STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	17BP.11.R.29	1	16

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 17BP.11.R.29 F.A. PROJ. N/A

COUNTY Watauga

PROJECT DESCRIPTION Culvert No. 940137 on SR 1136 (Clarks Creek Road) over Clarks Creek

CONTENTS

PERSONNEL

C. Boyce

J. Hoyle

P. Fahey

M. Grabski

K. Molander

D. Matty

INVESTIGATED BY F&R, Inc.

CHECKED BY W. Edelen, P.E.

SUBMITTED BY F&R, Inc.

DATE November 2015

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES OR SOIL TEST DATA ARE PART OF THE CONTRACT.

SOILS, 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 OR PLACE TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE PREPARED WATER LEVELS OR SOIL MOISTURE CONDITIONS NOTED 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 THE INDICATIONS IN THE SUBSURFACE INFORMATION.

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

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

NORTH CAROLINA PROFESSIONAL 11058 ENGINEER WILLIAM F. EDELEN, JR. 11-12-15

DRAWN BY: W. Edelen, P.E.

PROJECT REFERENCE NO.	SHEET NO.
17BP.11.R.29	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1556). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

PI OF A-7-5 SUBGROUP IS ≤ LL - 30. PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<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 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	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	2.00	0.42	0.25	0.075	0.053

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

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

ABBREVIATIONS

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

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS
- [ ] MOBILE B ___
- [ ] BK-51
- [X] CME 55
- [ ] CME-75
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 6" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____
- [ ] -N _____
- [ ] -H _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

REVISED 09/2009

PROJECT REFERENCE NO.	SHEET NO
17BP.11.R.29	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.

ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

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

WEATHERING

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

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER

AQUIFER - A WATER BEARING FORMATION OR STRATA

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN, AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS

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

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

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

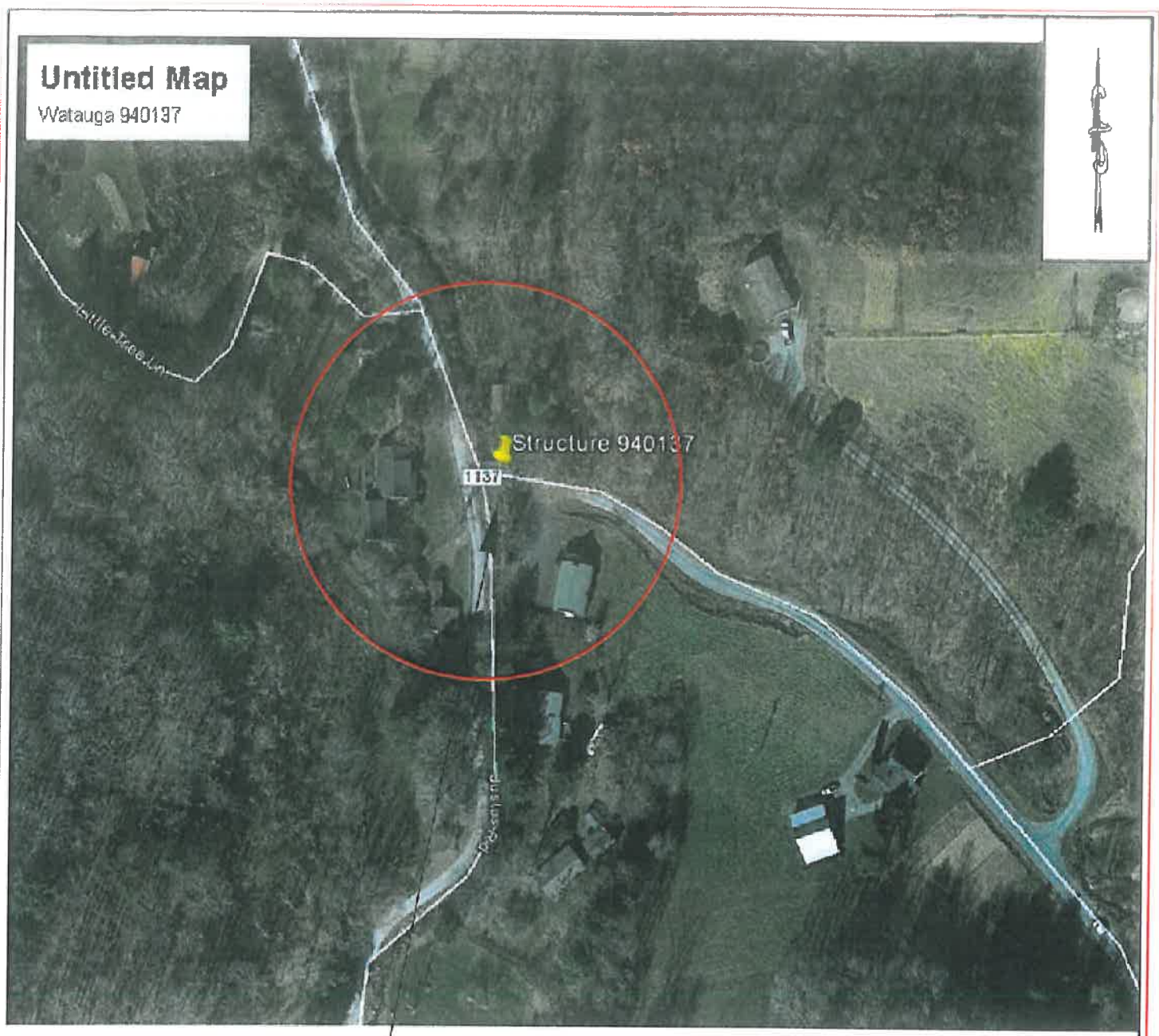
BENCH MARK: Survey information provided by NCDOT.

BM#1: N - 896,667 E - 1,180,258 PK NAIL IN BST PARKING LOT N E CORNER

ELEVATION: 2884.00 FT

NOTES:

REVISED 09/23/09



SITE

SITE LOCATION PLAN

Culvert No. 940137 on SR 1136 (Clarks Creek Road) over Clarks Creek

Scale: N.T.S.	DMB	MJW

Prepared For:

NCDOT WBS No.: 17BP.11.R.29

Froehling & Robertson, Inc.
2505 Hutchison-McDonald Road
Charlotte, North Carolina

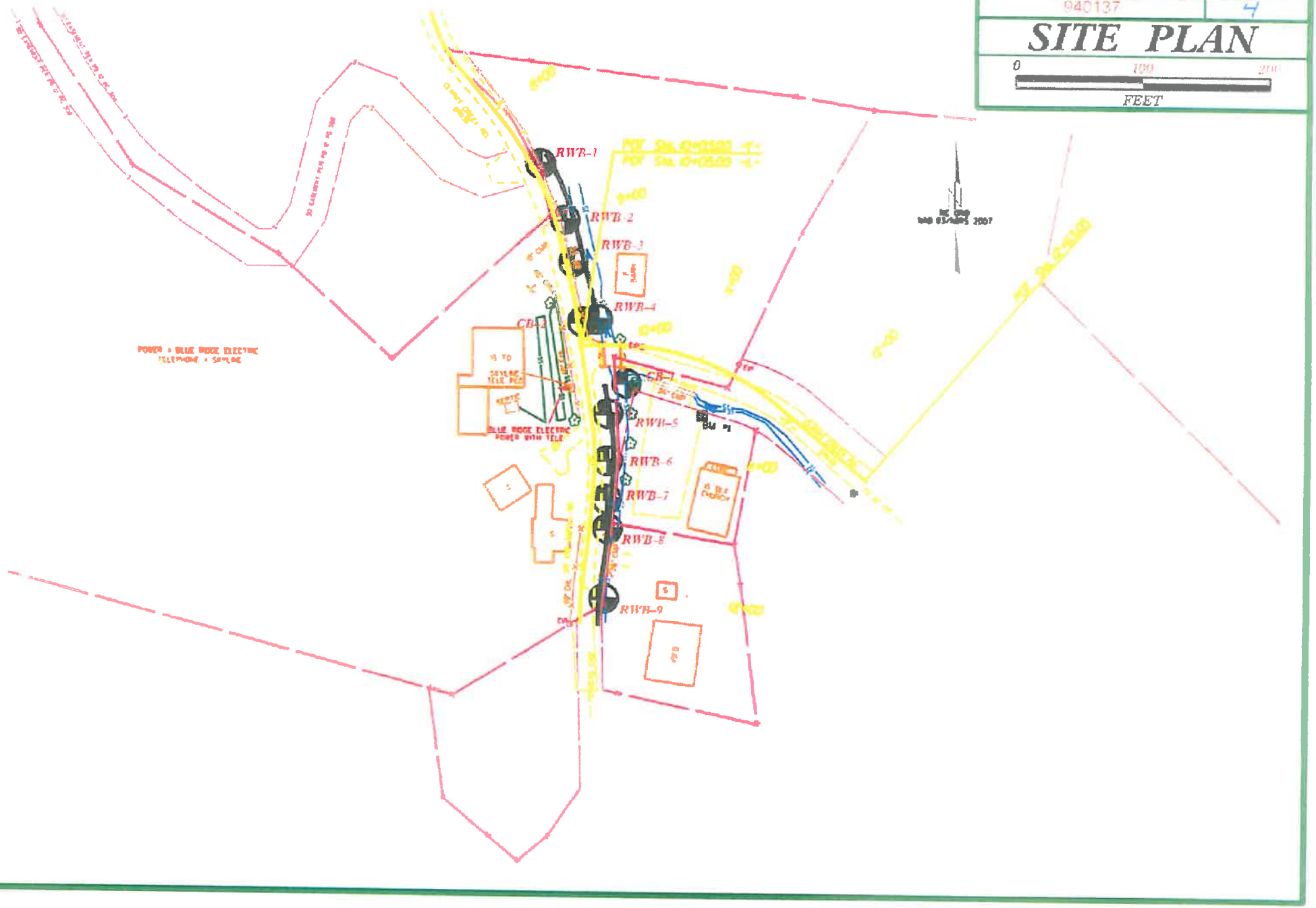
Proj.: 63S-0446	Date: November 2015	Sheet No. 3

PROJECT REFERENCE NO.	SHEET NO.
940137	4

SITE PLAN

0 100 200

FEET



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.11.R.29	TIP N/A	COUNTY WATAUGA	GEOLOGIST Fahey	
SITE DESCRIPTION Culvert 940137 - SR 1136 (Clarks Creek Road) over Clarks Creek				GROUND WTR (ft)
BORING NO CB-1	STATION 10+13	OFFSET 1 ft LT	ALIGNMENT -Y	0 HR. 13
COLLAR ELEV. 2,881.0 ft	TOTAL DEPTH 23.8 ft	NORTHING 896,724	EASTING 1,180,172	24 HR. 22.0 Caved
DRILL RIG/HAMMER EFF./DATE F&R2154 CME-55 79% 09/07/2013		DRILL METHOD H.S Augers		HAMMER TYPE Automatic
DRILLER Boyce	START DATE 10/22/15	COMP. DATE 10/22/15	SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
2865										
2860	2,881.0	0.0	86	12/2		100/0.2				2,881.0 GROUND SURFACE 0.0
	2,877.5	3.5	6	7	3			W		2,879.1 STONE BASE 0.9 Greenish-gray rock fragments ROADWAY EMBANKMENT Grayish-brown and orange-brown fine sandy SILT with some clay
2870	2,872.5	8.5	8	9	19			M		2,875.0 6.0 ALLUVIAL Light olive gray fine sandy SILT with some gravel
	2,867.5	13.5	12	22	24		SS-1	31% W		2,870.0 11.0 Grayish-brown and orange-brown fine to coarse sandy, silty CLAY with some gravel
2865	2,862.5	18.5	3	4	5			M		2,866.0 16.0 RESIDUAL Dark gray to yellowish-brown fine sandy SILT
2860	2,857.5	23.5	100/0.3			100/0.3				2,857.5 23.5 2,857.2 23.8 WEATHERED ROCK Grayish brown ROCK FRAGMENTS Boring Terminated with Standard Penetration Test Refusal at Elevation 2,857.2 ft

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.11.R.29	TIP N/A	COUNTY WATAUGA	GEOLOGIST Fahey	
SITE DESCRIPTION Culvert 940137 - SR 1136 (Clarks Creek Road) over Clarks Creek				GROUND WTR (ft)
BORING NO CB-2	STATION 10+50	OFFSET 9 ft RT	ALIGNMENT -Y-	0 HR. Dry
COLLAR ELEV. 2,882.2 ft	TOTAL DEPTH 4.6 ft	NORTHING 896,714	EASTING 1,180,208	24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE F&R2154 CME-55 79% 06/07/2013		DRILL METHOD H.S Augers		HAMMER TYPE Automatic
DRILLER Boyce	START DATE 10/22/15	COMP. DATE 10/22/15	SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP NO.	M/OI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
2885											
2880	2,882.2	0.0	10	12	5	17				2,882.2 GROUND SURFACE	0.0
	2,881.2									2,881.2 ASPHALT (7 inches) and STONE BASE (5 inches)	1.0
	2,678.7	3.5								2,678.2 ROADWAY EMBANKMENT Gray and grayish-brown fine sandy SILT with some gravel	
	2,677.6	4.6	35	65/0.3		65/0.3				2,677.6 WEATHERED ROCK Gray ROCK FRAGMENTS	4.6
			60/0			60/0				Boring Terminated by Auger Refusal at Elevation 2,877.6 ft	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.11.R.29	TIP N/A	COUNTY WATAUGA	GEOLOGIST Fahey	
SITE DESCRIPTION Culvert 940137 - SR 1136 (Clarks Creek Road) over Clarks Creek				GROUND WTR (ft)
BORING NO. RWB-1	STATION 8+36	OFFSET 3 ft RT	ALIGNMENT -L-	0 HR. Dry
COLLAR ELEV. 2,875.9 ft	TOTAL DEPTH 14.3 ft	NORTHING 896,882	EASTING 1,180,111	24 HR. 10.6 Caved
DRILL RIG/HAMMER EFF./DATE F&R2154 CME-55 79% 06/07/2013		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
DRILLER Boyce	START DATE 10/21/15	COMP. DATE 10/21/15	SURFACE WATER DEPTH N/A	

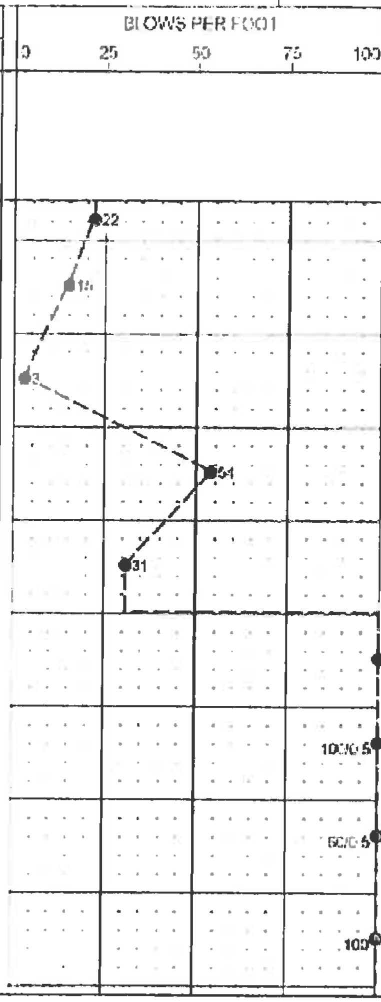
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	L O G	SOIL AND ROCK DESCRIPTION ELEV (ft)	DEPTH (ft)
2880											
2875	2,875.9	0.0	15	9	8	17		M		2,875.9 GROUND SURFACE	0.0
										2,875.2 STONE BASE	0.7
	2,872.4	3.5	4	3	4	7		M		ROADWAY EMBANKMENT Reddish-brown sandy SILT with some gravel	
2870										2,868.9	7.0
	2,866.4	9.5	9	10	24	34				RESIDUAL Reddish-brown and greenish-gray sandy SILT	
2865										2,864.8	11.0
	2,862.4	13.5	60	40/0.3		40/0.3		D		WEATHERED ROCK Greenish-gray gravelly SAND	
										2,861.6	14.3
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,861.6 ft	

NCDOT BORE SINGLE RDS-0448.GPJ NC_DOT.GDT 12/7/15

NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

WBS 17BP.11.R.29	TIP N/A	COUNTY WATAUGA	GEOLOGIST Fahey
SITE DESCRIPTION Culvert 940137 - SR 1136 (Clarks Creek Road) over Clarks Creek			GROUND WTR (ft)
BORING NO. RWB-2	STATION 8+89	OFFSET 5 ft RT	ALIGNMENT -L-
			0 HR. 25.0
COLLAR ELEV. 2,877.1 ft	TOTAL DEPTH 42.6 ft	NORTHING 896,834	EASTING 1,180,132
			24 HR. 6.8 Caved
DRILL RIG/HAMMER EFF./DATE F&R2154 CME-55 79% 05/07/2013	DRILL METHOD H.S Augers	HAMMER TYPE Automatic	
DRILLER Boyce	START DATE 10/21/15	COMP. DATE 11/24/15	SURFACE WATER DEPTH N/A

DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT	SAMP NO.	MOI
2,877.1	0.0	47	12	10	22		M
2,873.6	3.5	3	9	6	15		M
2,868.6	8.5	6	2	1	3	SS 2	46% W
2,863.6	13.5	13	20	34	54		M
2,858.6	18.5	6	7	24	31		M
2,853.6	23.5	18	62	38			M?
2,848.6	28.5	100/0.5			100/0.5		M
2,843.6	33.5	60/0.5			60/0.5		M
2,838.6	38.5	47	33	67	100		M



SOIL AND ROCK DESCRIPTION

ELEV. (ft)	DESCRIPTION	DEPTH (ft)
2,877.1	GROUND SURFACE	0.0
2,876.6	**STONE BASE**	0.5
	ROADWAY EMBANKMENT Light brown and brown clayey SILT with some sand	
2,870.1	**ALLUVIAL** Olive gray fine to coarse sandy, silty CLAY with little gravel	7.0
2,862.6	**RESIDUAL** Greenish-gray to reddish-brown sandy SILT with some rock fragments	14.5
2,860.1	Tan, orange, gray and black SILT with some clay and rock fragments	17.0
2,855.1	**WEATHERED ROCK** Tan, orange, gray and black SILT with some clay	22.0
2,834.5	Boring Terminated at Elevation 2,834.5 ft	42.6

ELEV (ft): 2880, 2875, 2870, 2865, 2860, 2855, 2850, 2845, 2840, 2835

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.11.R.29	TIP N/A	COUNTY WATAUGA	GEOLOGIST Fahey
SITE DESCRIPTION Culvert 940137 - SR 1136 (Clarks Creek Road) over Clarks Creek			GROUND WTR (ft)
BORING NO. RWB-3	STATION 9+39	OFFSET 4 ft RT	ALIGNMENT -L-	0 HR. 23.0
COLLAR ELEV. 2,878.8 ft	TOTAL DEPTH 29.0 ft	NORTHING 896,786	EASTING 1,180,146	24 HR. 18.0 Caved
DRILL RIG/HAMMER EFF./DATE F&R2154 CME-55 78% 06/07/2013		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Boyce	START DATE 10/21/15	COMP. DATE 11/24/15	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV (ft)	DEPTH (ft)
2880											
	2,878.8	0.0	19	30	32	62		M		GROUND SURFACE	0.0
										STONE BASE	0.3
2875	2,875.3	3.5	5	6	5	11				ROADWAY EMBANKMENT Brown silty fine to coarse SAND with some gravel	
										2,872.8	6.0
2870	2,870.3	8.5	8	12	12	24		Sat.		ALLUVIAL Gray fine to coarse sandy SILT with some gravel	
										2,867.8	11.0
2865	2,865.3	13.5	18	17	20	37		W		RESIDUAL Brownish-grey sandy SILT with some clay and rock fragments	
										2,861.8	17.0
2860	2,860.3	18.5	8	8	9	17		M		Tan, orange, gray and brown SILT with some clay and rock fragments	
										2,856.8	22.0
2855	2,855.3	23.5	16	24	76	100		Sat.		WEATHERED ROCK Gray and brown SILT with some clay and rock fragments	
2850	2,850.3	28.5	100/0.5			100/0.5		M		2,849.8	29.0
										Boring Terminated at Elevation 2,849.8 ft	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.11.R.29	TIP N/A	COUNTY WATAUGA	GEOLOGIST Fahey	
SITE DESCRIPTION Culvert 940137 - SR 1136 (Clarks Creek Road) over Clarks Creek				GROUND WTR (ft)
BORING NO. RWB-4	STATION 9+93	OFFSET 4 ft RT	ALIGNMENT -L-	0 HR. 6.0
COLLAR ELEV. 2,880.8 ft	TOTAL DEPTH 24.0 ft	NORTHING 896,731	EASTING 1,180,157	24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE F&R2154 CME-55 79% 08/07/2013		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
DRILLER Boyce	START DATE 10/21/15	COMP. DATE 11/25/15	SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV (ft) DEPTH (ft)
2885										
2880	2,880.8	0.0	12	13	88/0.3	101/0.8				2,880.8 GROUND SURFACE 0.0
	2,877.3	3.5								2,878.5 STONE BASE 2.0
	2,876.4	4.4	100/0.3			100/0.3				2,876.5 ROADWAY EMBANKMENT Grayish brown sandy GRAVEL with some metal and asphalt fragments 4.0
2875			60/5			2.00				BOULDER
	2,872.3	8.5	27	24	15	39				2,873.3 7.5 RESIDUAL Tan, orange, gray and brown SILT with some clay and rock fragments
2870										
	2,867.3	13.5	5	6	6	12				2,868.8 12.0 Dark gray SILT with some clay
2865										2,863.8 17.0 WEATHERED ROCK Dark gray SILT with some clay
	2,862.3	18.5	60/0.1			60/0.1				
2860										
	2,857.3	23.5	60/0.5			60/0.5				2,856.8 24.0 Boring Terminated at Elevation 2,856.8 ft On Crystalline Rock

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.11.R.29	TIP N/A	COUNTY WATAUGA	GEOLOGIST Fahey	
SITE DESCRIPTION Culvert 940137 - SR 1136 (Clarks Creek Road) over Clarks Creek				GROUND WTR (ft)
BORING NO. RWB-5	STATION 10+46	OFFSET CL	ALIGNMENT -L-	0 HR. Dry
COLLAR ELEV. 2,882.4 ft	TOTAL DEPTH 23.6 ft	NORTHING 895,682	EASTING 1,180,168	24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE F&R2154 CME-55 79% 05/07/2013		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
DRILLER Boyce	START DATE 10/21/15	COMP. DATE 11/25/15	SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV (ft)	DEPTH (ft)
2885											
	2,882.4	0.0	9	14	15	29		M		GROUND SURFACE	0.0
2880										2,881.5 STONE BASE	0.9
	2,878.9	3.5	13	15	13	28		M		ROADWAY EMBANKMENT Grayish-brown sandy SILT with some rock fragments	
2875										2,874.4	8.0
	2,873.9	8.5	10	13	21	34		Sat.		ALLUVIAL Brownish-gray fine to coarse sandy silty CLAY with some gravel	
2870										2,871.4	11.0
	2,868.9	13.5	12	13	30	43		M		RESIDUAL Greenish-gray sandy SILT	
2865										2,865.4	17.0
	2,863.9	18.5	14	16	8	24		M		Dark gray SILT with some clay	
2860										2,860.4	22.0
	2,858.9	23.5	60/0.1			100/0.1		M		2,858.8 WEATHERED ROCK Dark gray, brown, orange and tan SILT with some clay and rock fragments	23.6
										Boring Terminated at Elevation 2,858.8 ft	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.11.R.29	TIP N/A	COUNTY WATAUGA	GEOLOGIST Fahey	
SITE DESCRIPTION Culvert 940137 - SR 1136 (Clarks Creek Road) over Clarks Creek				GROUND WTR (ft)
BORING NO. RWB-5	STATION 10+94	OFFSET CL	ALIGNMENT -L-	0 HR. 6.0
COLLAR ELEV. 2,883.8 ft	TOTAL DEPTH 23.7 ft	NORTHING 896,635	EASTING 1,180,174	24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE	F&R2154 CME-55 79% 05/07/2013	DRILL METHOD H.S. Augers		HAMMER TYPE Automatic
DRILLER Boyce	START DATE 10/21/15	COMP. DATE 11/25/15	SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP NO	MO	LOG	SOIL AND ROCK DESCRIPTION
										ELEV (ft) DEPTH (ft)
2885										
	2,883.8	0.0	8	10	14	24		M		2,883.8 GROUND SURFACE 0.0
	2,880.3	3.5								2,883.3 STONE BASE 0.5
2880	2,879.8	4.0	60/0.5					M		ROADWAY EMBANKMENT
			50/0			50/0.5 (9.0)				Reddish brown to grayish-brown sandy SILT with some rock fragments 2,879.8 4.0
										BOULDER
	2,876.3	8.5	6	12	13			M		2,876.1 7.7
2875						22				RESIDUAL
										Grayish brown, orange, tan silty fine to coarse SAND with gravel
2870	2,870.3	13.5	41	59				M		
2865	2,865.3	18.5	17	26	37	63		M		
										2,861.8 22.0
	2,860.3	23.5	100/0.2			100/0.2		Sat.		2,860.1 Grayish brown, orange, tan fine to coarse SAND and Gravel 23.7
										Boring Terminated at Elevation 2,860.1 ft

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.11.R.29	TIP N/A	COUNTY WATAUGA	GEOLOGIST Fahey	
SITE DESCRIPTION Culvert 940137 - SR 1136 (Clarks Creek Road) over Clarks Creek				GROUND WTR (ft)
BORING NO. RWB-7	STATION 11+40	OFFSET CL	ALIGNMENT -L-	0 HR. 6.5
COLLAR ELEV. 2,884.3 ft	TOTAL DEPTH 14.7 ft	NORTHING 896,589	EASTING 1,180,171	24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE F&R2154 CME-55 79% 08/07/2013		DRILL METHOD H.S Augers		HAMMER TYPE Automatic
DRILLER Boyce	START DATE 10/22/15	COMP. DATE 10/22/15	SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV (ft)	DEPTH (ft)
2885											
	2,884.3	0.0	6	10	12	22		M		2,884.3 GROUND SURFACE	0.0
										2,880.5 STONE BASE	3.8
2880	2,880.8	3.5	6	7	4	11		M		ROADWAY EMBANKMENT Brownish-grey sandy SILT	
										2,877.8	6.5
2875	2,875.8	8.5	10	11	13	24		M		ALLUVIAL Greenish-brown and reddish-brown sandy SILT	
										2,873.5	11.0
2870	2,870.8	13.5	27	54	48/0.2	100/0.7				Gray fine to coarse sandy SILT	
										2,869.6	14.7
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,869.6 ft	

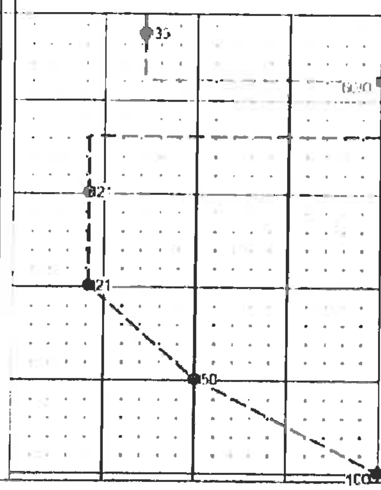
NCDOT BORE SINGLE 538-0445.GPJ NC_DOT.GDT 12/1/15

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP 11 R.29	TIP N/A	COUNTY WATAUGA	GEOLOGIST Fahey
SITE DESCRIPTION Culvert 940137 - SR 1136 (Clarks Creek Road) over Clarks Creek			
BORING NO. RWB-6	STATION 11+80	OFFSET CL	ALIGNMENT -L-
COLLAR ELEV. 2,884.6 ft	TOTAL DEPTH 25.0 ft	NORTHING 896,549	EASTING 1,180,167
DRILL RIG/HAMMER EFF./DATE F&R2154 CME 55 79% 08/07/2013		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Boyce	START DATE 10/22/15	COMP. DATE 11/25/15	SURFACE WATER DEPTH N/A

GROUND WTR (ft): 0 HR. Dry; 24 HR. FIAD

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT	SAMP NO.	MOI
2885	2,884.6	0.0	13	14	22	36		D
2880	2,881.1	3.5	60/0			60/0		D
2875	2,876.1	8.5	9	10	11	21	SS-3	26% M
2870	2,871.1	13.5	10	10	11	21		M
2865	2,866.1	18.5	17	24	26	50		Sat
2860	2,861.1	23.5	23	46	54	100		M



SOIL AND ROCK DESCRIPTION

ELEV. (ft)	DESCRIPTION	DEPTH (ft)
2,884.6	GROUND SURFACE	0.0
2,883.6	**STONE BASE**	1.0
	ROADWAY EMBANKMENT Brownish-gray SAND and GRAVEL	
2,881.1	**BOULDER** (No Recovery)	3.5
2,878.1	**ALLUVIAL** Gray fine to coarse sandy SILT	6.5
2,867.6	**RESIDUAL** Gray, tan and white silty fine to coarse SAND with rock fragments	17.0
2,862.6	Tan, orange, gray and brown SILT with some clay	22.0
2,859.6		25.0

Boring Terminated at Elevation 2,859.6 ft

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.11.R.29	TIP N/A	COUNTY WATAUGA	GEOLOGIST Fahey
SITE DESCRIPTION Culvert 940137 - SR 1136 (Clarks Creek Road) over Clarks Creek			GROUND WTR (ft)
BORING NO. RWB 9	STATION 12+29	OFFSET 5 ft LT	ALIGNMENT -L- / 0 HR. Dry
COLLAR ELEV. 2,886.1 ft	TOTAL DEPTH 11.5 ft	NORTHING 896,500	EASTING 1,180,167 / 24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE F&R2154 CME-55 78% 06/07/2013		DRILL METHOD H.S Augers	HAMMER TYPE Automatic
DRILLER Boyce	START DATE 10/22/15	COMP. DATE 10/22/15	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP NO	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV (ft)	DEPTH (ft)
2890											
2885	2,885.1	0.0	12	14	14	28		D		2,885.1 GROUND SURFACE	0.0
										2,885.0 STONE BASE	0.1
	2,882.6	3.5	4	1	2	3		Sat		2,883.5 ROADWAY EMBANKMENT Gray SAND and GRAVEL	2.6
2880										ALLUVIAL Dark brown silty CLAY	
	2,877.6	8.5	57	43/0.25		43/0.25				2,879.6	6.5
2875	2,874.6	11.5	60/0			60/0				RESIDUAL Gray and reddish brown sandy SILT with some rock fragments	9.0
										2,877.1 WEATHERED ROCK (No Recovery)	11.5
										Boring Terminated with Standard Penetration Test Refusal at Elevation 2,874.6 ft.	

NCDOT BORE SINGLE 6SS-0443.GPJ NC_DOT.GDT 12/1/15

SINCE F&R 1881

North Carolina Department of Transportation
Division of Highways
Materials and Test Unit
Soils Laboratory

M&T Form 503

WBS NO.: 17BP.11.R.29

REPORT ON SAMPLES OF: SOIL FOR QUALITY

PROJECT:	Culvert 940137	COUNTY:	Watauga, NC
DATE SAMPLED:	10-27-2015	RECEIVED:	10-27-2015
SAMPLED FROM:	On Site	REPORTED:	11-3-2015
SUBMITTED BY:	Froehling & Robertson, Inc.	BY:	M. Grabski

TEST RESULTS

PROJ. SAMPLE NO.	CB-1	RWB-2	RWB-8				
LAB SAMPLE NO.	SS-1	SS-2	SS-3				
Retained #4 Sieve %	25.0	5.3	0.0				
Passing #10 Sieve %	60.7	89.5	96.5				
Passing #40 Sieve %	52.7	81.2	82.5				
Passing #200 Sieve %	41.0	70.2	72.5				

MINUS #10 FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - #60 %	18.0	12.3	17.8				
Fine Sand Ret - #270 %	19.2	13.7	9.3				
Silt 0.053 - 0.010 mm %	30.1	43.7	44.6				
Clay < 0.010 mm %	32.7	30.3	28.3				
L.L.	44	48	36				
P.L.	28	36	29				
P.I.	16	12	7				
AASHTO Classification	A-7-6(3)	A-7-5(10)	A-4(5)				
Station	10+44	9+03	11+51				
Offset from Outside Shoulder	18 LT	8 LT	14 LT				
Depth (in.)	13.5	8.5	8.5				
to	15.0	10.0	10.0				
Moisture Content	30.8	45.8	24.8				
Organic Content	NT	NT	NT				

NT = Not Tested
NP = Not Plastic
NA = Not Applicable

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