NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
	MA5018B	2	26

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS 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:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE
UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

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

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

SAMPLE DESIGNATIONS

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
REF. - SPT REFUSAL
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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- ☐ MOBILE B-___
- ☐ BK-51
- ☐ CME-45
- ☐ CME-550
- ☐ PORTABLE HOIST
- ☒ OTHER D-50
- ☐ OTHER ____

ADVANCING TOOLS:
- ☐ CLAY BITS
- ☐ 6" CONTINUOUS FLIGHT AUGER
- ☐ 8" HOLLOW AUGERS
- ☐ HARD FACED FINGER BITS
- ☐ TUNG.-CARBIDE INSERTS
- ☐ CASING ☐ W/ ADVANCER
- ☒ TRICONE 3 " STEEL TEETH
- ☐ TRICONE ____ " TUNG.-CARB.
- ☐ CORE BIT
- ☐ OTHER ____

HAMMER TYPE:
- ☒ AUTOMATIC
- ☐ MANUAL

CORE SIZE:
- ☐ -B____
- ☐ -N____
- ☒ -H Q

HAND TOOLS:
- ☐ POST HOLE DIGGER
- ☐ HAND AUGER
- ☐ SOUNDING ROD
- ☐ VANE SHEAR TEST
- ☐ OTHER ____

ROCK DESCRIPTION

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:

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

WEATHERING

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

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGISTS 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 GEOLOGISTS 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 GEOLOGISTS PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS 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 IS 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 (N 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.

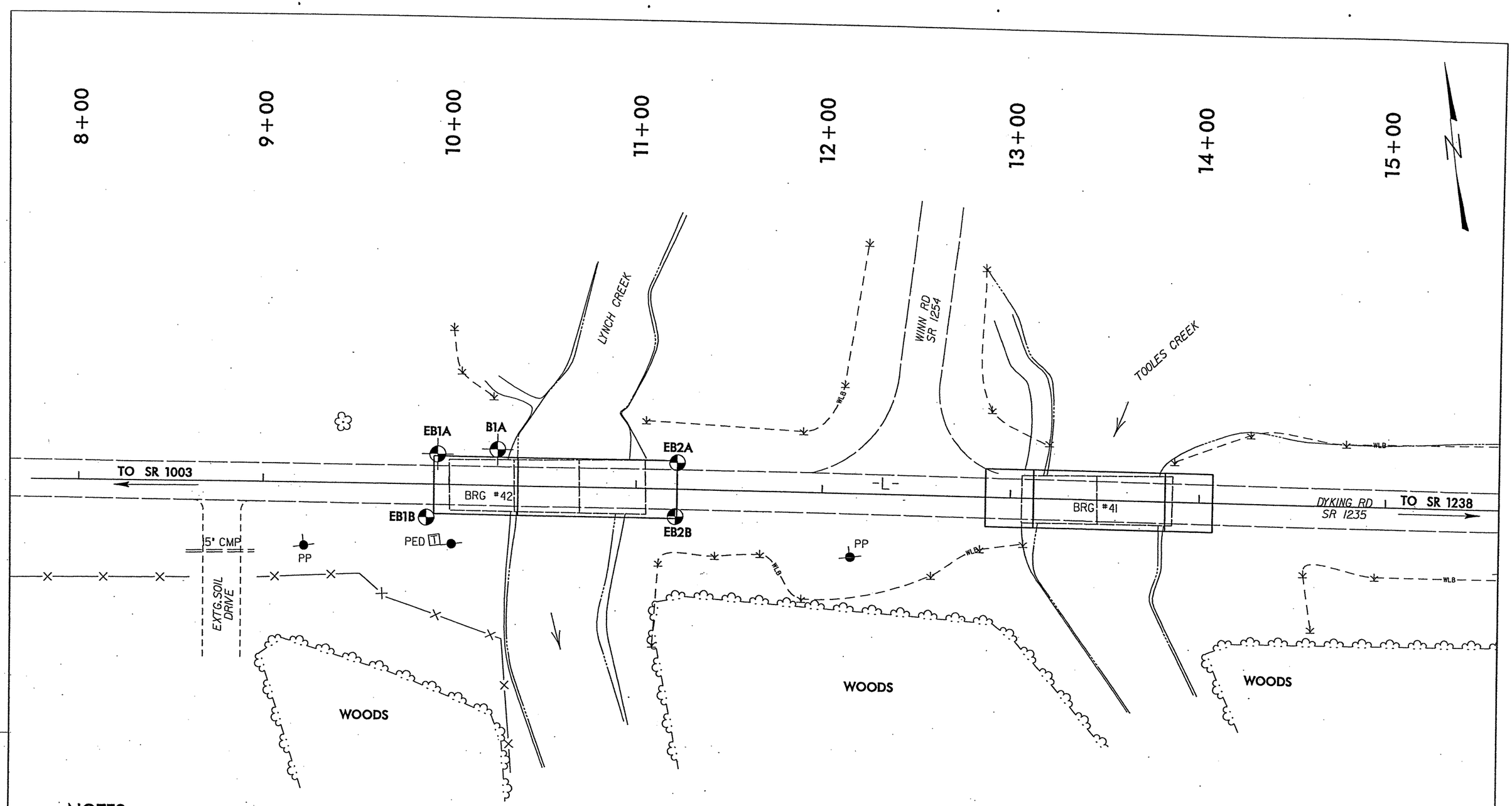
STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM #2, -BL- STA. 12+59.47, 52.60' RIGHT

ELEVATION: 204.36'

NOTES:



NOTES:

BENCH MARK: BM #2, -BL- STA. 12+59.47, 52.60' RT., ELEVATION 204.36'

PLANS ADOPTED FROM HYDRAULIC SURVEY FILES RECEIVED FROM SUNGATE, DATED 9-28-04

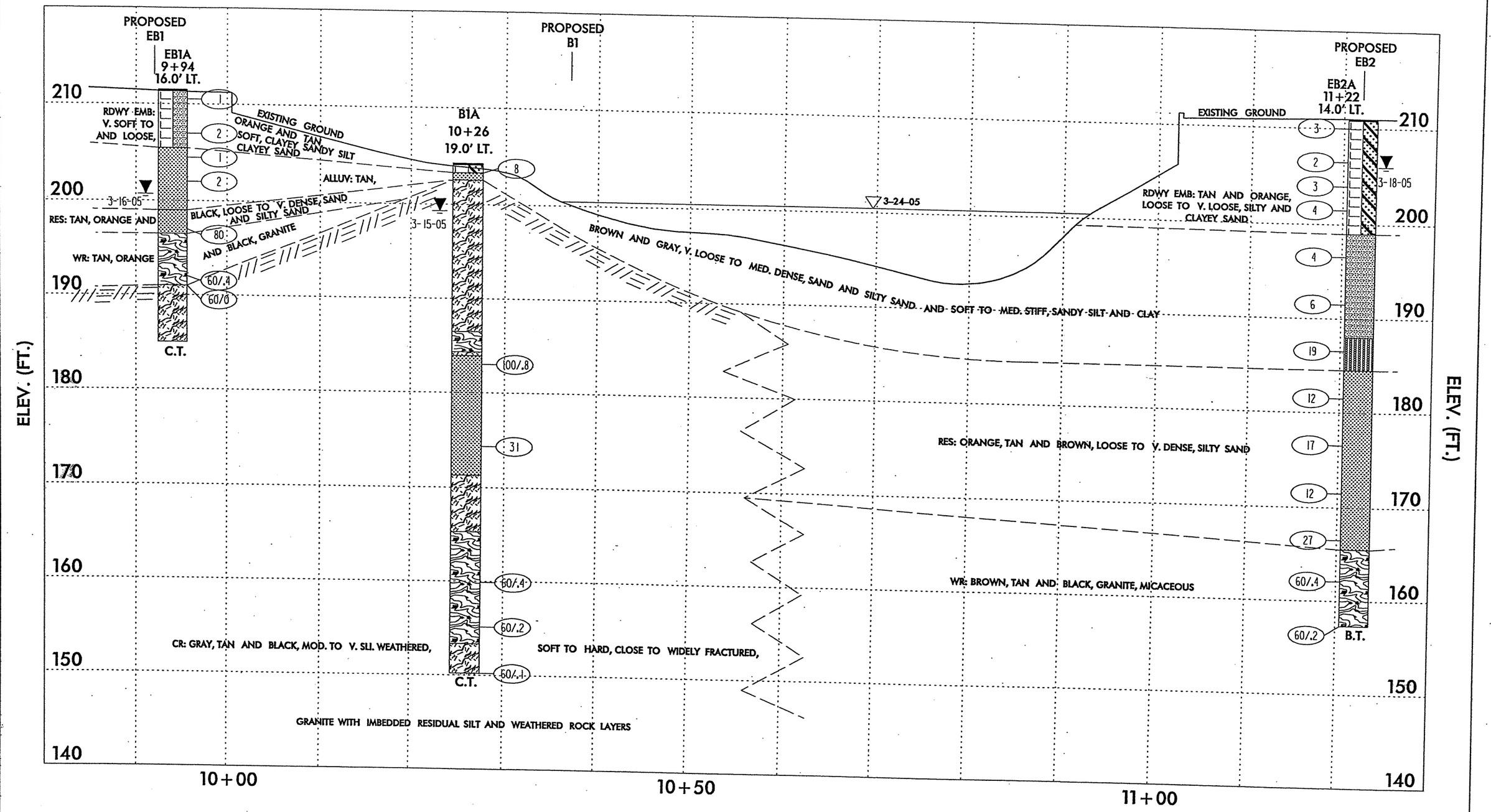
STATIONING ON LOCATION PLAN, CROSS-SECTIONS, PROFILE AND BORING LOGS BASED UPON HYDRO REPORT DATED 9-28-04

0 50 100
FEET

BORING LOCATION PLAN

NCDOT PROJECT #: MA5018B
FRANKLIN CO., NC
BRIDGE #42 ON SR 1235 (DYKING RD.)
OVER LYNCH CREEK

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
TIERRA, INC.
2736 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803



BENCH MARK: BM #2, –BL– STA. 12+59.47, 52.60' RIGHT, ELEVATION OF 204.36'

VERTICAL SCALE

0 10 20

HORIZONTAL SCALE

0 10 20

PROFILE 15' LEFT OF –L–

NCDOT PROJECT #: MA5018B
FRANKLIN CO., NC
BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK

TIERRA
GEOTECHNICAL • MATERIALS
TIERRA, INC.
2736 ROWLAND RD.
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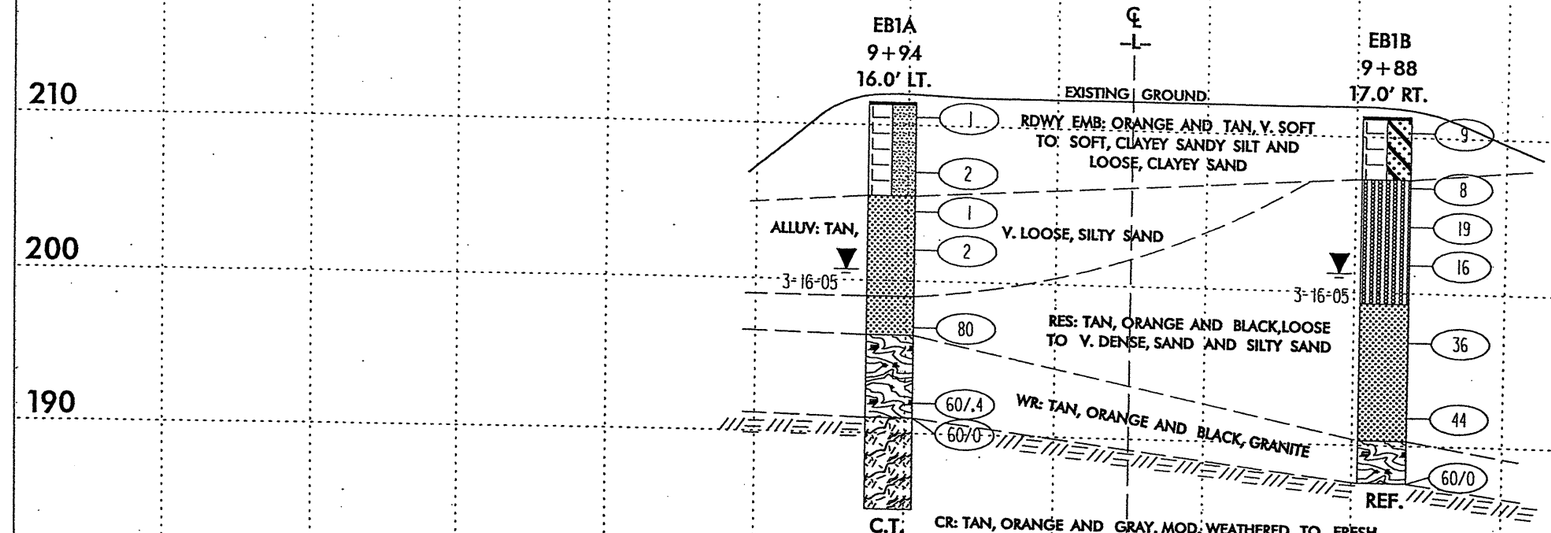
FAX (919) 870-0330



BENCH MARK: BM #2, –BL– STA. 12+59.47, 52.60' RIGHT, ELEVATION OF 204.36'

VERTICAL SCALE

0 10 20

HORIZONTAL SCALE

0 10 20

CROSS SECTION END BENT 1

NCDOT PROJECT #: MA5018B
FRANKLIN CO., NC
BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK

TIERRA
GEOTECHNICAL • MATERIALS
TIERRA, INC.
2734 ROWLAND RD.
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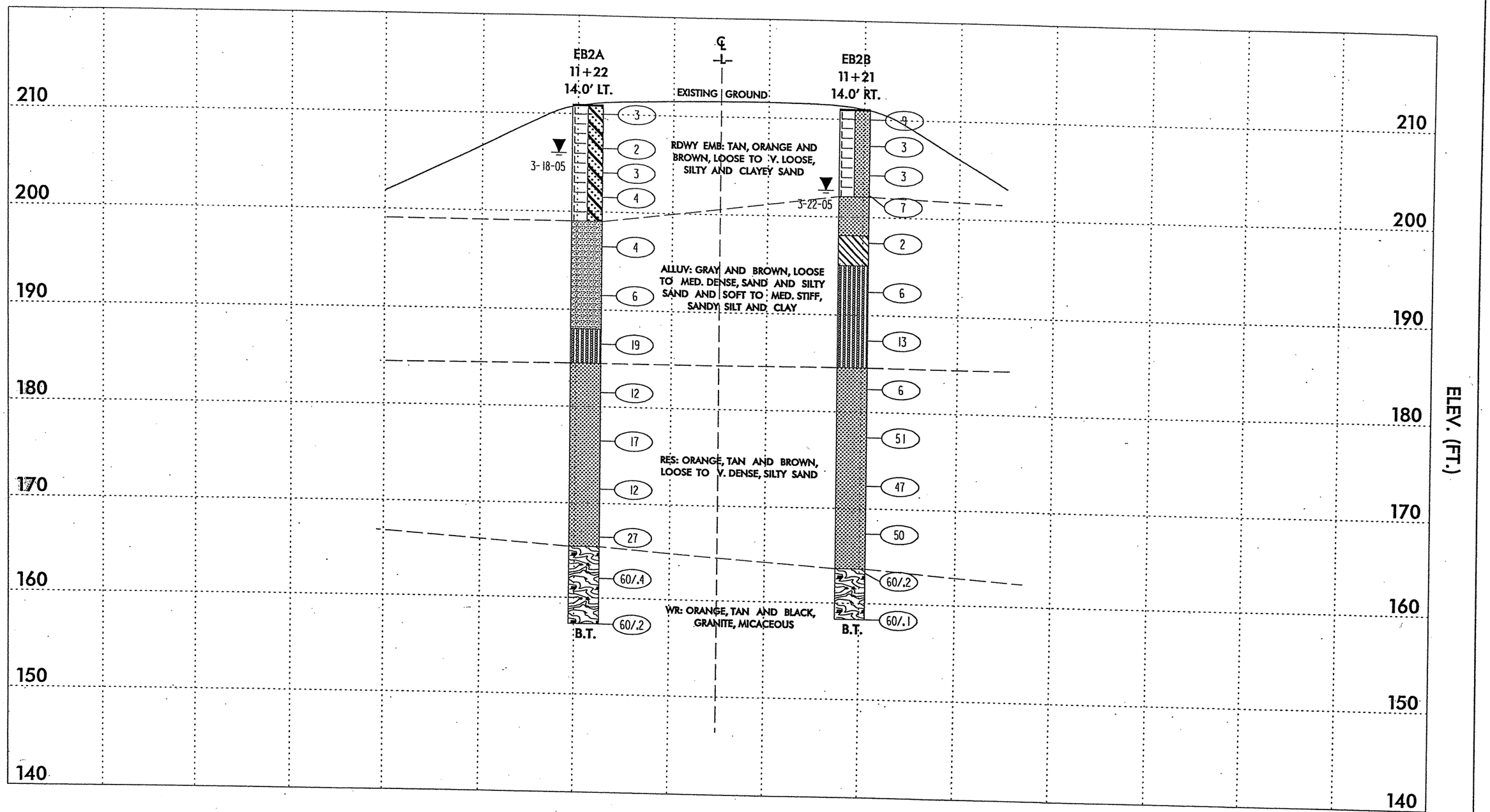

BENCH MARK: BM #2, –BL– STA. 12+59.47, 52.60' RIGHT, ELEVATION OF 204.36'

VERTICAL SCALE

0 10 20

HORIZONTAL SCALE

0 10 20

CROSS SECTION END BENT 2

NCDOT PROJECT #: MA5018B
FRANKLIN CO., NC
BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK

TIERRA
TIERRA, INC.
2726 ROWLAND RD.
RALEIGH, NC 27615
PHONE (919) 871-033309
FAX (919) 871-033303

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING
2736 ROWLAND ROAD
RALEIGH, NORTH CAROLINA 27615
Phone (919) 871-0800 Fax (919) 871-0803

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

SHEET 1 OF 1

PROJECT NO. 6211-04-064	ID. MA5018B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK			GROUND WATER (ft)
BORING NO. EB1A	BORING LOCATION 9+94	OFFSET 16.0' LT.	ALIGNMENT -L-	0 HR. 14.0
COLLAR ELEV. 211.5 ft	NORTHING	EASTING	24 HR. 10.8
TOTAL DEPTH 26.5 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-15-05	COMPLETED 3-15-05	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.5					EXISTING GROUND				211.5
210	0.0	1	WOH	1	1	SS-1	23.0%		211.3 ROOTMAT 0.2 RDWY EMB: TAN AND ORANGE, V. SOFT TO SOFT, CLAYEY SANDY SILT (A-4)
	3.5								
	6.0	1	1	1	2				
205	8.5	1	WOH	1	1	SS-2			205.5 6.0 ALLUV: TAN, V. LOOSE, SILTY SAND (A-2-4)
	13.5	1	1	1	2				
200		12	20	60	80				199.0 12.5 RES: TAN AND ORANGE, V. DENSE, SILTY SAND (A-2-4)
195	18.5	8	8	60/.4	60/.4				196.5 15.0 WR: TAN, ORANGE AND BLACK, GRANITE
	20.5	60/0			50/0"				191.0 20.5 CR: TAN, ORANGE AND GRAY, MOD. WEATHERED TO FRESH, HARD, MOD. CLOSELY FRACTURED, GRANITE
190									
185									185.0 26.5 CORING TERMINATED AT ELEV. 185.0' IN CR: TAN, ORANGE AND GRAY, GRANITE

NCDOT_BORE_VARIABLE DEPTH 04-064 BR 42 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

CORE BORING REPORT

DATE: 3-15-05

PROJECT: MA5018B I.D. NO.: BORING NO: EB1A GEOLOGIST: J. HOWARD

DESCRIPTION: BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK

COUNTY: FRANKLIN COLLAR ELEV.: 211.5 FT TOTAL DEPTH: 26.5 FT

ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
191.0	20.5	3:00	1.0	1.0/1.0 100%	1.0/1.0 100%		20.5-26.5 CR: TAN, ORANGE AND GRAY, MOD. WEATHERED TO FRESH, HARD, MOD. CLOSELY FRACTURED, GRANITE
190.0	21.5						
190.0	21.5	3:30 3:00 1:15 2:15	5.0	4.25/5.0 85%	4.25/5.0 85%		
185.0	26.5	3:00					STRATA REC = 88% STRATA RQD = 88%

CORING TERMINATED AT 26.5 FT
ELEVATION 185.0 FT

DRILLER: F. COX CORE SIZE: HQ EQUIPMENT: D-50

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

SHEET 1 OF 1

PROJECT NO. 6211-04-064	ID. MA5018B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK			GROUND WATER (ft)
BORING NO. EB1B	BORING LOCATION 9+88	OFFSET 17.0' RT.	ALIGNMENT -L-
COLLAR ELEV. 211.3 ft	NORTHING	EASTING	0 HR. 12.5
TOTAL DEPTH 23.8 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-15-05	COMPLETED 3-15-05	SURFACE WATER DEPTH N/A	24 HR. 10.1

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.3					EXISTING GROUND				
									211.3
	0.0	2	4	5	9				211.1 ROOTMAT 0.2
210	3.5								RDWY EMB: ORANGE AND TAN, LOOSE, CLAYEY SAND (A-2-6)
		6	4	4	8				207.3 4.0
	6.0								RES: TAN AND BLACK, LOOSE TO MED. DENSE, SAND (A-1-b)
205		8	8	11	19				
	8.5								
		10	12	4	16	SS-3			
200	13.5								199.3 12.0
		12	16	20	36				RES: TAN AND BLACK, DENSE, SILTY SAND (A-2-4)
195	18.5								
		22	25	19	44	SS-4			
190									190.3 21.0
	23.8	60/0			60/0				WR: TAN AND BLACK, GRANITE
									187.5 23.8
									SPT REFUSAL AT ELEV. 187.5' ON CR: TAN AND BLACK, GRANITE

NCDOT_BORE_VARIABLE DEPTH 04-084 BR 42 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

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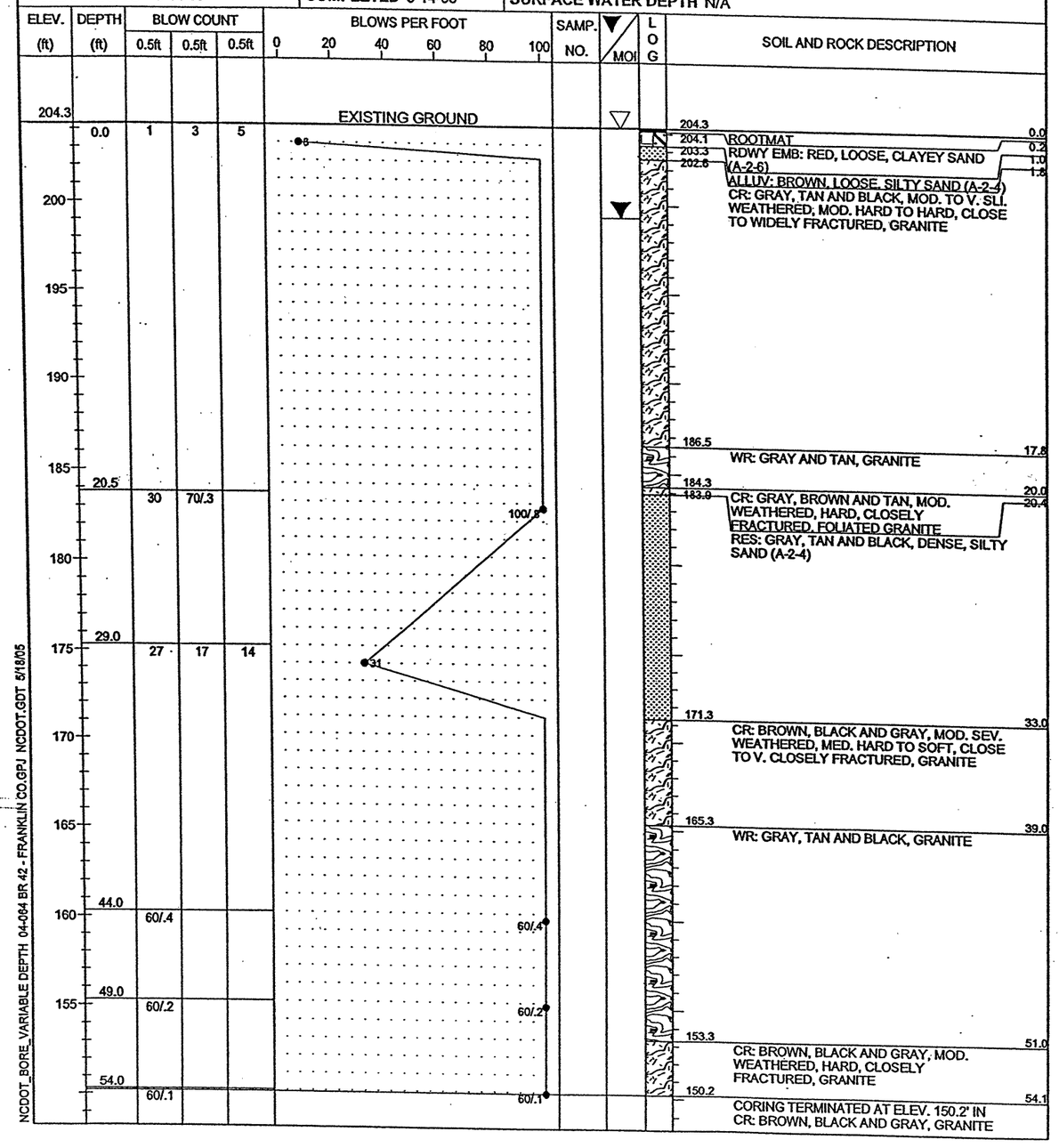
BORING LOG

PROJECT NO. 6211-04-064	ID. MA5018B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK			GROUND WATER (ft)
BORING NO. B1A	BORING LOCATION 10+26	OFFSET 19.0' LT.	ALIGNMENT -L-	0 HR. 0.0
COLLAR ELEV. 204.3 ft	NORTHING	EASTING		24 HR. 5.0
TOTAL DEPTH 54.1 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-14-05	COMPLETED 3-14-05	SURFACE WATER DEPTH N/A	



NCDOT_BORE_VARIABLE DEPTH 04-064 BR 42 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

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BORING LOG

SHEET 1 OF 1

PROJECT NO. 6211-04-064	ID. MA5018B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK			GROUND WATER (ft)
BORING NO. EB2A	BORING LOCATION 11+22	OFFSET 14.0' LT.	ALIGNMENT -L-	0 HR. 10.0
COLLAR ELEV. 211.0 ft	NORTHING	EASTING		24 HR. 5.0
TOTAL DEPTH 53.7 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO	
DATE STARTED 3-17-05	COMPLETED 3-17-05	SURFACE WATER DEPTH N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.0					EXISTING GROUND				
	0.0	3	2	1	3 2 3				211.0 ROOTMAT 0.0
210									210.8 RDWY EMB: TAN AND ORANGE, V. LOOSE TO LOOSE, CLAYEY SAND (A-2-6) 0.2
	3.5	1	1	1	4				
	6.0								
205		1	1	2	6				
	8.5								
		1	1	3	4				
200	13.5								199.0 ALLUV: GRAY, SOFT TO MED. STIFF, SANDY SILT (A-4) 12.0
		3	2	2	4	SS-5	33.9%		
195	18.5								
		3	2	4	6				
190	23.5								
		7	11	8	19	SS-6			188.0 ALLUV: GRAY, MED. DENSE, SAND (A-1-b) 23.0
185	28.5								
		4	5	7	12				184.5 RES: ORANGE, TAN AND BLACK, MED. DENSE, SILTY SAND (A-2-4) 26.5
180	33.5								
		5	7	10	17				
175	38.5								
		7	6	6	12				
170	43.5								
		9	9	18	27	SS-7			165.5 WR: ORANGE AND BLACK, GRANITE, MICACEOUS 45.5
165	48.5								
		60/.4			60/.4				
160	53.5								
		60/.2			60/.2				157.3 BORING TERMINATED AT ELEV. 157.3' ON CR: ORANGE AND BLACK, GRANITE 53.7

NCDOT_BORE_VARIABLE DEPTH 04-064 BR 42 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

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BORING LOG

SHEET 1 OF 1

PROJECT NO. 6211-04-064	ID. MA5018B	COUNTY FRANKLIN	GEOLOGIST C. BRUINSMA
SITE DESCRIPTION BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK			GROUND WATER (ft)
BORING NO. EB2B	BORING LOCATION 11+21	OFFSET 14.0' RT.	ALIGNMENT -L-	0 HR. 10.0
COLLAR ELEV. 211.1 ft	NORTHING	EASTING		24 HR. 8.4
TOTAL DEPTH 52.8 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO	
DATE STARTED 3-21-05	COMPLETED 3-21-05	SURFACE WATER DEPTH N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.1					EXISTING GROUND				
	0.1	3	5	4	9				211.1 ROOTMAT 0.0
210									210.9 RDWY EMB: ORANGE AND BROWN, LOOSE TO V. LOOSE, CLAYEY SILTY SAND (A-2-4) 0.2
	2.8	2	2	1	3				
	5.8								
205		2	1	2	3				
	7.8								
		2	3	4	7	SS-8			202.1 ALLUV: BROWN, LOOSE, CLAYEY SILTY SAND (A-2-4) 9.0
200	12.7								
		4	1	1	2	SS-9	26.4%		198.1 ALLUV: DARK GRAY, SOFT, SILTY SANDY CLAY (A-6) 13.0
195	17.7								195.1 ALLUV: GRAY, LOOSE TO MED. DENSE, SAND (A-1-b) WITH GRAVEL 16.0
		4	3	3	6				
190	22.7								
		4	4	9	13				
185	27.7								184.6 RES: BROWN AND TAN, LOOSE TO V. DENSE, SILTY SAND (A-2-4) SAPROLITIC, V. MICACEOUS 26.5
		4	3	3	6				
180	32.7					SS-10			
		28	27	24	51				
175	37.7								
		31	27	20	47				
170	42.7								
		10	20	30	50				163.6 WR: BROWN, TAN AND BLACK, GRANITE, V. MICACEOUS 47.5
165	47.7								
		60/.2			60/.2				
160	52.7								
		60/.1			60/.1				158.3 BORING TERMINATED AT ELEV. 158.3' IN WR: BROWN, TAN AND BLACK, GRANITE 52.8

NCDOT_BORE_VARIABLE DEPTH 04-064 BR 42 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
	MA5017B	2	20

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS 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:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE
UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. ALSO POORLY GRADED
GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

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

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

SAMPLE DESIGNATIONS

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- ☐ MOBILE B-___
- ☐ BK-51
- ☐ CME-45
- ☐ CME-550
- ☐ PORTABLE HOIST
- ☒ OTHER C-50
- ☐ OTHER ___

ADVANCING TOOLS:
- ☐ CLAY BITS
- ☐ 6" CONTINUOUS FLIGHT AUGER
- ☐ 8" HOLLOW AUGERS
- ☐ HARD FACED FINGER BITS
- ☐ TUNG.-CARBIDE INSERTS
- ☐ CASING ☐ W/ ADVANCER
- ☒ TRICONE 3" STEEL TEETH
- ☐ TRICONE ___" TUNG.-CARB.
- ☐ CORE BIT
- ☐ OTHER ___

HAMMER TYPE:
- ☒ AUTOMATIC ☐ MANUAL

CORE SIZE:
- ☐ -B___
- ☐ -N___
- ☐ -H___

HAND TOOLS:
- ☐ POST HOLE DIGGER
- ☐ HAND AUGER
- ☐ SOUNDING ROD
- ☐ VANE SHEAR TEST
- ☐ OTHER ___

ROCK DESCRIPTION

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:

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS 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 IS 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 (N 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.

BENCH MARK: BM #2, -BL- STA. 12+59.47, 52.60' RIGHT

ELEVATION: 204.36'

NOTES:

8+00 9+00 10+00 11+00 12+00 13+00 14+00 15+00

N

LYNCH CREEK

WLB

WINN RD
SR 1254

TOOLES CREEK

WLB

EB1A

EB2A

TO SR 1003

-L-

BRG #42

BRG #41

DYKING RD
SR 1235

TO SR 1238

EB1B B1B

B2B EB2B

15" CMP

EXTG. SOIL DRIVE

PP

PED

PP

WLB

WLB

WLB

WOODS

WOODS

WOODS

NOTES:

BENCH MARK: BM #2, -BL- STA. 12+59.47, 52.60' RT., ELEVATION 204.36'

PLANS ADOPTED FROM HYDRAULIC SURVEY FILES RECEIVED FROM SUNGATE, DATED 9-28-04

STATIONING ON LOCATION PLAN, CROSS-SECTIONS, PROFILE AND BORING LOGS BASED UPON HYDRO REPORT DATED 9-28-04

0 50 100

FEET

BORING LOCATION PLAN

NCDOT PROJECT #: MA5017B
FRANKLIN CO., NC
BRIDGE #41 ON SR 1235 (DYKING RD.)
OVER TOOLES CREEK

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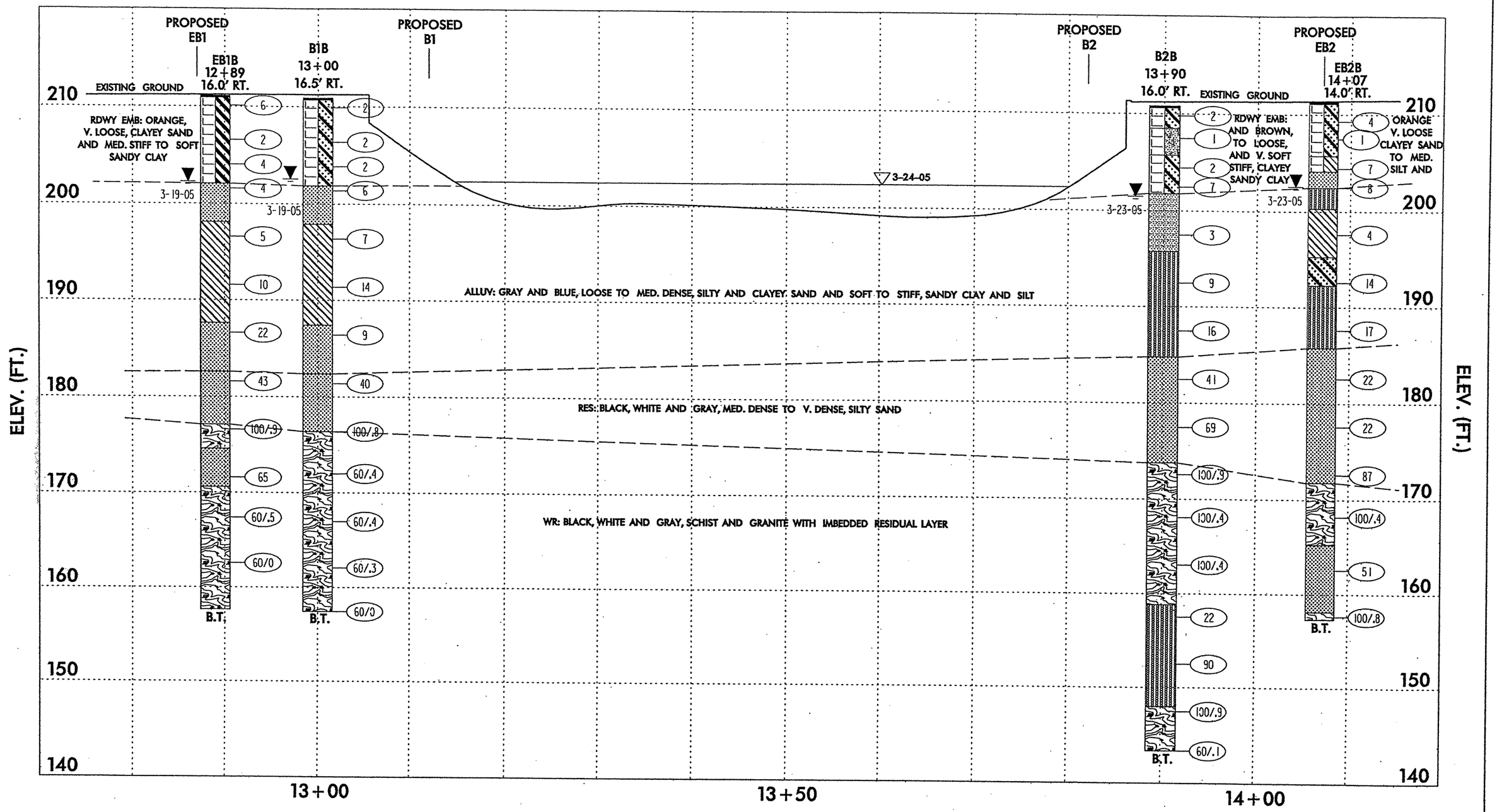

BENCH MARK: BM #2, -BL- STA. 12+59.47, 52.60' RIGHT, ELEVATION OF 204.36'

VERTICAL SCALE

0 10 20

HORIZONTAL SCALE

0 10 20

PROFILE 15' RIGHT OF -L-

NCDOT PROJECT #: MA5017B
FRANKLIN CO., NC
BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK

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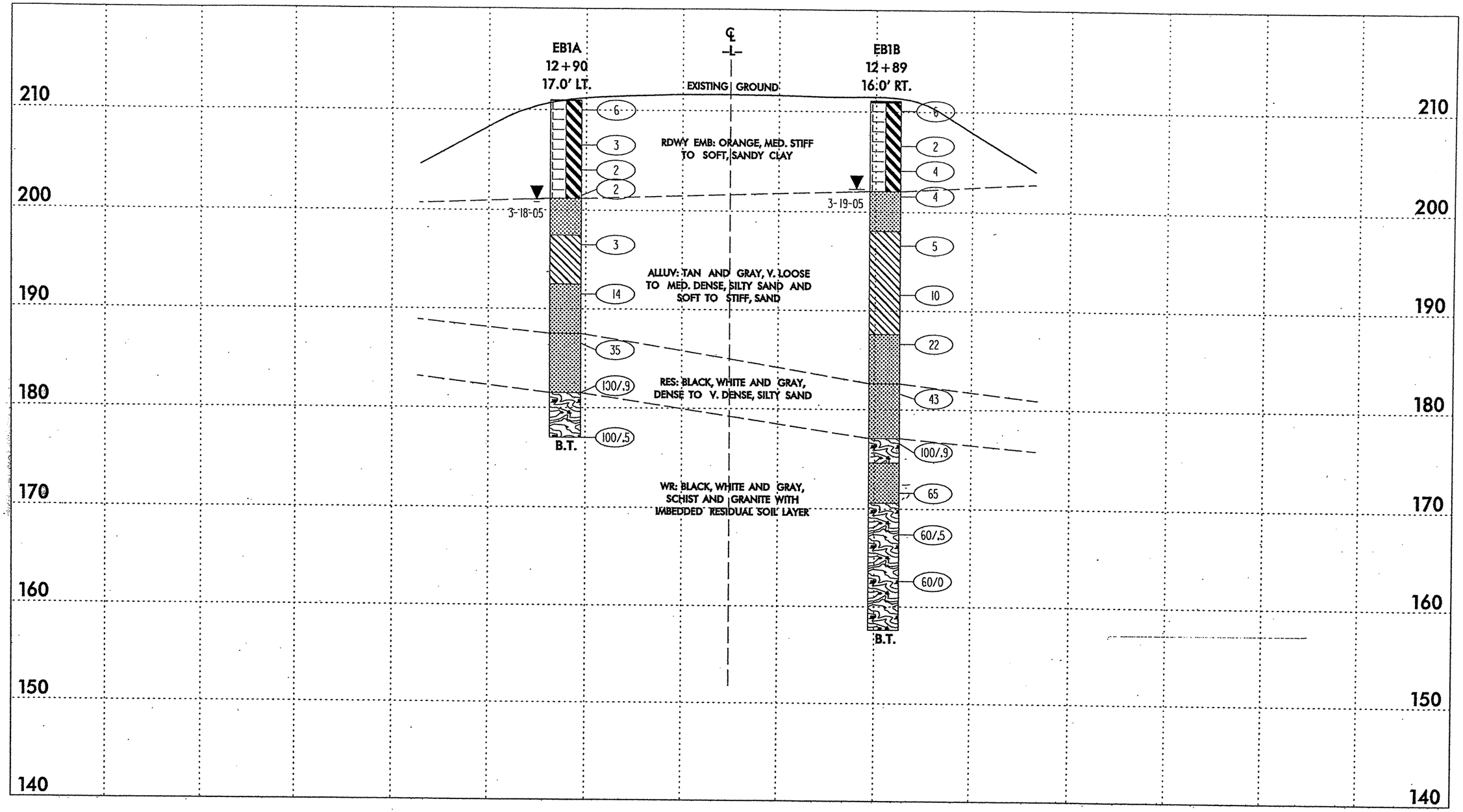

BENCH MARK: BM #2, –BL– STA. 12+59.47, 52.60' RIGHT, ELEVATION OF 204.36'

VERTICAL SCALE

0 10 20

HORIZONTAL SCALE

0 10 20

CROSS SECTION END BENT 1

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FRANKLIN CO., NC
BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK

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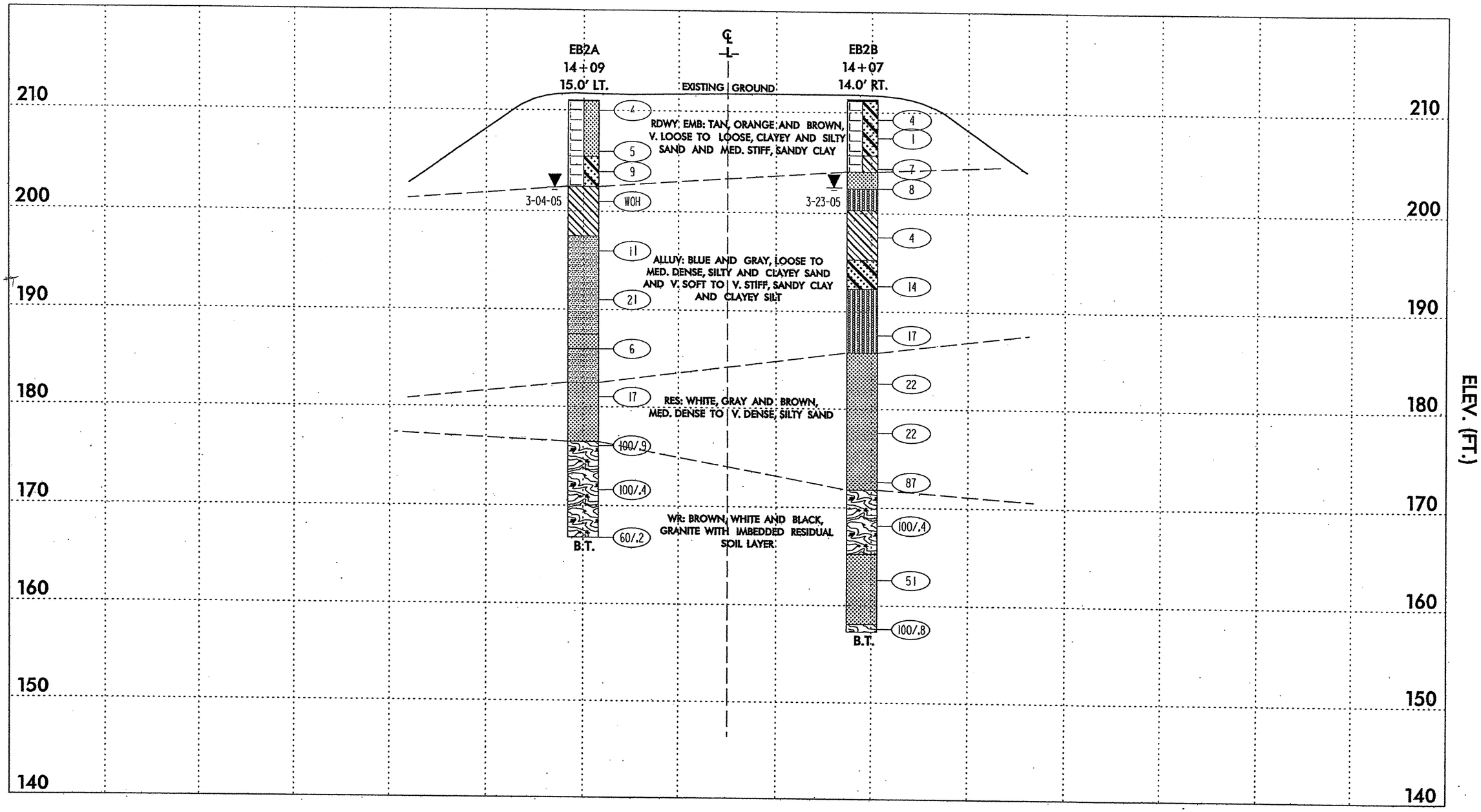
RALEIGH, NC 27615



BENCH MARK: BM #2, –BL– STA. 12+59.47, 52.60' RIGHT, ELEVATION OF 204.36'

VERTICAL SCALE

0 10 20

HORIZONTAL SCALE

0 10 20

CROSS SECTION END BENT 2

NCDOT PROJECT #: MA5017B
FRANKLIN CO., NC
BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK

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BORING LOG

SHEET 1 OF 1

PROJECT NO. 6211-04-063	ID. MA5017B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK			GROUND WATER (ft)
BORING NO. EB1A	BORING LOCATION 12+90	OFFSET 17.0' LT.	ALIGNMENT -L-	0 HR. 3.5
COLLAR ELEV. 211.0 ft	NORTHING	EASTING	24 HR. 9.9
TOTAL DEPTH 34.0 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-17-05	COMPLETED 3-17-05	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.0					EXISTING GROUND				
210	0.0	2	3	3	6	SS-1	24.3%		211.0 ROOTMAT 0.0
	3.5								210.9 RDWY EMB: ORANGE, MED. STIFF TO SOFT, SANDY CLAY (A-7-6) 0.1
205	6.0	1	1	2	3				
	8.5	1	WOH	2	2				201.2 ALLUV: TAN, V. LOOSE, SILTY SAND (A-2-4) 9.8
200	13.5	2	1	1	2				197.5 ALLUV: GRAY, SOFT, SANDY CLAY (A-6) 13.5
195	18.5	2	1	2	3				192.5 ALLUV: GRAY, MED. DENSE, SILTY SAND (A-2-4) 18.5
190	23.5	4	5	9	14				187.5 RES: GRAY, DENSE TO V. DENSE, SILTY SAND (A-2-4) 23.5
185	28.5	10	15	20	35	SS-2			181.5 WR: GRAY AND BLACK, GRANITE 29.5
180	33.5	30	40	60/.4	100/.9				177.0 BORING TERMINATED AT ELEV. 177.0' IN WR: GRAY AND BLACK, GRANITE 34.0
		100/.5			100/.5				

NCDOT_BORE_VARIABLE DEPTH 04-063 BR 41 - FRANKLIN CO.GPJ NCDOT.GDT 6/18/05

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SHEET 1 OF 1

PROJECT NO. 6211-04-063	ID. MA5017B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK			GROUND WATER (ft)
BORING NO. EB1B	BORING LOCATION 12+89	OFFSET 16.0' RT.	ALIGNMENT -L-	0 HR. 4.0
COLLAR ELEV. 211.1 ft	NORTHING	EASTING	24 HR. 8.8
TOTAL DEPTH 53.5 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-18-05	COMPLETED 3-18-05	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.1					EXISTING GROUND				
210	0.0	1	3	3	6	SS-3	30.2%		211.1 ROOTMAT 0
	3.5								210.9 RDWY EMB: ORANGE, MED. STIFF TO SOFT, SANDY CLAY (A-7-5) 0
205	6.0	1	1	1	2				
	8.5	1	2	2	4				202.1 ALLUV: GRAY, LOOSE, SILTY SAND (A-2-4) 9
200	13.5	WOH	2	2	4				198.1 ALLUV: GRAY, MED. STIFF TO STIFF, SANDY CLAY (A-6) 13
195	18.5	1	2	3	5				
190	23.5	3	4	6	10				187.6 ALLUV: GRAY, MED. DENSE, SILTY SAND (A-2-4) 23
185	28.5	7	9	13	22				182.6 RES: BLACK, WHITE AND GRAY, DENSE TO V. DENSE, SILTY SAND (A-2-4) 28
180	33.5	15	16	27	43				177.1 WR: BLACK, WHITE AND GRAY, SCHIST 34
175	38.5	34	66/.4		100/.9				174.6 RES: BLACK, ORANGE AND GRAY, V. DENSE, SILTY SAND (A-2-4) 36
170	43.5	13	24	41	65				170.6 WR: BLACK, TAN AND GRAY, GRANITE 40
165	48.5	60/.2			60/.5				
160		60/0			60/0				157.6 BORING TERMINATED AT ELEV. 157.6' IN WR: BLACK, TAN AND GRAY, GRANITE 53

NCDOT_BORE_VARIABLE DEPTH 04-063 BR 41 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

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BORING LOG

SHEET 1 OF 1

PROJECT NO. 6211-04-063	ID. MA5017B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK			GROUND WATER (ft)
BORING NO. B1B	BORING LOCATION 13+00	OFFSET 16.5' RT.	ALIGNMENT -L-
COLLAR ELEV. 210.9 ft	NORTHING	EASTING	24 HR. 8.3
TOTAL DEPTH 53.5 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-18-05	COMPLETED 3-18-05	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
210.9									EXISTING GROUND
210	0.0	1	1	1	2				210.9 0.0 ROOTMAT 210.7 0.2 RDWY EMB: ORANGE, V. LOOSE, CLAYEY SAND (A-2-6)
	3.5	1	1	1	2				
205	6.0	1	1	1	2	SS-4			
	8.5	1	2	4	6				201.9 9.0 ALLUV: GRAY, LOOSE, SILTY SAND (A-2-4)
200	13.5	2	3	4	7				197.9 13.0 ALLUV: GRAY, MED. STIFF TO STIFF, SANDY CLAY (A-6)
195	18.5	5	6	8	14				
190	23.5	3	4	5	9				187.4 23.5 ALLUV: GRAY, LOOSE, SILTY SAND (A-2-4)
185	28.5	11	16	24	40				182.4 28.5 RES: BLACK, WHITE AND GRAY, DENSE TO V. DENSE, SILTY SAND (A-2-4)
180	33.5	24	42	58/.3	100/.8				176.4 34.5 WR: BLACK, WHITE AND TAN, GRANITE
175	38.5	60/.4			60/.4				
170	43.5	60/.4			60/.4				
165	48.5	60/.3			60/.3				
160	53.5	60/0			60/0				157.4 53.5 SPT REFUSAL AT ELEV. 157.4' IN CR: BLACK, WHITE AND TAN, GRANITE

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SHEET 1 OF 1

PROJECT NO. 6211-04-063	ID. MA5017B	COUNTY FRANKLIN	GEOLOGIST C. BRUINSMA
SITE DESCRIPTION BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK			GROUND WATER (ft)
BORING NO. B2B	BORING LOCATION 13+90	OFFSET 16.0' RT.	ALIGNMENT -L-
COLLAR ELEV. 210.8 ft	NORTHING	EASTING	24 HR. 9.3
TOTAL DEPTH 67.4 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-22-05	COMPLETED 3-22-05	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
210.8									EXISTING GROUND
210	0.0	1	1	1	2				210.8 0. ROOTMAT 210.6 0.
	2.3	1	WOH	1	1				208.5 2. RDWY EMB: ORANGE AND BROWN, V. LOOSE, CLAYEY SAND (A-2-6)
205	5.3	1	1	1	2				RDWY EMB: ORANGE, V. SOFT, CLAYEY SILT (A-5) 205.8 5.
	7.3	1	2	5	7				RDWY EMB: ORANGE AND BROWN, V. LOOSE TO LOOSE, CLAYEY SAND (A-2-6)
200	12.3	1	1	2	3	SS-5	29.3%		201.8 9. ALLUV: GRAY, SOFT, SANDY SILT (A-4)
195	17.3	3	4	5	9				195.8 15. ALLUV: LT. GRAY, LOOSE TO MED. DENSE, SAND (A-1-b) WITH GRAVEL
190	22.3	5	6	10	16				
185	27.3	20	23	18	41				184.8 26. RES: BROWN, WHITE AND BLACK, DENSE TO V. DENSE, SILTY SAND (A-2-4) SAPROLITIC
180	32.3	20	26	43	69				
175	37.3	49	51/.4		100/.9				173.8 37. WR: BROWN, TAN AND BLACK, GRANITE
170	42.3	100/.4			100/.4				
165	47.3	100/.4			100/.4				
160	52.3	9	10	12	22	SS-6			158.8 52. RES: ORANGE, BROWN AND WHITE, MED. DENSE TO V. DENSE, COARSE SAND (A-1-b) SAPROLITIC
155	57.3	33	43	47	90				
150	62.3	27	38	62/.4	100/.9				148.0 62. WR: PINK, TAN AND BROWN, GRANITE
145	67.3	60/.1			60/.1				143.4 67. BORING TERMINATED AT ELEV. 143.4' IN WR: PINK, TAN AND BROWN, GRANITE

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BORING LOG

SHEET 1 OF 1

PROJECT NO. 6211-04-063	ID. MA5017B	COUNTY FRANKLIN	GEOLOGIST Y. SALEH
SITE DESCRIPTION BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK			GROUND WATER (ft)
BORING NO. EB2A	BORING LOCATION 14+09	OFFSET 15.0' LT.	ALIGNMENT -L-
COLLAR ELEV. 211.0 ft	NORTHING	EASTING	24 HR. 8.6
TOTAL DEPTH 44.2 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-02-05	COMPLETED 3-03-05	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.0					EXISTING GROUND				
	0.0	3	2	2	4				211.0 ROOTMAT 0.0
210	4.0								210.9 RDWY EMB: TAN AND BROWN, LOOSE, SILTY SAND (A-2-4) 0.1
	6.0	2	3	2	5				
205	9.0	2	7	2	9				205.5 RDWY EMB: GRAY, LOOSE, CLAYEY SAND (A-2-6) 5.5
		WOH	WOH	WOH	WOH 0				202.5 ALLUV: BLUE AND GRAY, V. SOFT, SANDY CLAY (A-6) 8.5
200	14.0								
	19.0	4	4	7	11				197.5 ALLUV: BLUE AND GRAY, STIFF TO V. STIFF, CLAYEY SILT (A-4) 13.5
195		9	9	12	21	SS-7			
	24.0								187.5 ALLUV: GRAY, LOOSE, SILTY SAND (A-2-4) 23.5
190		4	2	4	6	SS-8	21.5%		186.0 ALLUV: GREEN, MED. STIFF, SILT (A-4) 25.0
	29.0								182.5 RES: WHITE, GRAY AND BROWN, MED. DENSE TO V. DENSE, SILTY SAND (A-2-4) 28.5
185		7	9	8	17				
	34.0								176.5 WR: BROWN AND TAN, GRANITE 34.5
180		38	62/.4		100/.9				
	39.0								
175		100/.4			100/.4				
	44.0								166.8 BORING TERMINATED AT ELEV. 166.7' IN WR: BROWN AND TAN, GRANITE 44.2
170		60/.2			60/.2				

NCDOT_BORE_VARIABLE DEPTH 04-093 BR 41 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

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RALEIGH, NORTH CAROLINA 27615
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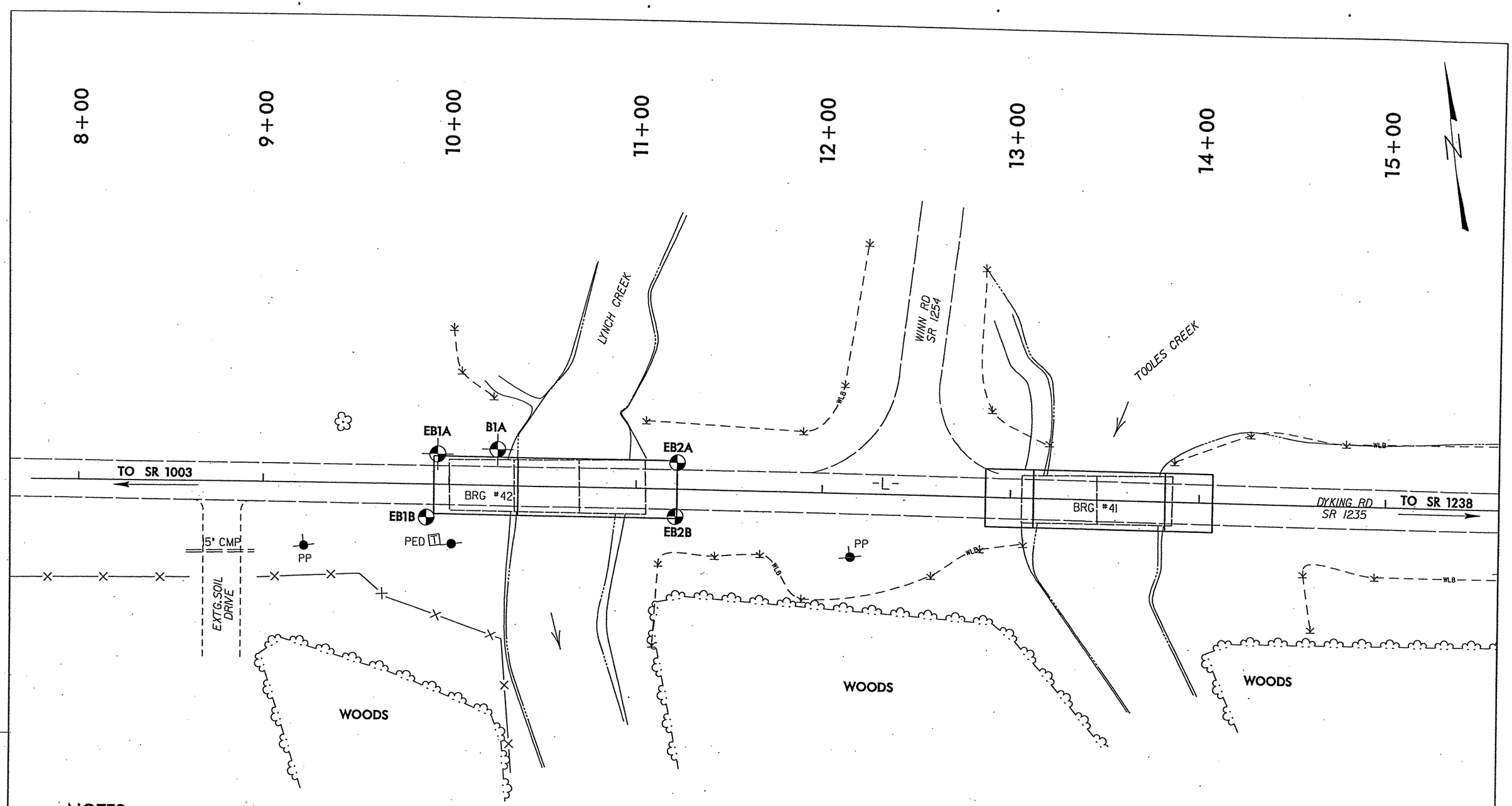
N.C.D.O.T. GEOTECHNICAL UNIT
BORING LOG

SHEET 1 OF 1

PROJECT NO. 6211-04-063	ID. MA5017B	COUNTY FRANKLIN	GEOLOGIST C. BRUINSMA	
SITE DESCRIPTION BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK				GROUND WATER (ft)
BORING NO. EB2B	BORING LOCATION 14+07	OFFSET 14.0' RT.	ALIGNMENT -L-	0 HR. 7.4
COLLAR ELEV. 211.3 ft	NORTHING	EASTING		24 HR. 8.7
TOTAL DEPTH 54.0 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO	
DATE STARTED 3-22-05	COMPLETED 3-22-05	SURFACE WATER DEPTH N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.3					EXISTING GROUND				
	1.0	2	2	2	4				211.3 211.1 ROOTMAT 0 0.2
210	2.8								RDWY EMB: BROWN, LOOSE TO V. LOOSE, CLAYEY SAND (A-2-6)
	5.8	1	WOH	1	1				205.8 5.
205	7.8	1	2	5	7				204.2 RDWY EMB: ORANGE AND BROWN, MED. STIFF, SANDY CLAY (A-6) 7.
	12.7	1	4	4	8	SS-9			202.5 ALLUV: GRAY AND BROWN, LOOSE, CLAYEY SILTY SAND (A-2-4) 8.
200									200.3 ALLUV: GRAY, LOOSE, SAND (A-1-b) 11.
	17.7	WOH	2	2	4	SS-10	21.5%		ALLUV: GRAY, SOFT, SANDY CLAY (A-6)
195		6	5	9	14				195.3 16.
	22.7								ALLUV: GRAY, MED. DENSE, CLAYEY SAND (A-2-6)
190		7	7	10	17				192.3 19.
	27.7								ALLUV: GRAY, MED. DENSE, SAND (A-1-b)
185		12	11	11	22				185.8 25.
	32.7								RES: BROWN AND GRAY, MED. DENSE TO V. DENSE, SILTY SAND (A-2-4) SAPROLITIC
180		11	9	13	22				
	37.7								171.8 39.
175		37	24	63	87				WR: BROWN, WHITE AND BLACK, GRANITE
	42.7								
170		100/.4			100/.4				165.3 46.
	47.7								RES: BROWN AND WHITE, V. DENSE, SILTY SAND (A-2-4) SAPROLITIC
165		22	17	34	51				
	52.7								158.1 53.
160		30	53	47/.3	100/.8				157.3 WR: TAN AND PINK, GRANITE 54.
									BORING TERMINATED AT ELEV. 157.3' IN WR: TAN AND PINK, GRANITE

NCDOT_BORE_VARIABLE DEPTH 04-093 BR 41 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05



NOTES:

BENCH MARK: BM #2, -BL- STA. 12+59.47, 52.60' RT., ELEVATION 204.36'

PLANS ADOPTED FROM HYDRAULIC SURVEY FILES RECEIVED FROM SUNGATE, DATED 9-28-04

STATIONING ON LOCATION PLAN, CROSS-SECTIONS, PROFILE AND BORING LOGS BASED UPON HYDRO REPORT DATED 9-28-04

0 50 100
FEET

BORING LOCATION PLAN

NCDOT PROJECT #: MA5018B
FRANKLIN CO., NC
BRIDGE #42 ON SR 1235 (DYKING RD.)
OVER LYNCH CREEK

TIERRA
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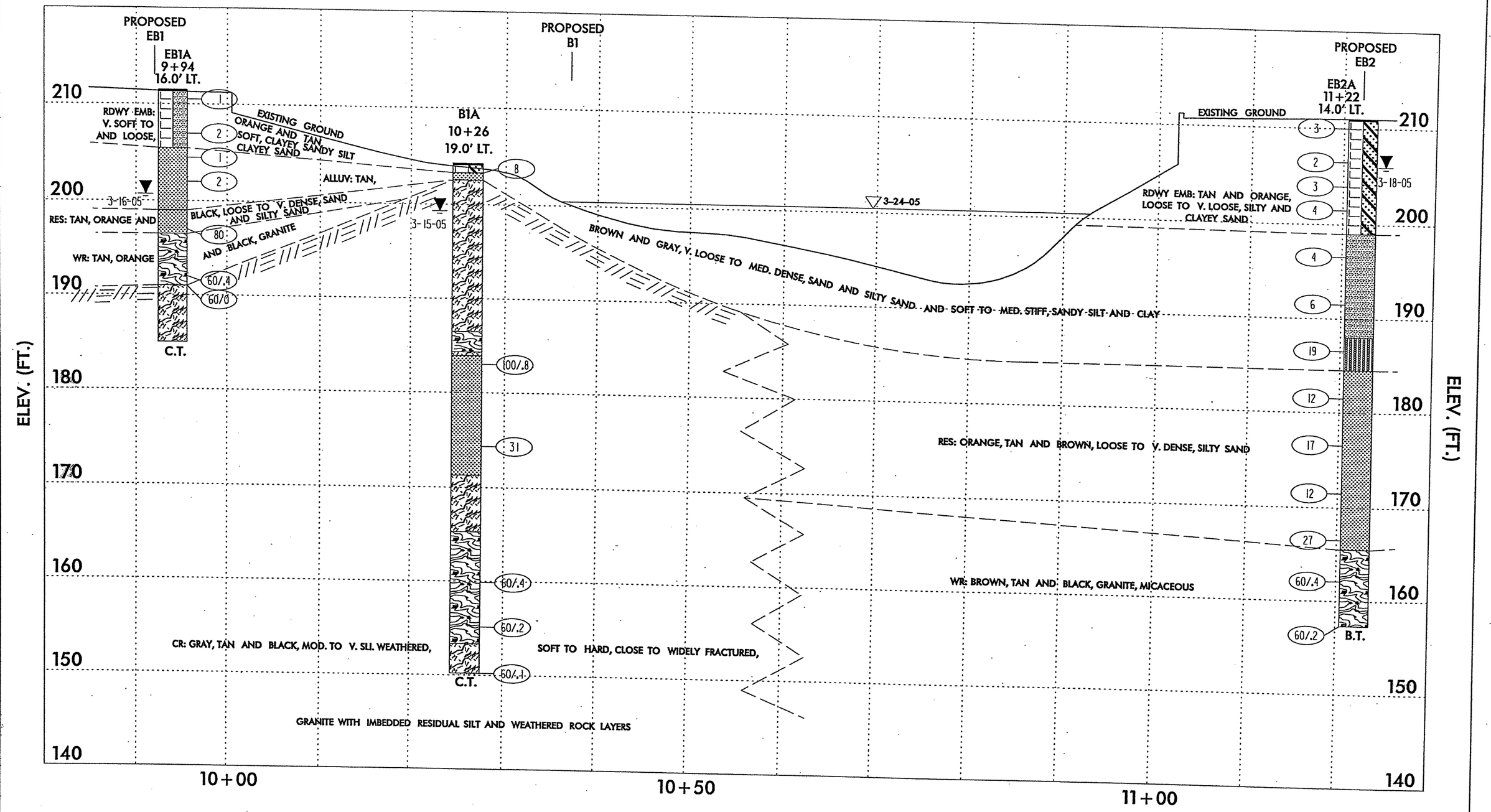

BENCH MARK: BM #2, –BL– STA. 12+59.47, 52.60' RIGHT, ELEVATION OF 204.36'

VERTICAL SCALE

0 10 20

HORIZONTAL SCALE

0 10 20

PROFILE 15' LEFT OF –L–

NCDOT PROJECT #: MA5018B
FRANKLIN CO., NC
BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK

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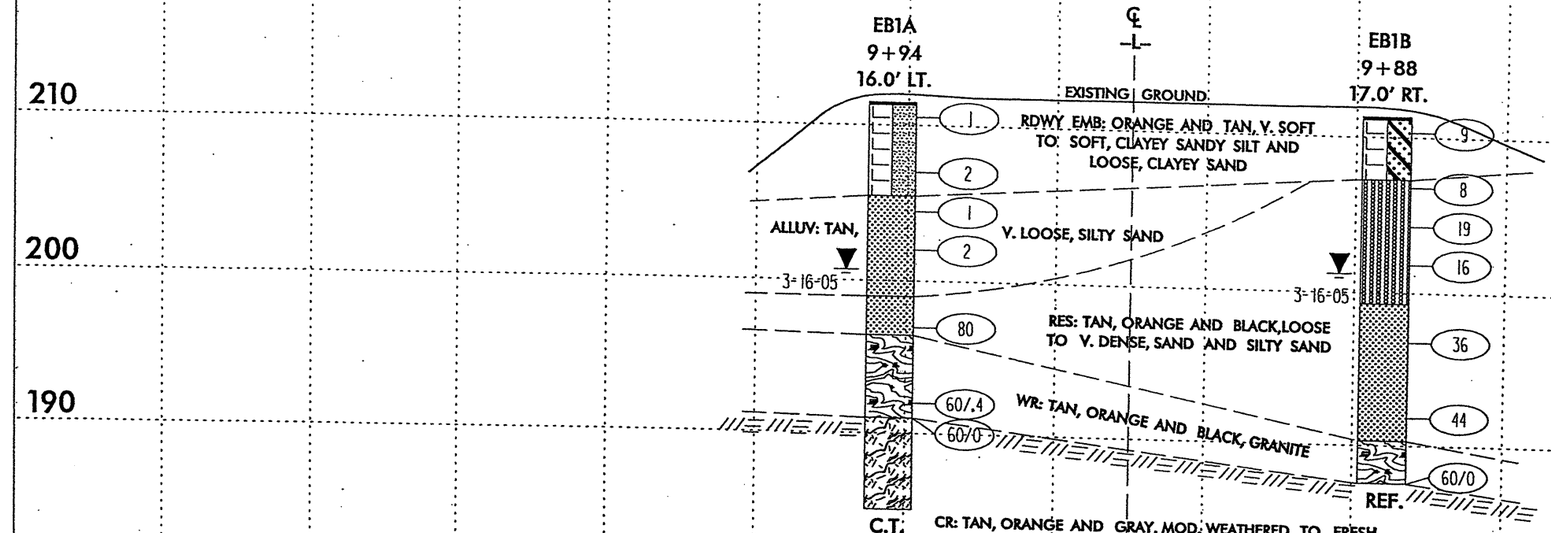

BENCH MARK: BM #2, –BL– STA. 12+59.47, 52.60' RIGHT, ELEVATION OF 204.36'

VERTICAL SCALE

0 10 20

HORIZONTAL SCALE

0 10 20

CROSS SECTION END BENT 1

NCDOT PROJECT #: MA5018B
FRANKLIN CO., NC
BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK

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TIERRA, INC.
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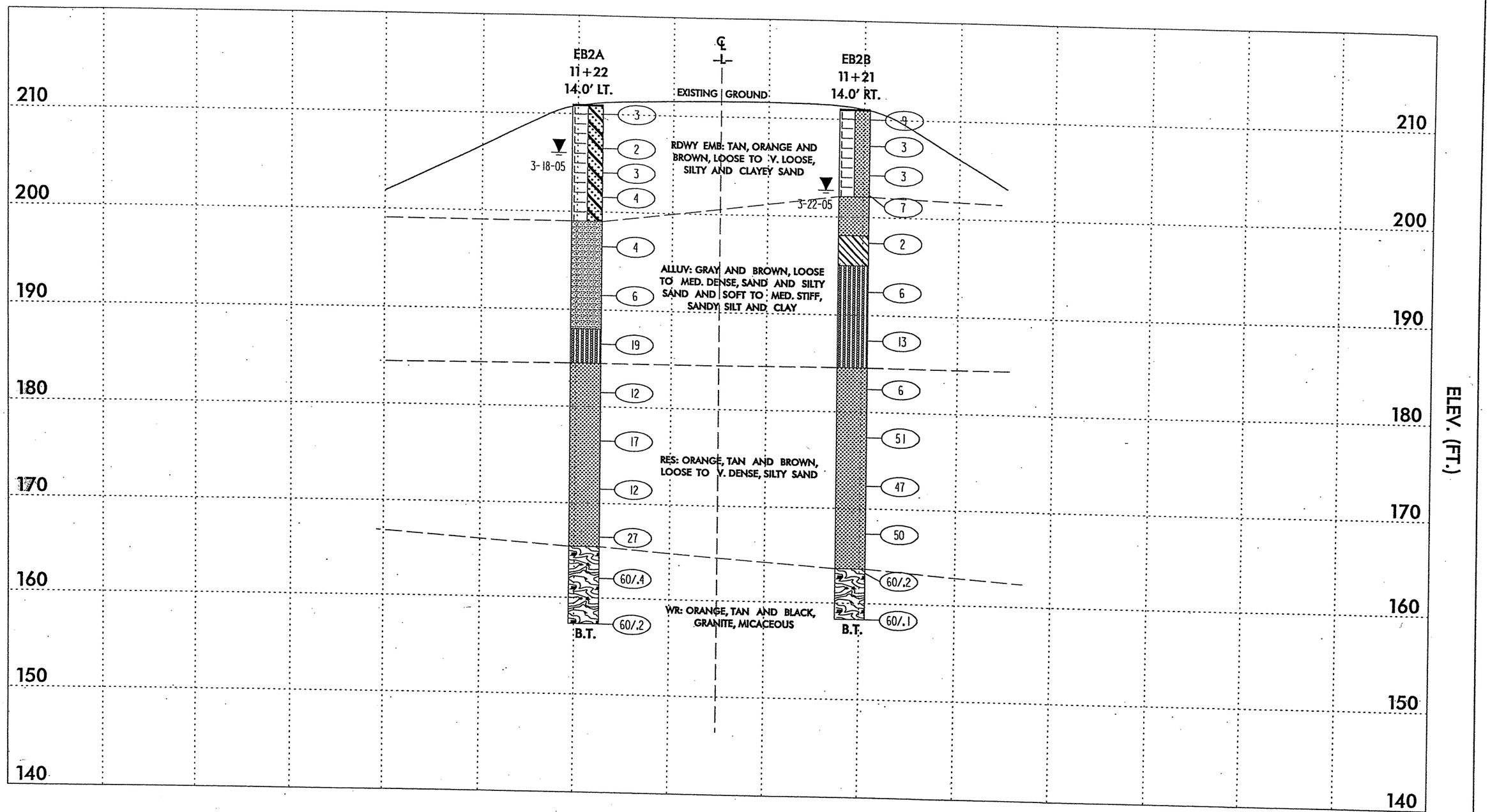

BENCH MARK: BM #2, –BL– STA. 12+59.47, 52.60' RIGHT, ELEVATION OF 204.36'

VERTICAL SCALE

0 10 20

HORIZONTAL SCALE

0 10 20

CROSS SECTION END BENT 2

NCDOT PROJECT #: MA5018B
FRANKLIN CO., NC
BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK

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

SHEET 1 OF 1

PROJECT NO. 6211-04-064	ID. MA5018B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK			GROUND WATER (ft)
BORING NO. EB1A	BORING LOCATION 9+94	OFFSET 16.0' LT.	ALIGNMENT -L-	0 HR. 14.0
COLLAR ELEV. 211.5 ft	NORTHING	EASTING	24 HR. 10.8
TOTAL DEPTH 26.5 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-15-05	COMPLETED 3-15-05	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.5					EXISTING GROUND				211.5
210	0.0	1	WOH	1	1	SS-1	23.0%		211.3 ROOTMAT 0.2 RDWY EMB: TAN AND ORANGE, V. SOFT TO SOFT, CLAYEY SANDY SILT (A-4)
	3.5								
	6.0	1	1	1	2				
205	8.5	1	WOH	1	1	SS-2			205.5 6.0 ALLUV: TAN, V. LOOSE, SILTY SAND (A-2-4)
	13.5	1	1	1	2				
200		12	20	60	80				199.0 12.5 RES: TAN AND ORANGE, V. DENSE, SILTY SAND (A-2-4)
195	18.5	8	8	60/.4	60/.4				196.5 15.0 WR: TAN, ORANGE AND BLACK, GRANITE
	20.5	60/0			50/0"				191.0 20.5 CR: TAN, ORANGE AND GRAY, MOD. WEATHERED TO FRESH, HARD, MOD. CLOSELY FRACTURED, GRANITE
190									
185									185.0 26.5 CORING TERMINATED AT ELEV. 185.0' IN CR: TAN, ORANGE AND GRAY, GRANITE

NCDOT_BORE_VARIABLE DEPTH 04-064 BR 42 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

CORE BORING REPORT

DATE: 3-15-05

PROJECT: MA5018B I.D. NO.: BORING NO: EB1A GEOLOGIST: J. HOWARD

DESCRIPTION: BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK

COUNTY: FRANKLIN COLLAR ELEV.: 211.5 FT TOTAL DEPTH: 26.5 FT

ELEV. (FT)	DEPTH (FT)	DRILL RATE MIN/FT	RUN (FT)	REC FT %	RQD FT %	SAMP #	FIELD CLASSIFICATION AND REMARKS
191.0	20.5	3:00	1.0	1.0/1.0 100%	1.0/1.0 100%		20.5-26.5 CR: TAN, ORANGE AND GRAY, MOD. WEATHERED TO FRESH, HARD, MOD. CLOSELY FRACTURED, GRANITE
190.0	21.5						
190.0	21.5	3:30 3:00 1:15 2:15	5.0	4.25/5.0 85%	4.25/5.0 85%		
185.0	26.5	3:00					STRATA REC = 88% STRATA RQD = 88%

CORING TERMINATED AT 26.5 FT
ELEVATION 185.0 FT

DRILLER: F. COX CORE SIZE: HQ EQUIPMENT: D-50

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

SHEET 1 OF 1

PROJECT NO. 6211-04-064	ID. MA5018B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK			GROUND WATER (ft)
BORING NO. EB1B	BORING LOCATION 9+88	OFFSET 17.0' RT.	ALIGNMENT -L-
COLLAR ELEV. 211.3 ft	NORTHING	EASTING	0 HR. 12.5
TOTAL DEPTH 23.8 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-15-05	COMPLETED 3-15-05	SURFACE WATER DEPTH N/A	24 HR. 10.1

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.3					EXISTING GROUND				
									211.3
	0.0	2	4	5	9				211.1 ROOTMAT 0.2
210	3.5								RDWY EMB: ORANGE AND TAN, LOOSE, CLAYEY SAND (A-2-6)
		6	4	4	8				207.3 4.0
	6.0								RES: TAN AND BLACK, LOOSE TO MED. DENSE, SAND (A-1-b)
205		8	8	11	19				
	8.5								
		10	12	4	16	SS-3			
200	13.5								199.3 12.0
		12	16	20	36				RES: TAN AND BLACK, DENSE, SILTY SAND (A-2-4)
195	18.5								
		22	25	19	44	SS-4			
190									190.3 21.0
	23.8	60/0			60/0				WR: TAN AND BLACK, GRANITE
									187.5 23.8
									SPT REFUSAL AT ELEV. 187.5' ON CR: TAN AND BLACK, GRANITE

NCDOT_BORE_VARIABLE DEPTH 04-084 BR 42 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

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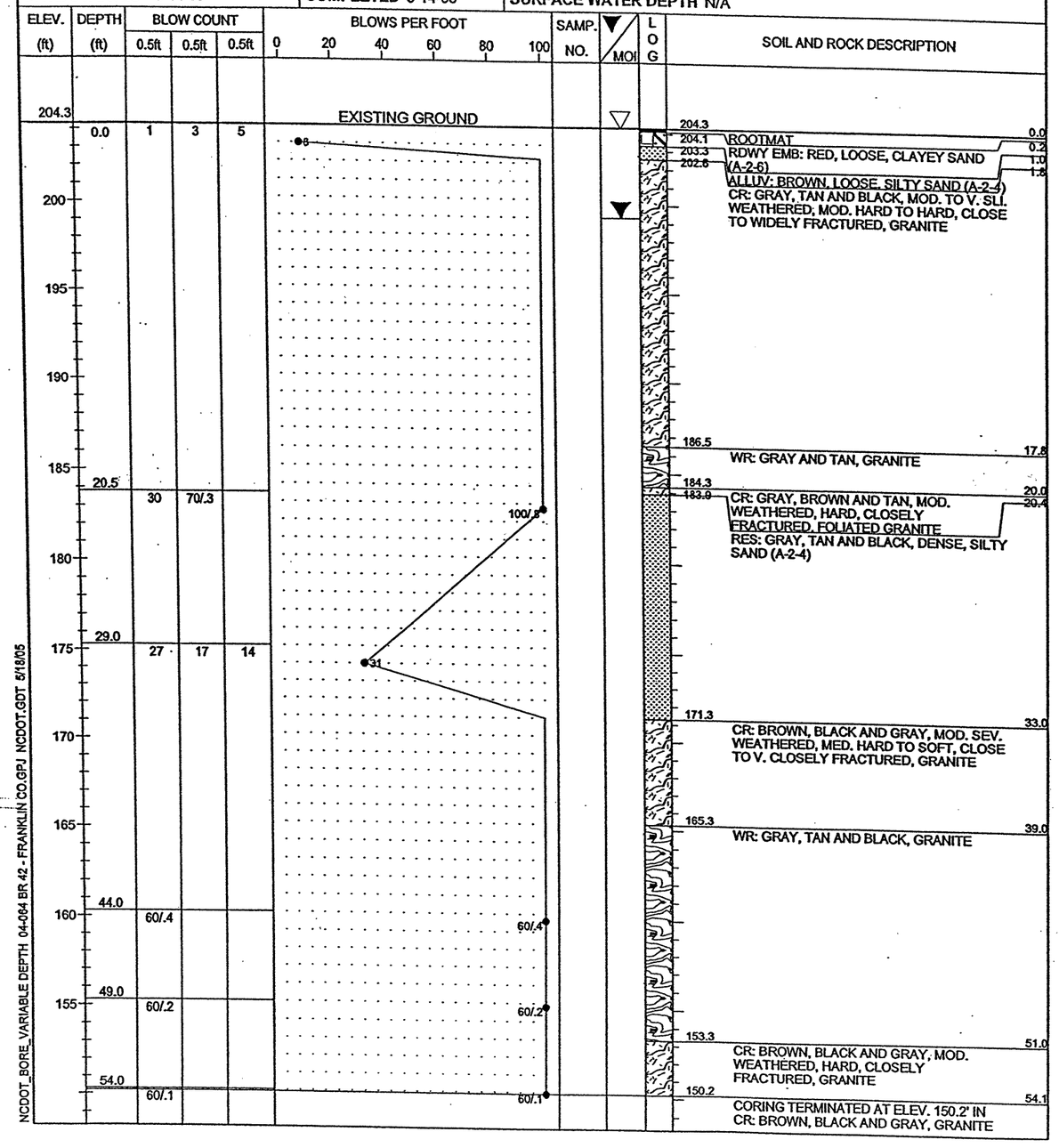
BORING LOG

PROJECT NO. 6211-04-064	ID. MA5018B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK			GROUND WATER (ft)
BORING NO. B1A	BORING LOCATION 10+26	OFFSET 19.0' LT.	ALIGNMENT -L-	0 HR. 0.0
COLLAR ELEV. 204.3 ft	NORTHING	EASTING		24 HR. 5.0
TOTAL DEPTH 54.1 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-14-05	COMPLETED 3-14-05	SURFACE WATER DEPTH N/A	



NCDOT_BORE_VARIABLE DEPTH 04-064 BR 42 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

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

SHEET 1 OF 1

PROJECT NO. 6211-04-064	ID. MA5018B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK			GROUND WATER (ft)
BORING NO. EB2A	BORING LOCATION 11+22	OFFSET 14.0' LT.	ALIGNMENT -L-	0 HR. 10.0
COLLAR ELEV. 211.0 ft	NORTHING	EASTING		24 HR. 5.0
TOTAL DEPTH 53.7 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO	
DATE STARTED 3-17-05	COMPLETED 3-17-05	SURFACE WATER DEPTH N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.0					EXISTING GROUND				
	0.0	3	2	1	3 2 3				211.0 ROOTMAT 0.0
210									210.8 RDWY EMB: TAN AND ORANGE, V. LOOSE TO LOOSE, CLAYEY SAND (A-2-6) 0.2
	3.5	1	1	1	4				
	6.0								
205		1	1	2	6				
	8.5								
		1	1	3	4				
200	13.5								199.0 ALLUV: GRAY, SOFT TO MED. STIFF, SANDY SILT (A-4) 12.0
		3	2	2	4	SS-5	33.9%		
195	18.5								
		3	2	4	6				
190	23.5								
		7	11	8	19	SS-6			188.0 ALLUV: GRAY, MED. DENSE, SAND (A-1-b) 23.0
185	28.5								
		4	5	7	12				184.5 RES: ORANGE, TAN AND BLACK, MED. DENSE, SILTY SAND (A-2-4) 26.5
180	33.5								
		5	7	10	17				
175	38.5								
		7	6	6	12				
170	43.5								
		9	9	18	27	SS-7			165.5 WR: ORANGE AND BLACK, GRANITE, MICACEOUS 45.5
165	48.5								
		60/.4			60/.4				
160	53.5								
		60/.2			60/.2				157.3 BORING TERMINATED AT ELEV. 157.3' ON CR: ORANGE AND BLACK, GRANITE 53.7

NCDOT_BORE_VARIABLE DEPTH 04-064 BR 42 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

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

SHEET 1 OF 1

PROJECT NO. 6211-04-064	ID. MA5018B	COUNTY FRANKLIN	GEOLOGIST C. BRUINSMA
SITE DESCRIPTION BRIDGE #42 ON SR 1235 (DYKING RD.) OVER LYNCH CREEK			GROUND WATER (ft)
BORING NO. EB2B	BORING LOCATION 11+21	OFFSET 14.0' RT.	ALIGNMENT -L-	0 HR. 10.0
COLLAR ELEV. 211.1 ft	NORTHING	EASTING		24 HR. 8.4
TOTAL DEPTH 52.8 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO	
DATE STARTED 3-21-05	COMPLETED 3-21-05	SURFACE WATER DEPTH N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.1					EXISTING GROUND				
	0.1	3	5	4	9				211.1 ROOTMAT 0.0
210									210.9 RDWY EMB: ORANGE AND BROWN, LOOSE TO V. LOOSE, CLAYEY SILTY SAND (A-2-4) 0.2
	2.8	2	2	1	3				
	5.8								
205		2	1	2	3				
	7.8								
		2	3	4	7	SS-8			202.1 ALLUV: BROWN, LOOSE, CLAYEY SILTY SAND (A-2-4) 9.0
200	12.7								
		4	1	1	2	SS-9	26.4%		198.1 ALLUV: DARK GRAY, SOFT, SILTY SANDY CLAY (A-6) 13.0
195	17.7								195.1 ALLUV: GRAY, LOOSE TO MED. DENSE, SAND (A-1-b) WITH GRAVEL 16.0
		4	3	3	6				
190	22.7								
		4	4	9	13				
185	27.7								184.6 RES: BROWN AND TAN, LOOSE TO V. DENSE, SILTY SAND (A-2-4) SAPROLITIC, V. MICACEOUS 26.5
		4	3	3	6				
180	32.7					SS-10			
		28	27	24	51				
175	37.7								
		31	27	20	47				
170	42.7								
		10	20	30	50				163.6 WR: BROWN, TAN AND BLACK, GRANITE, V. MICACEOUS 47.5
165	47.7								
		60/.2			60/.2				
160	52.7								
		60/.1			60/.1				158.3 BORING TERMINATED AT ELEV. 158.3' IN WR: BROWN, TAN AND BLACK, GRANITE 52.8

NCDOT_BORE_VARIABLE DEPTH 04-064 BR 42 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
	MA5017B	2	20

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS 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:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

P.I. OF A-7-5 ≤ L.L. - 30 ; P.I. OF A-7-6 > L.L. - 30

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE
UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. ALSO POORLY GRADED
GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

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

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

SAMPLE DESIGNATIONS

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- ☐ MOBILE B-___
- ☐ BK-51
- ☐ CME-45
- ☐ CME-550
- ☐ PORTABLE HOIST
- ☒ OTHER C-50
- ☐ OTHER ___

ADVANCING TOOLS:
- ☐ CLAY BITS
- ☐ 6" CONTINUOUS FLIGHT AUGER
- ☐ 8" HOLLOW AUGERS
- ☐ HARD FACED FINGER BITS
- ☐ TUNG.-CARBIDE INSERTS
- ☐ CASING ☐ W/ ADVANCER
- ☒ TRICONE 3" STEEL TEETH
- ☐ TRICONE ___" TUNG.-CARB.
- ☐ CORE BIT
- ☐ OTHER ___

HAMMER TYPE:
- ☒ AUTOMATIC ☐ MANUAL

CORE SIZE:
- ☐ -B___
- ☐ -N___
- ☐ -H___

HAND TOOLS:
- ☐ POST HOLE DIGGER
- ☐ HAND AUGER
- ☐ SOUNDING ROD
- ☐ VANE SHEAR TEST
- ☐ OTHER ___

ROCK DESCRIPTION

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:

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS 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 IS 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 (N 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.

BENCH MARK: BM #2, -BL- STA. 12+59.47, 52.60' RIGHT

ELEVATION: 204.36'

NOTES:

8+00 9+00 10+00 11+00 12+00 13+00 14+00 15+00

N

LYNCH CREEK

WLB

WINN RD
SR 1254

TOOLES CREEK

WLB

EB1A

EB2A

TO SR 1003

-L-

BRG #42

BRG #41

DYKING RD
SR 1235

TO SR 1238

EB1B B1B

B2B EB2B

15" CMP

EXTG. SOIL DRIVE

PP

PED

PP

WLB

WLB

WLB

WOODS

WOODS

WOODS

NOTES:

BENCH MARK: BM #2, -BL- STA. 12+59.47, 52.60' RT., ELEVATION 204.36'

PLANS ADOPTED FROM HYDRAULIC SURVEY FILES RECEIVED FROM SUNGATE, DATED 9-28-04

STATIONING ON LOCATION PLAN, CROSS-SECTIONS, PROFILE AND BORING LOGS BASED UPON HYDRO REPORT DATED 9-28-04

0 50 100

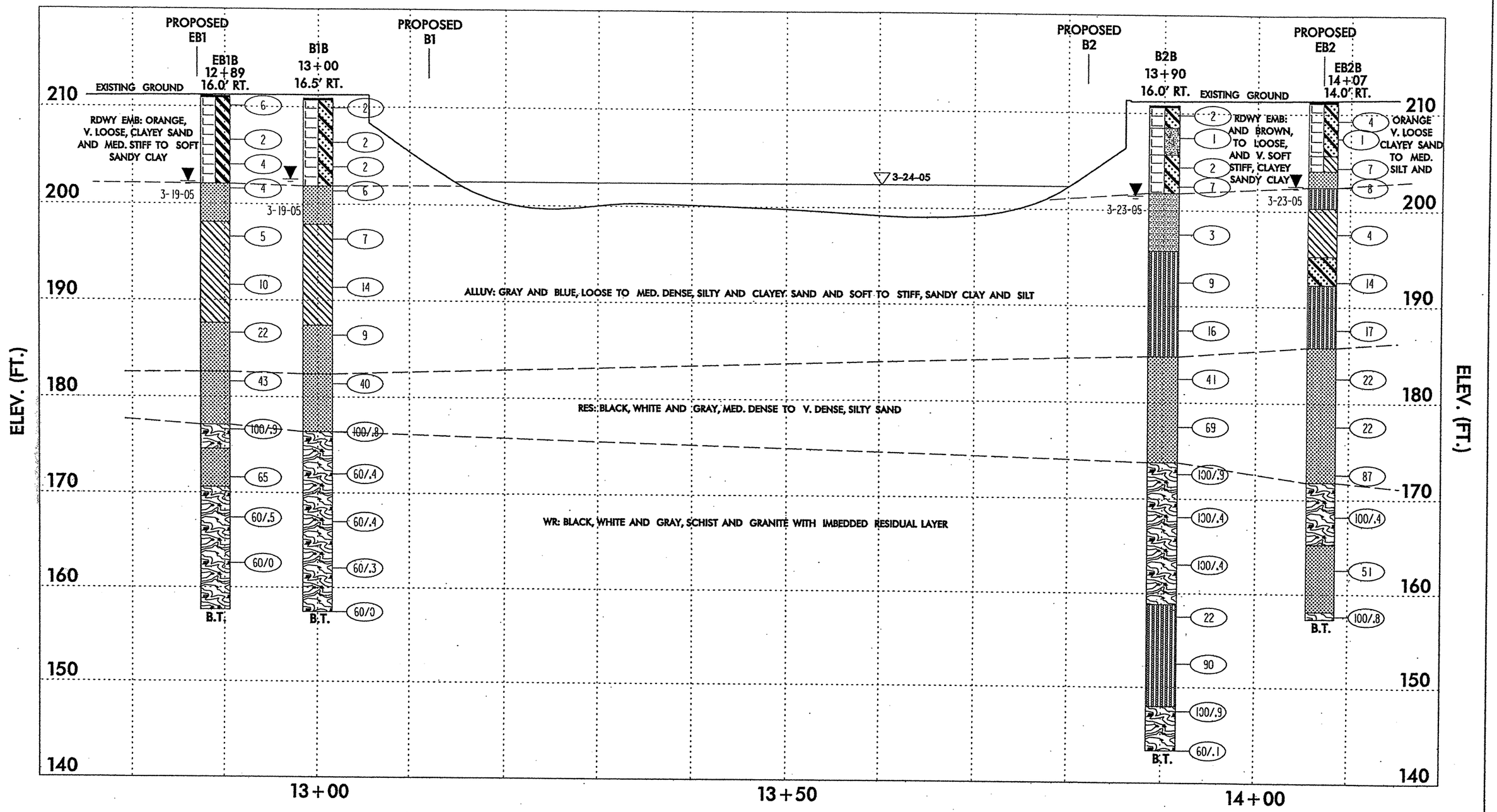
FEET

BORING LOCATION PLAN

NCDOT PROJECT #: MA5017B
FRANKLIN CO., NC
BRIDGE #41 ON SR 1235 (DYKING RD.)
OVER TOOLES CREEK

TIERRA
GEOTECHNICAL • MATERIALS ENGINEERING

TIERRA, INC.
2736 ROW AND RD.
RALEIGH, NC 27615
PHONE (919) 871-0800
FAX (919) 871-0803



BENCH MARK: BM #2, -BL- STA. 12+59.47, 52.60' RIGHT, ELEVATION OF 204.36'

VERTICAL SCALE

0 10 20

HORIZONTAL SCALE

0 10 20

PROFILE 15' RIGHT OF -L-

NCDOT PROJECT #: MA5017B
FRANKLIN CO., NC
BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK

TIERRA, INC.
2726 RONLAND RD.
RALEIGH, NC 2765
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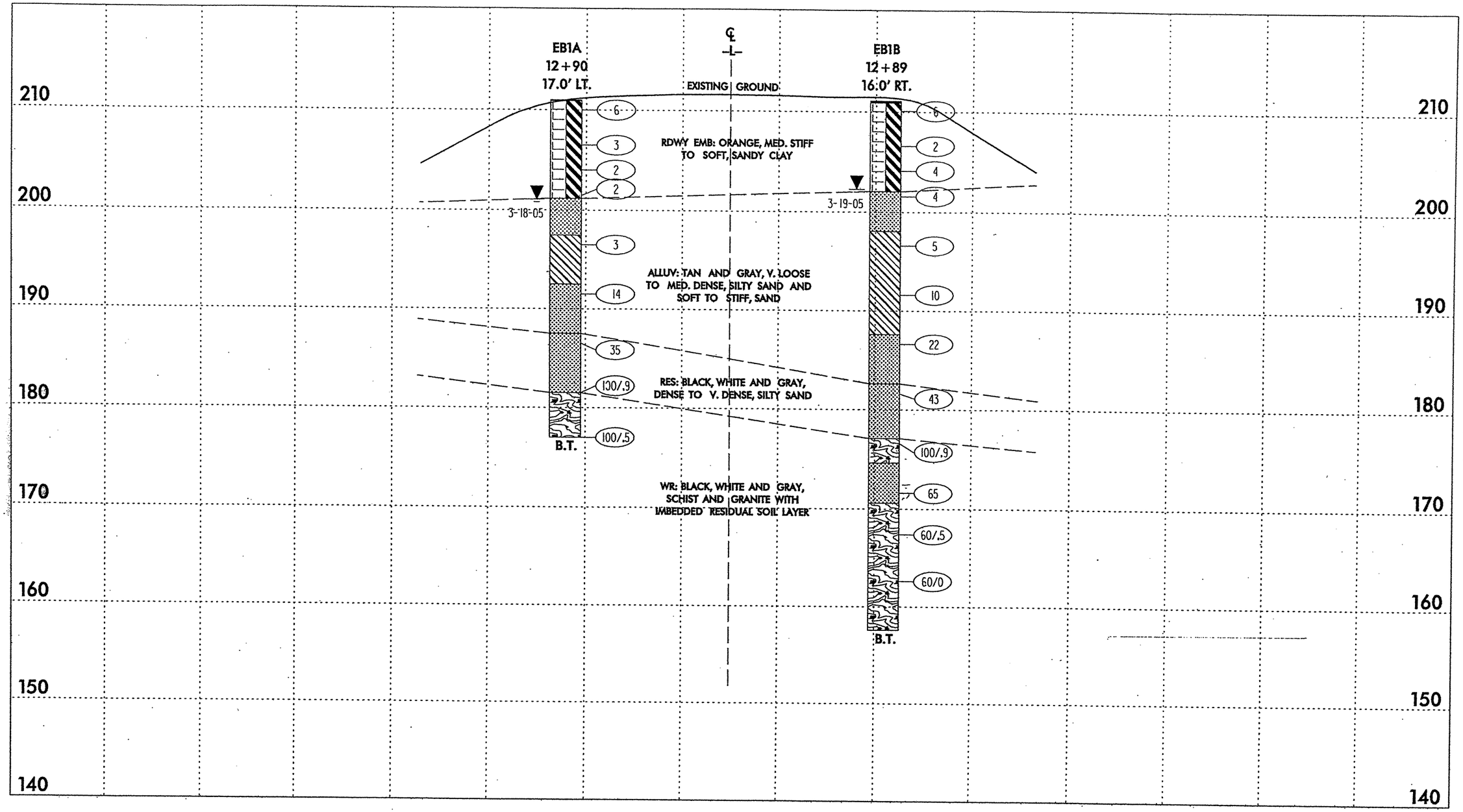


BENCH MARK: BM #2, –BL– STA. 12+59.47, 52.60' RIGHT, ELEVATION OF 204.36'

VERTICAL SCALE

0 10 20

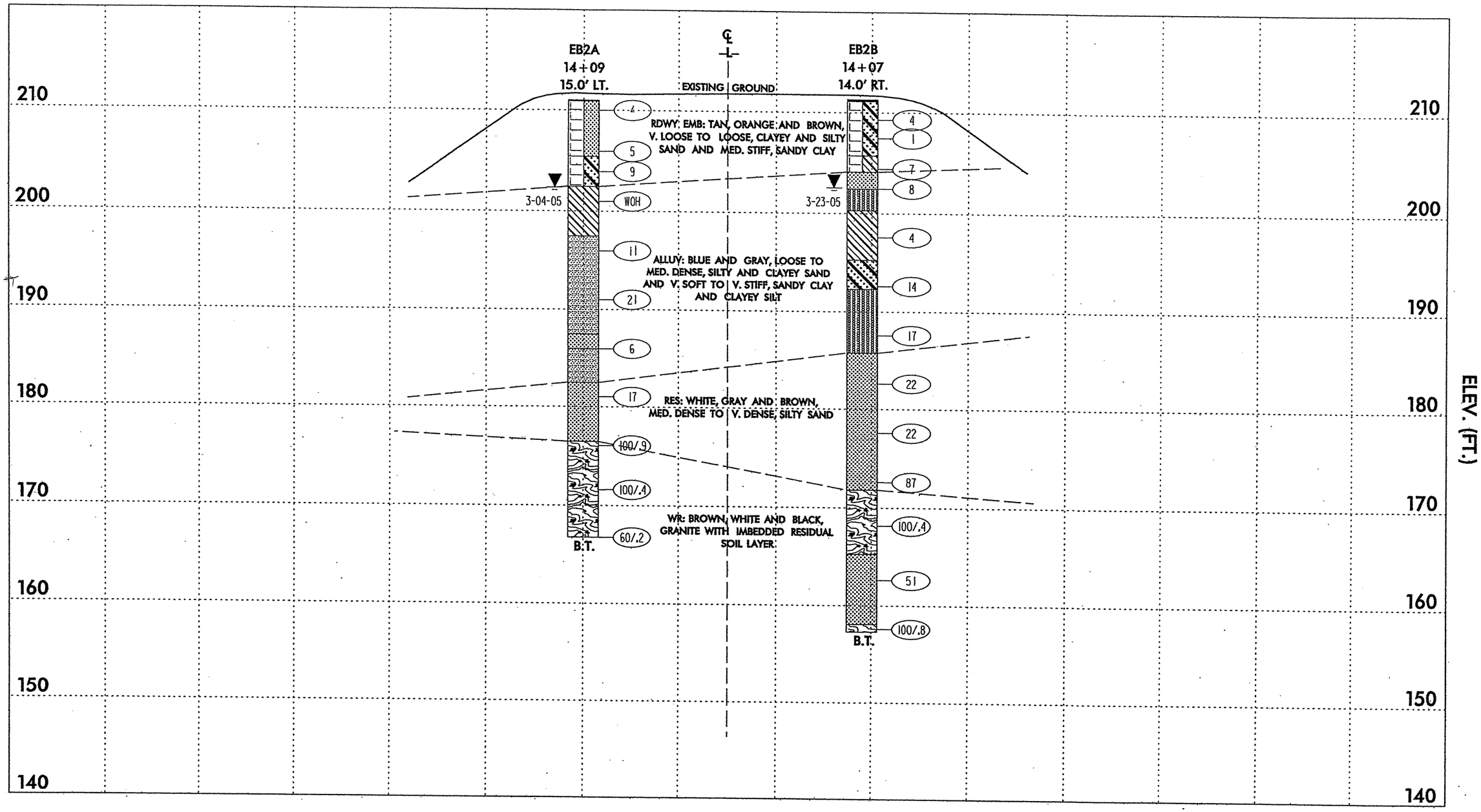
HORIZONTAL SCALE

0 10 20

CROSS SECTION END BENT 1

NCDOT PROJECT #: MA5017B
FRANKLIN CO., NC
BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK

TIERRA
TIERRA, INC.
2726 ROWLAND RD.
RALEIGH, NC 27615



BENCH MARK: BM #2, –BL– STA. 12+59.47, 52.60' RIGHT, ELEVATION OF 204.36'

VERTICAL SCALE

0 10 20

HORIZONTAL SCALE

0 10 20

CROSS SECTION END BENT 2

NCDOT PROJECT #: MA5017B
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BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK

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

SHEET 1 OF 1

PROJECT NO. 6211-04-063	ID. MA5017B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK			GROUND WATER (ft)
BORING NO. EB1A	BORING LOCATION 12+90	OFFSET 17.0' LT.	ALIGNMENT -L-	0 HR. 3.5
COLLAR ELEV. 211.0 ft	NORTHING	EASTING	24 HR. 9.9
TOTAL DEPTH 34.0 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-17-05	COMPLETED 3-17-05	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.0					EXISTING GROUND				
210	0.0	2	3	3	6	SS-1	24.3%		211.0 ROOTMAT 0.0
	3.5								210.9 RDWY EMB: ORANGE, MED. STIFF TO SOFT, SANDY CLAY (A-7-6) 0.1
205	6.0	1	1	2	3				
	8.5	1	WOH	2	2				201.2 ALLUV: TAN, V. LOOSE, SILTY SAND (A-2-4) 9.8
200	13.5	2	1	1	2				197.5 ALLUV: GRAY, SOFT, SANDY CLAY (A-6) 13.5
195	18.5	2	1	2	3				192.5 ALLUV: GRAY, MED. DENSE, SILTY SAND (A-2-4) 18.5
190	23.5	4	5	9	14				187.5 RES: GRAY, DENSE TO V. DENSE, SILTY SAND (A-2-4) 23.5
185	28.5	10	15	20	35	SS-2			181.5 WR: GRAY AND BLACK, GRANITE 29.5
180	33.5	30	40	60/.4	100/.9				177.0 BORING TERMINATED AT ELEV. 177.0' IN WR: GRAY AND BLACK, GRANITE 34.0
		100/.5			100/.5				

NCDOT_BORE_VARIABLE DEPTH 04-063 BR 41 - FRANKLIN CO.GPJ NCDOT.GDT 6/18/05

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

SHEET 1 OF 1

PROJECT NO. 6211-04-063	ID. MA5017B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK			GROUND WATER (ft)
BORING NO. EB1B	BORING LOCATION 12+89	OFFSET 16.0' RT.	ALIGNMENT -L-	0 HR. 4.0
COLLAR ELEV. 211.1 ft	NORTHING	EASTING	24 HR. 8.8
TOTAL DEPTH 53.5 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-18-05	COMPLETED 3-18-05	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.1					EXISTING GROUND				
210	0.0	1	3	3	6	SS-3	30.2%		211.1 ROOTMAT 0
	3.5								210.9 RDWY EMB: ORANGE, MED. STIFF TO SOFT, SANDY CLAY (A-7-5) 0
205	6.0	1	1	1	2				
	8.5	1	2	2	4				202.1 ALLUV: GRAY, LOOSE, SILTY SAND (A-2-4) 9
200	13.5	WOH	2	2	4				198.1 ALLUV: GRAY, MED. STIFF TO STIFF, SANDY CLAY (A-6) 13
195	18.5	1	2	3	5				
190	23.5	3	4	6	10				187.6 ALLUV: GRAY, MED. DENSE, SILTY SAND (A-2-4) 23
185	28.5	7	9	13	22				182.6 RES: BLACK, WHITE AND GRAY, DENSE TO V. DENSE, SILTY SAND (A-2-4) 28
180	33.5	15	16	27	43				177.1 WR: BLACK, WHITE AND GRAY, SCHIST 34
175	38.5	34	66/.4		100/.9				174.6 RES: BLACK, ORANGE AND GRAY, V. DENSE, SILTY SAND (A-2-4) 36
170	43.5	13	24	41	65				170.6 WR: BLACK, TAN AND GRAY, GRANITE 40
165	48.5	60/.2			60/.5				
160		60/0			60/0				157.6 BORING TERMINATED AT ELEV. 157.6' IN WR: BLACK, TAN AND GRAY, GRANITE 53

NCDOT_BORE_VARIABLE DEPTH 04-063 BR 41 - FRANKLIN CO.GPJ NCDOT.GDT 5/18/05

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BORING LOG

SHEET 1 OF 1

PROJECT NO. 6211-04-063	ID. MA5017B	COUNTY FRANKLIN	GEOLOGIST J. HOWARD
SITE DESCRIPTION BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK			GROUND WATER (ft)
BORING NO. B1B	BORING LOCATION 13+00	OFFSET 16.5' RT.	ALIGNMENT -L-
COLLAR ELEV. 210.9 ft	NORTHING	EASTING	24 HR. 8.3
TOTAL DEPTH 53.5 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-18-05	COMPLETED 3-18-05	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
210.9									EXISTING GROUND
210	0.0	1	1	1	2				210.9 0.0 ROOTMAT 210.7 0.2 RDWY EMB: ORANGE, V. LOOSE, CLAYEY SAND (A-2-6)
	3.5	1	1	1	2				
205	6.0	1	1	1	2	SS-4			
	8.5	1	2	4	6				201.9 9.0 ALLUV: GRAY, LOOSE, SILTY SAND (A-2-4)
200	13.5	2	3	4	7				197.9 13.0 ALLUV: GRAY, MED. STIFF TO STIFF, SANDY CLAY (A-6)
195	18.5	5	6	8	14				
190	23.5	3	4	5	9				187.4 23.5 ALLUV: GRAY, LOOSE, SILTY SAND (A-2-4)
185	28.5	11	16	24	40				182.4 28.5 RES: BLACK, WHITE AND GRAY, DENSE TO V. DENSE, SILTY SAND (A-2-4)
180	33.5	24	42	58/.3	100/.8				176.4 34.5 WR: BLACK, WHITE AND TAN, GRANITE
175	38.5	60/.4			60/.4				
170	43.5	60/.4			60/.4				
165	48.5	60/.3			60/.3				
160	53.5	60/0			60/0				157.4 53.5 SPT REFUSAL AT ELEV. 157.4' IN CR: BLACK, WHITE AND TAN, GRANITE

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SHEET 1 OF 1

PROJECT NO. 6211-04-063	ID. MA5017B	COUNTY FRANKLIN	GEOLOGIST C. BRUINSMA
SITE DESCRIPTION BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK			GROUND WATER (ft)
BORING NO. B2B	BORING LOCATION 13+90	OFFSET 16.0' RT.	ALIGNMENT -L-
COLLAR ELEV. 210.8 ft	NORTHING	EASTING	24 HR. 9.3
TOTAL DEPTH 67.4 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-22-05	COMPLETED 3-22-05	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
210.8									EXISTING GROUND
210	0.0	1	1	1	2				210.8 0. ROOTMAT 210.6 0.
	2.3	1	WOH	1	1				208.5 2. RDWY EMB: ORANGE AND BROWN, V. LOOSE, CLAYEY SAND (A-2-6)
205	5.3	1	1	1	2				RDWY EMB: ORANGE, V. SOFT, CLAYEY SILT (A-5) 205.8 5.
	7.3	1	2	5	7				RDWY EMB: ORANGE AND BROWN, V. LOOSE TO LOOSE, CLAYEY SAND (A-2-6)
200	12.3	1	1	2	3	SS-5	29.3%		201.8 9. ALLUV: GRAY, SOFT, SANDY SILT (A-4)
195	17.3	3	4	5	9				195.8 15. ALLUV: LT. GRAY, LOOSE TO MED. DENSE, SAND (A-1-b) WITH GRAVEL
190	22.3	5	6	10	16				
185	27.3	20	23	18	41				184.8 26. RES: BROWN, WHITE AND BLACK, DENSE TO V. DENSE, SILTY SAND (A-2-4) SAPROLITIC
180	32.3	20	26	43	69				
175	37.3	49	51/.4		100/.9				173.8 37. WR: BROWN, TAN AND BLACK, GRANITE
170	42.3	100/.4			100/.4				
165	47.3	100/.4			100/.4				
160	52.3	9	10	12	22	SS-6			158.8 52. RES: ORANGE, BROWN AND WHITE, MED. DENSE TO V. DENSE, COARSE SAND (A-1-b) SAPROLITIC
155	57.3	33	43	47	90				
150	62.3	27	38	62/.4	100/.9				148.0 62. WR: PINK, TAN AND BROWN, GRANITE
145	67.3	60/.1			60/.1				143.4 67. BORING TERMINATED AT ELEV. 143.4' IN WR: PINK, TAN AND BROWN, GRANITE

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SHEET 1 OF 1

PROJECT NO. 6211-04-063	ID. MA5017B	COUNTY FRANKLIN	GEOLOGIST Y. SALEH
SITE DESCRIPTION BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK			GROUND WATER (ft)
BORING NO. EB2A	BORING LOCATION 14+09	OFFSET 15.0' LT.	ALIGNMENT -L-
COLLAR ELEV. 211.0 ft	NORTHING	EASTING	24 HR. 8.6
TOTAL DEPTH 44.2 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO
DATE STARTED 3-02-05	COMPLETED 3-03-05	SURFACE WATER DEPTH N/A	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.0					EXISTING GROUND				
	0.0	3	2	2	4				211.0 ROOTMAT 0.0
210	4.0								210.9 RDWY EMB: TAN AND BROWN, LOOSE, SILTY SAND (A-2-4) 0.1
	6.0	2	3	2	5				
205	9.0	2	7	2	9				205.5 RDWY EMB: GRAY, LOOSE, CLAYEY SAND (A-2-6) 5.5
		WOH	WOH	WOH	WOH 0				202.5 ALLUV: BLUE AND GRAY, V. SOFT, SANDY CLAY (A-6) 8.5
200	14.0								
	19.0	4	4	7	11				197.5 ALLUV: BLUE AND GRAY, STIFF TO V. STIFF, CLAYEY SILT (A-4) 13.5
195		9	9	12	21	SS-7			
	24.0								187.5 ALLUV: GRAY, LOOSE, SILTY SAND (A-2-4) 23.5
190		4	2	4	6	SS-8	21.5%		186.0 ALLUV: GREEN, MED. STIFF, SILT (A-4) 25.0
	29.0								182.5 RES: WHITE, GRAY AND BROWN, MED. DENSE TO V. DENSE, SILTY SAND (A-2-4) 28.5
185		7	9	8	17				
	34.0								176.5 WR: BROWN AND TAN, GRANITE 34.5
180		38	62/.4		100/.9				
	39.0								
175		100/.4			100/.4				
	44.0								166.8 BORING TERMINATED AT ELEV. 166.7' IN WR: BROWN AND TAN, GRANITE 44.2
170		60/.2			60/.2				

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SHEET 1 OF 1

PROJECT NO. 6211-04-063	ID. MA5017B	COUNTY FRANKLIN	GEOLOGIST C. BRUINSMA	
SITE DESCRIPTION BRIDGE #41 ON SR 1235 (DYKING RD.) OVER TOOLES CREEK				GROUND WATER (ft)
BORING NO. EB2B	BORING LOCATION 14+07	OFFSET 14.0' RT.	ALIGNMENT -L-	0 HR. 7.4
COLLAR ELEV. 211.3 ft	NORTHING	EASTING		24 HR. 8.7
TOTAL DEPTH 54.0 ft	DRILL MACHINE D-50	DRILL METHOD MUD ROTARY	HAMMER TYPE AUTO	
DATE STARTED 3-22-05	COMPLETED 3-22-05	SURFACE WATER DEPTH N/A		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
211.3					EXISTING GROUND				
	1.0	2	2	2	4				211.3 211.1 ROOTMAT 0 0.2
210	2.8								RDWY EMB: BROWN, LOOSE TO V. LOOSE, CLAYEY SAND (A-2-6)
	5.8	1	WOH	1	1				205.8 5.
205	7.8	1	2	5	7				204.2 RDWY EMB: ORANGE AND BROWN, MED. STIFF, SANDY CLAY (A-6) 7.
	12.7	1	4	4	8	SS-9			202.5 ALLUV: GRAY AND BROWN, LOOSE, CLAYEY SILTY SAND (A-2-4) 8.
200									200.3 ALLUV: GRAY, LOOSE, SAND (A-1-b) 11.
	17.7	WOH	2	2	4	SS-10	21.5%		ALLUV: GRAY, SOFT, SANDY CLAY (A-6)
195		6	5	9	14				195.3 16.
	22.7								ALLUV: GRAY, MED. DENSE, CLAYEY SAND (A-2-6)
190		7	7	10	17				192.3 19.
	27.7								ALLUV: GRAY, MED. DENSE, SAND (A-1-b)
185		12	11	11	22				185.8 25.
	32.7								RES: BROWN AND GRAY, MED. DENSE TO V. DENSE, SILTY SAND (A-2-4) SAPROLITIC
180		11	9	13	22				
	37.7								171.8 39.
175		37	24	63	87				WR: BROWN, WHITE AND BLACK, GRANITE
	42.7								
170		100/.4			100/.4				165.3 46.
	47.7								RES: BROWN AND WHITE, V. DENSE, SILTY SAND (A-2-4) SAPROLITIC
165		22	17	34	51				
	52.7								158.1 53.
160		30	53	47/.3	100/.8				157.3 WR: TAN AND PINK, GRANITE 54.
									BORING TERMINATED AT ELEV. 157.3' IN WR: TAN AND PINK, GRANITE

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