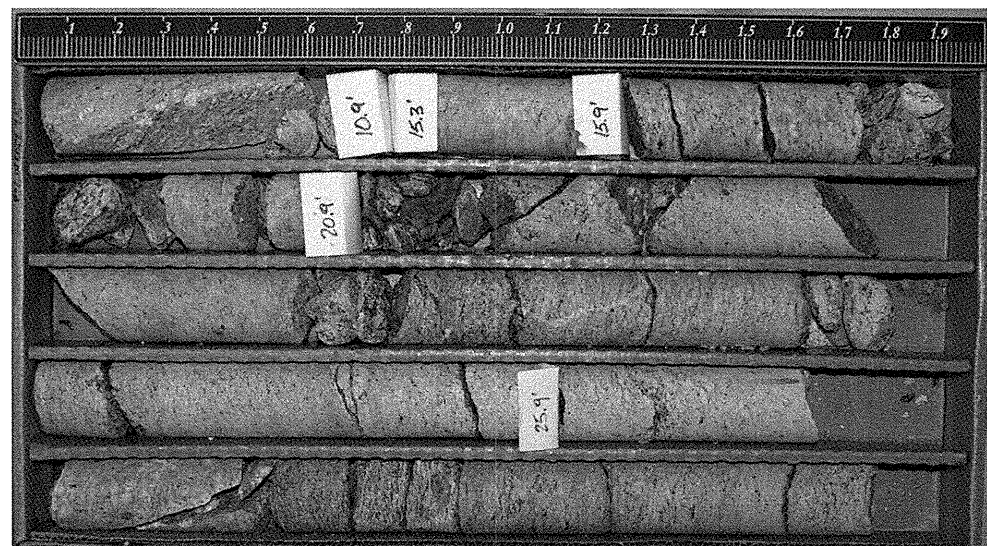


Boring EB1-A – Station 14+70 @ 12' Left - Box 2 of 2

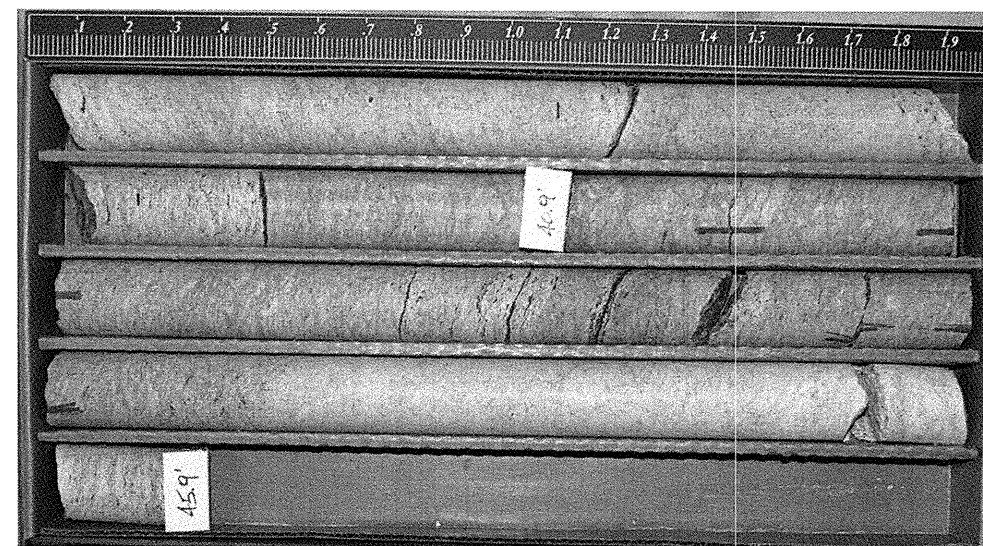
PROJECT NO. 33653.1.1		ID. B-4316		COUNTY Watauga		GEOLOGIST Gragg, D.M.										
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)							GROUND WTR (ft)									
BORING NO. B1-A		STATION 14+91		OFFSET 12ft LT		ALIGNMENT -L-										
COLLAR ELEV. 2,912.9 ft		TOTAL DEPTH 45.9 ft		NORTHING 917,271		EASTING 1,148,489										
DRILL MACHINE CME-45C		DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic												
START DATE 04/10/08		COMP. DATE 04/10/08		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 22.4 ft										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2915														2,912.9	GROUND SURFACE	0.0
														2,911.1	ARTIFICIAL FILL Brown & gray, silty sand w/gravel (1/2"-3/4") & cobbles (3") (A-1-a).	1.8
														2,908.1	ARTIFICIAL FILL Brown & gray, loose gravel & sand (A-1-a).	6.8
														2,905.4	ARTIFICIAL FILL Gneiss boulder.	7.5
														2,904.4	ARTIFICIAL FILL Gneiss boulder.	8.5
														2,902.0	ALLUVIAL Granite gravel.	10.9
														2,900.5	ALLUVIAL Granite gravel.	12.4
														2,897.6	ALLUVIAL Brown, gray & orange, v. loose to loose, coarse sand w/gravel, trace weathered rock (A-1-b).	15.3
														2,897.0	COLLUVIUM Granite & gneiss gravel & cobbles.	15.9
														2,890.5	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Gneiss w/granite layers.	22.4
														2,887.0	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Gneiss w/granite layers.	25.9
														2,882.0	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Gneiss w/granite layers.	30.9
														2,877.0	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Gneiss w/granite layers.	35.9
														2,872.0	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Gneiss w/granite layers.	40.9
														2,867.0	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Gneiss w/granite layers.	45.9
														2,874.9	CRYSTALLINE ROCK Gneiss w/granite layer.	38.0
														2,867.0	CRYSTALLINE ROCK Gneiss w/granite layer.	45.9
															Boring Terminated at Elevation 2,867.0 ft in gneiss (CR). cave-in 5.5'. Final casing depth = 15.3'. Drilling fluid = native water.	

NCDOT BORE SINGLE BRIDGE 320 OVER BEECH CR.GPJ NC_DOT.GDT 6/18/08

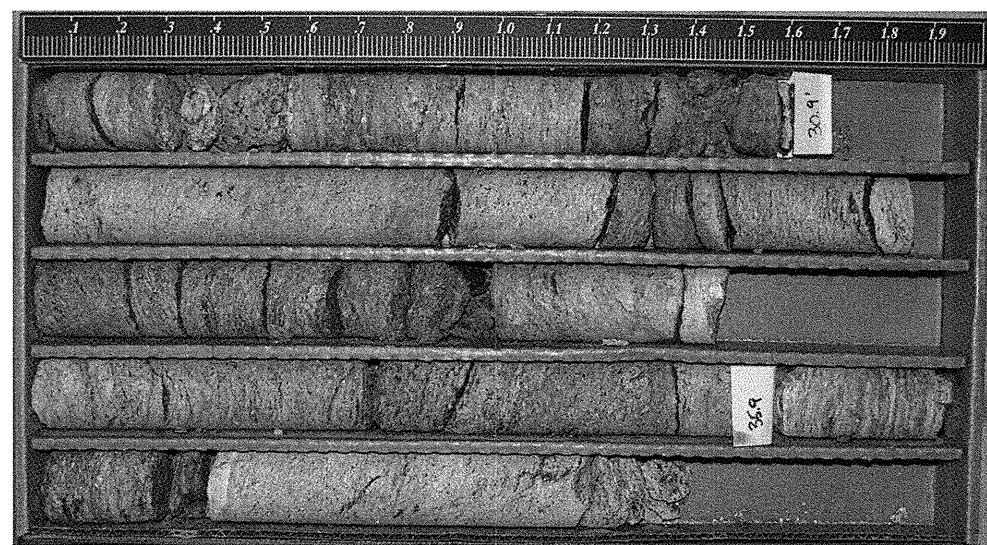
PROJECT NO. 33653.1.1		ID. B-4316		COUNTY Watauga		GEOLOGIST Gragg, D.M.	
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)							GROUND WTR (ft)
BORING NO. B1-A		STATION 14+91		OFFSET 12ft LT		ALIGNMENT -L-	
COLLAR ELEV. 2,912.9 ft		TOTAL DEPTH 45.9 ft		NORTHING 917,271		EASTING 1,148,489	
DRILL MACHINE CME-45C		DRILL METHOD NW Casing w/ SPT Core		HAMMER TYPE Automatic			
START DATE 04/10/08		COMP. DATE 04/10/08		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 22.4 ft	
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	TOTAL RUN 34.0 ft		DRILLER Contract Driller
					REC. (%)	ROD (%)	
						DESCRIPTION AND REMARKS	
						DEPTH (ft)	
	2905.4						Begin Coring @ 7.5 ft
	2,905.4	7.5	3.4	0:43	(0.7)	N/A	ARTIFICIAL FILL Gneiss boulder (20") (continued).
	2,902.0	10.9		0:10	21%		ARTIFICIAL FILL Gneiss boulder (20") (continued).
	2,902.0			0:10			ARTIFICIAL FILL Gneiss boulder (20") (continued).
	2,902.0			0:08/0.4			ALLUVIAL Green, gray & brown/orange, granite gravel (2") & gneiss boulder (15").
	2,900.5			N=4			ALLUVIAL Green, gray & brown/orange, granite gravel (2") & gneiss boulder (15").
	2,897.6	15.3		0:58/0.6			ALLUVIAL Green, gray & brown/orange, granite gravel (2") & gneiss boulder (15").
	2,897.0	15.9	0.6	0:58/0.6	(0.4)	N/A	COLLUVIUM Gray, green & brown/orange, granite & gneiss gravel (3/4"-2") & cobbles (6").
	2,895.4		5.0	0:55	67%	N/A	COLLUVIUM Gray, green & brown/orange, granite & gneiss gravel (3/4"-2") & cobbles (6").
	2,895.4			0:15	(1.3)		COLLUVIUM Gray, green & brown/orange, granite & gneiss gravel (3/4"-2") & cobbles (6").
	2,892.0			0:16	26%		COLLUVIUM Gray, green & brown/orange, granite & gneiss gravel (3/4"-2") & cobbles (6").
	2,892.0			0:15			COLLUVIUM Gray, green & brown/orange, granite & gneiss gravel (3/4"-2") & cobbles (6").
	2,892.0			0:24			COLLUVIUM Gray, green & brown/orange, granite & gneiss gravel (3/4"-2") & cobbles (6").
	2,890.5		5.0	0:32	(3.8)	(1.6)	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,890.5			1:15	76%	32%	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,887.0			0:56			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,887.0			0:51	(3.9)	(1.2)	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,887.0			0:54	78%	24%	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,887.0			0:53			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,887.0			0:57			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,887.0			1:01			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,880.5		5.0	1:05	(4.9)	(2.4)	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,880.5			1:07	98%	48%	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,880.5			1:13			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,877.0			1:09			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,877.0			1:02			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,875.0		5.0	0:32	(4.6)	(4.1)	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,875.0			1:02	92%	82%	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,875.0			1:22			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,875.0			1:34			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,872.0		5.0	2:24	(5.0)	(4.3)	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,872.0			2:41	100%	86%	CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,872.0			2:58			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0			3:17			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0			7:08			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0			8:46			CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0						CRYSTALLINE ROCK Top in-situ rock 22.4' (Elev. 2890.5). Green, gray, pink/orange & dark gray, sli. to mod. weathered w/intervals mod. sev. to v. sev. weathered, hard w/soft intervals, close frac. w/v. close frac. swarms, feldspar chlorite gneiss w/granite layers (<1.0'). 12 jts @ 0°-20°, 4 jts @ 50°-60°.
	2,867.0		</				



Boring B1-A – Station 14+91 @ 12' Left - Box 1 of 3



Boring B1-A – Station 14+91 @ 12' Left - Box 3 of 3



Boring B1-A – Station 14+91 @ 12' Left - Box 2 of 3

PROJECT NO. 33653.1.1	ID. B-4316	COUNTY Watauga	GEOLOGIST Gragg, D.M.
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)			GROUND WTR (ft)
BORING NO. B1-B	STATION 14+92	OFFSET 12ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,911.8 ft	TOTAL DEPTH 49.5 ft	NORTHING 917,263	EASTING 1,148,512
DRILL MACHINE CME-45C	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 04/09/08	COMP. DATE 04/10/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 28.1 ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2915															
2910															
2905	2,907.7	4.1	3	7	7										
2900	2,905.3	6.5	3	3	3										
2895	2,901.3	10.5	7	7	6										
2890	2,896.3	15.5	13	13	11										
2885															
2880															
2875															
2870															
2865															
2860															
2855															
2850															
2845															
2840															
2835															

PROJECT NO. 33653.1.1	ID. B-4316	COUNTY Watauga	GEOLOGIST Gragg, D.M.
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)			GROUND WTR (ft)
BORING NO. B1-B	STATION 14+92	OFFSET 12ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,911.8 ft	TOTAL DEPTH 49.5 ft	NORTHING 917,263	EASTING 1,148,512
DRILL MACHINE CME-45C	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 04/09/08	COMP. DATE 04/10/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 28.1 ft

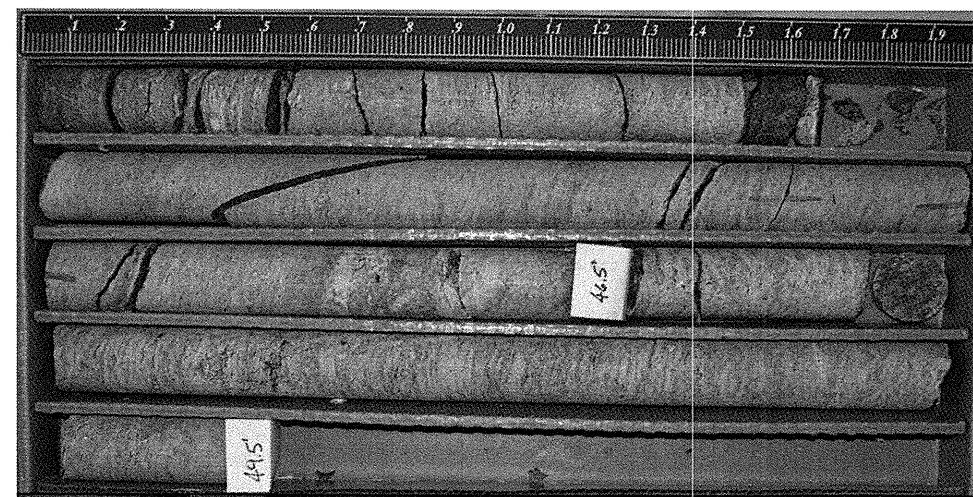
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC (%)	RQD (%)		REC (%)	RQD (%)			
2905.6												
2900	2,905.3	6.2	0.3	0.32/0.3	(0.3)	N/A	SS-5	(0.3)	N/A			
2895												
2890	2,891.8	20.0	1.5	0.23	(0.6)	N/A		(4.7)	N/A			
2885	2,885.3	26.5	5.0	0.23/0.5	(2.9)	N/A						
2880	2,880.3	31.5	5.0	1:08	(4.6)	(1.9)	RS-1	(14.7)	(7.3)			
2875	2,875.3	36.5	5.0	1:19	(2.8)	56%						
2870	2,870.3	41.5	5.0	1:08	(4.7)	(2.5)						
2865	2,865.3	46.5	3.0	1:25	(3.0)	(2.8)	RS-2	(6.0)	(5.3)			
2860	2,862.3	49.5		4:22	100%	93%						
2855												
2850												
2845												
2840												
2835												

NCDOT BORE SINGLE BRIDGE 320 OVER BEECH CR.GPJ NC_DOT.GDT 6/18/08

NCDOT CORE SINGLE BRIDGE 320 OVER BEECH CR.GPJ NC_DOT.GDT 6/18/08



Boring B1-B – Station 14+92 @ 12' Right - Box 1 of 3



Boring B1-B – Station 14+92 @ 12' Right - Box 3 of 3



Boring B1-B – Station 14+92 @ 12' Right - Box 2 of 3

PROJECT NO. 33653.1.1	ID. B-4316	COUNTY Watauga	GEOLOGIST Gragg, D.M.
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)			GROUND WTR (ft)
BORING NO. B2-A	STATION 15+55	OFFSET 12ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,910.9 ft	TOTAL DEPTH 45.8 ft	NORTHING 917,331	EASTING 1,148,511
DRILL MACHINE CME-45C	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 04/12/08	COMP. DATE 04/12/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 27.3 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					
2915															
2910	2,908.9	2.0												2,910.9 GROUND SURFACE	0.0
														2,909.9 ROADWAY EMBANKMENT	1.0
														2,907.4 ROADWAY EMBANKMENT	3.5
														2,905.9 ROADWAY EMBANKMENT	
2905	2,905.9	5.0	1	2	5									2,899.9 COLLUVIUM	11.0
														2,895.9 COLLUVIUM	15.0
														2,892.9 COLLUVIUM	18.0
2900	2,900.9	10.0	1	3	49									2,890.9 ALLUVIAL	
														2,886.8 COLLUVIUM	24.1
2890	2,890.9	20.0	2	5	12									2,883.6 COLLUVIUM	27.3
														2,880.1 CRYSTALLINE ROCK	
2885														2,873.5 CRYSTALLINE ROCK	37.4
2880														2,867.5 CRYSTALLINE ROCK	43.4
2875														2,865.1 CRYSTALLINE ROCK	45.8
2870														Boring Terminated at Elevation 2,865.1 ft in gneiss (CR).	
2865														cave-in 4.5'. Final casing depth = 24.1'. Drilling fluid = native water.	
2860															
2855															
2850															
2845															
2840															
2835															

NCDOT BORE SINGLE BRIDGE 320 OVER BEECH CR.GPJ NC_DOT.GDT 6/18/08

PROJECT NO. 33653.1.1	ID. B-4316	COUNTY Watauga	GEOLOGIST Gragg, D.M.
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)			GROUND WTR (ft)
BORING NO. B2-A	STATION 15+55	OFFSET 12ft LT	ALIGNMENT -L-
COLLAR ELEV. 2,910.9 ft	TOTAL DEPTH 45.8 ft	NORTHING 917,331	EASTING 1,148,511
DRILL MACHINE CME-45C	DRILL METHOD NW Casing w/ SPT Core	HAMMER TYPE Automatic	
START DATE 04/12/08	COMP. DATE 04/12/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 27.3 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 (%)			
	2895.9											
2895	2,895.9	15.0	1.2	0:51	(0.3)	N/A		(0.8)	N/A		Begin Coring @ 15.0 ft	
	2,894.7	16.2	1.8	0:16/0.2	25%	N/A					2,895.9 COLLUVIUM	15.0
	2,892.9	18.0		0:42	(0.5)						2,892.9 Green, gray, pink & brown, gneiss & granite gravel (1/2"-1 1/2") & cobbles (3"-4"), void 15.2'-16.1'.	18.0
				1:39/0.8	28%						ALLUVIAL	
2890				N=17								
	2,886.8	24.1										
2885	2,885.1	25.8	1.7	1:03	(1.1)	N/A		(1.4)	N/A		2,886.8 COLLUVIUM	24.1
			5.0	0:25/0.7	65%						2,883.6 Green, gray, pink & brown/orange, gneiss & granite gravel (3/4"-1 1/2") & cobbles (4").	27.3
				0:44	(3.9)	48%					CRYSTALLINE ROCK	
				0:59	(2.4)						Top in-situ rock 27.3' (Elev. 2883.6).	
2880	2,880.1	30.8	5.0	1:30	(4.6)	(3.9)		(9.3)	(7.5)		2,883.6 Green, gray & pink/brown, sli. weathered w/intervals (0.1') mod. weathered, hard to mod. hard, close to mod. close frac. spacing, interlayered chlorite feldspar gneiss & granite.	
				1:54							16 jts @ 16°-20°, 5 jts @ 30°-40° & 1 jt @ 50°.	
				1:57								
2875	2,875.1	35.8	5.0	1:38	(4.1)	(2.6)		(4.8)	(3.5)		2,873.5 CRYSTALLINE ROCK	37.4
				1:27	82%	52%					Green, white & gray, sli. weathered to fresh w/interval mod. sev. weathered (37.4'-39.0'), hard, close to mod. close frac. spacing granite.	
				1:32							11 jts @ 0°-20° & 2 jts @ 30°-40°	
2870	2,870.1	40.8	5.0	1:58	(4.8)	(3.1)					2,867.5 CRYSTALLINE ROCK	43.4
				2:09							Green, gray & brown/pink, sli. weathered w/intervals (<0.1') mod. sev. weathered, hard, close frac. spacing chlorite feldspar gneiss w/feldspar phenocrysts.	
				2:00							6 jts @ 0°-20° & 1 jt @ 30°-40°.	
				2:01							Boring Terminated at Elevation 2,865.1 ft in gneiss (CR).	
2865	2,865.1	45.8		2:08				(2.4)	(1.0)		2,865.1 CRYSTALLINE ROCK	45.8
				2:10								
2860												
2855												
2850												
2845												
2840												
2835												

NCDOT BORE SINGLE BRIDGE 320 OVER BEECH CR.GPJ NC_DOT.GDT 6/18/08



Boring B2-A – Station 15+55 @ 12' Left - Box 1 of 3



Boring B2-A – Station 15+55 @ 12' Left - Box 3 of 3



Boring B2-A – Station 15+55 @ 12' Left - Box 2 of 3

PROJECT NO. 33653.1.1	ID. B-4316	COUNTY Watauga	GEOLOGIST Gragg, D.M.
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)			GROUND WTR (ft)
BORING NO. B2-B (1)	STATION 15+72	OFFSET 16ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,900.4 ft	TOTAL DEPTH 1.5 ft	NORTHING 917,337	EASTING 1,148,543
DRILL MACHINE CME-45C	DRILL METHOD Core Boring	HAMMER TYPE Automatic	
START DATE 04/09/08	COMP. DATE 04/09/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

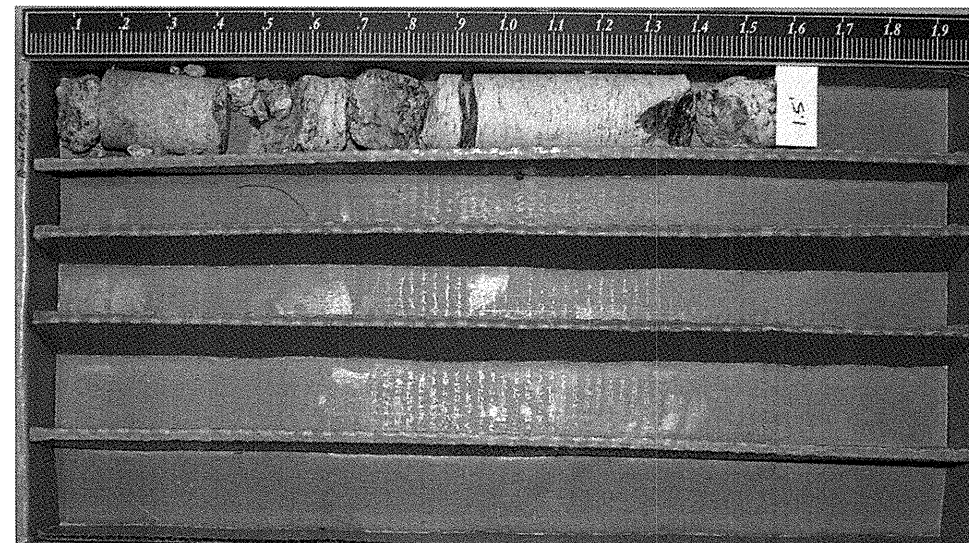
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2905															
2900														GROUND SURFACE	0.0
														COLLUVIUM	1.5
														Granite & gneiss cobbles.	
														Boring Terminated at Elevation 2,898.9 ft in granite & gneiss cobbles (Colluvium).	
														Moved borehole due to siltation in creek. Final casing depth = N/A. Drilling fluid = native water.	

NCDOT BORE SINGLE BRIDGE 320 OVER BEECH CR.GPJ NC_DOT.GDT 6/18/08

PROJECT NO. 33653.1.1	ID. B-4316	COUNTY Watauga	GEOLOGIST Gragg, D.M.
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)			GROUND WTR (ft)
BORING NO. B2-B (1)	STATION 15+72	OFFSET 16ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,900.4 ft	TOTAL DEPTH 1.5 ft	NORTHING 917,337	EASTING 1,148,543
DRILL MACHINE CME-45C	DRILL METHOD Core Boring	HAMMER TYPE Automatic	
START DATE 04/09/08	COMP. DATE 04/09/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 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. (%)	RQD (%)		REC. (%)	RQD (%)			
2900.4		0.0	1.5	1:27	(1.5)	N/A		(1.4)	N/A		Ground Surface	
2898.9		1.5		0:54/0.5	100%			93%			COLLUVIUM	1.5
											Granite & gneiss cobbles (3").	
											Boring Terminated at Elevation 2,898.9 ft in granite & gneiss cobbles (Colluvium).	
											Moved borehole due to siltation in creek. Final casing depth = N/A. Drilling fluid = native water.	

NCDOT CORE SINGLE BRIDGE 320 OVER BEECH CR.GPJ NC_DOT.GDT 6/18/08



Boring B2-B(1) – Station 15+72 @ 16' Right – Box 1 of 1

PROJECT NO. 33653.1.1	ID. B-4316	COUNTY Watauga	GEOLOGIST Gragg, D.M.
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)			GROUND WTR (ft)
BORING NO. B2-B (2)	STATION 15+77	OFFSET 12ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,902.2 ft	TOTAL DEPTH 35.7 ft	NORTHING 917,343	EASTING 1,148,541
DRILL MACHINE CME-45C	DRILL METHOD Core Boring	HAMMER TYPE Automatic	
START DATE 04/09/08	COMP. DATE 04/09/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 12.8 ft

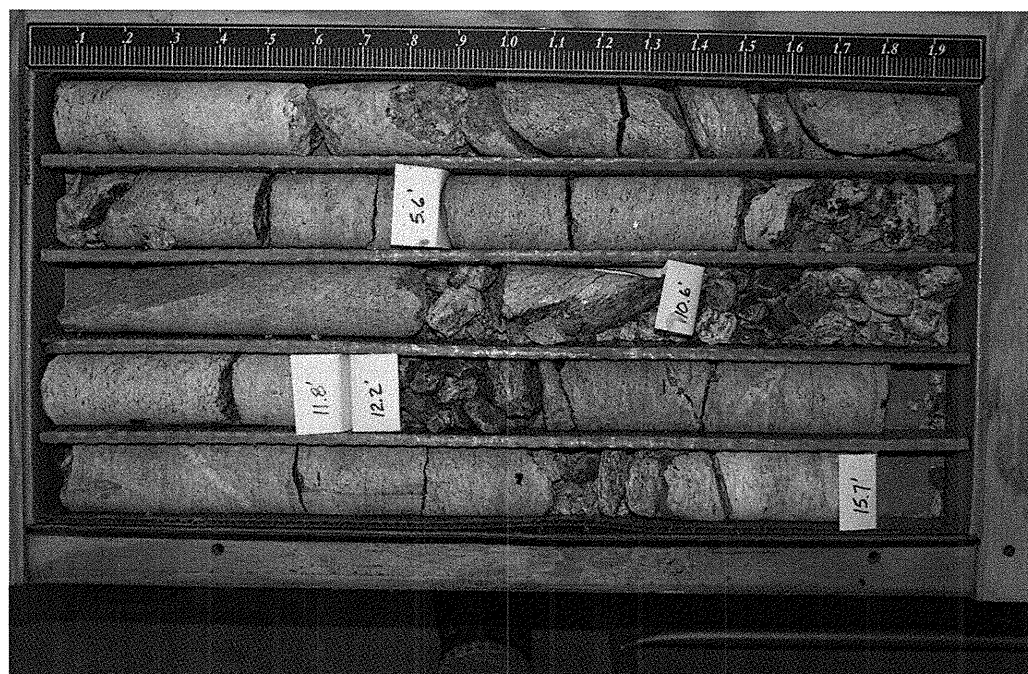
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
2905														
2900													GROUND SURFACE 0.0	
2895													ALLUVIAL Brown, clayey silt w/gravel (2"-3") & cobbles (4"-6") (A-1-b). COLLUVIUM Granite gravel, cobbles & boulders.	0.9
2890													CRYSTALLINE ROCK Top in-situ rock 12.8' (Elev. 2889.4). Gneiss.	12.8
2885											RS-6			
2880													CRYSTALLINE ROCK Granite.	22.7
2875											RS-7		CRYSTALLINE ROCK Gneiss.	28.8
2870														
2865													Boring Terminated at Elevation 2,866.5 ft in gneiss (CR). Core bit change @ 28.7'. Final casing depth = 12.2'. Drilling fluid = native water.	35.7

NCDOT BORE SINGLE BRIDGE 320 OVER BEECH CR.GPJ NC_DOT.GDT 6/18/08

PROJECT NO. 33653.1.1	ID. B-4316	COUNTY Watauga	GEOLOGIST Gragg, D.M.
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)			GROUND WTR (ft)
BORING NO. B2-B (2)	STATION 15+77	OFFSET 12ft RT	ALIGNMENT -L-
COLLAR ELEV. 2,902.2 ft	TOTAL DEPTH 35.7 ft	NORTHING 917,343	EASTING 1,148,541
DRILL MACHINE CME-45C	DRILL METHOD Core Boring	HAMMER TYPE Automatic	
START DATE 04/09/08	COMP. DATE 04/09/08	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 12.8 ft

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		L O G	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft)	RQD (%)		REC. (ft)	RQD (%)			
2900	2,901.3	0.9	4.7	0:47 1:01 1:30 2:34 0:57/0.7	(2.8)	N/A		(6.7)	N/A		Begin Coring @ 0.9 ft COLLUVIUM Gray, green, pink & brown, gneiss & granite gravel (3/4"-2"), cobbles (3"-6") & boulder (16") w/sand & silt in interstices, void 12.2'-12.5'. 0.9	0.9
2895	2,896.6	5.6	5.0	1:00 0:27 5:30 1:20 0:20	(2.3)	N/A						
2890	2,891.6 2,890.4 2,890.0	10.6 11.8 12.2	1.2 3.5	1:29 0:25/0.2 1:35 4:39 1:20 2:27/0.5	(1.1) 92%	N/A		(9.2)	(3.8)		CRYSTALLINE ROCK Top in-situ rock 12.8' (Elev. 2889.4). Green, gray, brown & cream, sli. to intervals mod. sev. weathering (0.3'-0.7'), med. hard, close frac. spacing w/stain on frags., chlorite feldspar gneiss w/feldspar phenocrysts, voids 14.5'-15.2' & 16.4'-16.5'. 42 jts @ 0°-20° & 1 jt @ 35°. 12.8	12.8
2885	2,886.5	15.7	5.0	2:22 1:36 1:22 1:05 1:09	(4.9)	(2.5)	RS-6	93%	38%			
2880	2,881.5	20.7	5.0	0:56 1:12 6:27 8:30 21:36	(5.0)	(3.0)		100%	60%			
2875	2,876.5	25.7	5.0	14:39 10:08 20:40 2:24 2:55	(5.0)	(5.0)	RS-7	100%	93%		CRYSTALLINE ROCK Green, gray, pink & pale green, sli. weathering to fresh, mod. hard to v. hard, close to mod. close frac. spacing chlorite & epidote rich granite w/feldspar phenocrysts. 10 jts @ 0°-20° & 1 jt @ 70°. 22.7	22.7
2870	2,871.5	30.7	5.0	2:11 2:13 1:30 1:41 1:36	(4.8)	(4.0)		99%	86%		CRYSTALLINE ROCK Green, gray, pink & pale green, fresh to sli. weathering, v. hard, close to mod. close frac. spacing, chlorite feldspar gneiss w/feldspar phenocrysts. 5 jts @ 0°-20°. 28.8	28.8
2865	2,866.5	35.7									Boring Terminated at Elevation 2,866.5 ft in gneiss (CR). Core bit change @ 28.7'. Final casing depth = 12.2'. Drilling fluid = native water. 35.7	35.7

NCDOT CORE SINGLE BRIDGE 320 OVER BEECH CR.GPJ NC_DOT.GDT 6/18/08



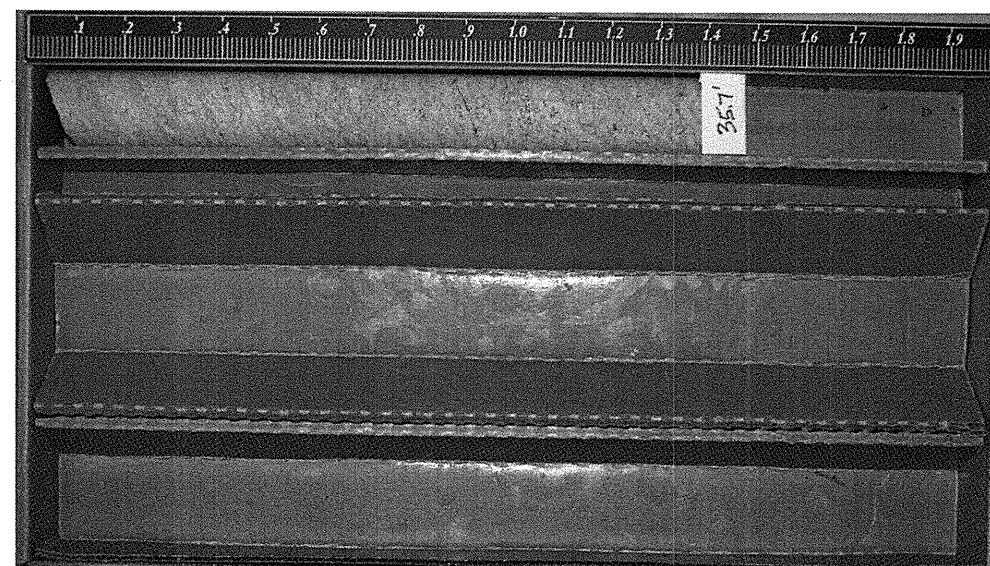
Boring B2-B(2) – Station 15+77 @ 12' Right - Box 1 of 4



Boring B2-B(2) – Station 15+77 @ 12' Right - Box 3 of 4



Boring B2-B(2) – Station 15+77 @ 12' Right - Box 2 of 4



Boring B2-B(2) – Station 15+77 @ 12' Right - Box 4 of 4



FROEHLING & ROBERTSON, INC.
 GEOTECHNICAL • ENVIRONMENTAL • MATERIALS
 ENGINEERS • LABORATORIES
 "OVER ONE HUNDRED YEARS OF SERVICE"

N.C.D.O.T. GEOTECHNICAL UNIT
 BORING LOG

SHEET 1 OF 1

PROJECT NO. 33653.1.1		ID. B-4316		COUNTY Watauga		GEOLOGIST C. Baldwin								
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)							GROUND WATER (ft)							
BORING NO. EB2-A		BORING LOCATION 15+87		OFFSET 10ft LT		ALIGNMENT -L-								
COLLAR ELEV. 2,903.4 ft		NORTHING 917,366		EASTING 1,148,531		0 HR. 2.6								
TOTAL DEPTH 6.9 ft		DRILL MACHINE CME 750		DRILL METHOD 2.25" ID HSA		HAMMER TYPE Automatic								
DATE STARTED 12/6/05		COMPLETED 12/6/05		SURFACE WATER DEPTH N/A										
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100	
2,903.4	0.0	1	1	100/0.4'	Ground Surface					M	MO	2,903.4	0.0	
2,899.9	3.5	5	8	6	Brown, fine to coarse SAND & GRAVEL (A-1-a).					SS-4	W	2,902.4	1.0	
2,896.5	6.9	60/0.0'			Brown, fine to coarse SAND & GRAVEL (A-1-a(0)), with little clay.							2,901.4	2.0	
					Gray, BIOTITE GRANITIC GNEISS.							2,896.9	6.5	
					Boring Terminated with Standard Penetration Test Refusal at Elevation 2,896.5 ft in CRYSTALLINE ROCK (BIOTITE GRANITIC GNEISS)							2,896.5	6.9	
NOTES:														
1) Geologist indicates strata break in split spoon at a depth of 1.0' (elev. 2902.4').														
2) Driller indicates softer drilling at a depth of 2.0' (elev. 2901.4').														
3) Driller indicates harder drilling at a depth of 6.5' (elev. 2896.9').														
4) Auger refusal at a depth of 6.9' (elev. 2896.5').														

NCDOT BORE SINGLE G66-192.GPJ NC DOT.GDT 1/6/06



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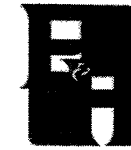
N.C.D.O.T. GEOTECHNICAL UNIT
 BORING LOG

SHEET 21A

SHEET 1 OF 1

PROJECT NO. 33653.1.1		ID. B-4316		COUNTY Watauga		GEOLOGIST C. Baldwin								
SITE DESCRIPTION Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Rd.)							GROUND WATER (ft)							
BORING NO. EB2-B		BORING LOCATION 15+87		OFFSET 15ft RT		ALIGNMENT -L-								
COLLAR ELEV. 2,903.1 ft		NORTHING 917,365		EASTING 1,148,556		0 HR. 3.4								
TOTAL DEPTH 5.1 ft		DRILL MACHINE CME 750		DRILL METHOD 2.25" ID HSA		HAMMER TYPE Automatic								
DATE STARTED 12/6/05		COMPLETED 12/6/05		SURFACE WATER DEPTH N/A										
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100	
2,903.1	0.0	WOH			Ground Surface					M	MO	2,903.1	0.0	
2,899.6	3.5	9	7	100/0.3'	Dark brown, silty fine to coarse SAND (A-2-4), with some gravel & organics.							2,898.6	4.5	
					Gray, BIOTITE GRANITIC GNEISS.							2,898.0	5.1	
					Boring Terminated with Auger Refusal at Elevation 2,898.0 ft in WEATHERED ROCK (BIOTITE GRANITIC GNEISS)									
NOTES:														
1) Geologist indicates strata break in split spoon at a depth of 4.5' (elev. 2898.6').														
2) Auger refusal at a depth of 5.1' (elev. 2898.0').														

NCDOT BORE SINGLE G66-192.GPJ NC DOT.GDT 1/6/06



Moisture Data

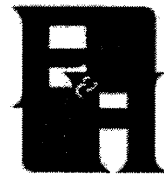
Project Name : Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Road)

Location : Watauga County, North Carolina

Job Number : 08012-02

Project Job No. : 33653.1.1 ; ID. B-4316

Soil No.	Boring No.	Station & Offset	Sample No.	Depth	Description of Soil	Natural NC Sample No.	Moisture Content (%)
End Bent 1							
1	EB1-A		SS-1	5.0	6.5	Dark Brown Coarse Sand & Gravel	10.1
1			SS-2	10.0	11.5	Brown Coarse Sand & Gravel	SS-1 19.2
EB1-B							
1			SS-1	2.0	3.0	Dark Brown Coarse Sand & Gravel	15.7
1			SS-2	5.0	6.5	Light Brown Coarse Sand & Gravel	7.4
2			SS-3	21.0	21.7	Light Gray, Brown, Orange & Tan Coarse Sand & Gravel	SS-2 11.5
3			SS-4	26.0	27.5	Light Brown Silt	25.2
3			SS-5	30.0	31.5	Gray Silt	12.9
3			SS-6	35.0	36.5	Gray & Brown/Orange Silt	SS-3 25.0
Bent 1							
B1-A							
5			SS-1	3.6	5.1	Brown Stone, Gravel & Sand	11.4
4			SS-2	10.9	12.4	Brown, Gray & Orange Coarse Sand & Gravel	SS-4 9.5
4			SS-3	15.0	15.3	Gray Coarse Sand & Gravel	9.7
B1-B							
5			SS-1	4.1	5.6	Brown Stone, Gravel & Sand	11.6
5			SS-2	6.5	8.0	Gray, White & Tan Stone, Gravel & Sand	SS-5 14.5
6			SS-3	10.5	12.0	Gray, White & Pink Coarse Sand with rock fragments	13.9
6			SS-4	15.5	17.0	Gray, Brown & Orange Coarse Sand with rock fragments	SS-6 9.8
Bent 2							
B2-A							
7			SS-1	2.0	3.5	Brown, Tan & Gray Silt with rock fragments	13.4
7			SS-2	5.0	6.5	Brown & Dark Brown Silt with rock fragments	SS-7 20.9
7			SS-3	10.0	11.5	Brown, Dark Brown & Orange Silt with rock fragments	22.2
8			SS-4	20.0	21.5	Brown, Red Gray & Tan Silty Sand with Gravel	SS-8 22.0



Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316
 Project County : Watauga
 Project State : North Carolina
 Laboratory No. : 08012-02
 Submitted By : Florence & Hutcheson, Inc.
 Soil Type : Brown Coarse Sand & Gravel

Sample No. : SS - 1
 Sample Loc. : Boring No. EB1-A
 Sample Depth : 10.0' to 11.5'
 Date Tested : 04-17-08
 Date Reported : 04-23-08

% Passing			
4	in.	100	mm
3 1/2	in.	90	mm
3	in.	75	mm
2 1/2	in.	63	mm
2	in.	50	mm
1 3/4	in.	45	mm
1 1/2	in.	38.1	mm
1 1/4	in.	31.5	mm
1	in.	25	mm
3/4	in.	19	mm
1/2	in.	12.5	mm
3/8	in.	9.5	mm
No.4		4.75	mm
No.6		3.35	mm
No.8		2.36	mm
No.10		2	mm

% Passing			
No.16		1.18	mm
No.30		0.6	mm
No.40		0.425	mm
No.50		0.3	mm
No.60		0.25	mm
No.80		0.18	mm
No.100		0.15	mm
No.200		0.075	mm
No.270		0.053	mm
Hyd. Rd. # 1		0.0500	mm
Hyd. Rd. # 2		0.0050	mm
Hyd. Rd. # 3			mm
Hyd. Rd. # 4			mm
Hyd. Rd. # 5			mm
Hyd. Rd. # 6			mm
Hyd. Rd. # 7			mm

D₅₀ = 2.274 mm

California Bearing Ratio : NA
 Maximum Dry Density : NA
 Optimum Moisture : NA

Natural Moisture (%) : 19.2
 Liquid Limit : 23
 Plastic Limit : 22
 Plasticity Index : 1
 Liquidity Index : -2.59
 Activity : 0.17
 Specific Gravity : NA
 AASHTO Classification : A-1-b (0)
 ASTM Classification : SM

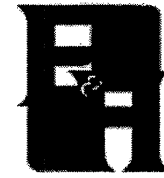
AASHTO Composition of Total Sample
 Gravel (3in. + No.10) : 51.9
 Coarse Sand (-No.10 + No.40) : 20.4
 Fine Sand (-No.40 + No.200) : 10.8
 Silt (-No.200 + 0.002mm) : 11.1
 Clay (-0.002mm + 0.001mm) : 1.3
 Colloids (-0.001mm) : 4.4

ASTM Composition of Total Sample
 Coarse Gravel (3in. + 3/4in.) : 20.8
 Fine Gravel (-3/4in. + No.4) : 18.3
 Coarse Sand (-No.4 + No.10) : 12.8
 Medium Sand (-No.10 + No.40) : 20.4
 Fine Sand (-No.40 + No.200) : 10.8
 Silt (-No.200 + 0.005mm) : 9.4
 Clay (-0.005mm + 0.001mm) : 3.1
 Colloids (-0.001mm) : 4.4

N. C. Composition of Total Sample
 Coarse Gravel (3in. + No.10) : 51.9
 Coarse Sand (-No.10 + No.60) : 24.5
 Fine Sand (-No.60 + No.270) : 7.8
 Silt (-No.270 + 0.005mm) : 8.3
 Clay (-0.005mm) : 7.5

Approved By : DML

Soil No. 1



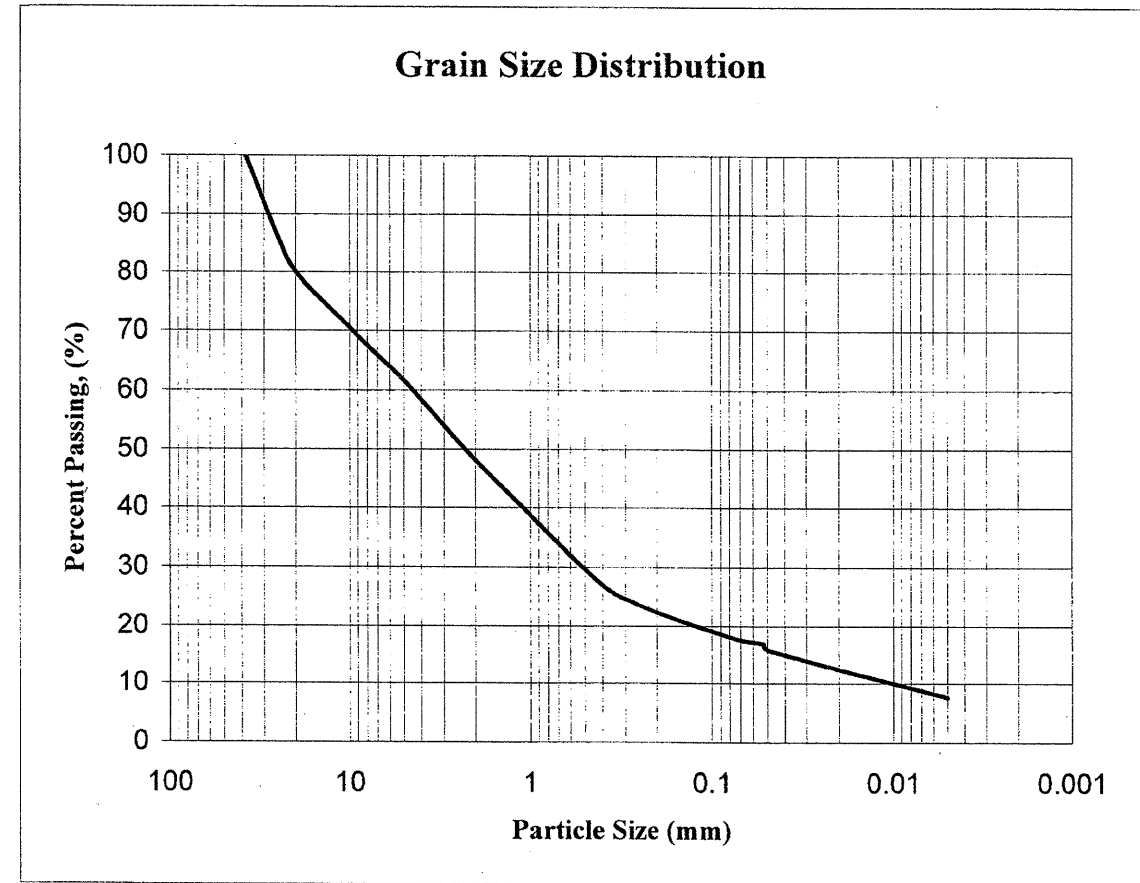
Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316
 Project County : Watauga
 Project State : North Carolina
 Laboratory No. : 08012-02
 Submitted By : Florence & Hutcheson, Inc.
 Soil Type : Brown Coarse Sand & Gravel

Sample No. : SS - 1
 Sample Loc. : Boring No. EB1-A
 Sample Depth : 10.0' to 11.5'
 Date Tested : 04-17-08
 Date Reported : 04-23-08

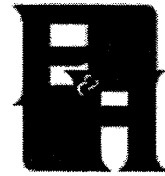


Minus 2.00mm Fraction
 Soil Mortar = 100% (as per NCDOT)

Coarse Sand Retained #60	Fine Sand Retained #270	Silt 0.05 to 0.005mm	Clay <0.005mm
50.9	16.3	17.1	15.7

Approved By : DML

Soil No. 1



Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316
 Project County : Watauga
 Project State : North Carolina
 Laboratory No. : 08012-02
 Submitted By : Florence & Hutcheson, Inc.
 Soil Type : Light Gray, Brown, Orange & Tan Coarse Sand & Gravel

Sample No. : SS - 2
 Sample Loc. : Boring No. EB1-B
 Sample Depth : 21.0' to 21.7'
 Date Tested : 04-17-08
 Date Reported : 04-23-08

% Passing			
4	in.	100	mm
3 1/2	in.	90	mm
3	in.	75	mm
2 1/2	in.	63	mm
2	in.	50	mm
1 3/4	in.	45	mm
1 1/2	in.	38.1	mm
1 1/4	in.	31.5	mm
1	in.	25	mm
3/4	in.	19	mm
1/2	in.	12.5	mm
3/8	in.	9.5	mm
No.4		4.75	mm
No.6		3.35	mm
No.8		2.36	mm
No.10		2	mm

% Passing			
No.16		1.18	mm
No.30		0.6	mm
No.40		0.425	mm
No.50		0.3	mm
No.60		0.25	mm
No.80		0.18	mm
No.100		0.15	mm
No.200		0.075	mm
No.270		0.053	mm
Hyd. Rd. # 1		0.0500	mm
Hyd. Rd. # 2		0.0050	mm
Hyd. Rd. # 3			mm
Hyd. Rd. # 4			mm
Hyd. Rd. # 5			mm
Hyd. Rd. # 6			mm
Hyd. Rd. # 7			mm

D₅₀ = 1.6838 mm

California Bearing Ratio : NA
 Maximum Dry Density : NA
 Optimum Moisture : NA

Natural Moisture (%) : 11.5
 Liquid Limit : 21
 Plastic Limit : NP
 Plasticity Index : NP
 Liquidity Index : NA
 Activity : NA
 Specific Gravity : NA
 AASHTO Classification : A-1-b (0)
 ASTM Classification : SM

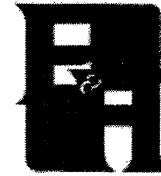
AASHTO Composition of Total Sample
 Gravel (3in. + No.10) : 47.3
 Coarse Sand (-No.10 + No.40) : 24.3
 Fine Sand (-No.40 + No.200) : 13.3
 Silt (-No.200 + 0.002mm) : 11.0
 Clay (-0.002mm + 0.001mm) : 1.0
 Colloids (-0.001mm) : 3.2

ASTM Composition of Total Sample
 Coarse Gravel (3in. + 3/4in.) : 9.4
 Fine Gravel (-3/4in. + No.4) : 25.9
 Coarse Sand (-No.4 + No.10) : 12.0
 Medium Sand (-No.10 + No.40) : 24.3
 Fine Sand (-No.40 + No.200) : 13.3
 Silt (-No.200 + 0.005mm) : 9.7
 Clay (-0.005mm + 0.001mm) : 2.2
 Colloids (-0.001mm) : 3.2

N. C. Composition of Total Sample
 Coarse Gravel (3in. + No.10) : 47.3
 Coarse Sand (-No.10 + No.60) : 29.4
 Fine Sand (-No.60 + No.270) : 9.7
 Silt (-No.270 + 0.005mm) : 8.2
 Clay (-0.005mm) : 5.4

Approved By : DMG

Soil No. 2



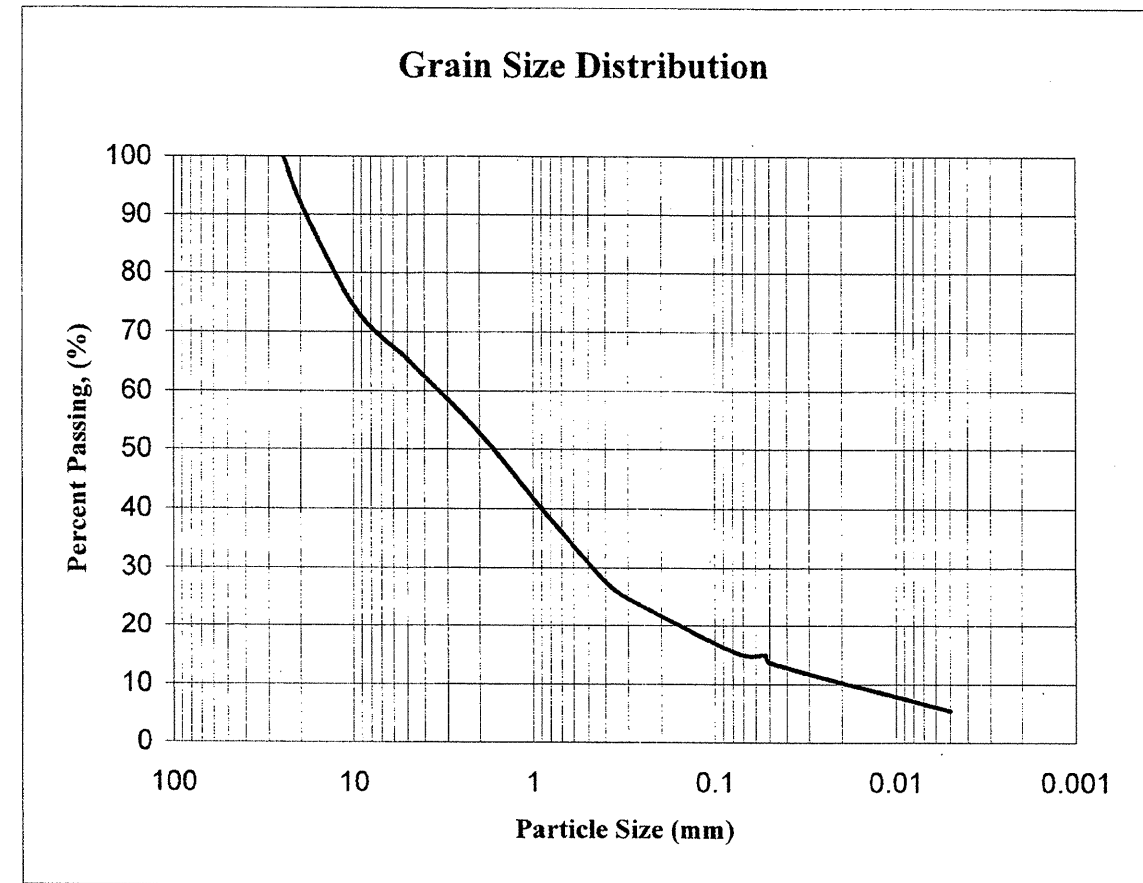
Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316
 Project County : Watauga
 Project State : North Carolina
 Laboratory No. : 08012-02
 Submitted By : Florence & Hutcheson, Inc.
 Soil Type : Light Gray, Brown, Orange & Tan Coarse Sand & Gravel

Sample No. : SS - 2
 Sample Loc. : Boring No. EB1-B
 Sample Depth : 21.0' to 21.7'
 Date Tested : 04-17-08
 Date Reported : 04-23-08

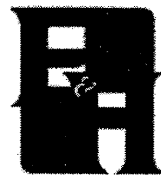


Minus 2.00mm Fraction
 Soil Mortar = 100% (as per NCDOT)

Coarse Sand Retained #60	Fine Sand Retained #270	Silt 0.05 to 0.005mm	Clay <0.005mm
55.8	18.3	15.7	10.2

Approved By : DMG

Soil No. 2



Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name	: Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)	Sample No.	: SS - 3
Project No.	: 33653.1.1 : ID. B-4316	Sample Loc.	: Boring No. EB1-B
Project County	: Watauga	Sample Depth	: 35.0' to 36.5'
Project State	: North Carolina	Date Tested	: 04-17-08
Laboratory No.	: 08012-02	Date Reported	: 04-23-08
Submitted By	: Florence & Hutcheson, Inc.		
Soil Type	: Gray & Brown/Orange Silt		

% Passing			
4	in.	100	mm
3 1/2	in.	90	mm
3	in.	75	mm
2 1/2	in.	63	mm
2	in.	50	mm
1 3/4	in.	45	mm
1 1/2	in.	38.1	mm
1 1/4	in.	31.5	mm
1	in.	25	mm
3/4	in.	19	mm
1/2	in.	12.5	mm
3/8	in.	9.5	mm
No.4		4.75	mm
No.6		3.35	mm
No.8		2.36	mm
No.10		2	mm

% Passing			
No.16		1.18	mm
No.30		0.6	mm
No.40		0.425	mm
No.50		0.3	mm
No.60		0.25	mm
No.80		0.18	mm
No.100		0.15	mm
No.200		0.075	mm
No.270		0.053	mm
Hyd. Rd. # 1		0.0500	mm
Hyd. Rd. # 2		0.0050	mm
Hyd. Rd. # 3			mm
Hyd. Rd. # 4			mm
Hyd. Rd. # 5			mm
Hyd. Rd. # 6			mm
Hyd. Rd. # 7			mm

D₅₀ = 0.0898 mm

California Bearing Ratio : NA
 Maximum Dry Density : NA
 Optimum Moisture : NA

Natural Moisture (%) : 25
 Liquid Limit : 25
 Plastic Limit : 21
 Plasticity Index : 4
 Liquidity Index : 1.02
 Activity : 0.24
 Specific Gravity : NA
 AASHTO Classification : A-4 (0)
 ASTM Classification : SM

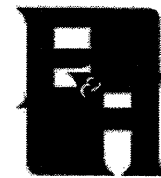
AASHTO Composition of Total Sample
 Gravel (3in. + No.10) : 2.1
 Coarse Sand (-No.10 + No.40) : 16.5
 Fine Sand (-No.40 + No.200) : 34.9
 Silt (-No.200 + 0.002mm) : 30.1
 Clay (-0.002mm + 0.001mm) : 3.8
 Colloids (-0.001mm) : 12.6

ASTM Composition of Total Sample
 Coarse Gravel (3in. + 3/4in.) : 0.0
 Fine Gravel (-3/4in. + No.4) : 0.6
 Coarse Sand (-No.4 + No.10) : 1.5
 Medium Sand (-No.10 + No.40) : 16.5
 Fine Sand (-No.40 + No.200) : 34.9
 Silt (-No.200 + 0.005mm) : 25.0
 Clay (-0.005mm + 0.001mm) : 8.8
 Colloids (-0.001mm) : 12.6

N. C. Composition of Total Sample
 Coarse Gravel (3in. + No.10) : 2.1
 Coarse Sand (-No.10 + No.60) : 28.0
 Fine Sand (-No.60 + No.270) : 27.1
 Silt (-No.270 + 0.005mm) : 21.3
 Clay (-0.005mm) : 21.5

Approved By : DMG

Soil No. 3

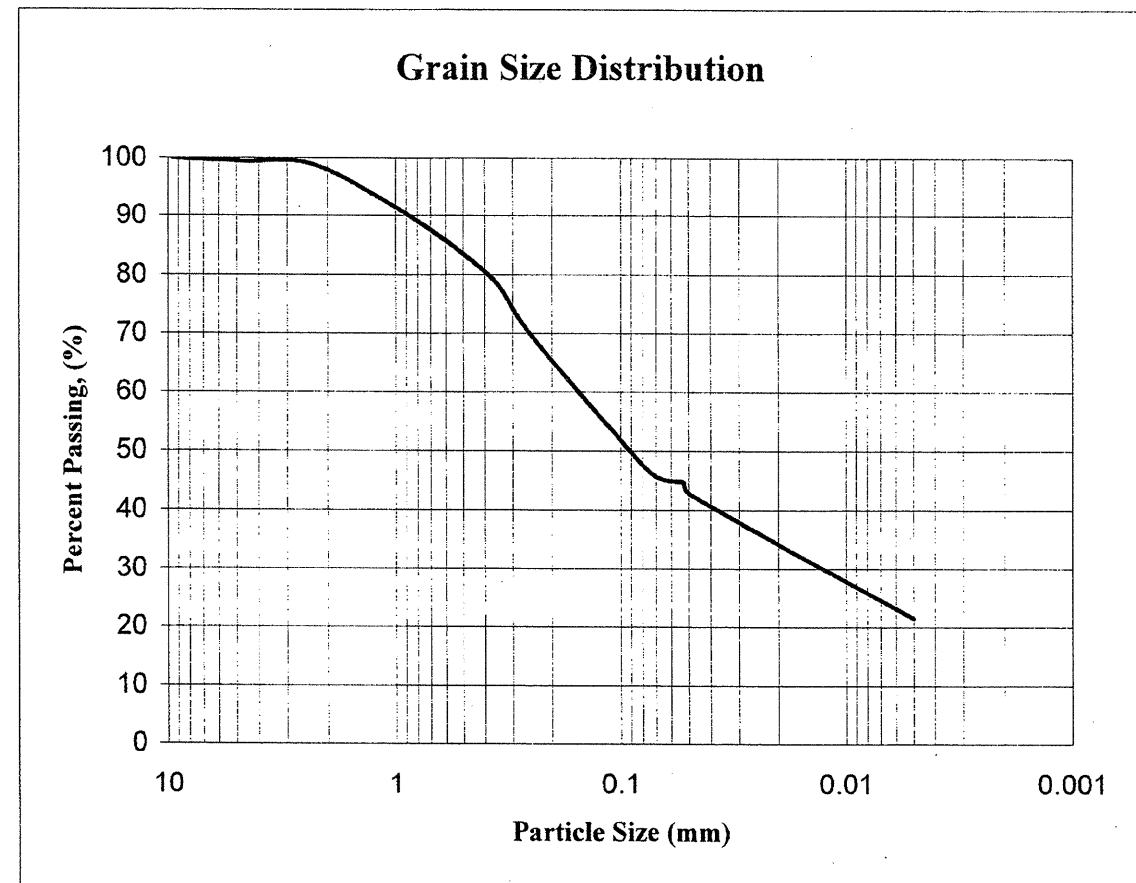


Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name	: Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)	Sample No.	: SS - 3
Project No.	: 33653.1.1 : ID. B-4316	Sample Loc.	: Boring No. EB1-B
Project County	: Watauga	Sample Depth	: 35.0' to 36.5'
Project State	: North Carolina	Date Tested	: 04-17-08
Laboratory No.	: 08012-02	Date Reported	: 04-23-08
Submitted By	: Florence & Hutcheson, Inc.		
Soil Type	: Gray & Brown/Orange Silt		

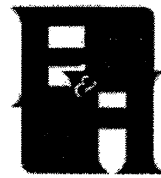


Minus 2.00mm Fraction
 Soil Mortar = 100% (as per NCDOT)

Coarse Sand Retained #60	Fine Sand Retained #270	Silt 0.05 to 0.005mm	Clay <0.005mm
28.7	27.7	21.7	21.9

Approved By : DMG

Soil No. 3



Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316
 Project County : Watauga
 Project State : North Carolina
 Laboratory No. : 08012-02
 Submitted By : Florence & Hutcheson, Inc.
 Soil Type : Brown, Gray & Orange Coarse Sand with Gravel

Sample No. : SS - 4
 Sample Loc. : Boring No. B1-A
 Sample Depth : 10.9' to 12.4'
 Date Tested : 04-17-08
 Date Reported : 04-23-08

% Passing			
4	in.	100	mm
3 1/2	in.	90	mm
3	in.	75	mm
2 1/2	in.	63	mm
2	in.	50	mm
1 3/4	in.	45	mm
1 1/2	in.	38.1	mm
1 1/4	in.	31.5	mm
1	in.	25	mm
3/4	in.	19	mm
1/2	in.	12.5	mm
3/8	in.	9.5	mm
No.4		4.75	mm
No.6		3.35	mm
No.8		2.36	mm
No.10		2	mm

% Passing			
No.16		1.18	mm
No.30		0.6	mm
No.40		0.425	mm
No.50		0.3	mm
No.60		0.25	mm
No.80		0.18	mm
No.100		0.15	mm
No.200		0.075	mm
No.270		0.053	mm
Hyd. Rd. # 1		0.0500	mm
Hyd. Rd. # 2		0.0050	mm
Hyd. Rd. # 3			mm
Hyd. Rd. # 4			mm
Hyd. Rd. # 5			mm
Hyd. Rd. # 6			mm
Hyd. Rd. # 7			mm

D₅₀ = 1.8069 mm

California Bearing Ratio : NA
 Maximum Dry Density : NA
 Optimum Moisture : NA

Natural Moisture (%) : 9.5
 Liquid Limit : 23
 Plastic Limit : NP
 Plasticity Index : NP
 Liquidity Index : NA
 Activity : NA
 Specific Gravity : NA
 AASHTO Classification : A-1-b (0)
 ASTM Classification : SM

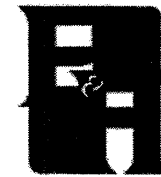
AASHTO Composition of Total Sample
 Gravel (3in. + No.10) : 48.4
 Coarse Sand (-No.10 + No.40) : 24.4
 Fine Sand (-No.40 + No.200) : 12.5
 Silt (-No.200 + 0.002mm) : 11.1
 Clay (-0.002mm + 0.001mm) : 0.8
 Colloids (-0.001mm) : 2.7

ASTM Composition of Total Sample
 Coarse Gravel (3in. + 3/4in.) : 12.1
 Fine Gravel (-3/4in. + No.4) : 21.5
 Coarse Sand (-No.4 + No.10) : 14.8
 Medium Sand (-No.10 + No.40) : 24.4
 Fine Sand (-No.40 + No.200) : 12.5
 Silt (-No.200 + 0.005mm) : 10.0
 Clay (-0.005mm + 0.001mm) : 1.9
 Colloids (-0.001mm) : 2.7

N. C. Composition of Total Sample
 Coarse Gravel (3in. + No.10) : 48.4
 Coarse Sand (-No.10 + No.60) : 29.3
 Fine Sand (-No.60 + No.270) : 8.9
 Silt (-No.270 + 0.005mm) : 8.7
 Clay (-0.005mm) : 4.7

Approved By : DMG

Soil No. 4



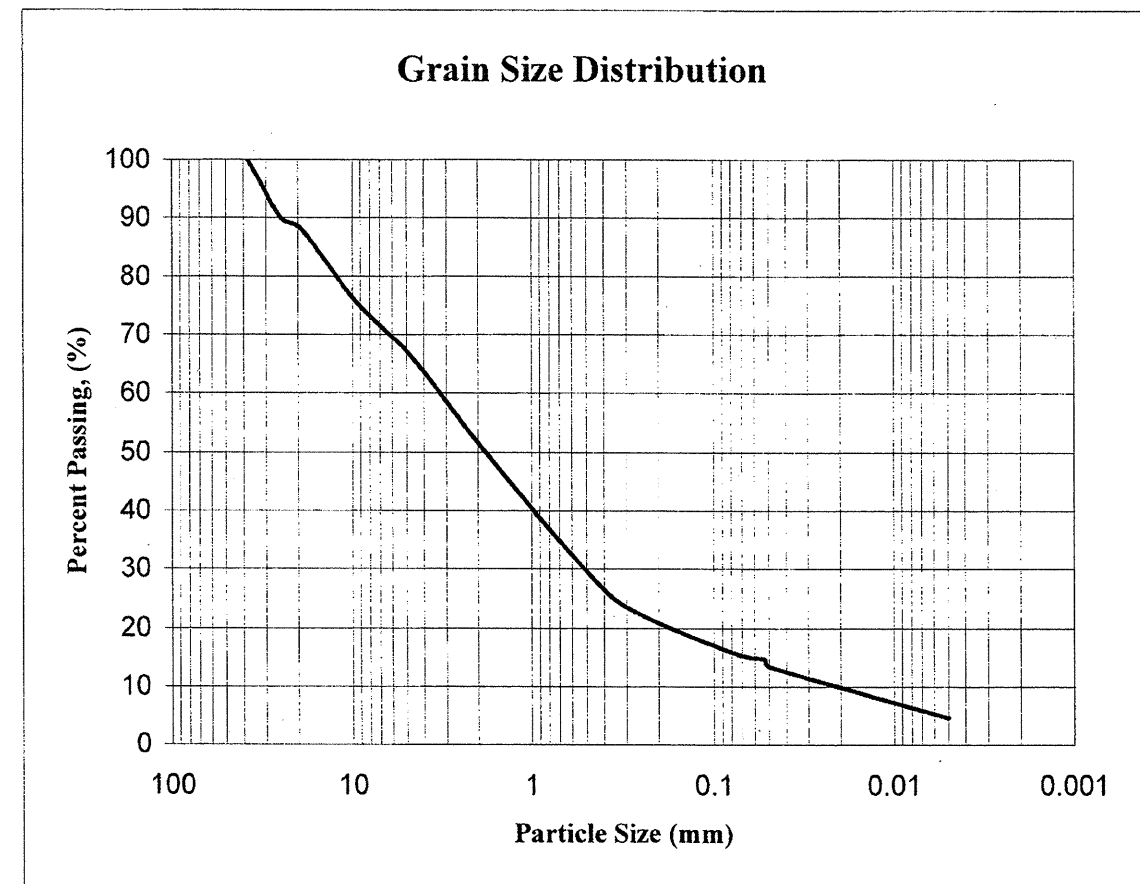
Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316
 Project County : Watauga
 Project State : North Carolina
 Laboratory No. : 08012-02
 Submitted By : Florence & Hutcheson, Inc.
 Soil Type : Brown, Gray & Orange Coarse Sand with Gravel

Sample No. : SS - 4
 Sample Loc. : Boring No. B1-A
 Sample Depth : 10.9' to 12.4'
 Date Tested : 04-17-08
 Date Reported : 04-23-08

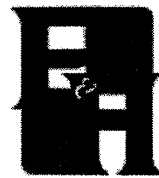


Minus 2.00mm Fraction
 Soil Mortar = 100% (as per NCDOT)

Coarse Sand Retained #60	Fine Sand Retained #270	Silt 0.05 to 0.005mm	Clay <0.005mm
56.8	17.4	16.7	9

Approved By : DMG

Soil No. 4



Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316
 Project County : Watauga
 Project State : North Carolina
 Laboratory No. : 08012-02
 Submitted By : Florence & Hutcheson, Inc.
 Soil Type : Gray, White & Tan Stone, Gravel & Sand

Sample No. : SS - 5
 Sample Loc. : Boring No. B1-B
 Sample Depth : 6.5' to 8.0'
 Date Tested : 04-17-08
 Date Reported : 04-23-08

% Passing			
4	in.	100	mm
3 1/2	in.	90	mm
3	in.	75	mm
2 1/2	in.	63	mm
2	in.	50	mm
1 3/4	in.	45	mm
1 1/2	in.	38.1	mm
1 1/4	in.	31.5	mm
1	in.	25	mm
3/4	in.	19	mm
1/2	in.	12.5	mm
3/8	in.	9.5	mm
No.4		4.75	mm
No.6		3.35	mm
No.8		2.36	mm
No.10		2	mm

% Passing			
No.16		1.18	mm
No.30		0.6	mm
No.40		0.425	mm
No.50		0.3	mm
No.60		0.25	mm
No.80		0.18	mm
No.100		0.15	mm
No.200		0.075	mm
No.270		0.053	mm
Hyd. Rd. # 1		0.0500	mm
Hyd. Rd. # 2		0.0050	mm
Hyd. Rd. # 3			mm
Hyd. Rd. # 4			mm
Hyd. Rd. # 5			mm
Hyd. Rd. # 6			mm
Hyd. Rd. # 7			mm

D₅₀ = 2.8838 mm

California Bearing Ratio : NA
 Maximum Dry Density : NA
 Optimum Moisture : NA

Natural Moisture (%) : 14.5
 Liquid Limit : 26
 Plastic Limit : NP
 Plasticity Index : NP
 Liquidity Index : NA
 Activity : NA
 Specific Gravity : NA
 AASHTO Classification : A-1-a (0)
 ASTM Classification : SM

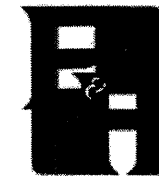
AASHTO Composition of Total Sample
 Gravel (3in. + No.10) : 55.5
 Coarse Sand (-No.10 + No.40) : 19.5
 Fine Sand (-No.40 + No.200) : 11.0
 Silt (-No.200 + 0.002mm) : 9.8
 Clay (-0.002mm + 0.001mm) : 1.0
 Colloids (-0.001mm) : 3.2

ASTM Composition of Total Sample
 Coarse Gravel (3in. + 3/4in.) : 6.7
 Fine Gravel (-3/4in. + No.4) : 35.8
 Coarse Sand (-No.4 + No.10) : 13.0
 Medium Sand (-No.10 + No.40) : 19.5
 Fine Sand (-No.40 + No.200) : 11.0
 Silt (-No.200 + 0.005mm) : 8.5
 Clay (-0.005mm + 0.001mm) : 2.2
 Colloids (-0.001mm) : 3.2

N. C. Composition of Total Sample
 Coarse Gravel (3in. + No.10) : 55.5
 Coarse Sand (-No.10 + No.60) : 23.4
 Fine Sand (-No.60 + No.270) : 8.4
 Silt (-No.270 + 0.005mm) : 7.2
 Clay (-0.005mm) : 5.5

Approved By : Dmg

Soil No. 5



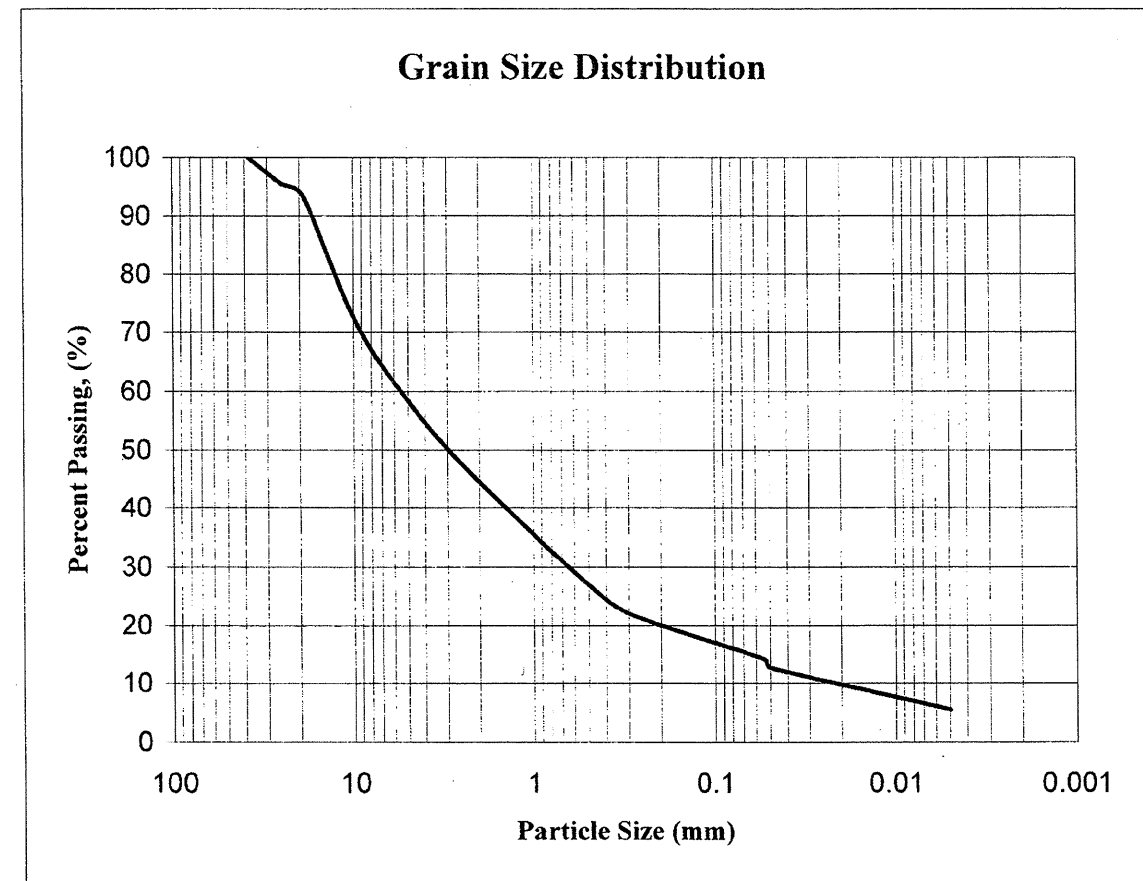
Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316
 Project County : Watauga
 Project State : North Carolina
 Laboratory No. : 08012-02
 Submitted By : Florence & Hutcheson, Inc.
 Soil Type : Gray, White & Tan Stone, Gravel & Sand

Sample No. : SS - 5
 Sample Loc. : Boring No. B1-B
 Sample Depth : 6.5' to 8.0'
 Date Tested : 04-17-08
 Date Reported : 04-23-08

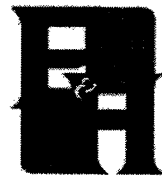


Minus 2.00mm Fraction
 Soil Mortar = 100% (as per NCDOT)

Coarse Sand Retained #60	Fine Sand Retained #270	Silt 0.05 to 0.005mm	Clay <0.005mm
52.7	18.8	16.3	12.3

Approved By : Dmg

Soil No. 5



SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
Project No. : 33653.1.1 : ID. B-4316
Project County : Watauga
Project State : North Carolina
Laboratory No. : 08012-02
Submitted By : Florence & Hutcheson, Inc.
Soil Type : Gray, Brown & Orange Coarse Sand with rock fragments

Table with 4 columns: Sieve Size, Unit, % Passing, and Sieve Size. Rows include 4 in., 3 1/2 in., 3 in., 2 1/2 in., 2 in., 1 3/4 in., 1 1/2 in., 1 1/4 in., 1 in., 3/4 in., 1/2 in., 3/8 in., No.4, No.6, No.8, No.10.

Table with 4 columns: Sieve Size, Unit, % Passing, and Sieve Size. Rows include No.16, No.30, No.40, No.50, No.60, No.80, No.100, No.200, No.270, Hyd. Rd. #1-7.

D50 = 2.529 mm

California Bearing Ratio : NA
Maximum Dry Density : NA
Optimum Moisture : NA

Natural Moisture (%) : 9.8
Liquid Limit : 24
Plastic Limit : NP
Plasticity Index : NP
Liquidity Index : NA
Activity : NA
Specific Gravity : NA
AASHTO Classification : A-1-b (0)
ASTM Classification : SM

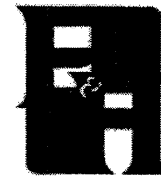
AASHTO Composition of Total Sample
Gravel (3in. + No.10) : 53.5
Coarse Sand (-No.10 + No.40) : 19.0
Fine Sand (-No.40 + No.200) : 12.0
Silt (-No.200 + 0.002mm) : 11.6
Clay (-0.002mm + 0.001mm) : 0.9
Colloids (-0.001mm) : 3.0

ASTM Composition of Total Sample
Coarse Gravel (3in. + 3/4in.) : 16.3
Fine Gravel (-3/4in. + No.4) : 24.3
Coarse Sand (-No.4 + No.10) : 12.9
Medium Sand (-No.10 + No.40) : 19.0
Fine Sand (-No.40 + No.200) : 12.0
Silt (-No.200 + 0.005mm) : 10.4
Clay (-0.005mm + 0.001mm) : 2.1
Colloids (-0.001mm) : 3.0

N. C. Composition of Total Sample
Coarse Gravel (3in. + No.10) : 53.5
Coarse Sand (-No.10 + No.60) : 23.6
Fine Sand (-No.60 + No.270) : 8.9
Silt (-No.270 + 0.005mm) : 8.9
Clay (-0.005mm) : 5.1

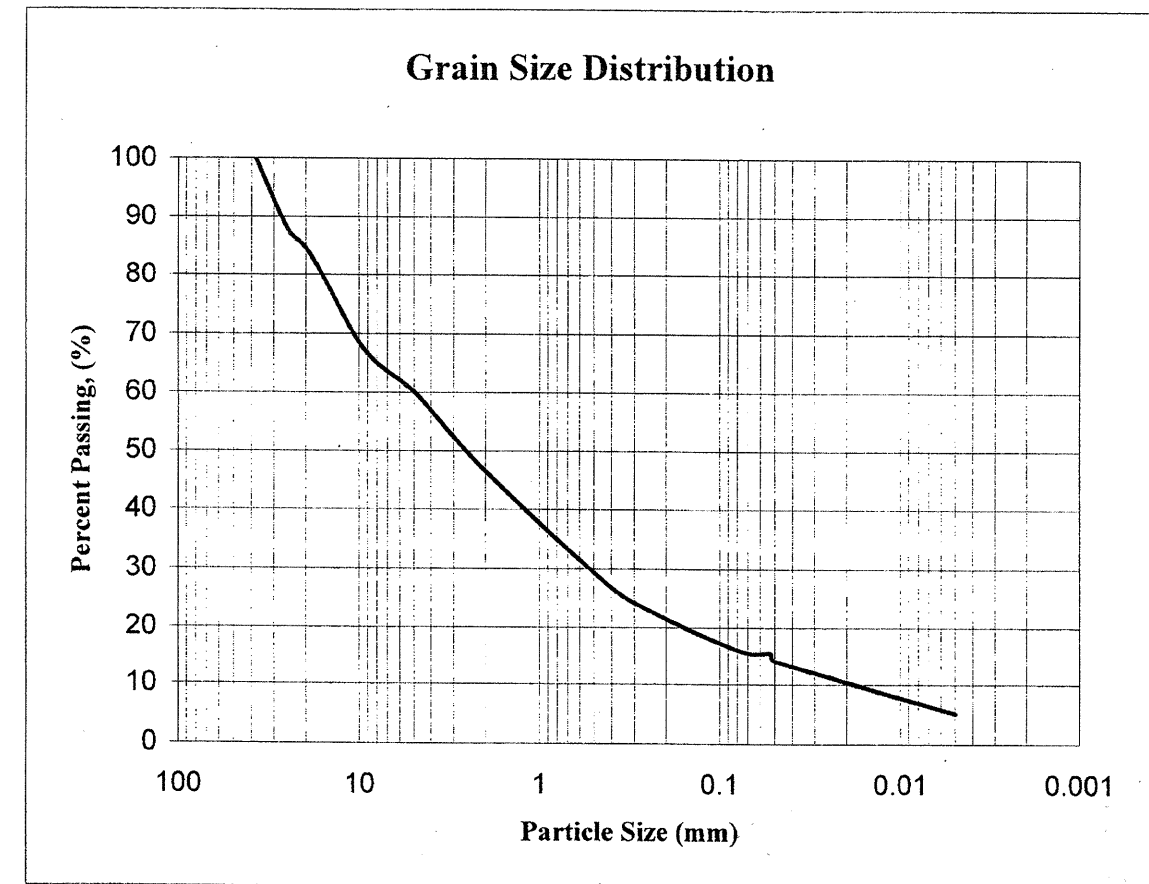
Approved By : [Signature]

Soil No. 6



SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
Project No. : 33653.1.1 : ID. B-4316
Project County : Watauga
Project State : North Carolina
Laboratory No. : 08012-02
Submitted By : Florence & Hutcheson, Inc.
Soil Type : Gray, Brown & Orange Coarse Sand with rock fragments

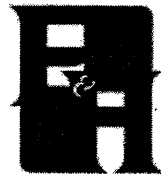


Minus 2.00mm Fraction
Soil Mortar = 100% (as per NCDOT)

Table with 4 columns: Coarse Sand Retained #60, Fine Sand Retained #270, Silt 0.05 to 0.005mm, Clay <0.005mm. Values: 50.8, 19.2, 19, 11.

Approved By : [Signature]

Soil No. 6



Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316
 Project County : Watauga
 Project State : North Carolina
 Laboratory No. : 08012-02
 Submitted By : Florence & Hutcheson, Inc.
 Soil Type : Brown & Dark Brown Silt with rock fragments

Sample No. : SS - 7
 Sample Loc. : Boring No. B2-A
 Sample Depth : 5.0' to 6.5'
 Date Tested : 04-17-08
 Date Reported : 04-23-08

% Passing			
4	in.	100	mm
3 1/2	in.	90	mm
3	in.	75	mm
2 1/2	in.	63	mm
2	in.	50	mm
1 3/4	in.	45	mm
1 1/2	in.	38.1	mm
1 1/4	in.	31.5	mm
1	in.	25	mm
3/4	in.	19	mm
1/2	in.	12.5	mm
3/8	in.	9.5	mm
No.4		4.75	mm
No.6		3.35	mm
No.8		2.36	mm
No.10		2	mm

% Passing			
No.16		1.18	mm
No.30		0.6	mm
No.40		0.425	mm
No.50		0.3	mm
No.60		0.25	mm
No.80		0.18	mm
No.100		0.15	mm
No.200		0.075	mm
No.270		0.053	mm
Hyd. Rd. # 1		0.0500	mm
Hyd. Rd. # 2		0.0050	mm
Hyd. Rd. # 3			mm
Hyd. Rd. # 4			mm
Hyd. Rd. # 5			mm
Hyd. Rd. # 6			mm
Hyd. Rd. # 7			mm

D₅₀ = 0.4566 mm

California Bearing Ratio : NA
 Maximum Dry Density : NA
 Optimum Moisture : NA

Natural Moisture (%) : 20.9
 Liquid Limit : 27
 Plastic Limit : 25
 Plasticity Index : 2
 Liquidity Index : -1.91

AASHTO Composition of Total Sample
 Gravel (3in. + No.10) : 25.3
 Coarse Sand (-No.10 + No.40) : 25.9
 Fine Sand (-No.40 + No.200) : 13.6
 Silt (-No.200 + 0.002mm) : 22.0
 Clay (-0.002mm + 0.001mm) : 3.1
 Colloids (-0.001mm) : 10.2

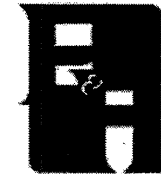
AASHTO Classification : A-4 (0)
 ASTM Classification : SM

ASTM Composition of Total Sample
 Coarse Gravel (3in. + 3/4in.) : 0.0
 Fine Gravel (-3/4in. + No.4) : 12.9
 Coarse Sand (-No.4 + No.10) : 12.4
 Medium Sand (-No.10 + No.40) : 25.9
 Fine Sand (-No.40 + No.200) : 13.6
 Silt (-No.200 + 0.005mm) : 17.9
 Clay (-0.005mm + 0.001mm) : 7.1
 Colloids (-0.001mm) : 10.2

N. C. Composition of Total Sample
 Coarse Gravel (3in. + No.10) : 25.3
 Coarse Sand (-No.10 + No.60) : 31.4
 Fine Sand (-No.60 + No.270) : 9.9
 Silt (-No.270 + 0.005mm) : 16.1
 Clay (-0.005mm) : 17.3

Approved By : DMG

Soil No. 7



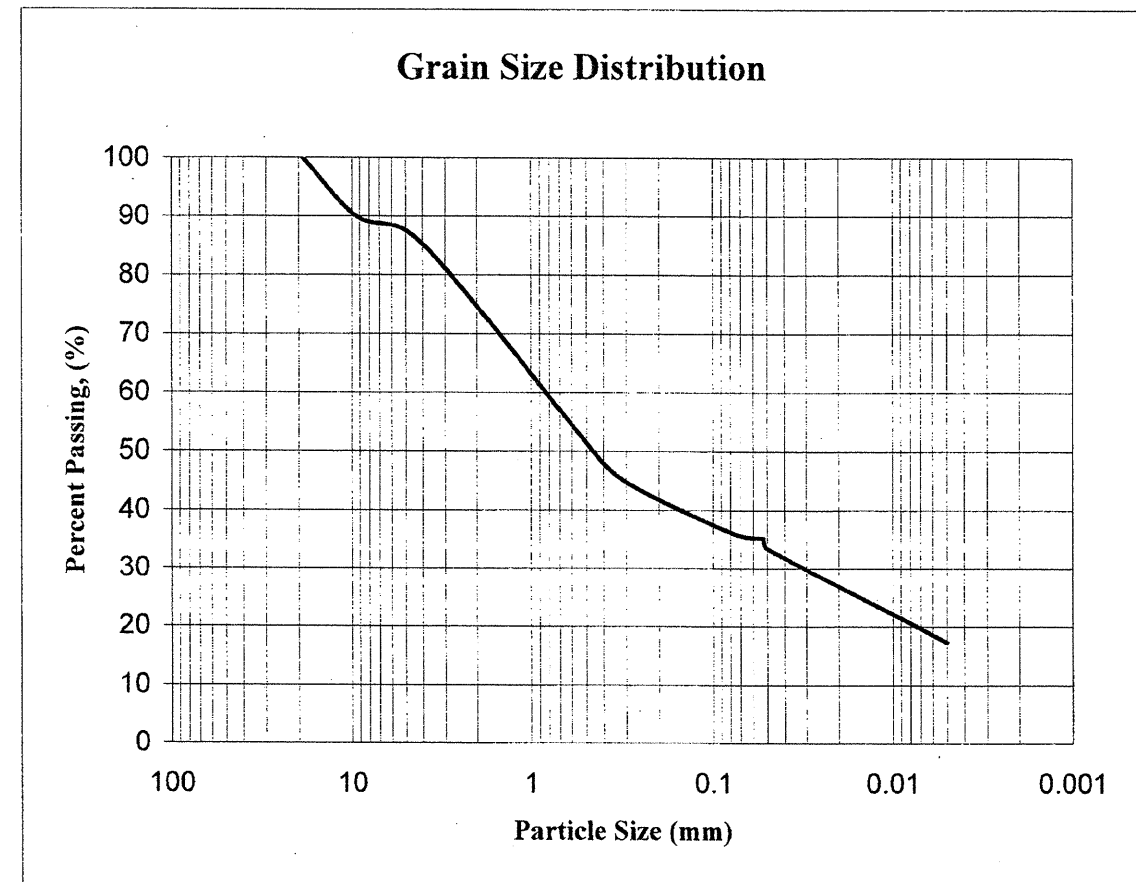
Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316
 Project County : Watauga
 Project State : North Carolina
 Laboratory No. : 08012-02
 Submitted By : Florence & Hutcheson, Inc.
 Soil Type : Brown & Dark Brown Silt with rock fragments

Sample No. : SS - 7
 Sample Loc. : Boring No. B2-A
 Sample Depth : 5.0' to 6.5'
 Date Tested : 04-17-08
 Date Reported : 04-23-08

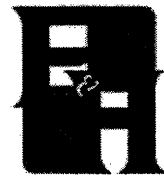


Minus 2.00mm Fraction
 Soil Mortar = 100% (as per NCDOT)

Coarse Sand Retained #60	Fine Sand Retained #270	Silt 0.05 to 0.005mm	Clay <0.005mm
42.1	13.2	21.6	23.1

Approved By : DMG

Soil No. 7



Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316
 Project County : Watauga
 Project State : North Carolina
 Laboratory No. : 08012-02
 Submitted By : Florence & Hutcheson, Inc.
 Soil Type : Brown, Red, Gray & Tan Silty Sand with Gravel

Sample No. : SS - 8
 Sample Loc. : Boring No. B2-A
 Sample Depth : 20.0' to 21.5'
 Date Tested : 04-17-08
 Date Reported : 04-23-08

% Passing			
4	in.	100	mm
3 1/2	in.	90	mm
3	in.	75	mm
2 1/2	in.	63	mm
2	in.	50	mm
1 3/4	in.	45	mm
1 1/2	in.	38.1	mm
1 1/4	in.	31.5	mm
1	in.	25	mm
3/4	in.	19	mm
1/2	in.	12.5	mm
3/8	in.	9.5	mm
No.4		4.75	mm
No.6		3.35	mm
No.8		2.36	mm
No.10		2	mm

% Passing			
No.16		1.18	mm
No.30		0.6	mm
No.40		0.425	mm
No.50		0.3	mm
No.60		0.25	mm
No.80		0.18	mm
No.100		0.15	mm
No.200		0.075	mm
No.270		0.053	mm
Hyd. Rd. # 1		0.0500	mm
Hyd. Rd. # 2		0.0050	mm
Hyd. Rd. # 3			mm
Hyd. Rd. # 4			mm
Hyd. Rd. # 5			mm
Hyd. Rd. # 6			mm
Hyd. Rd. # 7			mm

D₅₀ = 0.3642 mm

California Bearing Ratio : NA
 Maximum Dry Density : NA
 Optimum Moisture : NA

Natural Moisture (%) : 22
 Liquid Limit : 24
 Plastic Limit : NP
 Plasticity Index : NP
 Liquidity Index : NA
 Activity : NA
 Specific Gravity : NA
 AASHTO Classification : A-2-4 (0)
 ASTM Classification : SM

AASHTO Composition of Total Sample

Gravel (3in. + No.10) : 27.6
 Coarse Sand (-No.10 + No.40) : 20.1
 Fine Sand (-No.40 + No.200) : 25.1
 Silt (-No.200 + 0.002mm) : 20.5
 Clay (-0.002mm + 0.001mm) : 1.5
 Colloids (-0.001mm) : 5.1

ASTM Composition of Total Sample

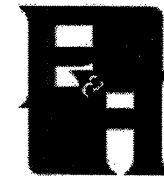
Coarse Gravel (3in. + 3/4in.) : 2.6
 Fine Gravel (-3/4in. + No.4) : 15.7
 Coarse Sand (-No.4 + No.10) : 9.3
 Medium Sand (-No.10 + No.40) : 20.1
 Fine Sand (-No.40 + No.200) : 25.1
 Silt (-No.200 + 0.005mm) : 18.5
 Clay (-0.005mm + 0.001mm) : 3.6
 Colloids (-0.001mm) : 5.1

N. C. Composition of Total Sample

Coarse Gravel (3in. + No.10) : 27.6
 Coarse Sand (-No.10 + No.60) : 28.0
 Fine Sand (-No.60 + No.270) : 20.1
 Silt (-No.270 + 0.005mm) : 15.6
 Clay (-0.005mm) : 8.7

Approved By : JMG

Soil No. 8



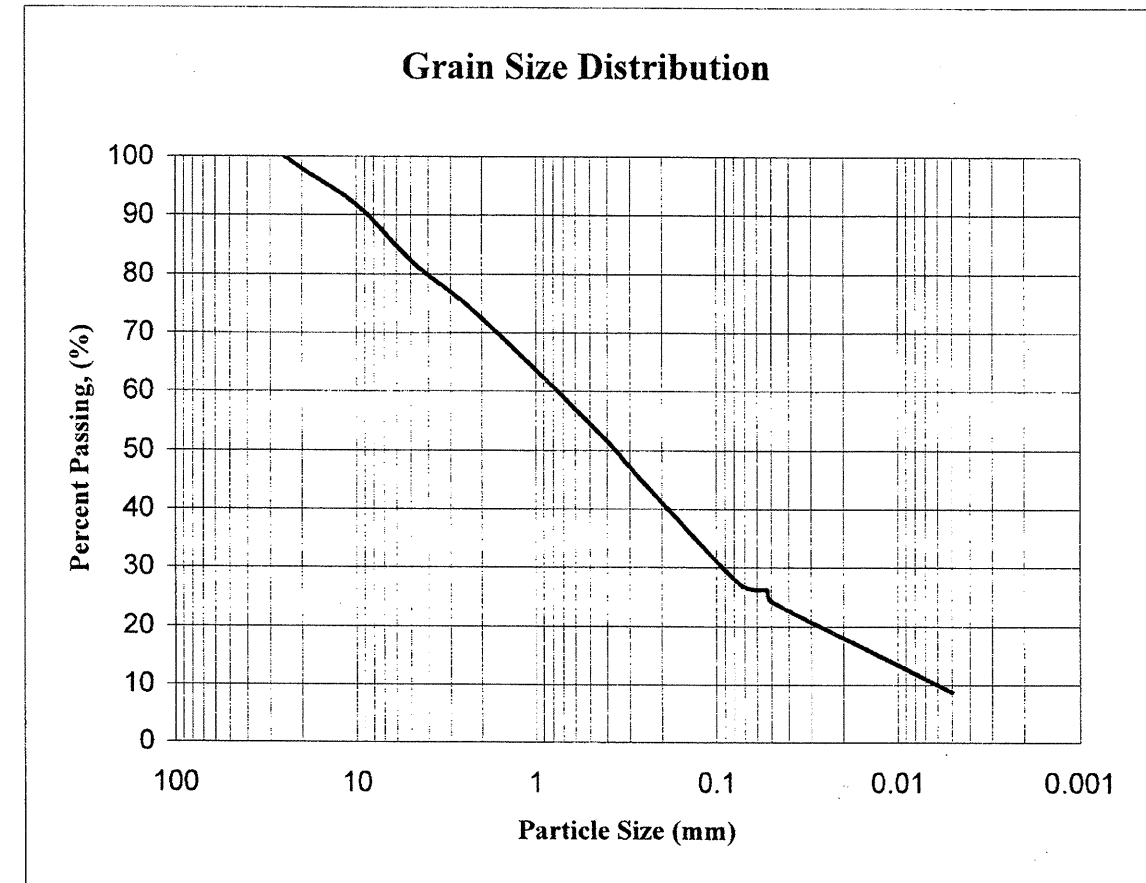
Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name : Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316
 Project County : Watauga
 Project State : North Carolina
 Laboratory No. : 08012-02
 Submitted By : Florence & Hutcheson, Inc.
 Soil Type : Brown, Red, Gray & Tan Silty Sand with Gravel

Sample No. : SS - 8
 Sample Loc. : Boring No. B2-A
 Sample Depth : 20.0' to 21.5'
 Date Tested : 04-17-08
 Date Reported : 04-23-08



Minus 2.00mm Fraction
 Soil Mortar = 100% (as per NCDOT)

Coarse Sand Retained #60	Fine Sand Retained #270	Silt 0.05 to 0.005mm	Clay <0.005mm
38.8	27.8	21.3	12.1

Approved By : JMG

Soil No. 8



SOIL CLASSIFICATION

Project Name	: Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)	Sample No.	: Bag No. 1
Project No.	: 33653.1.1 : ID. B-4316	Sample Loc.	: Bank
Project County	: Watauga	Sample Depth	: Surface
Project State	: North Carolina	Date Tested	: 04-17-08
Laboratory No.	: 08012-02	Date Reported	: 04-23-08
Submitted By	: Florence & Hutcheson, Inc.		
Soil Type	: Beige & Brown Well-Graded Gravel with Sand		

		% Passing	
7 1/2 in.	180.5 mm		100.0
7 in.	177.8 mm		87.4
4 in.	101.5 mm		81.3
3 in.	76.2 mm		63.1
2 in.	50.8 mm		52.8
1 3/4 in.	45 mm		
1 1/2 in.	38.1 mm		
1 1/4 in.	31.5 mm		
1 in.	25 mm		42.9
3/4 in.	19 mm		38.4
1/2 in.	12.5 mm		
3/8 in.	9.5 mm		31.6
No.4	4.75 mm		26.2
No.6	3.35 mm		
No.8	2.36 mm		
No.10	2 mm		17.7

		% Passing	
No.16	1.18 mm		
No.30	0.6 mm		
No.40	0.425 mm		3.6
No.50	0.3 mm		
No.60	0.25 mm		
No.80	0.18 mm		
No.100	0.15 mm		1.6
No.200	0.075 mm		0.8
No.270	0.053 mm		
Hyd. Rd. # 1			
Hyd. Rd. # 2			
Hyd. Rd. # 3			
Hyd. Rd. # 4			
Hyd. Rd. # 5			
Hyd. Rd. # 6			
Hyd. Rd. # 7			

D₅₀ = 41.5694 mm

California Bearing Ratio : NA
 Maximum Dry Density : NA
 Optimum Moisture : NA

Natural Moisture (%) : NA
 Liquid Limit : NA
 Plastic Limit : NA
 Plasticity Index : NA
 Liquidity Index : NA
 Activity : NA
 Specific Gravity : NA
 AASHTO Classification : A-1-a (0) *
 ASTM Classification : GW *
 * Visual Classification

AASHTO Composition of Total Sample
 Gravel (3in. + No.10) : 82.3
 Coarse Sand (-No.10 + No.40) : 14.1
 Fine Sand (-No.40 + No.200) : 2.8
 Silt + Clay (-No.200) : 0.8

ASTM Composition of Total Sample
 Coarse Gravel (3in. + 3/4in.) : 61.6
 Fine Gravel (-3/4in. + No.4) : 12.2
 Coarse Sand (-No.4 + No.10) : 8.5
 Medium Sand (-No.10 + No.40) : 14.1
 Fine Sand (-No.40 + No.200) : 2.8
 Silt + Clay (-No.200) : 0.8

Approved By : DG

Soil No. 9

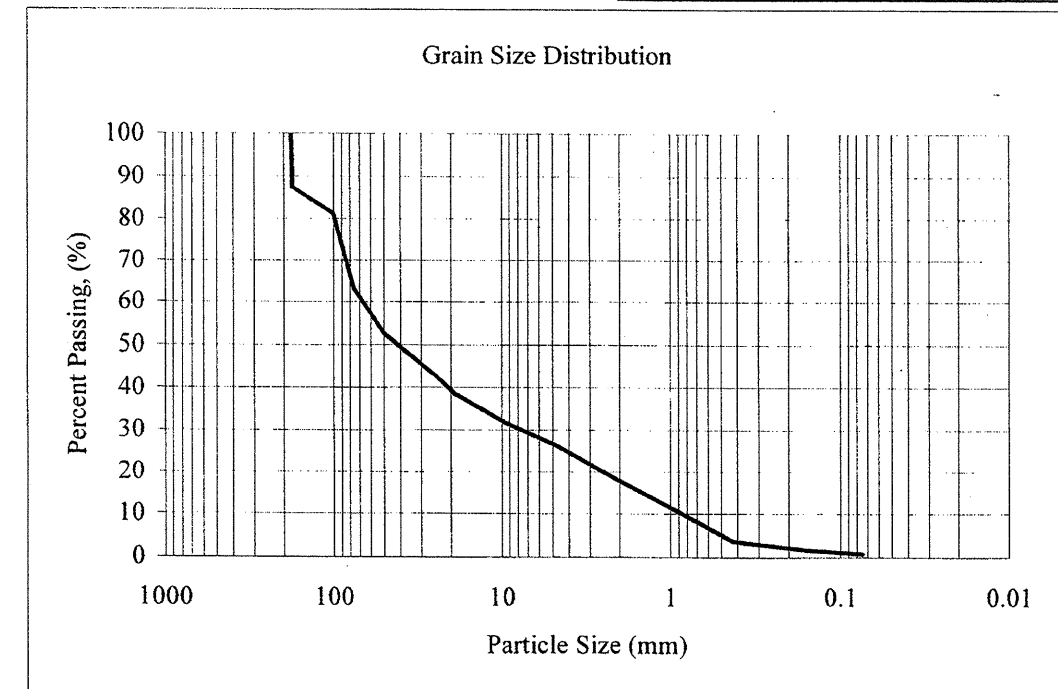


SIEVE ANALYSIS

Project Name	: Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)	Sample No.	: Bag No. 1
Project No.	: 33653.1.1 : ID. B-4316	Sample Loc.	: Bank
Project County	: Watauga	Sample Depth	: Surface
Project State	: North Carolina	Date Tested	: 04-17-08
Laboratory No.	: 08012-02	Date Reported	: 04-23-08
Submitted By	: Florence & Hutcheson, Inc.		
Soil Type	: Beige & Brown Well-Graded Gravel with Sand		

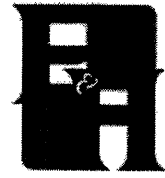
		% Pass.		Spec.
4 in.	100 mm		100	
3 1/2 in.	90 mm		87.4	
3 in.	75 mm		81.3	
2 1/2 in.	63 mm		63.1	
2 in.	50 mm		52.8	
1 3/4 in.	45 mm			
1 1/2 in.	38.1 mm			
1 1/4 in.	31.5 mm			
1 in.	25 mm		42.9	
3/4 in.	19 mm		38.4	
1/2 in.	12.5 mm			
3/8 in.	9.5 mm		31.6	

		% Pass.		Spec.
No.4	4.75 mm		26.2	90 - 100
No.6	3.35 mm			
No.8	2.36 mm			
No.10	2 mm		17.7	
No.16	1.18 mm			45 - 85
No.30	0.6 mm			
No.40	0.425 mm		3.6	
No.50	0.3 mm			5 - 25
No.60	0.25 mm			
No.80	0.18 mm			
No.100	0.15 mm		1.6	0 - 8
No.200	0.075 mm		0.8	
No.270	0.053 mm			



Approved By : DG

Soil No. 9



Florence & Hutcheson, Inc.
CONSULTING ENGINEERS

SOIL CLASSIFICATION

Project Name	: Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)	Sample No.	: Bag No. 1
Project No.	: 33653.1.1 : ID. B-4316	Sample Loc.	: Bed
Project County	: Watauga	Sample Depth	: Surface
Project State	: North Carolina	Date Tested	: 04-17-08
Laboratory No.	: 08012-02	Date Reported	: 04-23-08
Submitted By	: Florence & Hutcheson, Inc.		
Soil Type	: Beige & Brown Poorly Graded Gravel		

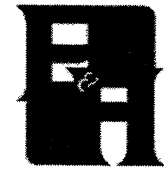
% Passing				
5 1/2	in.	139.7	mm	100.0
5	in.	128	mm	92.8
4	in.	101.5	mm	92.8
3	in.	76.2	mm	73.1
2	in.	50.8	mm	47.6
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	26.8
3/4	in.	19	mm	22.3
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	16.4
No.4		4.75	mm	12.9
No.6		3.35	mm	
No.8		2.36	mm	
No.10		2	mm	7.5

% Passing				
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	1.0
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	0.5
No.200		0.075	mm	0.0
No.270		0.053	mm	
Hyd. Rd. # 1			mm	
Hyd. Rd. # 2			mm	
Hyd. Rd. # 3			mm	
Hyd. Rd. # 4			mm	
Hyd. Rd. # 5			mm	
Hyd. Rd. # 6			mm	
Hyd. Rd. # 7			mm	

D₅₀ = 52.7761 mm

California Bearing Ratio : NA	Natural Moisture (%) : NA
Maximum Dry Density : NA	Liquid Limit : NA
Optimum Moisture : NA	Plastic Limit : NA
AASHTO Composition of Total Sample	Plasticity Index : NA
Gravel (3in. + No.10) : 92.5	Liquidity Index : NA
Coarse Sand (-No.10 + No.40) : 6.5	Activity : NA
Fine Sand (-No.40 + No.200) : 1.0	Specific Gravity : NA
Silt + Clay (-No.200) : 0.0	AASHTO Classification : A-1-a (0) *
	ASTM Classification : GP *
	* Visual Classification
ASTM Composition of Total Sample	
Coarse Gravel (3in. + 3/4in.) : 77.7	
Fine Gravel (-3/4in. + No.4) : 9.4	
Coarse Sand (-No.4 + No.10) : 5.4	
Medium Sand (-No.10 + No.40) : 6.5	
Fine Sand (-No.40 + No.200) : 1.0	
Silt + Clay (-No.200) : 0.0	

Approved By : Soil No. 10



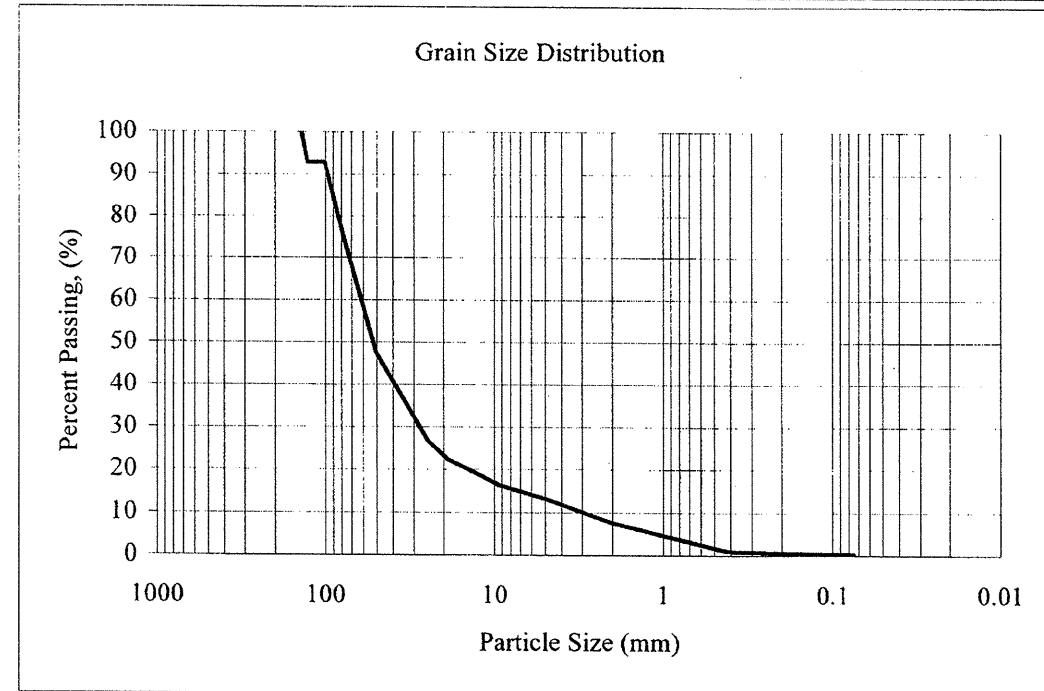
Florence & Hutcheson, Inc.
CONSULTING ENGINEERS

SIEVE ANALYSIS

Project Name	: Bridge No. 320 over Beech on SR 1153 (Wiley Harmon Road)	Sample No.	: Bag No. 1
Project No.	: 33653.1.1 : ID. B-4316	Sample Loc.	: Bed
Project County	: Watauga	Sample Depth	: Surface
Project State	: North Carolina	Date Tested	: 04-17-08
Laboratory No.	: 08012-02	Date Reported	: 04-23-08
Submitted By	: Florence & Hutcheson, Inc.		
Soil Type	: Beige & Brown Poorly Graded Gravel		

% Pass. Spec.				
4	in.	100	mm	100
3 1/2	in.	90	mm	92.8
3	in.	75	mm	92.8
2 1/2	in.	63	mm	73.1
2	in.	50	mm	47.6
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	26.8
3/4	in.	19	mm	22.3
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	16.4

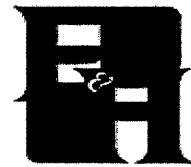
% Pass. Spec.				
No.4	4.75	mm	12.9	90 - 100
No.6	3.35	mm		
No.8	2.36	mm		
No.10	2	mm	7.5	
No.16	1.18	mm		45 - 85
No.30	0.6	mm		
No.40	0.425	mm	1.0	
No.50	0.3	mm		5 - 25
No.60	0.25	mm		
No.80	0.18	mm		
No.100	0.15	mm	0.5	0 - 8
No.200	0.075	mm	0.0	
No.270	0.053	mm		



Approved By : Soil No. 10

STATE PROJECT NO.: 33653.1.1
TIP NO.: B-4316
COUNTY: Watauga
PROJECT DESC.: Bridge No. 320 on SR 1153 (Wiley Harmon Road) over Beech Creek

SUMMARY OF SOIL CLASSIFICATIONS AND GRADATIONS																	
Boring No.	Sample No.	Depth Interval (ft.)	AASHTO Class.	N	Soil No.	Percent Passing No.10	Percent Passing No.40	Percent Passing No.200	Percent Retained No. 60	SOIL MORTAR				LL	PI	PL	Percent Moisture
										Coarse Sand	Fine Sand	Silt	Clay				
EB1-A	SS-1	10.0'-11.5'	A-1-b (0)	4	1	48	28	17	76	51	16	17	16	23	1	22	19.2
EB1-B	SS-2	21.0'-21.7'	A-1-b (0)	60/0.2	2	53	28	15	77	56	18	16	10	21	NP	NP	11.5
EB1-B	SS-3	35.0'-36.5'	A-4 (0)	4	3	98	81	47	30	29	28	21	22	25	4	21	25.0
B1-A	SS-4	10.9'-12.4'	A-1-b (0)	4	4	52	27	15	78	57	17	17	9	23	NP	NP	9.5
B1-B	SS-5	6.5'-8.0'	A-1-a (0)	6	5	45	25	14	79	53	19	16	12	26	NP	NP	14.5
B1-B	SS-6	15.5'-17.0'	A-1-b (0)	24	6	47	28	16	77	51	19	19	11	24	NP	NP	9.8
B2-A	SS-7	5.0'-6.5'	A-4 (0)	7	7	75	49	35	57	42	13	22	23	27	2	25	20.9
B2-A	SS-8	20.0'-21.5'	A-2-4 (0)	17	8	72	52	27	56	39	28	21	12	24	NP	NP	22.0



Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

UNCONFINED COMPRESSION TEST (ROCK CORE)

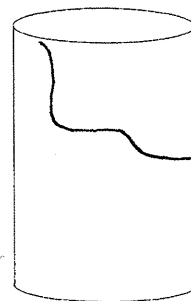
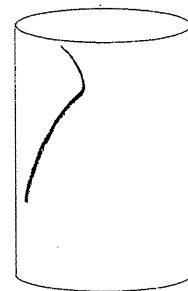
Project Name : Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316 Sample No. : RS - 3
 Project County : Watauga Sample Loc. : Boring No. B1-A
 Project State : North Carolina Sample Depth : 35.9' to 36.3'
 Laboratory No. : 08012-02 Date Tested : 04-24-08
 Submitted By : Florence & Hutcheson, Inc. Date Reported : 04-25-08
 Rock Description : Sli. to mod. weathered gneiss w/granite layers (CR)

Height & Diameter measurements:

Diameter : 1.98 in.
 Height : 3.18 in.
 Area : 3.08 in.²
 Volume : 0.0057 ft.³

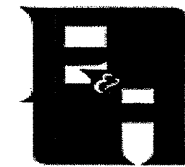
Results:

Moisture Air-Dry : NA %
 Air-Dry Density : 163.36 lbs/ft.³
 Maximum Stress : 4436 psi
 Elapsed Time : 03:40 min.



Comments :

Approved By: DMG



Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

UNCONFINED COMPRESSION TEST (ROCK CORE)

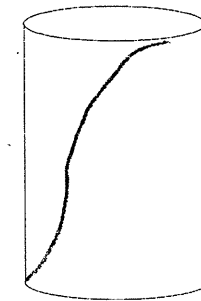
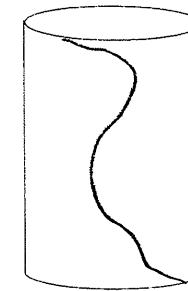
Project Name : Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316 Sample No. : RS - 4
 Project County : Watauga Sample Loc. : Boring No. B2-A
 Project State : North Carolina Sample Depth : 28.1' to 28.6'
 Laboratory No. : 08012-02 Date Tested : 04-24-08
 Submitted By : Florence & Hutcheson, Inc. Date Reported : 04-25-08
 Rock Description : Sli. weathered interlayered gneiss and granite (CR)

Height & Diameter measurements:

Diameter : 1.97 in.
 Height : 4.08 in.
 Area : 3.06 in.²
 Volume : 0.0072 ft.³

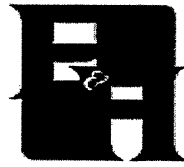
Results:

Moisture Air-Dry : NA %
 Air-Dry Density : 165.05 lbs/ft.³
 Maximum Stress : 11771 psi
 Elapsed Time : 14:33 min.



Comments :

Approved By: DMG



Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

UNCONFINED COMPRESSION TEST (ROCK CORE)

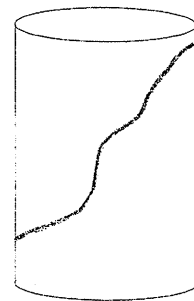
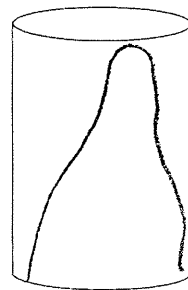
Project Name : Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316 Sample No. : RS - 5
 Project County : Watauga Sample Loc. : Boring No. B2-A
 Project State : North Carolina Sample Depth : 43.7' to 44.1'
 Laboratory No. : 08012-02 Date Tested : 04-24-08
 Submitted By : Florence & Hutcheson, Inc. Date Reported : 04-25-08
 Rock Description : Sli. weathered gneiss w/feldspar phenocrysts (CR)

Height & Diameter measurements:

Diameter : 1.98 in.
 Height : 3.44 in.
 Area : 3.08 in.²
 Volume : 0.0061 ft.³

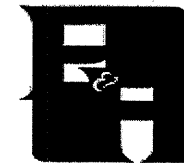
Results:

Moisture Air-Dry : NA %
 Air-Dry Density : 163.92 lbs/ft.³
 Maximum Stress : 5567 psi
 Elapsed Time : 04:21 min.



Comments :

Approved By: DM6



Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

UNCONFINED COMPRESSION TEST (ROCK CORE)

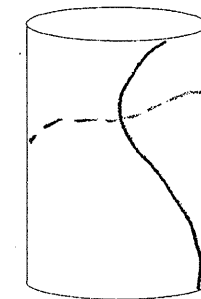
Project Name : Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Road)
 Project No. : 33653.1.1 : ID. B-4316 Sample No. : RS - 6
 Project County : Watauga Sample Loc. : Boring No. B2-B(2)
 Project State : North Carolina Sample Depth : 16.6' to 17.0'
 Laboratory No. : 08012-02 Date Tested : 04-24-08
 Submitted By : Florence & Hutcheson, Inc. Date Reported : 04-25-08
 Rock Description : Sli. w/intervals mod. sev. weathered gneiss w/feldspar phenocrysts (CR)

Height & Diameter measurements:

Diameter : 1.97 in.
 Height : 3.77 in.
 Area : 3.05 in.²
 Volume : 0.0066 ft.³

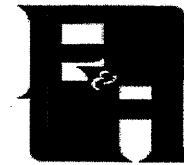
Results:

Moisture Air-Dry : NA %
 Air-Dry Density : 159.50 lbs/ft.³
 Maximum Stress : 4946 psi
 Elapsed Time : 08:20 min.



Comments :

Approved By: DM6



Florence & Hutcheson, Inc.

CONSULTING ENGINEERS

UNCONFINED COMPRESSION TEST (ROCK CORE)

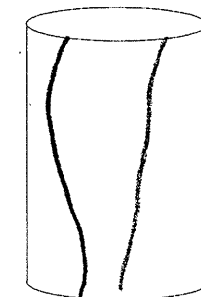
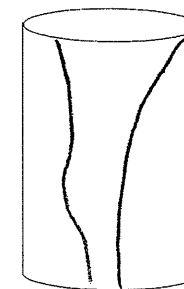
Project Name	: Bridge No. 320 over Beech Creek on SR 1153 (Wiley Harmon Road)	Sample No.	: RS - 7
Project No.	: 33653.1.1 : ID. B-4316	Sample Loc.	: Boring No. B2-B(2)
Project County	: Watauga	Sample Depth	: 23.2' to 23.7'
Project State	: North Carolina	Date Tested	: 04-24-08
Laboratory No.	: 08012-02	Date Reported	: 04-25-08
Submitted By	: Florence & Hutcheson, Inc.		
Rock Description	: Sli. weathered to fresh granite w/feldspar phenocrysts (CR)		

Height & Diameter measurements:

Diameter	: 1.97 in.
Height	: 4.03 in.
Area	: 3.05 in. ²
Volume	: 0.0071 ft. ³

Results:

Moisture Air-Dry	: NA	%
Air-Dry Density	: 162.93	lbs/ft. ³
Maximum Stress	: 17068	psi
Elapsed Time	: 11:35	min.



Comments :

Approved By: pmg

STATE PROJECT NO.: 33653.1.1
TIP NO.: B-4316
COUNTY: Watauga
PROJECT DESC.: Bridge No. 320 on SR 1153 (Wiley Harmon Road) over Beech Creek

LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES											
Sample No.	Boring No.	Depth Interval (ft)	Rock Type	Run RQD (%)	Height (inches)	Diameter (inches)	Unit Weight (PCF)	Unconfined Compressive Strength (PSI)	Young's Modulus	Splitting Tensile Strength	Remarks
RS-1	B1-B	30.2'-30.6'	Gneiss	38	4.05	1.98	159.7	3625	N/A	N/A	
RS-2	B1-B	44.9'-45.3'	Gneiss & Granite	50	3.95	1.99	170.5	15101	N/A	N/A	
RS-3	B1-A	35.9'-36.3'	Gneiss & Granite	82	3.18	1.98	163.4	4436	N/A	N/A	
RS-4	B2-A	28.1'-28.6'	Gneiss & Granite	48	4.08	1.97	165.1	11771	N/A	N/A	
RS-5	B2-A	43.7'-44.1'	Gneiss	62	3.44	1.98	163.9	5567	N/A	N/A	
RS-6	B2-B(2)	16.6'-17.0'	Gneiss	50	3.77	1.97	159.5	4946	N/A	N/A	
RS-7	B2-B(2)	23.2'-23.7'	Granite	60	4.03	1.97	162.9	17068	N/A	N/A	



**FIELD
SCOUR REPORT**

WBS: 33653.1.1 TIP: B-4316 COUNTY: Watauga

DESCRIPTION(1): Bridge No. 320 on SR 1153 (Wiley Harmon Road) over Beech Creek

EXISTING BRIDGE

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

Bridge No.: 320 Length: 55' Total Bents: 4 Bents in Channel: 3 Bents in Floodplain: 1
Foundation Type: Concrete Spread Footings on Rock for Interior Bents; Creosote Treated Poles for End Bents

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Upstream Scour of Embankment at North Abutment behind Wing Wall;
Minimal Evidence at South Abutment.

Interior Bents: Northern Interior Bent Exhibits Minor Scour along Upstream edge; Southern Interior Bent
Exhibits Severe Scour - Contact with Creek Bed Non-Existent for Part of Foundation Length.

Channel Bed: Isolated Pockets of Sand and Gravel Observed among Cobbles and Boulders; Vegetation
Growing on Small Cobble Bar Immediately Downstream from Bridge.

Channel Bank: Vegetation Growing, Little Evidence of Scour

EXISTING SCOUR PROTECTION

Type(3): Creosote Treated Timbers and Poles (End Bents)

Extent(4): 20' with 18' Wing Walls on North; 20' with 13' Wing Walls - SW and Missing Wing Wall - SE

Effectiveness(5): OK - North; Poor - South

Obstructions(6): None Observed

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): Sample Results Attached, Material also Includes Cobbles (3"-1')
and Boulders (1'-20') with Small Pockets of Sand and Gravel

Channel Bank Material(8): Sample Results Attached, Material also Includes Cobbles (1'-20')

Channel Bank Cover(9): Timber with Brush and Grass

Floodplain Width(10): 300'

Floodplain Cover(11): Timber with Brush and Grass

Stream is(12): Aggrading Degrading Static

Channel Migration Tendency(13): Toward South Abutment

Observations and Other Comments: Flow Level in Channel was 6"-2' during Investigation

Reported by: D. Michael Gragg Date: 4/11/2008
D. Michael Gragg, P.G.

DESIGN SCOUR ELEVATIONS(14)

Feet Meters

BENTS

	B1	B2									
	N/A	2897.1									

Comparison of DSE to Hydraulics Unit theoretical scour:
We agree with the scour computations presented in the Bridge Survey and Hydraulic Design Report for B-4316, dated 12/10/2007.

DSE determined by: Chad m. walby Date: 5/20/2008

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank	Bed	Bank					
Sample No.	1	1					
Retained #4	87	74					
Passed #10	8	18					
Passed #40	1	4					
Passed #200	0	1					
Coarse Sand	7	14					
Fine Sand	1	3					
Silt	0	1					
Clay	0	0					
LL	N/A	N/A					
PI	N/A	N/A					
AASHTO	A-1-a (0)	A-1-a (0)					
Station	N/A	N/A					
Offset	N/A	N/A					
Depth	N/A	N/A					

PROJECT #: 33653.1.1/B-4316

COUNTY: Watauga

DESCRIPTION: Bridge No. 320 on SR 1153 (Wiley Harmon Road) over Beech Creek

SAMPLE #	CHANNEL BED MATERIAL			CHANNEL BANK MATERIAL		
	Bag 1			Bag 1		
RETAINED #4	87			74		
PASSING #10	8			18		
PASSING #40	1			4		
PASSING # 200	0			1		
COARSE SAND	7			14		
FINE SAND	1			3		
SILT + CLAY	0			1		
LL	N/A			N/A		
PL	N/A			N/A		
AASHTO CLASSIFICATION	A-1-a(0)			A-1-a (0)		
STATION	N/A			N/A		
OFFSET	N/A			N/A		
DEPTH	N/A			N/A		

SCOUR PHOTOGRAPHIC RECORD

Replacement of Bridge No. 320 on SR 1153 over Beech Creek



Photograph No. 1 - Bent 3 (north side) foundation & piers



Photograph No. 3 - North (bent 4) abutment upstream wingwall



Photograph No. 2 - Upstream bed material



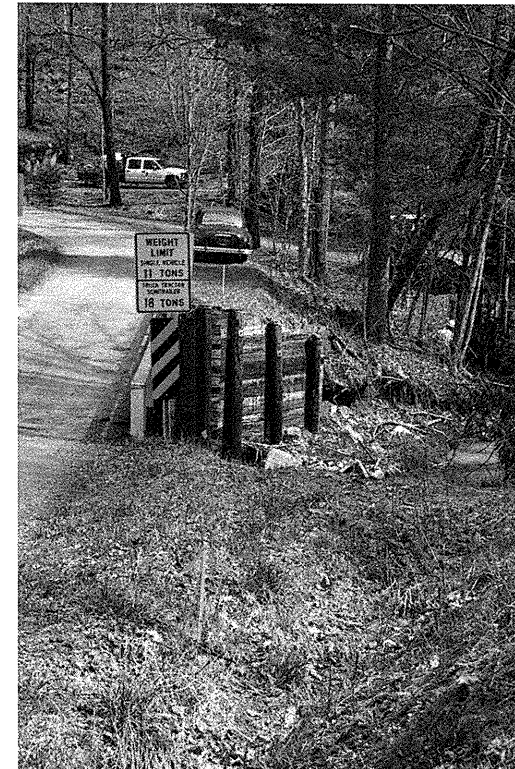
Photograph No. 4 - Downstream bed material

SITE PHOTOGRAPHIC RECORD

Replacement of Bridge No. 320 on SR 1153 Over Beech Creek



Photograph No. 1 - Bent 1 looking east;
B1-B stake in Laurel Thicket



Photograph No. 3 - Profile south to north (ahead) along left offset (A borings); drill rig on B2-B(2); red flag as drilled location for B1-A



Photograph No. 2 - End Bent 1 looking west;
EB1-A in ditch



Photograph No. 4 - Proposed Bridge looking west downstream at the Existing Bridge