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0012DEL_P28

REFERENCE: P-5705B

PROJECT: 44475

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5705B	1	13

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *MECKLENBURG*

PROJECT DESCRIPTION *CHARLOTTE GATEWAY STATION AND TRACK AND SAFETY IMPROVEMENTS*

SITE DESCRIPTION *BRIDGE ON TRACK 1 (-SI-) OVER WEST 4TH STREET (-Y-) BETWEEN WEST TRADE STREET AND WEST MOREHEAD STREET*

CONTENTS

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1	TITLE SHEET
2	LEGEND
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12	SOIL TEST RESULTS
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CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

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

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7/19/2017

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED 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 THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR 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
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 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 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 ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 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
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES 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 WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

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
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
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:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [X] ACKER (TER092-0)
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2⅝ " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. 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 "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD 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 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 FOOT
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 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, SUCH 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: BM4: N-544,771; E-1,448,453
STATION 51+04.00 - 2' RIGHT CHISELED SQUARE (5TH STREET BRIDGE)
ELEVATION: 738.12 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	3

SITE PLAN

0 40 80
FEET

TYPICAL SKEW ANGLE 94°22'08"

26+00 -S1-
27+00 -S1-
28+00 -S1-
29+00 -S1-
30+00 -S1-

54" CABLE FENCE
GA
72" CHL
DIR ONLY
18" RCP
CONC
NY
BM4 ELEVATION = 738.12
N 544771 E 1448453
BL STATION 51+04.00 2 RIGHT
CHISELED SQUARE
BOLLARDS
MONITORING WELL
TO SOUTH GRAHAM STREET
WEST 4TH STREET
PVT LP
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DB 10605 PG 225
DB 13053 PG 755
DB 23210 PG 693
EB1-A
B1-A
B2-A
EB2-A
24" RCP
12" RCP
B1-B
PROPOSED BRIDGE
EB2-B
B2-B
EB1-B
TO KANNAPOLIS
BST
TO GASTONIA
6" CONC WALL
-S1-
-A1-
84" CHL
-A3-
-M1-
-M2-
VARIABLE WIDTH PERMANENT PLATFORM EASEMENT
DB 13053 PG 770
SWITCH
CODE LINE
PED
EXISTING NORFOLK SOUTHERN
WOODS
ITY OF CHARLOTTE
B 24319 PG 421
18" CONC WALL
30' C&G
TO SOUTH CEDAR STREET
VARIABLE WIDTH

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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	4

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0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH END BENT 1 AT STA. 27+57 –S1–

℄

EXISTING GROUND

PAVEMENT, ASPHALT AND STONE BASE

EB1-A
27+58
31' LT

EB1-B
27+54
25' RT

ROADWAY EMBANKMENT, GRAY, RESIDUAL, BROWN, MEDIUM STIFF TO VERY STIFF, MOIST, SILTY CLAY (A-7-6)

MEDIUM DENSE, MOIST, CLAYEY AND SILTY FINE TO COARSE SAND (A-2-6, A-2-4)

BROWN, LOOSE TO DENSE, MOIST, CLAYEY FINE SAND (A-2-6)

BROWN, VERY STIFF, MOIST, FINE SANDY CLAY (A-6)

RESIDUAL, MOIST, FINE SANDY SILT (A-4)

WEATHERED ROCK (META-GRANODIORITE)

EB1-A		EB1-B	
11		11	
21		17	
10		18	
7		18	
14		19	
5		25	
10		29	
10		38	
28		100/0.9	
29		100/0.5	
28		100/0.2	
100/0.5			
100/0.6			
100/0.6			

BT

BT
CAVED
DRY @ 12.0'
03/17

03/17

TYPICAL SKEW ANGLE 94°22'08"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	5

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0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH BENT 1 AT STA. 27+91 –S1–

℄

B1-A
27+88
32' LT

B1-B
27+78
5' LT

EXISTING GROUND

PAVEMENT, ASPHALT AND STONE BASE

Ⓐ RESIDUAL, TO HARD, BROWN AND GRAY, MOIST, SILTY AND (A-7-6, A-6) — 7, 7, 28, 23, 37

03/17

GRAY, FINE, SANDY — 63, 30, 20

BROWN, WHITE AND GRAY, MEDIUM VERY DENSE, MOIST, SILTY AND (A-2-4, A-2-6) — 19, 26, 28, 28

WEATHERED ROCK — 100/0.2, 100/0.4, 100/0.4, 100/0.2, 60/0.

CRYSTALLINE ROCK (META-GRANODIORITE)

AR

Ⓐ ROADWAY EMBANKMENT, GRAY, LOOSE, MOIST, CLAYEY FINE SAND (A-2-6)

MEDIUM STIFF FINE SANDY CLAY — 11, 9, 13, 19

VERY STIFF TO HARD, MOIST, SILT (A-4) — 37, 56, 55, 57

DENSE TO CLAYEY FINE SAND — 35, 64, 26, 92

(META-GRANODIORITE) — 100/0.6, 100/0.9, 100/0.2, 100/0.2, 100/0.2

BT
FIAD
03/17

730 720 710 700 690 680 670 660 650

95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55

TYPICAL SKEW ANGLE 94°22'08"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	6

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0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH BENT 2 AT STA. 28+56 -S1-

95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15

730 720 710 700 690 680 670 660 650 640

B2-A
28+60
42' LT

℄ B2-B
28+55
4' RT

EXISTING GROUND

ARTIFICIAL FILL, CRUSHED STONE

ARTIFICIAL FILL, RED TO BROWN, MEDIUM STIFF, MOIST, SILTY CLAY (A-7-6)

FINE SANDY AND SILTY CLAY

RESIDUAL, RED-BROWN AND WHITE, MEDIUM STIFF TO STIFF, MOIST, (A-6, A-7-6)

BROWN AND WHITE, MEDIUM DENSE TO VERY DENSE, GREEN TO DARK GRAY, DENSE, MOIST, SILTY FINE TO COARSE SAND WITH SOME ROCK FRAGMENTS (A-1-B)

MOIST, CLAYEY FINE SAND (A-2-6)

WEATHERED ROCK (META-GRANODIORITE)

CRYSTALLINE ROCK (META-GRANODIORITE)

B2-A		B2-B	
4		11	
5		11	
6		4	
5		5	
8		13	
15		32	
27		26	
32		53	
35		63	
49		71	
36		51	
55		100/0.4	
57		100/0.2	
81		100/0.4	
70		100/0.2	
100/0.7		100/0.2	
100/0.4			
100/0.2			
60/0.0			

AR
CAVED
DRY @ 17.5'
03/17

BT
CAVED
DRY @ 18.0'
03/17

TYPICAL SKEW ANGLE 94°22'08"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	7

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NC REGISTERED FIRM: F-0869

0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH END BENT 2 AT STA. 28+76 –S1–

℄

EB2-A
28+80
38' LT

EB2-B
28+77
3' RT

EXISTING GROUND

RESIDUAL, TO HARD, RED-BROWN, BROWN-GRAY AND GREEN-GRAY, MOIST, SILTY CLAY AND FINE SANDY

MEDIUM STIFF CLAY (A-7-6, A-6)

SANDY SILT (A-4)

GRAY, VERY STIFF TO HARD, MOIST, FINE TO COARSE SANDY CLAY (A-6)

BROWN AND WEATHERED ROCK

(META-GRANODIORITE)

EB2-A		EB2-B	
(B)	4		
	8		
	8		14
	7		11
	8		8
	16		8
	03/17		22
	31		03/17
	87		22
	56		100/0.9
	59		100/0.9
	81		100/0.6
(D)			
	100/0.8		
	100/0.9		
	100/0.9		
	BT		BT

740 730 720 710 700 690 680 670 660 650

95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55

(B) ARTIFICIAL FILL, GRAY TO BROWN, LOOSE, MOIST, SILTY FINE TO COARSE SAND WITH SOME GRAVEL (A-2-4)

(C) ARTIFICIAL FILL, RED AND BROWN, STIFF, MOIST, FINE TO COARSE SANDY CLAY WITH SOME GRAVEL (A-6)

(D) BROWN AND WHITE, VERY DENSE, MOIST, CLAYEY FINE SAND (A-2-6)

TYPICAL SKEW ANGLE 94°22'08"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 27+58	**OFFSET** 31 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 722.1 ft	**TOTAL DEPTH** 58.6 ft	**NORTHING** 544,036	**EASTING** 1,447,867	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/22/17	**COMP. DATE** 03/23/17	**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)
725											
720	721.1	1.0								722.1 PAVEMENT SURFACE	0.0
	719.1	3.0	8	6	5	11 21		M		721.7 **PAVEMENT** 720.1 2.5" ASPHALT AND 2.5" STONE BASE	0.4 2.0
	716.1	6.0	6	8	13			M		**ROADWAY EMBANKMENT** GRAY, CLAYEY FINE TO COARSE SAND WITH SOME GRAVEL	
715	714.1	8.0	2	4	6	10 7		NR		**RESIDUAL** BROWN, SILTY CLAY	
			3	3	4			NR		NR-(NO RECOVERY FOR 6.0'-7.5' AND 8.0'-9.5' SPLIT-SPOON SAMPLES) 711.6	10.5
710	709.1	13.0	5	7	7	14		M		BROWN, CLAYEY FINE SAND	
705	704.1	18.0	2	2	3	5		M			
700	699.1	23.0	3	3	7	10		M			
695	694.1	28.0	3	3	7	10		M			
690	689.1	33.0	7	10	18	28		M		692.1 BROWN, FINE SANDY CLAY	30.0
685	684.1	38.0	10	13	16	29		M			
680	679.1	43.0	6	8	20	28		M		676.1 **WEATHERED ROCK** (META-GRANODIORITE)	46.0
675	674.1	48.0	100/0.5			100/0.5					
670	669.1	53.0	84	16/0.1		100/0.6					
665	664.1	58.0	83	17/0.1		100/0.6				663.5 Boring Terminated at Elevation 663.5 ft IN WEATHERED ROCK (META-GRANODIORITE)	58.6

24hr. Water Level Caved Dry at 12.0'

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 27+54	**OFFSET** 25 ft RT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 721.3 ft	**TOTAL DEPTH** 43.2 ft	**NORTHING** 544,077	**EASTING** 1,447,830	**24 HR.** 0.5
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/24/17	**COMP. DATE** 03/24/17	**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
725										
720	719.9	1.4								721.3 PAVEMENT SURFACE 0.0
	717.8	3.5	10	6	5	11 17		M		720.5 **PAVEMENT** 0.8
			6	8	9			M		718.8 5.0" ASPHALT AND 4.0" STONE BASE 2.5
715	715.3	6.0	4	8	10	18		M		**ROADWAY EMBANKMENT** GRAY, SILTY FINE TO COARSE SAND WITH SOME GRAVEL
	713.3	8.0	5	9	9	18	SS-25	23		**RESIDUAL** BROWN, FINE SANDY SILT
710	708.3	13.0	4	6	13	19		M		706.3 BROWN, CLAYEY FINE SAND 15.0
705	703.3	18.0	6	9	16	25		M		
700	698.3	23.0	5	12	17	29		M		
695	693.3	28.0	7	15	23	38		M		690.3 **WEATHERED ROCK** (META-GRANODIORITE) 31.0
690	688.3	33.0	32	68/0.4		100/0.9				
685	683.3	38.0	100/0.5			100/0.5				
680	678.3	43.0	100/0.2			100/0.2				678.1 Boring Terminated at Elevation 678.1 ft IN WEATHERED ROCK (META-GRANODIORITE) 43.2

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 27+88	**OFFSET** 32 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 721.8 ft	**TOTAL DEPTH** 73.1 ft	**NORTHING** 544,013	**EASTING** 1,447,847	**24 HR.** 11.0
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/23/17	**COMP. DATE** 03/23/17	**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)
725											
720	720.8	1.0	3	3	4	7 7		M		721.8 PAVEMENT SURFACE	0.0
	718.8	3.0	2	3	4					721.2 **PAVEMENT**	0.6
715	715.8	6.0	4	10	18	28	SS-26	38%		720.3 4.0" ASPHALT AND 3.0" STONE BASE	1.5
	713.8	8.0	5	9	14	23		M		**ROADWAY EMBANKMENT**	
710	708.8	13.0	8	13	24	37		M		716.8 GRAY, CLAYEY FINE SAND	5.0
705	703.8	18.0	10	28	35	63		M		**RESIDUAL** BROWN, SILTY CLAY	
700	698.8	23.0	5	9	21	30		M		BROWN, FINE SANDY CLAY	
695	693.8	28.0	4	9	11	20		M		706.8	15.0
690	688.8	33.0	5	8	11	19		M		BROWN AND WHITE, CLAYEY FINE SAND	
685	683.8	38.0	6	9	17	26		M			
680	678.8	43.0	6	11	17	28		M			
675	673.8	48.0	11	13	15	28		M			
670	668.8	53.0	100/0.2			100/0.2				669.8 **WEATHERED ROCK**	52.0
665	663.8	58.0	100/0.4			100/0.4				(META-GRANODIORITE)	
660	658.8	63.0	100/0.4			100/0.4					
655	653.8	68.0	100/0.2			100/0.2					
650	648.8	73.0	60/0.1			60/0.1				648.8 **CRYSTALLINE ROCK**	73.0
										648.7 (META-GRANODIORITE)	73.1
										Boring Terminated with Standard Penetration Test Refusal at Elevation 648.7 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)	

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 27+78	**OFFSET** 5 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 721.3 ft	**TOTAL DEPTH** 73.2 ft	**NORTHING** 544,039	**EASTING** 1,447,835	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/30/17	**COMP. DATE** 03/30/17	**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
725										
720	720.3	1.0	3	5	6	11		M		721.3 PAVEMENT SURFACE 0.0
	718.3	3.0	2	4	5	9		M		720.3 **PAVEMENT** 1.0
715	715.3	6.0	3	5	8	13		M		5.0" ASPHALT AND 6.0" STONE BASE
	713.3	8.0	4	7	12	19		M		**RESIDUAL** BROWN, SILTY CLAY
710	708.3	13.0	8	18	19	37		M		713.8 GRAY, FINE SANDY SILT 7.5
705	703.3	18.0	12	24	32	56		M		
700	698.3	23.0	7	22	33	55		M		696.3 BROWN AND WHITE, SILTY FINE SAND 25.0
695	693.3	28.0	13	23	34	57		M		
690	688.3	33.0	10	13	22	35		M		686.3 BROWN AND GRAY, CLAYEY FINE SAND 35.0
685	683.3	38.0	16	31	33	64		M		
680	678.3	43.0	3	8	18	26		M		
675	673.3	48.0	22	34	58	92		M		671.3 **WEATHERED ROCK** 50.0
670	668.3	53.0	60	40/0.1		100/0.6				(META-GRANODIORITE)
665	663.3	58.0	19	29	71/0.4	100/0.9				
660	658.3	63.0	100/0.2			100/0.2				
655	653.3	68.0	100/0.2			100/0.2				
650	648.3	73.0	100/0.2			100/0.2				648.1 73.2
										Boring Terminated at Elevation 648.1 ft IN WEATHERED ROCK (META-GRANODIORITE)

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S1-			**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 28+60	**OFFSET** 42 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 722.4 ft	**TOTAL DEPTH** 83.0 ft	**NORTHING** 543,955	**EASTING** 1,447,804	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/20/17	**COMP. DATE** 03/21/17	**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))
725										
720	721.4	1.0								722.4 / 0.0 GROUND SURFACE
	719.4	3.0	2	1	3	4		M		**ARTIFICIAL FILL** RED TO BROWN, SILTY CLAY
			1	2	3	5		M		
715	716.4	6.0	2	2	4	6		M		717.4 / 5.0 **RESIDUAL** BROWN AND WHITE, FINE SANDY CLAY
	714.4	8.0	3	3	2	5		M		
710	709.4	13.0								
			2	4	4	8		M		
705	704.4	18.0								
			5	6	9	15		M		
700	699.4	23.0								701.4 / 21.0 BROWN AND WHITE, CLAYEY FINE SAND
			9	10	17	27		M		
695	694.4	28.0								
			10	14	18	32		M		
690	689.4	33.0								
			12	14	21	35		M		687.4 / 35.0 GREEN TO DARK GRAY, SILTY FINE TO COARSE SAND WITH SOME ROCK FRAGMENTS
685	684.4	38.0								
			30	30	19	49		M		
680	679.4	43.0								681.4 / 41.0 BROWN AND WHITE, CLAYEY FINE SAND
			24	16	20	36		M		
675	674.4	48.0								
			14	23	32	55		M		
670	669.4	53.0								
			15	25	32	57		M		
665	664.4	58.0								
			21	37	44	81		M		
660	659.4	63.0								
			27	31	39	70		M		
655	654.4	68.0								656.4 / 66.0 **WEATHERED ROCK** (META-GRANODIORITE)
			26	51	49/0.2	100/0.7				
650	649.4	73.0								
			100/0.4			100/0.4				
645	644.4	78.0								
			100/0.2			100/0.2				
640	639.4	83.0								639.4 / 83.0 Boring Terminated with Standard Penetration Test Refusal at Elevation 639.4 ft ON CRYSTALLINE ROCK (META-GRANODIORITE)
			60/.0			60/0.0				24hr. Water Level Caved Dry at 17.5'

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S1-			**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 28+55	**OFFSET** 4 ft RT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 721.2 ft	**TOTAL DEPTH** 68.2 ft	**NORTHING** 543,990	**EASTING** 1,447,775	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/22/17	**COMP. DATE** 03/22/17	**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
725										
720	720.2	1.0								721.2 / 0.0 GROUND SURFACE
	718.2	3.0	2	5	6	11		M		**ARTIFICIAL FILL** CRUSHED STONE
			3	5	6	11		M		**RESIDUAL** RED-BROWN, SILTY CLAY
715	715.2	6.0	2	2	2	4	SS-28	37%		
	713.2	8.0	2	2	3	5		M		
710	708.2	13.0								710.2 / 11.0 BROWN, CLAYEY FINE SAND
			3	5	8	13		M		
705	703.2	18.0								
			6	14	18	32		M		
700	698.2	23.0								
			12	12	14	26		M		
695	693.2	28.0								
			16	22	31	53		M		
690	688.2	33.0								
			12	26	37	63		M		
685	683.2	38.0								
			22	30	41	71		M		
680	678.2	43.0								
			14	22	29	51		M		676.2 / 45.0 **WEATHERED ROCK** (META-GRANODIORITE)
675	673.2	48.0								
			26	100/0.4		100/0.4				
670	668.2	53.0								
			100/0.2			100/0.2				
665	663.2	58.0								
			100/0.4			100/0.4				
660	658.2	63.0								
			100/0.2			100/0.2				
655	653.2	68.0								653.0 / 68.2 Boring Terminated at Elevation 653.0 ft IN WEATHERED ROCK (META-GRANODIORITE)
			100/0.2			100/0.2				24hr. Water Level Caved Dry at 18.0'

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S1-			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 28+80	**OFFSET** 38 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 723.8 ft	**TOTAL DEPTH** 58.9 ft	**NORTHING** 543,943	**EASTING** 1,447,787	**24 HR.** 19.5
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/21/17	**COMP. DATE** 03/21/17	**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)
725										723.8 GROUND SURFACE	0.0
	722.8	1.0	2	2	2	4		M		722.3 **ARTIFICIAL FILL** GRAY TO BROWN, SILTY FINE TO COARSE SAND WITH SOME GRAVEL	1.5
720	720.8	3.0	2	2	6	8		M		**RESIDUAL** RED-BROWN, SILTY CLAY	
	717.8	6.0	2	3	5	8		M		716.3 BROWN-GRAY TO GREEN-GRAY, FINE SANDY CLAY	7.5
715	715.8	8.0	2	3	4	7		M			
710	710.8	13.0	2	3	5	8		M			
705	705.8	18.0	4	7	9	16		M			
700	700.8	23.0	6	12	19	31		M			
695	695.8	28.0	17	37	50	87		M			
690	690.8	33.0	14	21	35	56		M		688.8 BROWN, FINE SANDY SILT	35.0
685	685.8	38.0	19	28	31	59		M			
680	680.8	43.0	28	37	44	81		M		679.8 BROWN AND WHITE, CLAYEY FINE SAND	44.0
675	675.8	48.0	25	51	49/0.3	100/0.8				676.8 **WEATHERED ROCK** (META-GRANODIORITE)	47.0
670	670.8	53.0	14	36	64/0.4	100/0.9					
665	665.8	58.0	52	48/0.4		100/0.9				664.9 Boring Terminated at Elevation 664.9 ft IN WEATHERED ROCK (META-GRANODIORITE)	58.9

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S1-			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 28+77	**OFFSET** 3 ft RT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 722.3 ft	**TOTAL DEPTH** 33.6 ft	**NORTHING** 543,974	**EASTING** 1,447,760	**24 HR.** 19.0
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/21/17	**COMP. DATE** 03/22/17	**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
725										722.3 GROUND SURFACE 0.0
	721.3	1.0	9	7	7	14		M		720.8 **ARTIFICIAL FILL** RED AND BROWN, FINE TO COARSE SANDY CLAY WITH SOME GRAVEL 1.5
720	719.3	3.0	4	5	6	11		M		**RESIDUAL** RED-BROWN, SILTY CLAY
	716.3	6.0	2	3	5	8		M		
715	714.3	8.0	2	2	6	8		M		
710	709.3	13.0	6	11	11	22		M		707.3 GRAY, FINE SANDY SILT 15.0
705	704.3	18.0	10	10	12	22	SS-30	21%		
700	699.3	23.0	30	62	38/0.4	100/0.9				700.3 **WEATHERED ROCK** (META-GRANODIORITE) 22.0
695	694.3	28.0	19	42	58/0.4	100/0.9				
690	689.3	33.0	70	30/0.1		100/0.6				688.7 Boring Terminated at Elevation 688.7 ft IN WEATHERED ROCK (META-GRANODIORITE) 33.6

LABORATORY TESTING SUMMARY

PROJECT NUMBER: 44475.1.2 **TIP:** P-5705B **COUNTY:** MECKLENBURG

DESCRIPTION: Charlotte Gateway Station and Track and Safety Improvements - West 4th Street Bridge on -S1-

Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic	Ave. Wet Unit Wt. (pcf)	Shear Strength Values			
								Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200				Total Cohesion (psf)	Total Friction (ϕ)	Effective Cohesion (psf)	Effective Friction (ϕ')
SS-25	-S1-	EB1-B	25' RT	8.0-9.5	A-4 (5)	38	9	10.3	37.1	39.6	13.0	0	100	95	64	22.6	N/D	N/D	N/D	N/D	N/D	N/D
SS-26	-S1-	B1-A	32' LT	3.0-4.5	A-7-6 (41)	73	45	8.9	12.6	19.3	59.2	0	100	95	82	38.2	N/D	N/D	N/D	N/D	N/D	N/D
SS-28	-S1-	B2-B	4' RT	6.0-7.5	A-7-5 (17)	52	17	2.3	25.5	45.4	26.8	0	100	99	83	36.9	N/D	N/D	N/D	N/D	N/D	N/D
SS-30	-S1-	EB2-C	3' RT	18.0-19.5	A-4 (0)	29	NP	2.8	39.4	45.8	12.0	0	100	99	71	21.3	N/D	N/D	N/D	N/D	N/D	N/D

N/D - NOT DETERMINED

Stephanie H. Huffman

Certified Lab Technician Signature

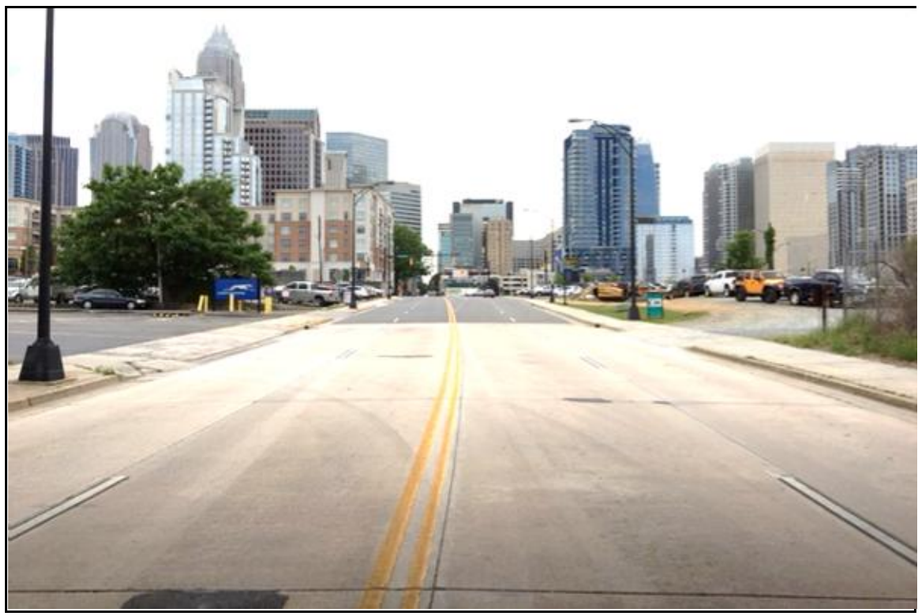
114-01-1203

Certification Number

SITE PHOTOGRAPHS
CHARLOTTE GATEWAY STATION AND TRACK IMPROVEMENTS - WEST 4th STREET BRIDGE ON -S1-

PHOTOGRAPH NO. 1: EAST APPROACH TO END BENT NO. 1 ON -S1- ALIGNMENT, LOOKING WEST

PHOTOGRAPH NO. 2: ON WEST 4th STREET (-Y-), SOUTHEAST OF -S1- ALIGNMENT, LOOKING NORTHWEST



PHOTOGRAPH NO. 3: ON WEST 4th STREET (-Y-), NORTHWEST OF -S1- ALIGNMENT, LOOKING SOUTHEAST

PHOTOGRAPH NO. 4: WEST APPROACH TO END BENT NO.2 ON -S1- ALIGNMENT, LOOKING EAST

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REFERENCE: P-5705B

PROJECT: 44475

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5705B	1	13

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY MECKLENBURG

PROJECT DESCRIPTION CHARLOTTE GATEWAY STATION AND TRACK AND SAFETY IMPROVEMENTS

SITE DESCRIPTION BRIDGE ON TRACK 2 (-S2-) OVER WEST 4TH STREET (-Y-) BETWEEN WEST TRADE STREET AND WEST MOREHEAD STREET

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4-7	CROSS SECTIONS
8-11	BORE LOGS
12	SOIL TEST RESULTS
13	SITE PHOTOGRAPHS

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. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

RIGGS, A. F.	WERITZ, M. A.
WEAVER, L. A.	DUGGINS, W. T.
COGAR, T. E.	TURNAGE, J. R.
McMILLIAN, M. F.	MASHBURN, S. R.

INVESTIGATED BY TERRACON CONSULTANTS

DRAWN BY FIELDS, W. D.

CHECKED BY RIGGS, A. F.

SUBMITTED BY TERRACON CONSULTANTS

DATE JUNE 2017

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DocuSigned by:
Abner F. Riggs, Jr.
5228073BBA4F482...

7/19/2017

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED 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 THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR 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
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 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 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 ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 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 SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES 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 WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

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
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
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:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [X] ACKER (TER092-0)
- [X] D-50 (TER373
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2⅝ " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. 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 "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD 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 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 FOOT
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 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, SUCH 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: BM3; N-544,105; E-1,447,804 BL STATION 41+74.00, 1' RIGHT CHISELED SQUARE
ELEVATION: 737.50 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

ADDITIONAL BENCH MARK USED:
BM4: N-544,771; E-1,448,453
BL STATION 51+04.00 - 2' RIGHT CHISELED SQUARE
(5TH STREET BRIDGE)

DATE: 8-15-14

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	3

SITE PLAN

0 40 80
FEET

TYPICAL SKEW ANGLE 94°22'07"

26+00 -S2- 27+00 -S2- 28+00 -S2- 29+00 -S2- 30+00 -S2-

54" CABLE FENCE
72" CHL
DIR ONLY
18" RCP
CONC
BM4 ELEVATION = 738.12
N 544771 E 1448453
BL STATION 51+04.00 2 RIGHT
CHISELED SQUARE
BOLLARDS
MONITORING WELL
TO KANNAPOLIS
BST
10" DIP
24" RCP
TO SOUTH GRAHAM STREET
WEST 4TH STREET
PVT LP
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DB 10605 PG 225
DB 13053 PG 755
DB 23210 PG 693
NY
GA
B1-A
B2-A
EB2-A
EB1-A
B2-B
EB2-B
PROPOSED BRIDGE
EB1-B
B1-B
6" CONC WALL
TO GASTONIA
84" CHL
PVT LP
-S2-
CODE LINE PED
EXISTING NORFOLK SOUTHERN
VARIABLE WIDTH PERMANENT PLATFORM EASEMENT
DB 13053 PG 770
SWITCH
BM3 ELEVATION = 737.50
N 544105 E 1447804
BL STATION 41+74.00 1RIGHT
CHISELED SQUARE
WOODS
ITY OF CHARLOTTE
B 24319 PG 421
8" CONC WALL
30" C&G
TO SOUTH CEDAR STREET
VARIABLE WIDTH

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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	4

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0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH END BENT 1 AT STA. 27+53 –S2–

℄

EB1-A
27+53
21' LT

EB1-B
27+39
29' RT

RAILROAD BALLAST, CRUSHED STONE

EXISTING GROUND

PAVEMENT, ASPHALT AND STONE BASE

RAILROAD EMBANKMENT, RED AND TAN, LOOSE TO MEDIUM DENSE, MOIST, CLAYEY FINE SAND WITH SOME ROCK FRAGMENTS AND TRACE OF MANGANESE (A-2-6)

Ⓐ 11 17 18 18 19 25 29 38 100/0.9 100/0.5 100/0.2

BROWN, MEDIUM STIFF TO VERY STIFF, MOIST, FINE SANDY SILT (A-4)

BROWN, TAN, GRAY AND WHITE, MEDIUM DENSE TO VERY DENSE, MOIST, CLAYEY AND SILTY FINE SAND WITH TRACE OF MANGANESE (A-2-6, A-2-4)

8 6 9 9 12 30 26 11 20 20 15 26 39 62 54 100/0.9 100/0.9

WEATHERED ROCK (META-GRANODIORITE)

03/17

BT

BT

FIAD
03/17

Ⓐ ROADWAY EMBANKMENT, GRAY, MEDIUM DENSE, MOIST, SILTY FINE TO COARSE SAND WITH SOME GRAVEL (A-2-4)

TYPICAL SKEW ANGLE 94°22'07"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	5

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0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH BENT 1 AT STA. 27+87 -S2-

℄

B1-A
27+77
51' LT

B1-B
27+96
10' RT

EXISTING GROUND

PAVEMENT, ASPHALT AND STONE BASE

RESIDUAL, BROWN, STIFF, MOIST, SILTY CLAY (A-7-6)

BROWN, TAN AND GRAY, VERY STIFF TO HARD, MOIST, FINE SANDY SILT (A-4)

RESIDUAL, BROWN, TAN, GRAY AND WHITE, MEDIUM DENSE TO VERY DENSE, MOIST, SILTY AND CLAYEY FINE SAND (A-2-4, A-2-6)

WEATHERED ROCK

WEATHERED ROCK (META-GRANODIORITE)

ROCK (META-GRANODIORITE)

B1-A: 11, 9, 13, 19, 37, 56, 55, 57, 35, 64, 26, 92, 100/0.6, 100/0.9, 100/0.2, 100/0.2, 100/0.2

B1-B: 21, 47, 39, 75, 100/0.8, 100/0.8, 87, 100/0.9, 44, 100/0.3, 100/0.3, 100/0.3, 100/0.6, 100/0.2

BT
FIAD
03/17

TYPICAL SKEW ANGLE 94°22'07"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	6

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0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH BENT 2 AT STA. 28+52 -S2-

℄

740 730 720 710 700 690 680 670 660 650

95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55

B2-A
28+55
42' LT

B2-B
28+53
23' LT

EXISTING GROUND

ARTIFICIAL FILL, BLACK, MEDIUM DENSE, FINE SAND WITH TRACE OF ORGANICS

RESIDUAL, RED-BROWN, MEDIUM STIFF, MOIST, SILTY CLAY (A-7-6)

STIFF TO LOOSE TO AND BROWN, RESIDUAL, RED, TAN VERY DENSE, MOIST, CLAYEY FINE SAND (A-2-6)

TAN AND WHITE, MOIST, FINE SANDY SILT HARD, (A-4)

(META-GRANODIORITE) WEATHERED ROCK

RESIDUAL, TAN, MEDIUM DENSE TO VERY DENSE, MOIST, CLAYEY FINE SAND (A-2-6)

B2-A		B2-B	
11		15	
11		17	
4		11	
5		8	
13		18	
32		32	
26		97	
53		82	
63		100/0.8	
71		100/0.8	
51		100/0.7	
100/0.4		100/0.3	
100/0.2		13	
100/0.4		68	
100/0.2		60/0.0	
100/0.2			

BT
CAVED
DRY @ 18.0'
03/17

AR
CAVED
03/17

TYPICAL SKEW ANGLE 94°22'07"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	7

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0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH END BENT 2 AT STA. 28+72 –S2–

℄

EB2-A
28+77
43' LT

EB2-B
28+77
16' LT

EXISTING GROUND

B

C

RESIDUAL, RED-BROWN, STIFF TO VERY STIFF, MOIST, SILTY CLAY (A-7-6)

14, 11, 8, 8

14, 10, 8, 12

22

19

FINE SANDY SILT (A-4)

VERY STIFF, MOIST, RED, TAN AND GRAY, WEATHERED ROCK

22

03/17

100/0.9

32

RESIDUAL, TAN, DENSE, MOIST, SILTY FINE SAND (A-2-4)

100/0.9, 100/0.9, 100/0.6

100/0.8, 100/0.3

(META-GRANODIORITE)

20

RESIDUAL, TAN, MEDIUM DENSE, MOIST, CLAYEY FINE SAND WITH SOME MICA (A-2-6)

100/0.7, 100/0.3, 100/0.6

BT

BT
DRY
04/17

750 740 730 720 710 700 690 680 670 660

95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55

(B) ARTIFICIAL FILL, RED BROWN, STIFF, MOIST, FINE TO COARSE SANDY CLAY WITH SOME GRAVEL (A-2-6)

(C) ARTIFICIAL FILL, BLACK AND GRAY, MEDIUM DENSE, MOIST, FINE SAND WITH SOME ROCK FRAGMENTS (A-3)

TYPICAL SKEW ANGLE 94°22'07"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S2-				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 27+53	**OFFSET** 21 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 721.3 ft	**TOTAL DEPTH** 43.2 ft	**NORTHING** 544,077	**EASTING** 1,447,830	**24 HR.** 0.5
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/24/17	**COMP. DATE** 03/24/17	**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)
725											
720	719.9	1.4								721.3 PAVEMENT SURFACE	0.0
			10	6	5	11 17		M		720.5 **PAVEMENT** 5.0" ASPHALT AND 4.0" STONE BASE	0.8
	717.8	3.5								718.8 **ROADWAY EMBANKMENT** GRAY, SILTY FINE TO COARSE SAND WITH SOME GRAVEL	2.5
715			6	8	9			M		**RESIDUAL** BROWN, FINE SANDY SILT	
	715.3	6.0									
			4	8	10	18 18		M			
	713.3	8.0									
			5	9	9		SS-25	23			
710											
	708.3	13.0									
			4	6	13	19		M		706.3 BROWN, CLAYEY FINE SAND	15.0
705											
	703.3	18.0									
			6	9	16	25		M			
700											
	698.3	23.0									
			5	12	17	29		M			
695											
	693.3	28.0									
			7	15	23	38		M			
690										690.3 **WEATHERED ROCK** (META-GRANODIORITE)	31.0
	688.3	33.0									
			32	68/0.4		100/0.9					
685											
	683.3	38.0									
			100/0.5			100/0.5					
680											
	678.3	43.0								678.1 Boring Terminated at Elevation 678.1 ft IN WEATHERED ROCK (META-GRANODIORITE)	43.2
			100/0.2			100/0.2					

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S2-				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 27+39	**OFFSET** 29 ft RT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 737.7 ft	**TOTAL DEPTH** 79.8 ft	**NORTHING** 544,122	**EASTING** 1,447,804	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 05/05/17	**COMP. DATE** 05/05/17	**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	
740											
										737.7 GROUND SURFACE	0.0
735	735.3	2.4								735.7 **RAILROAD BALLAST** CRUSHED STONE	2.0
			5	4	4	8		M		**RAILROAD EMBANKMENT** RED AND TAN, CLAYEY FINE SAND WITH SOME ROCK FRAGMENTS AND TRACE OF MANGANESE	
	732.2	5.5									
730			2	3	3	6		M			
	729.3	8.4									
			4	4	5	9		M			
725											
	724.3	13.4									
			4	4	5	9		M			
720											
	719.3	18.4									
			3	5	7	12		M			
715										715.7 **RESIDUAL** TAN AND GRAY, CLAYEY FINE SAND WITH TRACE OF MANGANESE	22.0
	714.3	23.4									
			7	13	17	30		M			
710											
	709.3	28.4									
			8	13	13	26		M			
705											
	704.3	33.4								705.2 TAN AND WHITE, SILTY FINE SAND	32.5
			2	3	8	11		M			
700											
	699.3	38.4									
			6	8	12	20		M			
695											
	694.3	43.4									
			7	8	12	20		M			
690											
	689.3	48.4									
			4	7	8	15		M			
685											
	684.3	53.4									
			13	14	12	26		M			
680											
	679.3	58.4									
			15	19	20	39		M			
675											
	674.3	63.4									
			32	30	32	62		M			
670											
	669.3	68.4									
			21	24	30	54		M			
665											
	664.3	73.4								663.8 **WEATHERED ROCK** (META-GRANODIORITE)	73.9
			34	50	50/0.4	100/0.9					
660											
	659.3	78.4								657.9 Boring Terminated at Elevation 657.9 ft IN WEATHERED ROCK (META-GRANODIORITE)	79.8
			19	33	67/0.4	100/0.9					

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S2-				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 27+77	**OFFSET** 51 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 721.3 ft	**TOTAL DEPTH** 73.2 ft	**NORTHING** 544,039	**EASTING** 1,447,835	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/30/17	**COMP. DATE** 03/30/17	**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)
725											
720	720.3	1.0								721.3 PAVEMENT SURFACE	0.0
	718.3	3.0	3	5	6	11 19		M		720.3 **PAVEMENT** 5.0" ASPHALT AND 6.0" STONE BASE	1.0
715	715.3	6.0	2	4	5	9		M		**RESIDUAL** BROWN, SILTY CLAY	
	713.3	8.0	3	5	8	13		M		713.8 GRAY, FINE SANDY SILT	7.5
710			4	7	12	19		M			
	708.3	13.0	8	18	19	37		M			
705	703.3	18.0									
			12	24	32	56		M			
700	698.3	23.0									
			7	22	33	55		M		696.3 BROWN AND WHITE, SILTY FINE SAND	25.0
695	693.3	28.0									
			13	23	34	57		M			
690	688.3	33.0									
			10	13	22	35		M			
685	683.3	38.0								686.3 BROWN AND GRAY, CLAYEY FINE SAND	35.0
			16	31	33	64		M			
680	678.3	43.0									
			3	8	18	26		M			
675	673.3	48.0									
			22	34	58	92		M		671.3 **WEATHERED ROCK** (META-GRANODIORITE)	50.0
670	668.3	53.0									
			60	40/0.1		100/0.6					
665	663.3	58.0									
			19	29	71/0.4	100/0.9					
660	658.3	63.0									
			100/0.2			100/0.2					
655	653.3	68.0									
			100/0.2			100/0.2					
650	648.3	73.0								648.1 Boring Terminated at Elevation 648.1 ft IN WEATHERED ROCK (META-GRANODIORITE)	73.2
			100/0.2			100/0.2					

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S2-				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 27+96	**OFFSET** 10 ft RT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 718.4 ft	**TOTAL DEPTH** 58.4 ft	**NORTHING** 544,068	**EASTING** 1,447,778	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 03/29/17	**COMP. DATE** 03/29/17	**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	
720											
	717.1	1.3								718.4 PAVEMENT SURFACE	0.0
715	715.2	3.2	3	5	16	21		M		717.4 **PAVEMENT** 12" CONCRETE	1.0
	713.2	5.2	14	19	28	47		M		**RESIDUAL** TAN AND GRAY, FINE SANDY SILT	
710	710.2	8.2	14	16	23	39	SS-27	17%			
			23	35	40	75		M			
705	705.2	13.2								705.4	13.0
			50	50/0.3		100/0.8				**WEATHERED ROCK** (META-GRANODIORITE)	
700	700.2	18.2									
			39	61/0.3		100/0.8					
695	695.2	23.2									
			30	39	48	87		M		695.2 **RESIDUAL** TAN, CLAYEY FINE SAND	23.2
690	690.2	28.2									
			15	40	60/0.4	100/0.9				689.2	29.2
685	685.2	33.2								**WEATHERED ROCK** (META-GRANODIORITE)	
			19	16	28	44		M		687.4 **RESIDUAL** TAN, CLAYEY FINE SAND	31.0
680	680.2	38.2									
			100/0.3			100/0.3				680.4 **WEATHERED ROCK** (META-GRANODIORITE)	38.0
675	675.2	43.2									
			100/0.3			100/0.3					
670	670.2	48.2									
			100/0.3			100/0.3					
665	665.2	53.2									
			93	7/0.1		100/0.6					
660	660.2	58.2								660.0 Boring Terminated at Elevation 660.0 ft IN WEATHERED ROCK (META-GRANODIORITE)	58.4
			100/0.2			100/0.2					

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S2-			**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 28+55	**OFFSET** 42 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 721.2 ft	**TOTAL DEPTH** 68.2 ft	**NORTHING** 543,990	**EASTING** 1,447,775	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/22/17	**COMP. DATE** 03/22/17	**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))
725										
720	720.2	1.0	2	5	6	11 11		M		721.2 / 0.0 — GROUND SURFACE 721.0 / 0.2 — **ARTIFICIAL FILL** CRUSHED STONE **RESIDUAL** RED-BROWN, SILTY CLAY
	718.2	3.0	3	5	6			M		
715	715.2	6.0	2	2	2	4 5	SS-28	37%		
	713.2	8.0	2	2	3			M		
710	708.2	13.0	3	5	8	13		M		710.2 / 11.0 — BROWN, CLAYEY FINE SAND
705	703.2	18.0	6	14	18	32		M		
700	698.2	23.0	12	12	14	26		M		
695	693.2	28.0	16	22	31	53		M		
690	688.2	33.0	12	26	37	63		M		
685	683.2	38.0	22	30	41	71		M		
680	678.2	43.0	14	22	29	51		M		676.2 / 45.0 — **WEATHERED ROCK** (META-GRANODIORITE)
675	673.2	48.0	26	100/0.4		100/0.4				
670	668.2	53.0	100/0.2			100/0.2				
665	663.2	58.0	100/0.4			100/0.4				
660	658.2	63.0	100/0.2			100/0.2				
655	653.2	68.0	100/0.2			100/0.2				653.0 / 68.2 — Boring Terminated at Elevation 653.0 ft IN WEATHERED ROCK (META-GRANODIORITE) 24hr. Water Level Caved Dry At 18.0'

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S2-			**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 28+53	**OFFSET** 23 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 722.9 ft	**TOTAL DEPTH** 63.5 ft	**NORTHING** 544,005	**EASTING** 1,447,763	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 04/06/17	**COMP. DATE** 04/07/17	**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
725										
720	721.9	1.0	4	7	8	15		M		722.9 / 0.0 — GROUND SURFACE 722.4 / 0.5 — **ARTIFICIAL FILL** BLACK, FINE SAND WITH TRACE OF ORGANICS **RESIDUAL** RED AND TAN, CLAYEY FINE SAND
	719.7	3.2	7	7	10	17		M		
715	717.4	5.5	3	5	6	11		M		
	714.4	8.5	3	3	5	8		M		
710	709.4	13.5	6	8	10	18		M		
705	704.4	18.5	11	13	19	32	SS-29	24%		704.9 / 18.0 — TAN AND WHITE, FINE SANDY SILT
700	699.4	23.5	30	36	61	97		M		
695	694.4	28.5	32	40	42	82		M		
690	689.4	33.5	60	40/0.3		100/0.8				688.9 / 34.0 — **WEATHERED ROCK** (META-GRANODIORITE)
685	684.4	38.5	23	77/0.3		100/0.8				
680	679.4	43.5	81	19/0.2		100/0.7				
675	674.4	48.5	100/0.3			100/0.3				
670	669.4	53.5	5	7	6	13		M		669.9 / 53.0 — **RESIDUAL** TAN, CLAYEY FINE SAND
665	664.4	58.5	28	20	48	68		M		
660	659.4	63.5	60/0.0			60/0.0				659.4 / 63.5 — Boring Terminated with Standard Penetration Test Refusal at Elevation 659.4 ft ON CRYSTALLINE ROCK (META-GRANODIORITE) 24hr. Water Level Caved Dry At 5.0'

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S2-			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 28+77	**OFFSET** 43 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 722.3 ft	**TOTAL DEPTH** 33.6 ft	**NORTHING** 543,974	**EASTING** 1,447,760	**24 HR.** 19.0
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/21/17	**COMP. DATE** 03/22/17	**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)
725											
	721.3	1.0	9	7	7	14		M		722.3 GROUND SURFACE	0.0
720	719.3	3.0	4	5	6	11		M		720.8 **ARTIFICIAL FILL** RED AND BROWN, FINE TO COARSE SANDY CLAY WITH SOME GRAVEL	1.5
	716.3	6.0	2	3	5	8		M		**RESIDUAL** RED-BROWN, SILTY CLAY	
715	714.3	8.0	2	2	6	8		M			
710	709.3	13.0	6	11	11	22		M		707.3 GRAY, FINE SANDY SILT	15.0
705	704.3	18.0	10	10	12	22	SS-30	21%		700.3 **WEATHERED ROCK** (META-GRANODIORITE)	22.0
700	699.3	23.0	30	62	38/0.4	100/0.9					
695	694.3	28.0	19	42	58/0.4	100/0.9					
690	689.3	33.0	70	30/0.1		100/0.6				688.7 Boring Terminated at Elevation 688.7 ft IN WEATHERED ROCK (META-GRANODIORITE)	33.6

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 4TH STREET BRIDGE ON -S2-			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 28+77	**OFFSET** 16 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 722.5 ft	**TOTAL DEPTH** 54.1 ft	**NORTHING** 543,993	**EASTING** 1,447,741	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 04/07/17	**COMP. DATE** 04/07/17	**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
725										
	721.5	1.0	5	7	7	14		M		722.5 GROUND SURFACE 0.0
720	719.0	3.5	5	4	6	10		M		721.5 **ARTIFICIAL FILL** BLACK AND GRAY, FINE SAND WITH SOME ROCK FRAGMENTS 1.0
	717.0	5.5	3	3	5	8		M		**RESIDUAL** RED AND TAN, FINE SANDY SILT WITH TRACE OF MANGANESE
715	714.0	8.5	4	4	8	12		M		
710	709.0	13.5	12	9	10	19	SS-31	26%		
705	704.0	18.5	21	46	54/0.4	100/0.9				703.5 **WEATHERED ROCK** (META-GRANODIORITE) 19.0
700	699.0	23.5	11	14	18	32		M		699.5 **RESIDUAL** TAN, SILTY FINE SAND 23.0
695	694.0	28.5	34	58	42/0.3	100/0.8				693.5 **WEATHERED ROCK** (META-GRANODIORITE) 29.0
690	689.0	33.5	100/0.3			100/0.3				684.5 **RESIDUAL** TAN, CLAYEY FINE SAND WITH SOME MICA 38.0
685	684.0	38.5	7	10	10	20		M		680.0 **WEATHERED ROCK** (META-GRANODIORITE) 42.5
680	679.0	43.5	63	37/0.2		100/0.7				
675	674.0	48.5	100/0.3			100/0.3				
670	669.0	53.5	90	10/0.1		100/0.6				668.4 Boring Terminated at Elevation 668.4 ft IN WEATHERED ROCK (META-GRANODIORITE) 54.1

24hr. Water Level Caved Dry At 7.0'

NCDOT BORE DOUBLE P5705B_GEO_BRDG4_4TH ST_S2.GPJ NC_DOT.GDT 6/22/17

LABORATORY TESTING SUMMARY

PROJECT NUMBER: 44475.1.2 **TIP:** P-5705B **COUNTY:** MECKLENBURG

DESCRIPTION: Charlotte Gateway Station and Track and Safety Improvements - West 4th Street Bridge on -S2-

Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic	Ave. Wet Unit Wt. (pcf)	Shear Strength Values			
								Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200				Total Cohesion (psf)	Total Friction (ϕ)	Effective Cohesion (psf)	Effective Friction (ϕ')
SS-25	-S2-	EB1-A	21' LT	8.0-9.5	A-4 (5)	38	9	10.3	37.1	39.6	13.0	0	100	95	64	22.6	N/D	N/D	N/D	N/D	N/D	N/D
SS-27	-S2-	B1-B	10' RT	5.2-6.7	A-4 (0)	22	NP	32.3	33	22	12.7	0	100	79	42	16.6	N/D	N/D	N/D	N/D	N/D	N/D
SS-28	-S2-	B2-A	42' LT	6.0-7.5	A-7-5 (17)	52	17	2.3	25.5	45.4	26.8	0	100	99	83	36.9	N/D	N/D	N/D	N/D	N/D	N/D
SS-29	-S2-	B2-B	23' LT	18.5-20.0	A-4 (1)	32	NP	1.4	33.1	54.4	11.1	0	100	100	79	24.0	N/D	N/D	N/D	N/D	N/D	N/D
SS-30	-S2-	EB2-A	43' LT	18.0-19.5	A-4 (0)	29	NP	2.8	39.4	45.8	12.0	0	100	99	71	21.3	N/D	N/D	N/D	N/D	N/D	N/D
SS-31	-S2-	EB2-B	16' LT	13.5-15.0	A-4 (0)	30	NP	0.4	38.1	48.3	13.2	0	100	100	76	25.6	N/D	N/D	N/D	N/D	N/D	N/D

N/D - NOT DETERMINED

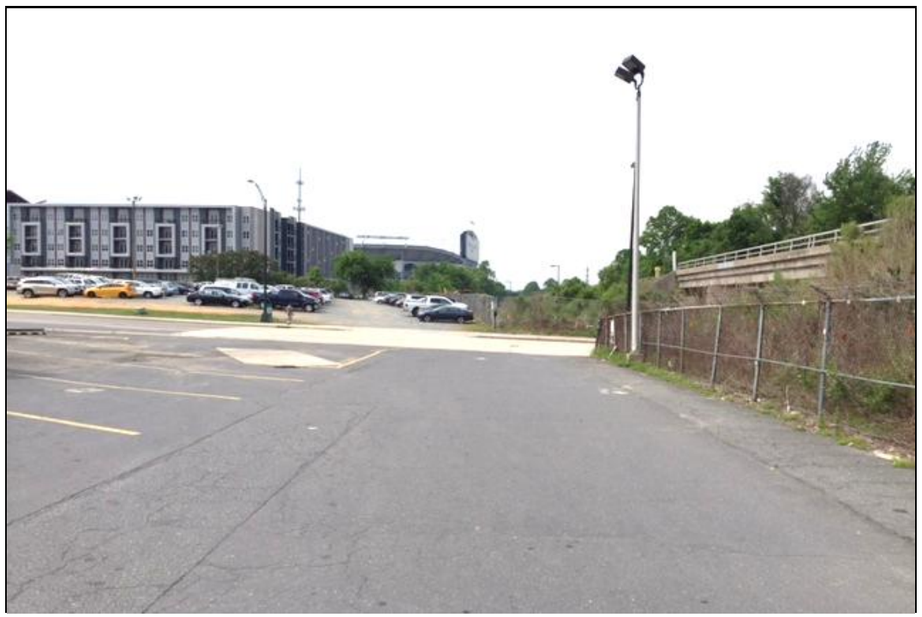
Stephanie H. Huffman

Certified Lab Technician Signature

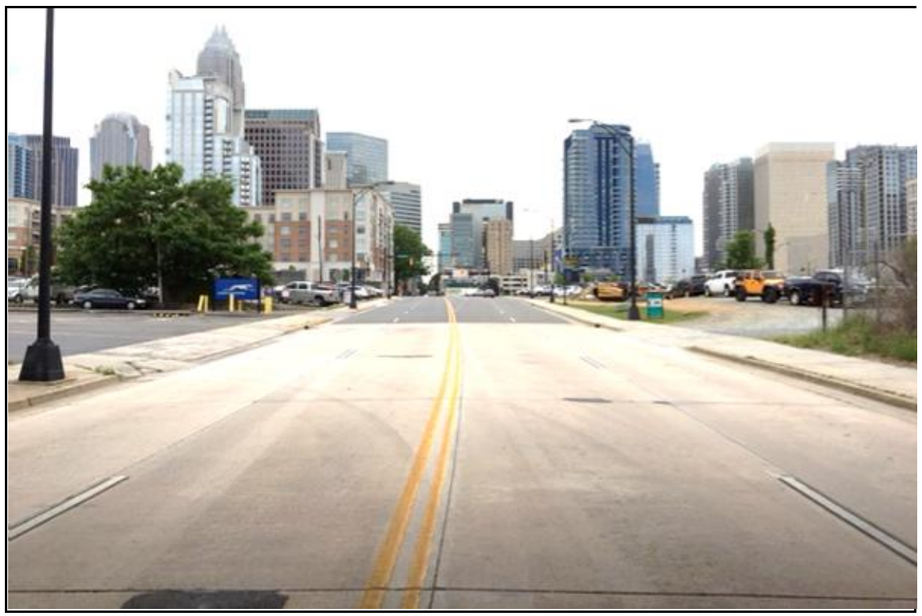
114-01-1203

Certification Number

SITE PHOTOGRAPHS
CHARLOTTE GATEWAY STATION AND TRACK IMPROVEMENTS - WEST 4th STREET BRIDGE ON -S2-



PHOTOGRAPH NO. 1: EAST APPROACH TO END BENT NO. 1 ON -S2- ALIGNMENT, LOOKING WEST



PHOTOGRAPH NO. 3: ON WEST 4th STREET (-Y-), NORTHWEST OF -S2- ALIGNMENT, LOOKING SOUTHEAST

PHOTOGRAPH NO. 2: ON WEST 4th STREET (-Y-), SOUTHEAST OF -S2- ALIGNMENT, LOOKING NORTHWEST

PHOTOGRAPH NO. 4: WEST APPROACH TO END BENT NO.2 ON -S2- ALIGNMENT, LOOKING EAST

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REFERENCE: P-5705B

PROJECT: 44475

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5705B	1	16

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY MECKLENBURG

PROJECT DESCRIPTION CHARLOTTE GATEWAY STATION AND TRACK AND SAFETY IMPROVEMENTS

SITE DESCRIPTION BRIDGE ON STATION TRACK 1 (-S1-) OVER WEST 6TH STREET BETWEEN WEST 5TH STREET AND NORTH GRAHAM STREET

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4-7	CROSS SECTIONS
8-14	BORE LOGS, CORE REPORTS AND CORE PHOTOGRAPHS
15	SOIL TEST RESULTS
16	SITE PHOTOGRAPHS

CAUTION NOTICE

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P-5705B	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED 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 THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR 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
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 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 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 ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 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 SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES 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 WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

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
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT / DPT / DMT / VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
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:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [X] ACKER (TER092-0)
- [X] D-50 (TER373
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2⅝ " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [X] CORE BIT
- [X] DRAG BIT

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [X] -H 03
- [ ] -N _____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. 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 "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD 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 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 FOOT
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 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, SUCH 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: BM4; N-544,771; E-1,448,453
BL STATION 51+04.00 2' RIGHT, CHISELED SQUARE
ELEVATION: 738.12 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities

BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets

VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets

BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity

DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces

LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

A. *Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.*

B. *Sandstone with thin interlayers of siltstone*

C. *Sandstone and siltstone in similar amounts*

D. *Siltstone or silty shale with sandstone layers*

E. *Weak siltstone or clayey shale with sandstone layers*

C, D, E, and **G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H.**

F. *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*

G. *Undisturbed silty or clayey shale with or without a few very thin sandstone layers*

H. ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***

→ Means deformation after tectonic disturbance

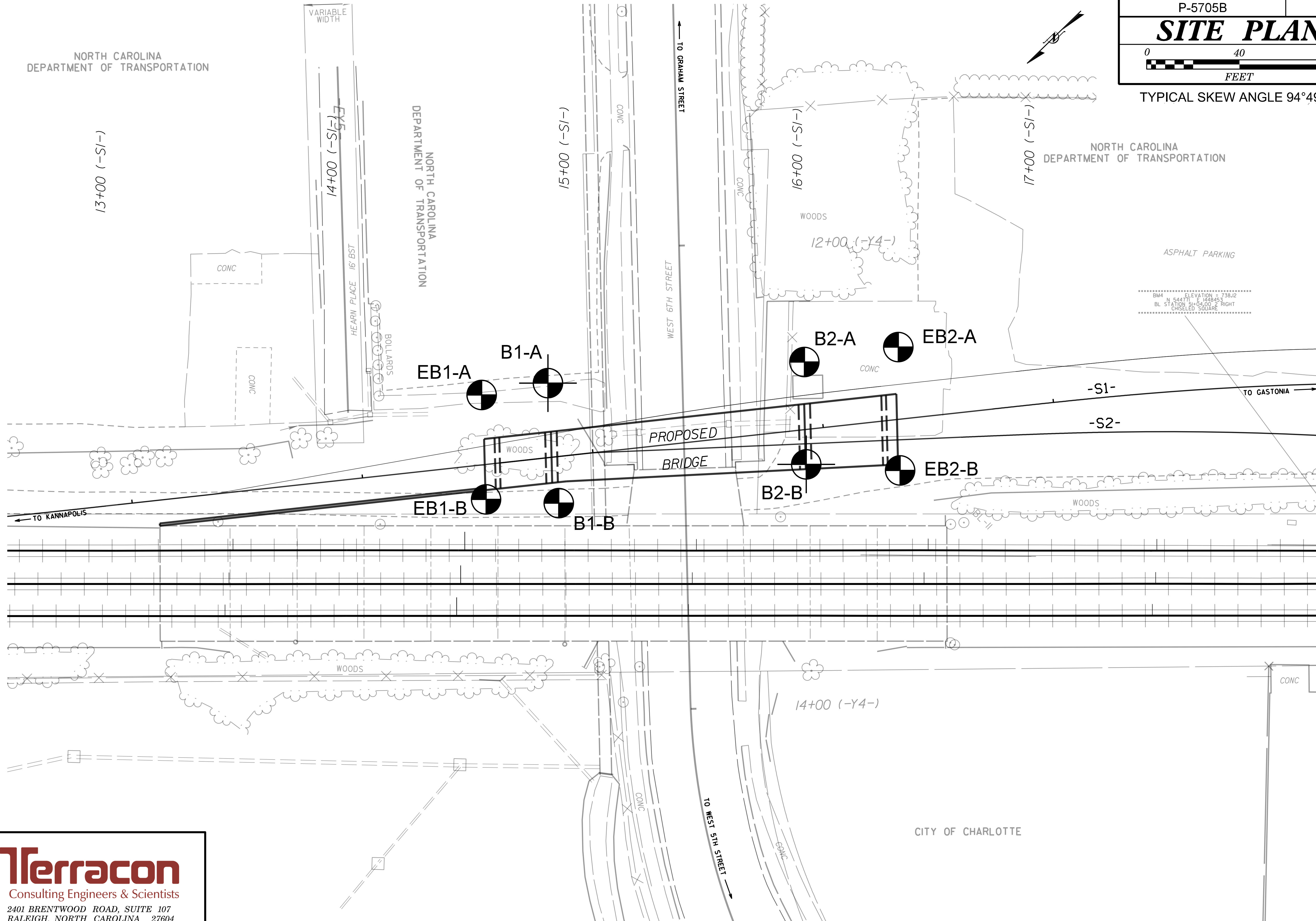
DATE: 8-19-16

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	3

SITE PLAN

TYPICAL SKEW ANGLE 94°49'23"



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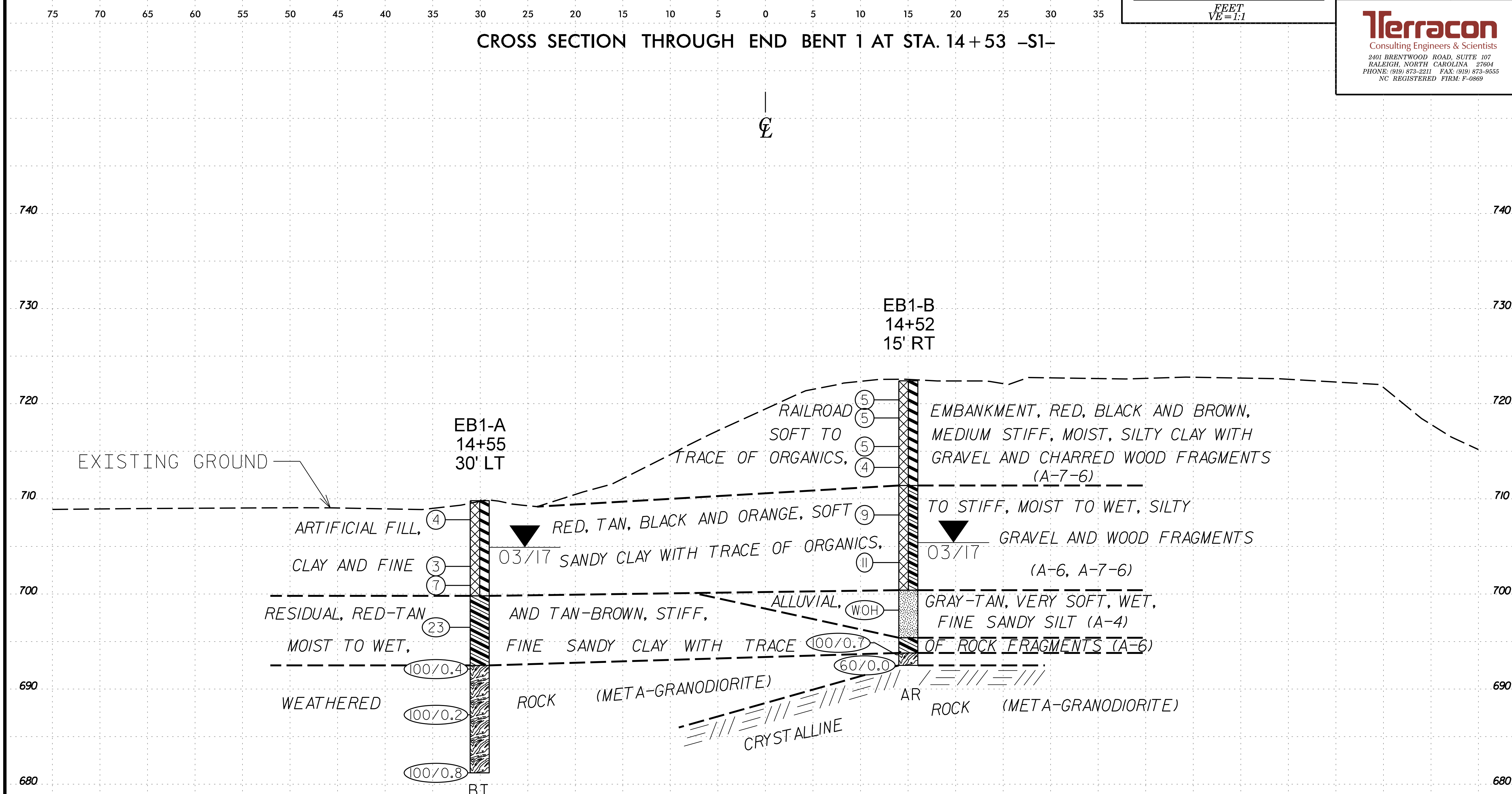
0 10 20 FEET VE=1:1

CROSS SECTION THROUGH END BENT 1 AT STA. 14+53 –S1–


℄
EB1-A
14+55
30' LT
EB1-B
14+52
15' RT
EXISTING GROUND
740
730
720
710
700
690
680
ARTIFICIAL FILL, RED, TAN, BLACK AND ORANGE, SOFT
CLAY AND FINE SANDY CLAY WITH TRACE OF ORGANICS,
RESIDUAL, RED-TAN AND TAN-BROWN, STIFF,
MOIST TO WET, FINE SANDY CLAY WITH TRACE OF ROCK FRAGMENTS (A-6)
WEATHERED ROCK (META-GRANODIORITE)
CRYSTALLINE ROCK (META-GRANODIORITE)
RAILROAD EMBANKMENT, RED, BLACK AND BROWN,
SOFT TO MEDIUM STIFF, MOIST, SILTY CLAY WITH
TRACE OF ORGANICS, GRAVEL AND CHARRED WOOD FRAGMENTS
(A-7-6)
TO STIFF, MOIST TO WET, SILTY
GRAVEL AND WOOD FRAGMENTS
(A-6, A-7-6)
ALLUVIAL, GRAY-TAN, VERY SOFT, WET,
FINE SANDY SILT (A-4)
03/17
03/17
4
3
7
23
100/0.4
100/0.2
100/0.8
BT
5
5
5
4
9
11
WOH
100/0.7
60/0.0
AR

TYPICAL SKEW ANGLE 94°49' 23"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS PROJECTED ON TO THE CROSS SECTION GROUND LINE TAKEN FROM PROVIDED TIN FILE: p5705b ls tin.tin (DATED 01/12/2017)

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0 10 20
FEET
VE = 1:1

CROSS SECTION THROUGH BENT 1 AT STA. 14+82 –S1–

℄

B1-A
14+84
32' LT

B1-B
14+83
20' RT

EXISTING GROUND

ARTIFICIAL FILL, RED, TAN, FINE SANDY CLAY WITH ALLUVIAL, BLUE-GRAY, RESIDUAL, TAN, CRYSTALLINE ROCK WITH LENSES (META-GRANODIORITE)

GRAY AND BLACK, SOFT TO MEDIUM STIFF, TRACE OF ORGANICS, BRICK FRAGMENTS

03/17

VERY SOFT TO SOFT, WET, FINE SANDY AND SILTY GRAY-TAN, LOOSE, WET, CLAYEY GRAY AND BROWN, STIFF TO HARD, MOIST, FINE

WEATHERED ROCK (META-GRANODIORITE)

WEATHERED ROCK

CRYSTALLINE ROCK (META-GRANODIORITE)

RAILROAD EMBANKMENT, RED, TAN AND BLACK, MEDIUM STIFF, MOIST, SILTY CLAY WITH TRACE OF GRAVEL, ORGANICS AND FINE SAND (A-7-6)

MOIST, SILTY CLAY AND AND GRAVEL (A-6, A-7-6)

CLAY WITH TRACE OF ORGANICS (A-6, A-7-6)

FINE SAND (A-2-6)

SANDY SILT (A-4)

AR
CAVED DRY
@ 7.5'
03/17

BT

HARD, SLIGHT TO VERY SLIGHTLY WEATHERED, GRAY TO DARK GRAY (META-GRANODIORITE) WITH CLOSE FRACTURE SPACING
GSI = 45-50

TYPICAL SKEW ANGLE 94°49' 23"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS PROJECTED ON TO THE CROSS SECTION GROUND LINE TAKEN FROM PROVIDED TIN FILE: p5705b ls tin.tin (DATED 01/12/2017)

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0 10 20
FEET
VE = 1:1

CROSS SECTION THROUGH BENT 2 AT STA. 15+92 -S1-

℄

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35

730 720 710 700 690 680 670 660

B2-A
15+95
29' LT

B2-B
15+91
15' RT

CONCRETE SLAB

EXISTING GROUND

ARTIFICIAL FILL, MOIST, SILTY

4 5 4 4

RED-TAN, RED AND BROWN, CLAY WITH TRACE OF ORGANICS,

7

15 4 6 4

MEDIUM STIFF TO STIFF, GRAVEL AND BRICK FRAGMENTS (A-7-6)

ALLUVIAL, TAN, VERY LOOSE, WET, SILTY FINE SAND (A-2-4)

WOH

ALLUVIAL, GRAY AND TAN, SOFT, WET, FINE SANDY SILT (A-4)

3

03/17

RESIDUAL, RED-GRAY, TAN AND GRAY, STIFF TO VERY STIFF, MOIST,

14

03/17

11

(A) 95

SILTY CLAY (A-7-6)

27

WEATHERED ROCK

100/0.8

100/0.9

(META-GRANODIORITE)

RESIDUAL, RED-GRAY, AND BROWN-TAN, HARD, MOIST, FINE SANDY SILT WITH TRACE OF MANGANESE (A-4)

95

70

67

48

WEATHERED ROCK (META-GRANODIORITE)

100/0.8

100/0.8

60/0.0

60/0.0

60/0.

AR

BT

CRYSTALLINE ROCK (META-GRANODIORITE)

HARD TO VERY HARD, SLIGHT TO VERY SLIGHTLY WEATHERED, GRAY, WHITE AND PINK (GRANITIC ROCK) AND DARK GRAY (META-GRANODIORITE) WITH VERY CLOSE TO CLOSE FRACTURE SPACING GSI = 45-50

CRYSTALLINE ROCK (GRANITIC)

CRYSTALLINE ROCK (META-GRANODIORITE)

CRYSTALLINE ROCK (GRANITIC)

CRYSTALLINE ROCK (META-GRANODIORITE)

CRYSTALLINE ROCK (GRANITIC)

TYPICAL SKEW ANGLE 94°49' 23"

(A) RESIDUAL, BROWN-TAN, HARD, MOIST, FINE SANDY SILT (A-4)

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS PROJECTED ON TO THE CROSS SECTION GROUND LINE TAKEN FROM PROVIDED TIN FILE: p5705b ls tin.tin (DATED 01/12/2017)

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0 10 20
FEET
VE = 1:1

CROSS SECTION THROUGH END BENT 2 AT STA. 16+32 –S1–

℄

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35

740 730 720 710 700 690 680 670 660

EXISTING GROUND

EB2-A
16+36
31' LT

CONCRETE SLAB

EB2-B
16+31
22' RT

RAILROAD BALLAST, CRUSHED STONE

6 12 3 3 4 — ARTIFICIAL FILL, RED, TAN AND RED-BROWN, SOFT TO STIFF, MOIST, GRAVEL, GLASS, ORGANICS AND CHARRED WOOD WITH TRACE OF

17 5 4 6 8 — SILTY CLAY FRAGMENTS (A-7-6)

2 — ALLUVIAL, TAN-GRAY, VERY CLAYEY FINE SAND (A-2-6)

8 — RESIDUAL, LOOSE, WET, BROWN, GRAY AND TAN-GRAY, STIFF TO

17 — 03/17 VERY STIFF, FINE SANDY CLAY (A-6)

39 71 49 — BROWN, TAN AND GRAY, HARD, MOIST, FINE SANDY SILT WITH TRACE OF MANGANESE (A-4)

43 68 100 100/0.7 100/0.7 100/0.5 — WEATHERED ROCK

100/0.8 100/0.8 100/0.8 — (META-GRANODIORITE)

BT
CAVED DRY
@ 14.3'
03/17

BT

TYPICAL SKEW ANGLE 94°49' 23"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS PROJECTED ON TO THE CROSS SECTION GROUND LINE TAKEN FROM PROVIDED TIN FILE: p5705b ls tin.tin (DATED 01/12/2017)

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** RIGGS, A. F.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - WEST 6TH STREET BRIDGE ON -S1-			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 14+55	**OFFSET** 30 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 709.8 ft	**TOTAL DEPTH** 28.6 ft	**NORTHING** 544,995	**EASTING** 1,448,752	**24 HR.** 4.9
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017	DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/15/17	**COMP. DATE** 03/15/17	**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)
710										709.8 GROUND SURFACE	0.0
	708.8	1.0	3	2	2	4		M		**ARTIFICIAL FILL** RED, TAN AND BLACK, SILTY CLAY WITH TRACE OF ORGANICS, GRAVEL AND WOOD FRAGMENTS	
705	703.9	5.9	3	1	2	3		M			
	701.9	7.9	3	3	4	7		M		699.8 **RESIDUAL** RED-TAN AND GRAY, FINE SANDY CLAY	10.0
700	697.5	12.3	5	8	15	23	SS-9	45%			
695	692.5	17.3	100/0.4			100/0.4				692.5 **WEATHERED ROCK** (META-GRANODIORITE)	17.3
690	687.5	22.3	100/0.2			100/0.2					
685	682.5	27.3	33	55	45/0.3	100/0.8				681.2 Boring Terminated at Elevation 681.2 ft IN WEATHERED ROCK (META-GRANODIORITE)	28.6

NCDOT BORE SINGLE P5705B_GEO_BRDG1_6TH ST.GPJ NC_DOT.GDT 8/2/17

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** RIGGS, A. F.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - WEST 6TH STREET BRIDGE ON -S1-			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 14+52	**OFFSET** 15 ft RT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 722.4 ft	**TOTAL DEPTH** 29.9 ft	**NORTHING** 545,025	**EASTING** 1,448,718	**24 HR.** 17.0
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017	DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/16/17	**COMP. DATE** 03/16/17	**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)
725										722.4 GROUND SURFACE	0.0
	721.4	1.0	2	3	2	5		M		**RAILROAD EMBANKMENT** RED, BLACK AND BROWN, SILTY CLAY WITH TRACE OF ORGANICS, GRAVEL AND CHARRED WOOD FRAGMENTS	
720	719.5	2.9	2	2	3	5		M			
	716.5	5.9	2	3	2	5		M			
715	714.3	8.1	1	2	2	4		M			
710	709.3	13.1	3	5	4	9		M		711.4 **ARTIFICIAL FILL** RED-TAN AND ORANGE, FINE SANDY CLAY	11.0
705	704.3	18.1	5	5	6	11		W			
700	699.3	23.1	WOH	WOH	WOH	0	SS-10	20%		700.4 **ALLUVIAL** GRAY-TAN, FINE SANDY SILT	22.0
695	694.3	28.1	20	80/0.2						695.4	27.0
	692.5	29.9	60/0.0			100/0.7 60/0.0		W		693.8 **RESIDUAL** TAN-BROWN, FINE SANDY CLAY WITH TRACE OF ROCK FRAGMENTS	28.6
										692.5 **WEATHERED ROCK** (META-GRANODIORITE) Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 692.5 ft ON CRYSTALLINE ROCK (META-GRANODIORITE)	29.9

NCDOT BORE SINGLE P5705B_GEO_BRDG1_6TH ST.GPJ NC_DOT.GDT 8/2/17

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** RIGGS, A. F.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - WEST 6TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 14+84	**OFFSET** 32 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 706.6 ft	**TOTAL DEPTH** 46.0 ft	**NORTHING** 544,971	**EASTING** 1,448,735	**24 HR.** 6.5
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Wash Boring w/ Core	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/16/17	**COMP. DATE** 03/16/17	**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)
710										706.6 GROUND SURFACE	0.0
705	705.6	1.0	3	2	4	6		M		**ARTIFICIAL FILL** RED, TAN, GRAY AND BLACK, SILTY CLAY WITH TRACE OF ORGANICS, BRICK FRAGMENTS AND GRAVEL	
	703.8	2.8	2	4	3	7		M			
700	700.6	6.0	1	1	2	3				699.1	7.5
	698.6	8.0	WOH	WOH	WOH	0	SS-11	31%		**ALLUVIAL** BLUE-GRAY, FINE SANDY CLAY	
695	693.6	13.0	5	5	8	13		M		694.1 **RESIDUAL** TAN-GRAY AND BROWN, FINE SANDY SILT	12.5
690	688.6	18.0	13	16	17	33		M			
685	683.6	23.0	100/0.3			100/0.3				683.6 **WEATHERED ROCK** (META-GRANODIORITE)	23.0
680	678.6	28.0	60/0.1			60/0.1				678.6 **CRYSTALLINE ROCK** WITH WEATHERED ROCK LENSES (META-GRANODIORITE)	28.0
675	673.6	33.0	60/0.1			60/0.1					
670	668.6	38.0	60/0.0			60/0.0				668.6 **CRYSTALLINE ROCK** (META-GRANODIORITE)	38.0
665	660.6	46.0								660.6 Boring Terminated at Elevation 660.6 ft IN CRYSTALLINE ROCK (META-GRANODIORITE) 1) Advanced 2-15/16 Tricone to 38.0' 2) Advanced H Casing to 23.4', Total 25.4' 3) Potable Water Used for Drilling Fluid 4) Advanced HQ3 Core From 38.0' to 46.0'	46.0

NCDOT BORE SINGLE P5705B_GEO_BRDG1_6TH ST.GPJ NC_DOT.GDT 8/2/17

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** RIGGS, A. F.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - WEST 6TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 14+84	**OFFSET** 32 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 706.6 ft	**TOTAL DEPTH** 46.0 ft	**NORTHING** 544,971	**EASTING** 1,448,735	**24 HR.** 6.5
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Wash Boring w/ Core	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/16/17	**COMP. DATE** 03/16/17	**SURFACE WATER DEPTH** N/A	
CORE SIZE HQ3	**TOTAL RUN** 8.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
668.6											Begin Coring @ 38.0 ft	
	668.6	38.0	3.0	1:57/1.0 1:43/1.0 1:38/1.0	(3.0) 100%	(0.4) 13%		(8.0) 100%	(1.2) 15%		668.6 **CRYSTALLINE ROCK** HARD, SLIGHT TO VERY SLIGHTLY WEATHERED, GRAY TO DARK GRAY (META-GRANODIORITE) CLOSE FRACTURE SPACING WITH 9 JOINTS @15-30º, 9@ 30-45º, 4@ 45-60º, 5@ 60-75º AND 3@ 75-90º GSI=45-50	38.0
665	665.6	41.0	5.0	1:40/1.0 2:03/1.0 1:55/1.0 2:01/1.0 1:57/1.0	(5.0) 100%	(0.8) 16%					660.6 Boring Terminated at Elevation 660.6 ft IN CRYSTALLINE ROCK (META-GRANODIORITE) 1) Advanced 2-15/16 Tricone to 38.0' 2) Advanced H Casing to 23.4', Total 25.4' 3) Potable Water Used for Drilling Fluid 4) Advanced HQ3 Core From 38.0' to 46.0'	46.0
	660.6	46.0										

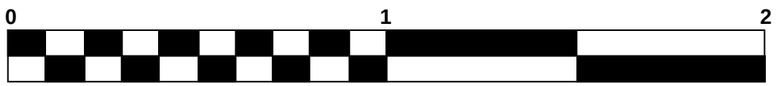
NCDOT CORE SINGLE P5705B_GEO_BRDG1_6TH ST.GPJ NC_DOT.GDT 8/2/17

Project No. 44475 (P-5705B)
CHARLOTTE GATEWAY STATION-6TH STREET BRIDGE

CORE PHOTOGRAPHS

B1-A

BOX 1: 38.0-46.0 FEET



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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** RIGGS, A. F.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - WEST 6TH STREET BRIDGE ON -S1-			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 14+83	**OFFSET** 20 ft RT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 722.3 ft	**TOTAL DEPTH** 41.0 ft	**NORTHING** 545,004	**EASTING** 1,448,695	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017	DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/17/17	**COMP. DATE** 03/17/17	**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)
725										722.3 GROUND SURFACE	0.0
	721.3	1.0				8		M		**RAILROAD EMBANKMENT** RED, TAN AND BLACK, SILTY CLAY WITH TRACE OF GRAVEL, ORGANICS AND FINE SAND	
720	719.0	3.3	5	4	4						
	716.4	5.9	3	2	3	5		M			
715	714.3	8.0	2	3	4	7		M			
			4	4	4	8		M			
710	709.3	13.0									
			2	3	4	7		M		706.3 **ARTIFICIAL FILL** RED-ORANGE, FINE SANDY CLAY	16.0
705	704.3	18.0									
			3	3	4	7	SS-12	19%		701.3 **ALLUVIAL** BLUE-GRAY, SILTY CLAY WITH TRACE ORGANICS	21.0
700	699.3	23.0								698.8 GRAY-TAN, CLAYEY FINE SAND	23.5
			2	2	4	6		W			
695	694.3	28.0									
			1	1	2	3		Sat.		692.3 **RESIDUAL** BROWN, TAN AND GRAY, FINE SANDY SILT	30.0
690	689.3	33.0									
			40	47	37	84		M			
685	684.3	38.0									
			35	65/0.3		100/0.8				683.8 **WEATHERED ROCK** (META-GRANODIORITE)	38.5
	681.3	41.0	60/0.0			60/0.0				681.3 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 681.3 ft ON CRYSTALLINE ROCK (META-GRANODIORITE)	41.0

24 Hr. Water Level Caved Dry at 7.5'

NCDOT BORE SINGLE P5705B_GEO_BRDG1_6TH ST.GPJ NC_DOT.GDT 8/2/17

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** RIGGS, A. F.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - WEST 6TH STREET BRIDGE ON -S1-			**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 15+95	**OFFSET** 29 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 721.3 ft	**TOTAL DEPTH** 52.8 ft	**NORTHING** 544,886	**EASTING** 1,448,665	**24 HR.** 24.4
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017	DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/13/17	**COMP. DATE** 03/14/17	**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)
725										721.3 GROUND SURFACE	0.0
										720.8 **CONCRETE SLAB**	0.5
720	720.3	1.0								**ARTIFICIAL FILL** RED-TAN, SILTY CLAY WITH TRACE OF ORGANICS, GRAVEL AND BRICK FRAGMENTS	
			2	2	2	4		M			
	717.4	3.9	2	2	3	5		M			
715	715.3	6.0	2	2	2	4		M			
	713.6	7.7	2	2	2	4		M			
710											
	708.6	12.7	2	2	5	7		M			
705	703.6	17.7								704.3 **ALLUVIAL** TAN, SILTY FINE SAND	17.0
			1	1	WOH	1		W			
700	698.6	22.7								700.3 **RESIDUAL** RED-GRAY AND TAN, SILTY CLAY	21.0
			4	6	8	14	SS-13	25%			
695	693.6	27.7								694.8 BROWN-TAN, FINE SANDY SILT	26.5
			20	34	61	95		M		692.6 **WEATHERED ROCK** (META-GRANODIORITE)	28.7
690	688.6	32.7									
			59	41/0.3		100/0.8					
685	683.6	37.7								685.3 **RESIDUAL** BROWN-TAN, FINE SANDY SILT	36.0
			22	36	59	95		M		682.6 **WEATHERED ROCK** (META-GRANODIORITE)	38.7
680	678.6	42.7									
			43	57/0.3		100/0.8					
675	673.6	47.7									
			18	38	62/0.3	100/0.8					
670	668.6	52.7	60/0.1			60/0.1				668.6 **CRYSTALLINE ROCK** (META-GRANODIORITE)	52.7
										668.5 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 668.5 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)	52.8

NCDOT BORE SINGLE P5705B_GEO_BRDG1_6TH ST.GPJ NC_DOT.GDT 8/2/17

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Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - WEST 6TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 15+91	**OFFSET** 15 ft RT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 721.8 ft	**TOTAL DEPTH** 68.0 ft	**NORTHING** 544,916	**EASTING** 1,448,632	**24 HR.** 20.6
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Wash Boring w/ Core	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/09/17	**COMP. DATE** 03/10/17	**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)
725										721.8 GROUND SURFACE	0.0
	720.8	1.0	4	8	7	15		M		**ARTIFICIAL FILL** RED AND BROWN, SILTY CLAY	
720	716.3	5.5	3	2	2	4		M			
715	714.5	7.3	3	3	3	6		M			
710	709.5	12.3	2	2	2	4	SS-14	32%			
705	704.5	17.3	2	1	2	3		W		704.3	17.5
										ALLUVIAL GRAY AND TAN, FINE SANDY SILT	
700	699.5	22.3	5	6	5	11		M		701.8 **RESIDUAL** GRAY AND TAN, SILTY CLAY	20.0
695	694.5	27.3	9	13	14	27		M			
690	689.5	32.3	25	65	35/0.4	100/0.9				689.0 **WEATHERED ROCK** (META-GRANODIORITE)	32.8
685	684.5	37.3	23	37	33	70		M		684.8 **RESIDUAL** GRAY AND TAN, FINE SANDY SILT WITH TRACE OF MANGANESE	37.0
680	679.5	42.3	20	28	39	67		M			
675	674.5	47.3	26	26	22	48		M			
670	669.5	52.3								669.8	52.0
	668.8	53.0	60/0.0			60/0.0				668.8 **CRYSTALLINE ROCK** (GRANITIC ROCK)	53.0
			60/0.0			60/0.0				**CRYSTALLINE ROCK** (GRANITIC ROCK)	
665										662.8 (META-GRANODIORITE)	59.0
										661.2 (GRANITIC ROCK)	60.6
660										659.2 (META-GRANODIORITE)	62.6
655										655.3 (GRANITIC ROCK)	66.5
										653.8	68.0

Boring Terminated at Elevation 653.8 ft IN CRYSTALLINE ROCK (GRANITIC)

1) Advanced 2-15/16 Tricone to 53.0'
2) Advanced H Casing to 51.3', Total 52.0'
3) Potable Water Used for Drilling Fluid
4) Advanced HQ3 Core From 53.0' to 68.0'

NCDOT BORE SINGLE P5705B_GEO_BRDG1_6TH ST.GPJ NC_DOT.GDT 8/2/17

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - WEST 6TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 15+91	**OFFSET** 15 ft RT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 721.8 ft	**TOTAL DEPTH** 68.0 ft	**NORTHING** 544,916	**EASTING** 1,448,632	**24 HR.** 20.6
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Wash Boring w/ Core	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/09/17	**COMP. DATE** 03/10/17	**SURFACE WATER DEPTH** N/A	
CORE SIZE HQ3	**TOTAL RUN** 15.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
668.8											Begin Coring @ 53.0 ft	
	668.8	53.0	5.0	4:15/1.0 4:11/1.0 4:25/1.0 3:05/1.0 3:40/1.0	(3.9) 78%	(1.6) 32%		(4.9) 82%	(1.6) 27%		668.8 **CRYSTALLINE ROCK** HARD TO V. HARD, SLI. TO V. SLI. WEATHERED, GRAY AND WHITE (GRANITIC ROCK), CLOSE FRACTURE SPACING WITH JOINTS 15º-60º TO NEAR VERTICAL GSI=45-50	53.0
665	663.8	58.0	5.0	3:30/1.0 2:55/1.0 4:40/1.0 5:50/1.0 3:40/1.0	(5.0) 100%	(1.4) 28%		(1.6) 100%	(0.4) 25%		662.8 HARD, SLI. WEATHERED, DARK GRAY (META-GRANODIORITE) V. CLOSE TO CLOSE FRACTURE SPACING WITH JOINTS 20º-60º GSI=45-50	59.0
660	658.8	63.0	5.0	2:55/1.0 3:17/1.0 3:14/1.0 2:47/1.0 3:40/1.0	(5.0) 100%	(0.5) 10%		(2.0) 100% (3.9) 100%	(1.0) 50% (0.8) 21%		661.2 659.2 655.3 HARD, SLI. WEATHERED, GRAY AND PINK (GRANITIC ROCK) V. CLOSE TO CLOSE FRACTURE SPACING WITH JOINTS 20º-60º TO NEAR VERTICAL, GSI=45-50	60.6 62.6 66.5
655	653.8	68.0						(1.5) 100%	(0.0) 0%		653.8 HARD TO V. HARD, SLI. WEATHERED, DARK GRAY (META-GRANODIORITE) V. CLOSE TO CLOSE FRACTURE SPACING WITH JOINTS 20º-60º TO NEAR VERTICAL, GSI=45-50 HARD, SLI. WEATHERED, GRAY AND PINK (GRANITIC ROCK) V. CLOSE TO CLOSE FRACTURE SPACING WITH JOINTS 20º-60º TO NEAR VERTICAL, GSI=45-50	68.0

Boring Terminated at Elevation 653.8 ft IN CRYSTALLINE ROCK (GRANITIC)

1) Advanced 2-15/16 Tricone to 53.0'
2) Advanced H Casing to 51.3', Total 52.0'
3) Potable Water Used for Drilling Fluid
4) Advanced HQ3 Core From 53.0' to 68.0'

NCDOT CORE SINGLE P5705B_GEO_BRDG1_6TH ST.GPJ NC_DOT.GDT 8/2/17

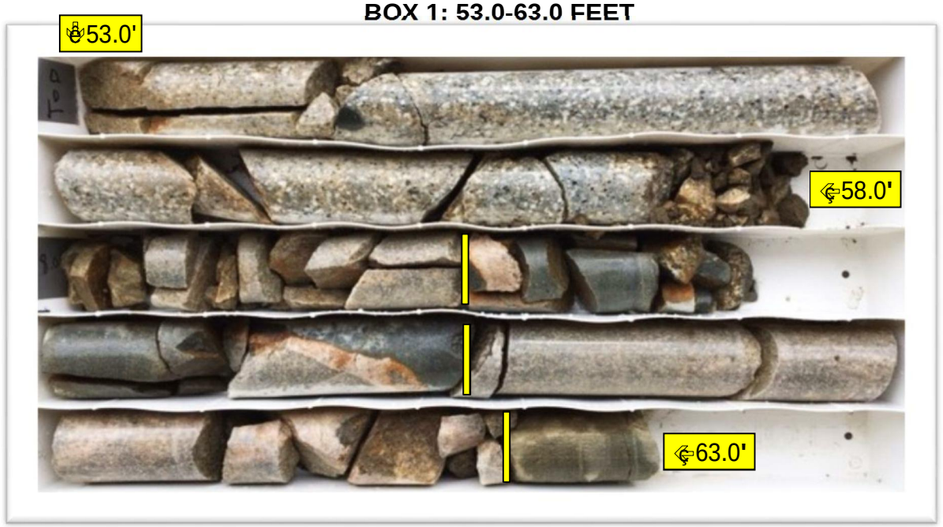
Project No. 44475 (P-5705)

CHARLOTTE GATEWAY STATION-6TH STREET BRIDGE

CORE PHOTOGRAPHS

B2-B

BOX 1: 53.0-63.0 FEET



BOX 2: 63.0-68.0 FEET

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** RIGGS, A. F.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - WEST 6TH STREET BRIDGE ON -S1-			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 16+36	**OFFSET** 31 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 721.6 ft	**TOTAL DEPTH** 53.4 ft	**NORTHING** 544,852	**EASTING** 1,448,641	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017	DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/14/17	**COMP. DATE** 03/15/17	**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)
725											
	720.6	1.0								721.6 GROUND SURFACE	0.0
720	719.1	2.5	2	3	3	6		M		721.1 **CONCRETE SLAB**	0.5
			4	6	6	12		M		**ARTIFICIAL FILL** RED AND TAN, SILTY CLAY WITH TRACE OF GRAVEL, GLASS, ORGANICS AND CHARRED WOOD FRAGMENTS	
	716.6	5.0									
715			1	1	2	3		M			
	713.7	7.9									
			1	2	1	3		M			
710											
	708.7	12.9	2	1	3	4		M			
705											
	703.7	17.9								703.6	18.0
			3	1	1	2		W		**ALLUVIAL** TAN-GRAY, CLAYEY FINE SAND	
700										699.1	22.5
	698.7	22.9	4	4	4	8		M		**RESIDUAL** TAN-GRAY, FINE SANDY CLAY	
695										695.6	26.0
	693.7	27.9	11	18	25	43	SS-15	19%		BROWN, TAN AND GRAY, FINE SANDY SILT	
690											
	688.7	32.9	18	32	36	68		M			
685											
	683.7	37.9	42	52	48	100		M			
680											
	678.7	42.9	25	63	37/0.2	100/0.7				678.2	43.4
675										**WEATHERED ROCK** (META-GRANODIORITE)	
	673.7	47.9	40	60/0.2		100/0.7					
670											
	668.7	52.9	100/0.5			100/0.5				668.2	53.4
										Boring Terminated at Elevation 668.2 ft IN WEATHERED ROCK (META-GRANODIORITE)	

24 Hr. Water Level Caved Dry at 14.3'

NCDOT BORE SINGLE P5705B_GEO_BRDG1_6TH ST.GPJ NC_DOT.GDT 8/2/17

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** RIGGS, A. F.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - WEST 6TH STREET BRIDGE ON -S1-			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 16+31	**OFFSET** 22 ft RT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 722.1 ft	**TOTAL DEPTH** 49.7 ft	**NORTHING** 544,889	**EASTING** 1,448,602	**24 HR.** 18.6
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-51 99% 03/09/2017	DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 03/09/17	**COMP. DATE** 03/09/17	**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)
725											
	721.1	1.0								722.1 GROUND SURFACE	0.0
720	719.2	2.9	3	9	8	17		M		**RAILROAD BALLAST**	
			1	2	3	5		M		720.1 CRUSHED STONE	2.0
	716.4	5.7								**ARTIFICIAL FILL** RED-BROWN, SILTY CLAY WITH TRACE OF ORGANICS	
715			1	2	2	4		M			
	714.2	7.9									
			2	3	3	6		M			
710											
	709.2	12.9	3	3	5	8		M			
705											
	704.2	17.9								706.1	16.0
			4	7	10	17				**RESIDUAL** BROWN AND GRAY, FINE SANDY CLAY	
700										701.1	21.0
	699.2	22.9	10	16	23	39		M		BROWN AND TAN, FINE SANDY SILT WITH TRACE OF MANGANESE	
695											
	693.2	28.9	19	30	41	71		M			
690											
	688.2	33.9	18	17	32	49		M			
685											
	683.2	38.9	51	48	52/0.3	100/0.8				682.2	39.9
680										**WEATHERED ROCK** (META-GRANODIORITE)	
	678.2	43.9	36	52	48/0.3	100/0.8					
675											
	673.2	48.9	50	50/0.3		100/0.8				672.4	49.7
										Boring Terminated at Elevation 672.4 ft IN WEATHERED ROCK (META-GRANODIORITE)	

NCDOT BORE SINGLE P5705B_GEO_BRDG1_6TH ST.GPJ NC_DOT.GDT 8/2/17

LABORATORY TESTING SUMMARY

PROJECT NUMBER: 44475.1.2 **TIP:** P-5705B **COUNTY:** MECKLENBURG

DESCRIPTION: Charlotte Gateway Station and Track and Safety Improvements - West 6th Street Bridge on -S1-

Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic	Ave. Wet Unit Wt. (pcf)	Shear Strength Values			
								Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200				Total Cohesion (psf)	Total Friction (ϕ)	Effective Cohesion (psf)	Effective Friction (ϕ')
SS-9	-S1-	14+55	30 LT	12.3-13.8	A-6 (3)	37	18	28.8	35.2	21.2	14.8	0	100	87	42	44.8	N/D	N/D	N/D	N/D	N/D	N/D
SS-10	-S1-	14+52	15 RT	23.1-24.6	A-4 (0)	16	NP	33.3	25.5	29.2	12.0	0	99	77	47	19.9	N/D	N/D	N/D	N/D	N/D	N/D
SS-11	-S1-	14+84	32 LT	8.0-9.5	A-6 (3)	30	12	30	21.8	26	22.2	3	93	75	49	31	N/D	N/D	N/D	N/D	N/D	N/D
SS-12	-S1-	14+83	20 RT	18.0-19.5	A-6 (4)	32	18	34.0	22.1	16.2	27.7	1	99	80	47	18.5	N/D	N/D	N/D	N/D	N/D	N/D
SS-13	-S1-	15+95	29 LT	22.7-24.2	A-7-6 (12)	45	32	28.8	20.8	14.8	35.6	2	96	79	52	25.4	N/D	N/D	N/D	N/D	N/D	N/D
SS-14	-S1-	15+91	15 RT	12.3-13.8	A-7-6 (19)	49	27	6.8	23.8	17.8	51.6	0	100	96	73	31.7	N/D	N/D	N/D	N/D	N/D	N/D
SS-15	-S1-	16+36	31 LT	27.9-29.4	A-4 (0)	27	6	36.5	29.8	23.4	10.3	0	100	80	39	18.9	N/D	N/D	N/D	N/D	N/D	N/D

N/D - NOT DETERMINED

LABORATORY TESTING OF SHELBY TUBE SAMPLES ST-1 AND ST-2 PERFORMED BY GEOTECHNICS

Stephanie H. Huffman

Certified Lab Technician Signature

114-01-1203

Certification Number

SITE PHOTOGRAPHS
CHARLOTTE GATEWAY STATION AND TRACK IMPROVEMENTS - WEST 6th STREET BRIDGE ON -S1-

PHOTOGRAPH NO. 1: EAST APPROACH TO END BENT NO. 1 ON -S1- ALIGNMENT, LOOKING WEST

PHOTOGRAPH NO. 3: ON WEST 6TH STREET (-Y4-), NORTHWEST OF -S1- ALIGNMENT, LOOKING SOUTHEAST

PHOTOGRAPH NO. 2: ON WEST 6TH STREET (-Y4-), SOUTHEAST OF -S1- ALIGNMENT, LOOKING NORTHWEST

PHOTOGRAPH NO. 4: WEST APPROACH TO END BENT NO.2 ON -S1- ALIGNMENT, LOOKING EAST

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REFERENCE: P-5705B

PROJECT: 44475

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5705B	1	15

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *MECKLENBURG*

PROJECT DESCRIPTION *CHARLOTTE GATEWAY STATION AND TRACK AND SAFETY IMPROVEMENTS*

SITE DESCRIPTION *BRIDGE ON PROPOSED LEAD TRACK OVER P&N CORRIDOR (-A1-) BETWEEN WEST 4TH STREET AND WEST MOREHEAD STREET*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2-2A	LEGEND
3	SITE PLAN
4-7	CROSS SECTIONS
8-12	BORE LOGS, CORE LOG & CORE PHOTOGRAPHS
13-14	SOIL AND CORE TEST RESULTS
15	SITE PHOTOGRAPHS

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. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

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

NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

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DATE *JULY 2017*

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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED 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 THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR 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
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 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 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 ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 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
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES 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 WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

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
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
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:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [X] D-50 (TER373
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [X] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2⅝ " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [X] CORE BIT
- [X] 3¼" HOLLOW STEM AUGER

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N 02

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. 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 "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD 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 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 FOOT
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 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, SUCH 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: BL5: N-542,885; E-1,446,655.71
STATION 24+97.65 -BL- 18" REBAR WITH CAP
ELEVATION: 706.95 FEET

NOTES:
FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

STRUCTURE

- INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities
- BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets
- VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets
- BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity
- DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces
- LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

DECREASING INTERLOCKING OF ROCK PIECES ⇩

SURFACE CONDITIONS

VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Very rough, fresh unweathered surfaces	Rough, slightly weathered, iron stained surfaces	Smooth, moderately weathered and altered surfaces	Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	Slickensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY ⇨

	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
90			N/A	N/A	
80					
70					
60					
50					
40					
30					
20					
10					
	N/A	N/A			

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

COMPOSITION AND STRUCTURE

- **A.** *Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.*
- **B.** *Sandstone with thin interlayers of siltstone*
- **C.** *Sandstone and siltstone in similar amounts*
- **D.** *Siltstone or silty shale with sandstone layers*
- **E.** *Weak siltstone or clayey shale with sandstone layers*
- **C, D, E,** and **G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H.**
- **F.** *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*
- **G.** *Undisturbed silty or clayey shale with or without a few very thin sandstone layers* → **H.** ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***

→ Means deformation after tectonic disturbance

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Very Rough, fresh unweathered surfaces	Rough, slightly weathered surfaces	Smooth, moderately weathered and altered surfaces	Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings

	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
70		A			
60					
50		B	C	D	E
40					
30				F	
20					
10			G	H	

DATE: 8-19-16

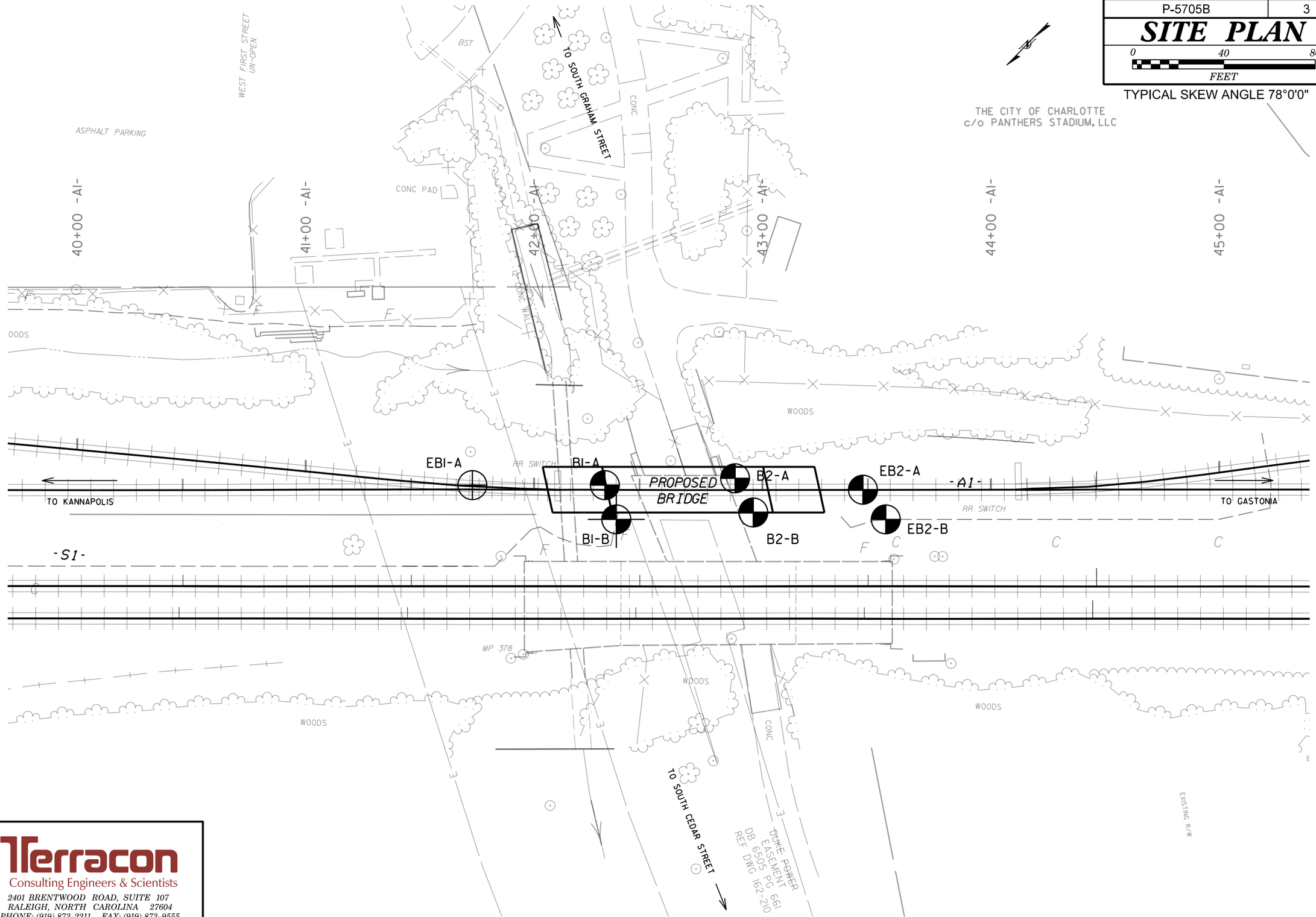
0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	3

SITE PLAN

0 40 80
FEET

TYPICAL SKEW ANGLE 78°0'0"



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NC REGISTERED FIRM: F-0869

0012DEL_P28

CROSS SECTION THROUGH END BENT 1 AT STA. 42+06 –A1–

℄

0 10 20
FEET
VE = 1:1

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	4

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EB1-A
47+73
2' LT

EXISTING GROUND

RAILROAD EMBANKMENT, BLACK AND RED, LOOSE TO MEDIUM DENSE, MOIST, SILTY FINE SAND WITH SOME CINDERS AND ROCK FRAGMENTS (A-2-4)

BLACK AND RED, MEDIUM STIFF, TRACE OF ROCK FRAGMENTS MOIST, FINE SANDY CLAY WITH (A-6)

RESIDUAL, TAN, MEDIUM DENSE, WITH LITTLE ROCK FRAGMENTS MOIST, CLAYEY FINE SAND (A-2-6)

WEATHERED ROCK (META-GRANODIORITE)

CRYSTALLINE ROCK (META-GRANODIORITE)

AR
FIAD
05/17

Ⓐ RAILROAD BALLAST, CRUSHED STONE (A-1-a)

TYPICAL SKEW ANGLE 78°0'0"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

CROSS SECTION THROUGH BENT 1 AT STA. 42+32 –A1–

℄

0 10 20
FEET
VE = 1:1

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	5

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B1-A
43+21
2' LT

B1-B
42+36
13' RT

EXISTING GROUND

(A) 19 4 3 4 4 8

RAILROAD BLACK, VERY FINE TO COARSE SAND

TAN, MEDIUM STIFF, MOIST, FINE SANDY SILT (A-4)

LOOSE TO AND SILTY AND

11 26 4 5 8

EMBANKMENT, MEDIUM DENSE, MOIST, FINE SAND WITH SOME CINDERS ROCK FRAGMENTS (A-1-b, A-2-4)

5 04/17

BLACK AND RED, MEDIUM STIFF, MOIST, FINE SANDY CLAY (A-6)

5 (B)

(META-GRANODIORITE)

WEATHERED 100/0.2 60/0.0 CRYSTALLINE AR

ROCK 100/0.8 60/0.0 FIAD 04/17

ROCK (META-GRANODIORITE)

BT

CRYSTALLINE ROCK, FRESH TO VERY SLIGHTLY WEATHERED, HARD TO VERY HARD, GRAY (META-GRANODIORITE), CLOSE TO MODERATELY CLOSE FRACTURE SPACING

REC = 100%
RQD = 73%
RMR 61-69
GSI 65-76

720 710 700 690 680 670 660 650 640

70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70

(A) RAILROAD BALLAST, CRUSHED STONE (A-1-a)

(B) RESIDUAL, TAN, HARD, MOIST, CLAYEY FINE SAND WITH SOME ROCK FRAGMENTS (A-2-6)

TYPICAL SKEW ANGLE 78°0'0"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

CROSS SECTION THROUGH BENT 2 AT STA. 43+02 –A1–

℄

FEET
VE=1:1

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	6

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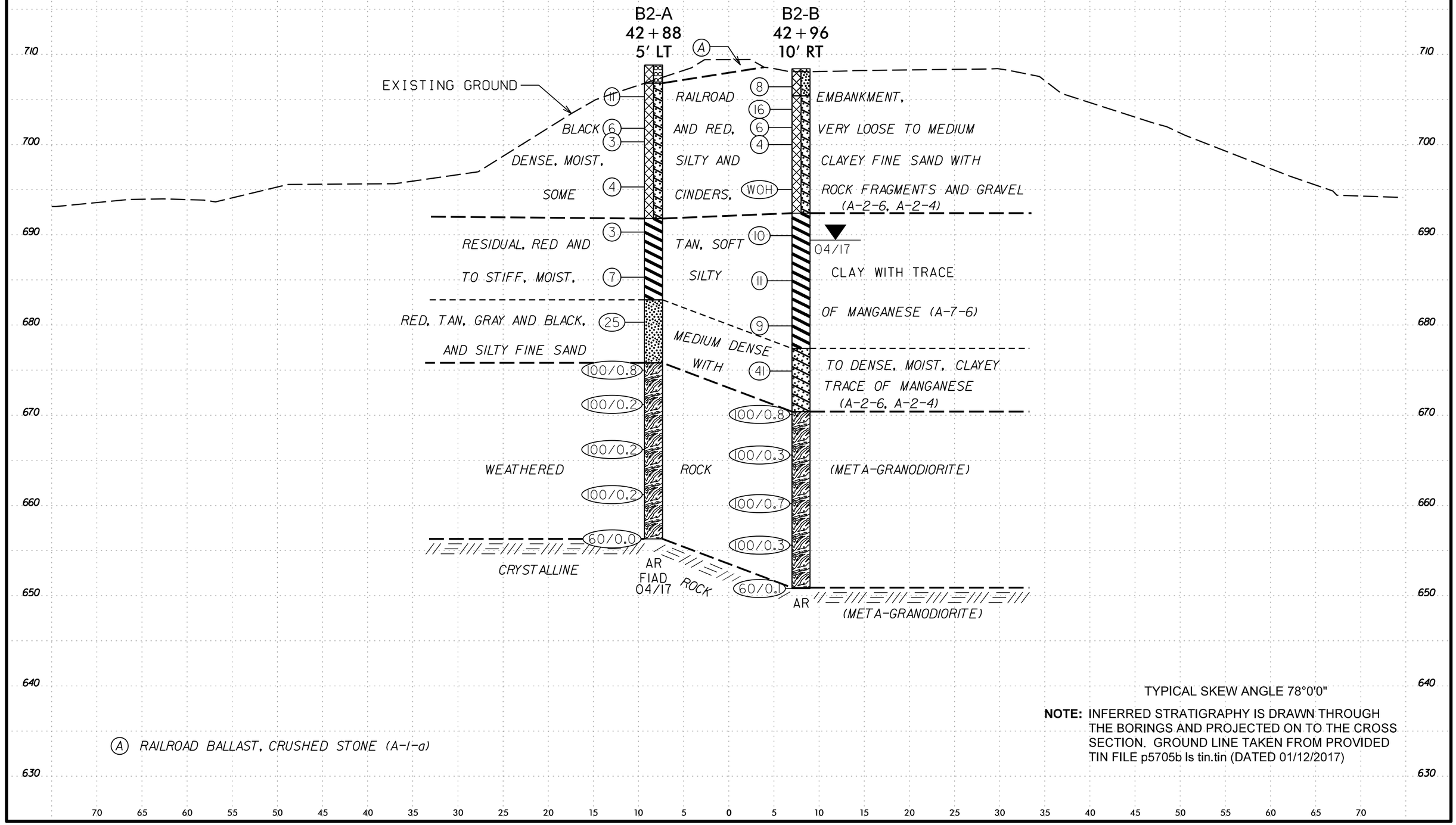

Ⓐ RAILROAD BALLAST, CRUSHED STONE (A-1-a)

TYPICAL SKEW ANGLE 78°0'0"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

CROSS SECTION THROUGH END BENT 2 AT STA. 43+25 –A1–

℄

0 10 20
FEET
VE=1:1

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	7

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EB2-A
43+44
CL

EB2-B
43+54
13' RT

EXISTING GROUND

(A) 19 2 5 — GRAY TO BLACK, SILTY FINE SAND

5 10 8 8 59 100/0.6 60/0.0 — RESIDUAL, TAN, RED STIFF, MOIST, (A-7-6) RED, TAN AND WHITE, SILTY FINE SAND WEATHERED ROCK CRYSTALLINE ROCK (META-GRANODIORITE)

AR
FIAD
04/17

(A) 22 6 8 6 — RAILROAD EMBANKMENT, LOOSE TO MEDIUM DENSE, VERY SOME CINDERS AND ROCK FRAGMENTS (A-2-4) WITH

3 13 9 8 9 100/0.8 100/0.8 100/0.7 — AND WHITE, SOFT TO SILTY CLAY LOOSE TO VERY DENSE, MOIST, SAND (A-2-4) (META-GRANODIORITE)

BT
FIAD
04/17

(A) RAILROAD BALLAST, CRUSHED STONE (A-1-a)

TYPICAL SKEW ANGLE 78°0'0"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

GEOTECHNICAL BORING REPORT
BORE LOG

Terracon Consulting Engineers & Scientists

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - BRIDGE OVER P&N CORRIDOR				**GROUND WTR (ft)**
BORING NO. P&N_EB1-A	**STATION** 41+73	**OFFSET** 2 ft LT	**ALIGNMENT** -A1-	**0 HR.** Caved
COLLAR ELEV. 709.2 ft	**TOTAL DEPTH** 29.8 ft	**NORTHING** 543,074	**EASTING** 1,446,829	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-51 99% 03/09/2017		DRILL METHOD Solid Augers	HAMMER TYPE Automatic	
DRILLER TURNAGE, J.R.	**START DATE** 05/05/17	**COMP. DATE** 05/05/17	**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)
710										709.2 GROUND SURFACE	0.0
										RAILROAD BALLAST CRUSHED STONE 707.2	2.0
705										**RAILROAD EMBANKMENT** BLACK, SILTY FINE SAND WITH SOME CINDERS AND ROCK FRAGMENTS	
700								M			
695										694.2	15.0
690								M		BLACK AND RED, FINE SANDY CLAY WITH TRACE OF ROCK FRAGMENTS	
685										685.2	24.0
								M		**RESIDUAL** TAN, CLAYEY FINE SAND WITH LITTLE ROCK FRAGMENTS	
680										680.7	28.5
										679.4 **WEATHERED ROCK** (META-GRANODIORITE)	29.8

Boring Terminated BY AUGER REFUSAL at Elevation 679.4 ft ON CRYSTALLINE ROCK (META-GRANODIORITE)

0 HR. WATER LEVEL CAVED DRY AT 21.0'

NCDOT BORE SINGLE P5705B_GEO_BRDG_P&N.GPJ NC_DOT.GDT 7/20/17

0012DEL_P28

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - BRIDGE OVER P&N CORRIDOR				**GROUND WTR (ft)**
BORING NO. P&N_B1-A	**STATION** 42+31	**OFFSET** 2 ft LT	**ALIGNMENT** -A1-	**0 HR.** N/A
COLLAR ELEV. 708.9 ft	**TOTAL DEPTH** 28.1 ft	**NORTHING** 543,033	**EASTING** 1,446,789	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-51 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J.R.	**START DATE** 04/25/17	**COMP. DATE** 04/25/17	**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)
710										708.9 GROUND SURFACE	0.0
	706.6	2.3								**RAILROAD BALLAST** CRUSHED STONE 706.9	2.0
705			12	11	8	19		M		**RAILROAD EMBANKMENT** BLACK FINE TO COARSE SAND WITH SOME CINDERS AND ROCK FRAGMENTS	
	703.4	5.5	3	2	2	4		M			
	701.6	7.3	2	1	2	3		M			
700											
	696.6	12.3								696.9	12.0
695			WOH	2	2	4		M		TAN FINE SANDY SILT	
	691.6	17.3	3	2	2						
690						4		M			
	686.6	22.3	2	3	5						
685						8	SS-39	19%			
	681.6	27.3								681.9	27.0
	680.8	28.1	100/0.2			100/0.2				680.8 **WEATHERED ROCK** (META-GRANODIORITE)	28.1
			60/0.0			60/0.0					

Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 680.8 ft ON CRYSTALLINE ROCK (META-GRANODIORITE)

NCDOT BORE SINGLE P5705B_GEO_BRDG_P&N.GPJ NC_DOT.GDT 7/20/17

0012DEL_P28

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - BRIDGE OVER P&N CORRIDOR				**GROUND WTR (ft)**
BORING NO. P&N_B1-B	**STATION** 42+36	**OFFSET** 13 ft RT	**ALIGNMENT** -A1-	**0 HR.** N/A
COLLAR ELEV. 708.3 ft	**TOTAL DEPTH** 45.0 ft	**NORTHING** 543,040	**EASTING** 1,446,774	**24 HR.** 20.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-51 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J.R.	**START DATE** 04/18/17	**COMP. DATE** 04/18/17	**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)
710										708.3 GROUND SURFACE 0.0
	707.3	1.0								**RAILROAD EMBANKMENT**
705	704.6	3.7	5	5	6	11		M		BLACK, SILTY FINE SAND WITH SOME CINDERS AND ROCK FRAGMENTS
	702.6	5.7	10	14	12	26		M		
	701.1	7.2	8	2	2	4		M		
700			3	3	2	5		M		
	696.1	12.2								
695			4	4	4	8		M		
690	690.1	18.2	WOH	3	2	5	SS-40	28%		690.3 18.0 BLACK AND RED, FINE SANDY CLAY WITH TRACE OF ROCK FRAGMENTS
685	685.1	23.2	WOH	2	3	5		M		
680	680.1	28.2	17	16	84/0.3	100/0.8				680.8 27.5 **RESIDUAL**
	677.0	31.3	60/0.0			60/0.0				679.3 29.0 TAN, CLAYEY FINE SAND WITH SOME ROCK FRAGMENTS
675							RS-1			677.0 31.3 **WEATHERED ROCK** (META-GRANODIORITE)
670										**CRYSTALLINE ROCK** (META-GRANODIORITE)
665							RS-2			663.3 45.0
										Boring Terminated at Elevation 663.3 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)

1) Advanced 2-15/16 Tricone to 31.3'
2) Advanced NW Casing to 31.7', Total 33.7'
3) Potable Water Used for Drilling Fluid
4) Advanced NQ2 Core From 31.3' to 45.0'

NCDOT BORE SINGLE P5705B_GEO_BRDG_P&N.GPJ NC_DOT.GDT 7/20/17

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - BRIDGE OVER P&N CORRIDOR				**GROUND WTR (ft)**
BORING NO. P&N_B1-B	**STATION** 42+36	**OFFSET** 13 ft RT	**ALIGNMENT** -A1-	**0 HR.** N/A
COLLAR ELEV. 708.3 ft	**TOTAL DEPTH** 45.0 ft	**NORTHING** 543,040	**EASTING** 1,446,774	**24 HR.** 20.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-51 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J.R.	**START DATE** 04/18/17	**COMP. DATE** 04/18/17	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 13.7 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
677											Begin Coring @ 31.3 ft
675	677.0	31.3	3.7	1:31/0.7 9:02/1.0 6:05/1.0 4:38/1.0	(3.7) 100%	(3.4) 92%		(13.7) 100%	(10.0) 73%		677.0 **CRYSTALLINE ROCK** 31.3
	673.3	35.0					RS-1				FRESH TO VERY SLIGHTLY WEATHERED HARD TO VERY HARD GRAY (META-GRANODIORITE) CLOSE TO MODERATELY CLOSE FRACTURE SPACING WITH 8 JOINTS @ 30°-50° AND 3 JOINTS AT 50°-70° GSI= 65-75 RMR= 61-69
670			5.0	3:17/1.0 3:06/1.0 3:16/1.0 3:06/1.0 3:42/1.0	(5.0) 100%	(2.5) 50%					
	668.3	40.0									
665			5.0	3:29/1.0 3:28/1.0 3:41/1.0 3:30/1.0 3:32/1.0	(5.0) 100%	(4.1) 82%	RS-2				
	663.3	45.0									663.3 45.0 Boring Terminated at Elevation 663.3 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)

1) Advanced 2-15/16 Tricone to 31.3'
2) Advanced NW Casing to 31.7', Total 33.7'
3) Potable Water Used for Drilling Fluid
4) Advanced NQ2 Core From 31.3' to 45.0'

NCDOT CORE SINGLE P5705B_GEO_BRDG_P&N.GPJ NC_DOT.GDT 7/20/17

Project No. 44475 (P-5705B)

CHARLOTTE GATEWAY STATION AND TRACK AND SAFETY IMPROVEMENTS

BRIDGE ON PROPOSED LEAD TRACK OVER P&N CORRIDOR

CORE PHOTOGRAPHS

B1-B

BOX 1: 31.3-38.5 FEET

0 1 2

FEET

BOX 2: 38.5-45.0 FEET

0 1 2

FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - BRIDGE OVER P&N CORRIDOR				**GROUND WTR (ft)**
BORING NO. P&N_B2-A	**STATION** 42+88	**OFFSET** 5 ft LT	**ALIGNMENT** -A1-	**0 HR.** N/A
COLLAR ELEV. 708.8 ft	**TOTAL DEPTH** 52.5 ft	**NORTHING** 542,990	**EASTING** 1,446,751	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-51 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J.R.	**START DATE** 04/13/17	**COMP. DATE** 04/14/17	**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)
710										708.8 GROUND SURFACE	0.0
	706.3	2.5								**RAILROAD BALLAST** CRUSHED STONE	2.0
705			3	4	7	11		M		706.8 **RAILROAD EMBANKMENT** BLACK AND RED, CLAYEY FINE SAND WITH SOME CINDERS AND ROCK FRAGMENTS	
	702.8	6.0	2	3	3	6		M			
	701.3	7.5	2	1	2	3		M			
700											
	696.3	12.5	2	2	2	4		M			
695											
	691.3	17.5	WOH	WOH	3	3	SS-41	37%		691.8 **RESIDUAL** RED AND TAN, SILTY CLAY	17.0
690											
	686.3	22.5	3	3	4	7		M			
685											
	681.3	27.5	7	10	15	25		M		682.8 GRAY TO BLACK, SILTY FINE SAND	26.0
680											
	676.3	32.5	34	52	48/0.3	100/0.8				675.8 **WEATHERED ROCK** (META-GRANODIORITE)	33.0
675											
	671.3	37.5	100/0.2			100/0.2					
670											
	666.3	42.5	100/0.2			100/0.2					
665											
	661.3	47.5	100/0.2			100/0.2					
660											
	656.3	52.5	60/0.0			60/0.0				656.3 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 656.3 ft ON CRYSTALLINE ROCK (META-GRANODIORITE)	52.5

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - BRIDGE OVER P&N CORRIDOR				**GROUND WTR (ft)**
BORING NO. P&N_B2-B	**STATION** 42+96	**OFFSET** 10 ft RT	**ALIGNMENT** -A1-	**0 HR.** N/A
COLLAR ELEV. 708.4 ft	**TOTAL DEPTH** 57.6 ft	**NORTHING** 542,995	**EASTING** 1,446,735	**24 HR.** 19.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-51 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J.R.	**START DATE** 04/12/17	**COMP. DATE** 04/13/17	**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)
710										708.4 GROUND SURFACE	0.0
	707.4	1.0								**RAILROAD EMBANKMENT** BLACK, SILTY FINE SAND WITH SOME CINDERS AND GRAVEL	3.0
705			6	4	4	8		M		705.4 BLACK AND RED, CLAYEY FINE SAND WITH SOME CINDERS AND GRAVEL	
	704.9	3.5	8	9	7	16		M			
	702.9	5.5	3	3	3	6		M			
	701.0	7.4	3	2	2	4		M			
700											
	696.0	12.4	WOH	WOH	WOH	0		M			
695											
	690.9	17.5	4	4	6	10	SS-42	21%		692.4 **RESIDUAL** RED AND TAN, SILTY CLAY WITH TRACE OF MANGANESE	16.0
690											
	685.9	22.5	3	5	6	11	SS-43	31%			
685											
	680.9	27.5	3	5	4	9		M		677.4 RED AND TAN, CLAYEY FINE SAND WITH TRACE OF MANGANESE	31.0
680											
	675.9	32.5	6	17	24	41		M		670.4 **WEATHERED ROCK** (META-GRANODIORITE)	38.0
675											
	670.9	37.5	43	57/0.3		100/0.8					
670											
	665.9	42.5	100/0.3			100/0.3					
665											
	660.9	47.5	80	20/0.2		100/0.7					
660											
	655.9	52.5	100/0.3			100/0.3					
655											
	650.9	57.5	60/0.1			60/0.1				650.9 **CRYSTALLINE ROCK** (META-GRANODIORITE) 650.8 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 650.8 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)	57.5 57.6

GEOTECHNICAL BORING REPORT
BORE LOG

Terracon Consulting Engineers & Scientists

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - BRIDGE OVER P&N CORRIDOR				**GROUND WTR (ft)**
BORING NO. P&N_EB2-A	**STATION** 43+44	**OFFSET** CL	**ALIGNMENT** -A1-	**0 HR.** N/A
COLLAR ELEV. 708.7 ft	**TOTAL DEPTH** 39.4 ft	**NORTHING** 542,953	**EASTING** 1,446,708	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-51 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J.R.	**START DATE** 04/20/17	**COMP. DATE** 04/20/17	**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)
710										708.7 GROUND SURFACE	0.0
	706.4	2.3						M		707.2 **RAILROAD BALLAST** CRUSHED STONE	1.5
705			7	10	9	19		M		**RAILROAD EMBANKMENT** BLACK, SILTY FINE SAND WITH SOME CINDERS AND ROCK FRAGMENTS	
	703.2	5.5	1	1	1	2		M			
	701.4	7.3	1	2	3	5		M		698.7	10.0
700										**RESIDUAL** TAN, RED AND WHITE, SILTY CLAY	
	696.4	12.3	1	2	3	5		M			
695											
	691.4	17.3	3	4	6	10		M			
690											
	686.4	22.3	3	4	4	8		M			
685											
	681.4	27.3	3	3	5	8		M		681.7	27.0
680										TAN AND WHITE, SILTY FINE SAND	
	676.4	32.3	35	34	25	59		M			
675											
	671.4	37.3	91	9/0.1		100/0.6				671.7	37.0
670										**WEATHERED ROCK** (META-GRANODIORITE)	
	669.3	39.4	60/0.0			60/0.0				669.3	39.4
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 669.3 ft ON CRYSTALLINE ROCK (META-GRANODIORITE)	

NCDOT BORE SINGLE P5705B_GEO_BRDG_P&N.GPJ NC_DOT.GDT 7/20/17

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION - BRIDGE OVER P&N CORRIDOR				**GROUND WTR (ft)**
BORING NO. P&N_EB2-B	**STATION** 43+54	**OFFSET** 13 ft RT	**ALIGNMENT** -A1-	**0 HR.** N/A
COLLAR ELEV. 708.5 ft	**TOTAL DEPTH** 49.2 ft	**NORTHING** 542,955	**EASTING** 1,446,692	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-51 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J.R.	**START DATE** 04/14/17	**COMP. DATE** 04/14/17	**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)
710										708.5 GROUND SURFACE	0.0
	707.5	1.0						M		**RAILROAD EMBANKMENT** GRAY TO BLACK, SILTY FINE SAND WITH SOME CINDERS AND ROCK FRAGMENTS	
705	705.0	3.5	10	10	12	22		M		703.5	5.0
	703.0	5.5	5	3	3	6		M		**RESIDUAL** RED AND TAN, SILTY CLAY	
			2	4	4	8		M			
700	700.0	8.5	10	4	2	6		M			
695	695.0	13.5	WOH	WOH	3	3	SS-44	34%			
690	690.0	18.5	4	6	7	13		M			
685	685.0	23.5	3	4	5	9		M		686.0	22.5
680	680.0	28.5	2	3	5	8		M		RED, TAN AND WHITE, SILTY FINE SAND	
675	675.0	33.5	2	4	5	9		M			
670	670.0	38.5	7	37	63/0.3	100/0.8				669.0	39.5
665	665.0	43.5	30	57	43/0.3	100/0.8				**WEATHERED ROCK** (META-GRANODIORITE)	
660	660.0	48.5	86	14/0.2		100/0.7				659.3	49.2
										Boring Terminated at Elevation 659.3 ft IN WEATHERED ROCK (META-GRANODIORITE)	

NCDOT BORE SINGLE P5705B_GEO_BRDG_P&N.GPJ NC_DOT.GDT 7/20/17

LABORATORY TESTING SUMMARY

PROJECT NUMBER: 44475.1.2 **TIP:** P-5705B **COUNTY:** MECKLENBURG

DESCRIPTION: Charlotte Gateway Station and Track and Safety Improvements - Bridge on Proposed Lead Track over P&N Corridor

Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic	Ave. Wet Unit Wt. (pcf)	Shear Strength Values			
								Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200				Total Cohesion (psf)	Total Friction (ϕ)	Effective Cohesion (psf)	Effective Friction (ϕ')
SS-39	-A1-	42+31	2 LT	22.3-23.8	A-4 (1)	30	8	36.0	17.6	26.5	19.9	2	97	70	48	19.2	N/D	N/D	N/D	N/D	N/D	N/D
SS-40	-A1-	42+36	13 RT	18.2-19.7	A-6 (7)	40	18	28.2	18.6	21.2	32.0	1	97	76	55	28.3	N/D	N/D	N/D	N/D	N/D	N/D
SS-41	-A1-	42+88	5 LT	17.5-19.0	A-7-6 (20)	50	27	8.1	22.1	26.5	43.3	1	99	96	74	36.7	N/D	N/D	N/D	N/D	N/D	N/D
SS-42	-A1-	42+96	10 RT	17.5-19.0	A-7-6 (12)	41	22	16.6	20.6	21.6	41.2	0	99	90	65	20.5	N/D	N/D	N/D	N/D	N/D	N/D
SS-43	-A1-	42+96	10 RT	22.5-24.0	A-7-6 (29)	73	46	26.5	10.6	24.5	38.4	0	98	77	65	31.0	N/D	N/D	N/D	N/D	N/D	N/D
SS-44	-A1-	43+54	13 RT	13.5-15.0	A-7-6 (32)	61	36	5.4	15.9	26.6	52.1	0	100	97	83	34.1	N/D	N/D	N/D	N/D	N/D	N/D

N/D - NOT DETERMINED

Stephanie H. Huffman

Certified Lab Technician Signature

114-01-1203

Certification Number

UNCONFINED COMPRESSION
(ASTM D7012 Method C)

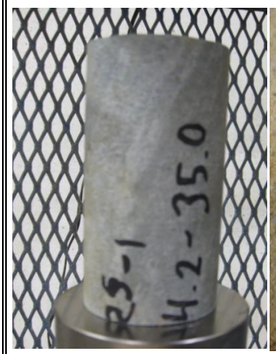
Project: 44475.1.2 Tip No.: P-5705B
Description: Charlotte Gateway Station - Bridge on Proposed Lead Track over P&N Corridor
County: MECKLENBURG, NORTH CAROLINA
F. A. ID No.:

TERRACON Project No.: 70175003
Tested By: SFS (Geotechnics)
Reviewed By: GEM (Geotechnic)
Report Date: JUNE 14, 2017

Boring No.	Sample Id	Depth (ft)	Dimensions, in.		Rock Type	Area (in^2)	Unit Weight (lbs/ft^3)	Loading Rate (lb/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)	Geological Strength Index GSI
			Length	Diameter								
B1-B	RS-1	34.2 - 35.0	4.09	1.99	Biotite Gneiss	3.10	170.8	104	71,310	23,020	0.2	65-75
B1-B	RS-2	41.6 - 42.2	4.07	1.99	Biotite Gneiss	3.10	171.9	127	44,210	14,260	0.2	

NOTES: Effective (as received) unit weight
Loading rates were selected to target reaching failure between 2 and 15 minutes.

ASTM D4543-08 *Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance* Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For these and other rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."



RS-1	B1-B (34.2' - 35.0')
	Comments:

RS-2	B1-B (41.6'- 42.2')
	Comments:

SITE PHOTOGRAPHS
CHARLOTTE GATEWAY STATION AND TRACK IMPROVEMENTS - BRIDGE ON PROPOSED LEAD TRACK -A1- OVER P & N CORRIDOR

PHOTOGRAPH NO. 1: EAST APPROACH TO END BENT NO. 1 ON -A1- ALIGNMENT, LOOKING WEST

PHOTOGRAPH NO. 2: ON TUNNEL WALKWAY, SOUTHEAST OF -A1- ALIGNMENT, LOOKING NORTHWEST

PHOTOGRAPH NO. 3: ON TUNNEL WALKWAY, NORTHWEST OF -A1- ALIGNMENT, LOOKING SOUTHEAST

PHOTOGRAPH NO. 4: WEST APPROACH TO END BENT NO.2 ON -A1- ALIGNMENT, LOOKING EAST

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REFERENCE: P-5705B

PROJECT: 44475

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5705B	1	19

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *MECKLENBURG*

PROJECT DESCRIPTION *CHARLOTTE GATEWAY STATION AND TRACK AND SAFETY IMPROVEMENTS*

SITE DESCRIPTION *BRIDGE ON STATION TRACK 1 (-S1-) OVER WEST TRADE STREET BETWEEN WEST 4TH STREET AND WEST 5TH STREET*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2-2A	SOIL & ROCK, AND GSI LEGEND
3	SITE PLAN
4-8	CROSS SECTIONS
9-17	BORE LOGS, CORE LOGS AND CORE PHOTOGRAPHS
18	SOIL TEST RESULTS
19	SITE PHOTOGRAPHS

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. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

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

PERSONNEL

RIGGS, A. F.	*DUGGINS, W. T.*
WERITZ, M. A.	*J. R. TURNAGE*
WEAVER, L. A.	*EKLUND, M. A.*
SCHLEMM, T. S.	*MASHBURN, S. R.*
McMILLIAN, M. F.	*STUDNICKY, R. T.*
	COGAR, T. E.

INVESTIGATED BY *TERRACON CONSULTANTS*

DRAWN BY *FIELDS, W. D.*

CHECKED BY *RIGGS, A. F.*

SUBMITTED BY *TERRACON CONSULTANTS*

DATE *DECEMBER 2017*

Prepared in the Office of:

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DocuSigned by:
Abner F. Riggs, Jr. 12/18/2017
SIGNATURE DATE
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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED 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 THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR 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
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 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 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 ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 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 SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES 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 WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

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
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
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:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [X] ACKER (TER92-0)
- [X] D-50 (TER373)
- [X] D-50 (TER346)

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2⅝ " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [X] CORE BIT
- [X] DRAG BIT

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [X] -H Q3
- [ ] -N _____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. 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 "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD 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 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 FOOT
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 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, SUCH 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: BM4: N-544,771; E-1,448,453
STATION 51+04.00 - 2' RIGHT CHISELED SQUARE (5TH STREET BRIDGE)
ELEVATION: 738.12 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

PROJECT WAS DRAFTED USING NCDOT PROVIDED TIN FILE
FILE: p5705b_ls_tin (DATED: 01/12/2017)

DATE: 8-15-14

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

SURFACE CONDITIONS

VERY GOOD
Very rough, fresh unweathered surfaces

GOOD
Rough, slightly weathered, iron stained surfaces

FAIR
Smooth, moderately weathered and altered surfaces

POOR
Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments

VERY POOR
Slickensided, highly weathered surfaces with soft clay coatings or fillings

STRUCTURE

INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities

BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets

VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets

BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity

DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces

LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

VERY GOOD - Very Rough, fresh unweathered surfaces

GOOD - Rough, slightly weathered surfaces

FAIR - Smooth, moderately weathered and altered surfaces

POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments

VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings

COMPOSITION AND STRUCTURE

A. *Thick bedded, very blocky sandstone*
The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.

B. *Sandstone with thin interlayers of siltstone*

C. *Sandstone and siltstone in similar amounts*

D. *Siltstone or silty shale with sandstone layers*

E. *Weak siltstone or clayey shale with sandstone layers*

C, D, E, and **G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H.**

F. *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*

G. *Undisturbed silty or clayey shale with or without a few very thin sandstone layers*

H. ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***

—▷ Means deformation after tectonic disturbance

DATE: 8-19-16

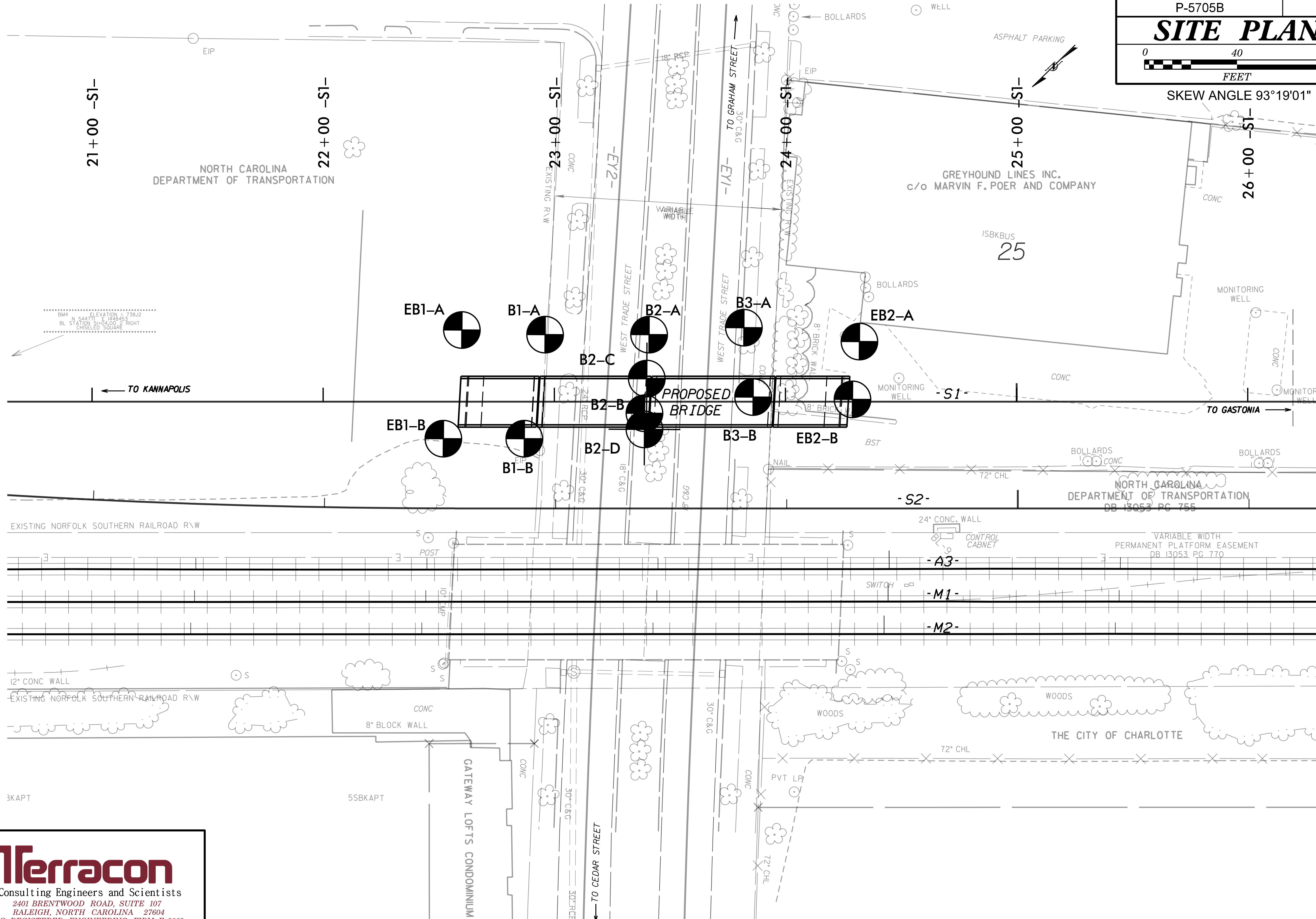
0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	3

SITE PLAN

0 40 80
FEET

SKEW ANGLE 93°19'01"



21+00 -S1-
22+00 -S1-
23+00 -S1-
24+00 -S1-
25+00 -S1-
26+00 -S1-
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
GREYHOUND LINES INC.
c/o MARVIN F. POER AND COMPANY
TO GRAHAM STREET
TO KANNAPOLIS
TO GASTONIA
TO CEDAR STREET
PROPOSED
BRIDGE
EB1-A
B1-A
B2-A
B3-A
EB2-A
B2-C
B2-B
EB1-B
B1-B
B2-D
B3-B
EB2-B
-EY2-
-EY1-
-S1-
-S2-
-A3-
-M1-
-M2-
WEST TRADE STREET
EXISTING R/W
VARIABLE WIDTH
BOLLARDS
WELL
ASPHALT PARKING
EIP
MONITORING WELL
8' BRICK WALL
CONC
BST
NAIL
72" CHL
24" CONC. WALL
CONTROL CABNET
SWITCH
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DB 13053 PG 755
VARIABLE WIDTH
PERMANENT PLATFORM EASEMENT
DB 13053 PG 770
EXISTING NORFOLK SOUTHERN RAILROAD R\W
12" CONC WALL
8" BLOCK WALL
POST
WOODS
THE CITY OF CHARLOTTE
PVT LP
GATEWAY LOFTS CONDOMINIUM
30" C&G
18" C&G
24" RCP
18" RCP
30" RCP
ISBKBUS
25
3KAPT
5SBKAPT

Terracon

Consulting Engineers and Scientists

2401 BRENTWOOD ROAD, SUITE 107
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NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	4

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NC REGISTERED GEOLOGIC FIRM: C-367

0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH END BENT 1 AT STA. 22+59 –S1–

℄

EB1-A
22+60
31' LT

EB1-B
22+52
16' RT

EXISTING GROUND

ARTIFICIAL FILL, RED TO BROWN, STIFF, MOIST, FINE SANDY CLAY (A-6)

RESIDUAL, TAN AND WHITE, MEDIUM STIFF TO HARD, MOIST, FINE SANDY SILT AND CLAYEY SILT WITH TRACE TO SOME MANGANESE AND TRACE OF MICA (A-4, A-5)

WEATHERED ROCK (META-GRANODIORITE)

EB1-A		EB1-B	
19		10	
24		6	
13		14	
19		11	
15		27	
12	03/17	7	03/17
26		20	
24		35	
29		60	
25		31	
71		100/0.9	
100/0.9		100/0.2	
100/0.8		100/0.9	
100/0.9		100/0.9	
100/0.4	BT	BT	

740 730 720 710 700 690 680 670 660

85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

TYPICAL SKEW ANGLE 93°19'01"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	5

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RALEIGH, NORTH CAROLINA 27604
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367

0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH BENT 1 AT STA. 22+93 –S1–

B1-A
22+96
29' LT

℄

B1-B
22+87
16' RT

EXISTING GROUND

730 720 710 700 690 680 670 660 650 640

85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65

Ⓐ RESIDUAL, TAN AND ORANGE, CLAY WITH TRACE OF MANGANESE
15 10 15 9 13 25 21 16 20 42 52 100/0.7 100/0.9 100/0.2 100/0.2 60/0.1

Ⓑ STIFF, MOIST, FINE SANDY
18 19 17 16 9 16 32 26 36 64 44 85 100/0.9 100/0.2 100/0.2 100/0.3 60/0.1

RESIDUAL, TAN, ORANGE AND WHITE, LOOSE TO VERY DENSE, MOIST, CLAYEY FINE SAND AND SILTY FINE SAND WITH TRACE OF MANGANESE (A-2-4, A-2-6)

03/17

TAN AND ORANGE, STIFF, MOIST, SILTY CLAY (A-7-6)

VERY STIFF TO HARD, MOIST, FINE SANDY SILT WITH SOME MANGANESE

TAN, ORANGE AND WHITE, AND TRACE OF ROCK FRAGMENTS (A-4)

WEATHERED ROCK (META-GRANODIORITE)

CRYSTALLINE ROCK (META-GRANODIORITE)

AR

AR
CAVED DRY
@ 19'
03/17

Ⓐ ARTIFICIAL FILL, GRAY, MEDIUM DENSE, MOIST, SILTY FINE SAND WITH SOME ROCK FRAGMENTS (A-2-4)

Ⓑ ARTIFICIAL FILL, RED TO BROWN, VERY STIFF, MOIST, FINE SANDY CLAY (A-6)

TYPICAL SKEW ANGLE 93°19'01"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	6

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Consulting Engineers and Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367

0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH BENT 2 AT STA. 23+41 –S1–

℄

B2-A 23+41 29' LT
B2-C 23+40 10' LT
B2-B 23+39 5' RT
B2-D 23+39 12' RT

EXISTING GROUND

ARTIFICIAL FILL, RED-BROWN, BROWN AND GRAY, MOIST, SILTY CLAY, TRACE GRAVEL (A-7-6)

RESIDUAL, LIGHT GRAY, BROWN, RED, TAN AND WHITE, STIFF TO HARD, MOIST, CLAYEY SILT AND FINE SANDY SILT (A-5, A-4)

ARTIFICIAL FILL, BROWN AND LIGHT GRAY, STIFF, MOIST, FINE SILTY CLAY (A-7-6)

BROWN, VERY STIFF TO HARD, MOIST, SILTY CLAY (A-7-6)

WEATHERED ROCK (META-GRANODIORITE)

WEATHERED ROCK (DIABASE)

RESIDUAL, BROWN AND WHITE, MOIST, FINE SANDY SILT (A-4)

CRYSTALLINE ROCK (META-GRANODIORITE)

CRYSTALLNE ROCK, WHITE AND GREEN, MODERATELY SEVERE HARD, CLOSELY META-GRANODIORITE, DIABASE DIKE
REC=99%, RQD=60%, GSI=45-50

BROWN, MODERATE TO WEATHTHERED, FRACTURED, INTESECTING VERTICAL ROCK

CRYSTALLINE ROCK, BROWN AND GREEN-BLACK, MODERATELY SEVERE TO SLIGHTLY WEATHERED, MEDIUM HARD TO HARD, CLOSELY FRACTURED, OLIVINE, DIABASE
REC=71%
RQD=46%
GSI=45-50

AR — BT — AR — AR

CAVED DRY @ 15.5'

TYPICAL SKEW ANGLE 93°19'01"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

Ⓒ ARTIFICIAL FILL, BLACK AND GRAY, MEDIUM DENSE, MOIST, SILTY FINE SAND, SOME GRAVEL (A-2-4)

Ⓓ WEATHERED ROCK (DIABASE)

Ⓔ RESIDUAL, BROWN, LIGHT BROWN AND ORANGE, MEDIUM DENSE, MOIST, SILTY FINE TO COARSE SAND (A-2-4)

Ⓕ CRYSTALLINE ROCK, BROWN WHITE AND BLACK, MODERATE TO MODERATELY SEVERE WEATHERING, MODERATELY HARD TO HARD, CLOSELY FRACTURED, META-GRANODIORITE REC=81%, RQD=78%, GSI=45-50

Ⓖ CRYSTALLINE ROCK, GREEN AND BLACK, MODERATELY SEVERE, HARD, CLOSELY FRACTURED, OLIVINE DIABASE WITH QUARTZ VEINS REC=100%, RQD=0, GSI=45-50

Ⓗ CRYSTALLINE ROCK, BROWN AND GREEN-BLACK, MODERATELY SEVERE WEATHERING, SOFT, CLOSELY FRACTURED OLIVINE, DIABASE REC=100%, RQD=0, GSI=45-50

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CROSS SECTION THROUGH BENT 3 AT STA. 23+95 -S1-

0 10 20
FEET
VE-1:1

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	7

Terracon
Consulting Engineers and Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367

B3-A
23+82
32' LT

B3-B
23+86
2' LT

℄

EXISTING GROUND

(1) 10 10 16 15 13 13 19 99 100/0.9 71 60 87 100/0.9 55 46 100/0.2 100/0.2 100/0.4 100/0.3

(1) 12 11 11 13 22 22 47 47 27 32 25 34 47 46 100/0.9 38 (J) 100/0.3 60/0.0

ARTIFICIAL FILL, RED AND BLACK, STIFF, MOIST, FINE SANDY CLAY WITH TRACE OF ROCK FRAGMENTS (A-6)

RESIDUAL, TAN, ORANGE AND TAN, WHITE AND ORANGE, STIFF TO HARD, MOIST, SILTY CLAY AND FINE SANDY CLAY (A-7-6, A-6)

WHITE, MEDIUM DENSE TO VERY DENSE, MOIST, CLAYEY FINE SAND

03/17

WEATHERED ROCK (META-GRANODIORITE)

AND SILTY FINE SAND WITH TRACE OF MANGANESE (A-2-6, A-2-4)

WEATHERED ROCK (META-GRANODIORITE)

WEATHERED ROCK (META-GRANODIORITE)

CRYSTALLINE ROCK (META-GRANODIORITE)

BT
FIAD
03/17

AR

(1) ARTIFICIAL FILL, RED TO BROWN, LOOSE, MOIST, CLAYEY, FINE SAND WITH TRACE OF ROCK FRAGMENTS (A-2-6)

(J) RESIDUAL, TAN AND WHITE, DENSE, MOIST, SILTY FINE SAND (A-2-4)

TYPICAL SKEW ANGLE 93°19'01"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	8

Terracon
Consulting Engineers and Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367

0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH END BENT 2 AT STA. 24+29 -S1-

℄

EB2-A
24+32
26' LT

EB2-B
24+29
1' LT

EXISTING GROUND

ARTIFICIAL FILL, TO DENSE, MOIST, TO COARSE SAND WITH SOME GRAVEL (A-1-B, A-2-4)

GRAY, VERY LOOSE SILTY FINE TRACE TO

RESIDUAL, RED-BROWN, STIFF, MOIST, SILTY CLAY (A-7-6)

RESIDUAL, BROWN AND WHITE MEDIUM STIFF TO HARD, MOIST, CLAYEY SILT AND FINE

03/17

SANDY SILT (A-5, A-4)

DENSE, SILTY FINE SAND (A-2-4)

BROWN AND WHITE, DENSE TO VERY

(META-GRANODIORITE)

WEATHERED ROCK

RESIDUAL, BROWN, WHITE AND GRAY-BROWN, VERY DENSE, MOIST, SILTY AND CLAYEY FINE SAND (A-2-4, A-2-6)

WEATHERED ROCK (META-GRANODIORITE)

BT

BT

(K) ROADWAY EMBANKMENT, PAVEMENT (ASPHALT AND STONE BASE)

(L) CONCRETE SLAB (POSSIBLE ANCHOR FOR UST)

TYPICAL SKEW ANGLE 93°19'01"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 22+60	**OFFSET** 31 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 724.0 ft	**TOTAL DEPTH** 63.9 ft	**NORTHING** 544,392	**EASTING** 1,448,215	**24 HR.** 21.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 03/15/17	**COMP. DATE** 03/15/17	**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)
725										724.0 GROUND SURFACE	0.0
	723.0	1.0	7	10	9	19 24		M		**RESIDUAL** TAN AND WHITE, FINE SANDY SILT WITH TRACE OF MANGANESE AND MICA	
720	721.2	2.8	7	10	14			M			
	718.2	5.8	4	6	7	13 19		M			
715	715.5	8.5	6	7	12			M			
710	710.5	13.5	7	8	7	15		M			
705	705.5	18.5	3	4	8	12					
700	700.5	23.5	8	11	15	26		M			
695	695.5	28.5	11	12	12	24		M			
690	690.5	33.5	9	13	16	29		M			
685	685.5	38.5	9	11	14	25		M			
680	680.5	43.5	15	35	36	71		M			
675	675.5	48.5	45	50	45/0.4	100/0.9				676.0 **WEATHERED ROCK** (META-GRANODIORITE)	48.0
670	670.5	53.5	57	43/0.3		100/0.8					
665	665.5	58.5	57	43/0.4		100/0.9					
	660.5	63.5	100/0.4			100/0.4				660.1 Boring Terminated at Elevation 660.1 ft IN WEATHERED ROCK (META-GRANODIORITE)	63.9

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 22+52	**OFFSET** 16 ft RT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 726.7 ft	**TOTAL DEPTH** 59.5 ft	**NORTHING** 544,431	**EASTING** 1,448,187	**24 HR.** 22.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 03/14/17	**COMP. DATE** 03/14/17	**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)
730										726.7 GROUND SURFACE	0.0
	725.7	1.0	5	5	5	10		M		**ARTIFICIAL FILL**	
725	723.1	3.6								724.2 RED TO BROWN, FINE SANDY CLAY	2.5
	721.1	5.6	3	3	3	6		M		**RESIDUAL** TAN, FINE SANDY SILT WITH SOME MANGANESE	
720	718.1	8.6	4	6	8	14		M			
715	713.1	13.6	3	5	6	11		M			
710	708.1	18.6	7	11	16	27		M		708.2 TAN AND WHITE, CLAYEY SILT WITH SOME MANGANESE	18.5
705	703.1	23.6	2	2	5	7	SS-16	41%			
700	698.1	28.6	4	7	13	20		M			
695	693.1	33.6	14	16	19	35		M			
690	688.1	38.6	23	27	33	60		M			
685	683.1	43.6	13	14	17	31		M		685.7 **WEATHERED ROCK** (META-GRANODIORITE)	41.0
680	678.1	48.6	54	46/0.4		100/0.9					
675	673.1	53.6	100/0.2			100/0.2					
670	668.1	58.6	18	46	54/0.4	100/0.9				667.2 Boring Terminated at Elevation 667.2 ft IN WEATHERED ROCK (META-GRANODIORITE)	59.5
			57	43/0.4		100/0.9					

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Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 22+96	**OFFSET** 29 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 721.9 ft	**TOTAL DEPTH** 68.2 ft	**NORTHING** 544,368	**EASTING** 1,448,188	**24 HR.** 19.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic
DRILLER TURNAGE, J. R.	**START DATE** 03/27/17	**COMP. DATE** 03/27/17	**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)
										721.9 GROUND SURFACE	0.0
	720.9	1.0	5	7	8	15		M		721.1 **ARTIFICIAL FILL** GRAY, SILTY FINE SAND WITH SOME ROCK FRAGMENTS	0.8
	718.8	3.1	4	4	6	10		M			
	716.8	5.1	5	7	8	15		M		716.9 **RESIDUAL** TAN AND ORANGE, FINE SANDY CLAY WITH TRACE OF MANGANESE	5.0
	713.8	8.1	3	4	5	9		M		ORANGE AND WHITE, CLAYEY FINE SAND	
	708.8	13.1	4	5	8	13		M		710.9 TAN AND WHITE, SILTY FINE SAND WITH TRACE MANGANESE	11.0
	703.8	18.1	6	10	15	25				700.9 TAN, CLAYEY FINE SAND WITH TRACE MANGANESE	21.0
	698.8	23.1	7	9	12	21		M			
	693.8	28.1	6	7	9	16		M		694.9 TAN AND WHITE, SILTY FINE SAND WITH TRACE MANGANESE	27.0
	688.8	33.1	7	8	12	20		M			
	683.8	38.1	12	18	24	42		M			
	678.8	43.1	14	24	28	52		M			
	673.8	48.1	52	48/0.2		100/0.7				673.9 **WEATHERED ROCK** (META-GRANODIORITE)	48.0
	668.8	53.1	82	18/0.4		100/0.9					
	663.8	58.1	100/0.2			100/0.2					
	658.8	63.1	100/0.2			100/0.2					
	653.8	68.1	60/0.1			60/0.1				653.8 653.7 **CRYSTALLINE ROCK** (META-GRANODIORITE) Boring Terminated with Standard Penetration Test Refusal at Elevation 653.7 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)	68.1 68.2

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S1.GPJ NC_DOT.GDT 12/6/17

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 22+87	**OFFSET** 16 ft RT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 721.2 ft	**TOTAL DEPTH** 73.3 ft	**NORTHING** 544,406	**EASTING** 1,448,162	**24 HR.** 19.0 Caved
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic
DRILLER TURNAGE, J. R.	**START DATE** 03/21/17	**COMP. DATE** 03/21/17	**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)
										721.2 GROUND SURFACE	0.0
	720.2	1.0	5	7	11	18		M		**ARTIFICIAL FILL**	
	718.0	3.2	5	8	11	19		M		718.7 RED TO BROWN, FINE SANDY CLAY	2.5
	716.0	5.2	5	7	10	17		M		**RESIDUAL** TAN, SILTY FINE SAND	
	713.0	8.2	4	7	9	16		M		710.2 TAN AND ORANGE, SILTY CLAY	11.0
	708.0	13.2	3	3	6	9	SS-17	30%			
	703.0	18.2	5	8	8	16		M		704.2 TAN, ORANGE AND WHITE, FINE SANDY SILT WITH SOME MANGANESE AND TRACE OF ROCK FRAGMENTS	17.0
	698.0	23.2	7	13	19	32		M			
	693.0	28.2	10	11	15	26		M			
	688.0	33.2	14	16	20	36	SS-18	19%			
	683.0	38.2	21	31	33	64		M			
	678.0	43.2	21	24	20	44		M			
	673.0	48.2	17	42	43	85		M			
	668.0	53.2	57	43/0.4		100/0.9				668.2 **WEATHERED ROCK** (META-GRANODIORITE)	53.0
	663.0	58.2	100/0.2			100/0.2					
	658.0	63.2	100/0.2			100/0.2					
	653.0	68.2	100/0.3			100/0.3					
	648.0	73.2	60/0.1			60/0.1				648.0 647.9 **CRYSTALLINE ROCK** (META-GRANODIORITE) Boring Terminated with Standard Penetration Test Refusal at Elevation 647.9 ft IN CRYSTALLINE ROCK (META-GRANODIORITE) 24 Hr Water Level Caved Dry at 19.0'	73.2 73.3

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S1.GPJ NC_DOT.GDT 12/6/17

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Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-			**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 23+41	**OFFSET** 29 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 722.5 ft	**TOTAL DEPTH** 78.5 ft	**NORTHING** 544,336	**EASTING** 1,448,157	**24 HR.** 18.6
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M. A.	**START DATE** 03/16/17	**COMP. DATE** 03/17/17	**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)
725											
										722.5	0.0
										GROUND SURFACE	
	721.5	1.0	2	6	6	12		M		**ARTIFICIAL FILL** GRAY, SILTY CLAY	
720	719.0	3.5	4	5	9	14		M			
	716.5	6.0	9	10	18	28		M			
715	714.0	8.5	7	10	15	25		M			
	709.0	13.5	12	14	17	31	SS-20	15%			
710	704.0	18.5	17	17	20	37					
705	699.0	23.5	33	23	77	100		M			
700	694.0	28.5	6	12	14	26		M			
695	689.0	33.5	12	12	15	27		M			
690	684.0	38.5	11	13	22	35		M			
685	679.0	43.5	10	12	18	30		M			
680	674.0	48.5	14	18	25	43		M			
675	669.0	53.5	13	9	12	21		M			
670	664.0	58.5	78	22/0.1		100/0.6					
665	659.0	63.5	17	29	51	80		M			
660	654.0	68.5	100/0.3			100/0.3					
655	649.0	73.5	60/0.0			60/0.0					
650	644.0	78.5	60/0.0			60/0.0					
645											

665.5 — **WEATHERED ROCK** (GRANITE) — 57.0

661.5 — **RESIDUAL** BROWN AND WHITE, FINE SANDY SILT — 61.0

656.5 — **WEATHERED ROCK** (META-GRANODIORITE) — 66.0

649.0 — **CRYSTALLINE ROCK** (META-GRANODIORITE) — 73.5

644.0 — Boring Terminated with Standard Penetration Test Refusal at Elevation 644.0 ft IN CRYSTALLINE ROCK (META-GRANODIORITE) — 78.5

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S1.GPJ NC_DOT.GDT 12/6/17

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-			**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 23+39	**OFFSET** 5 ft RT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 719.7 ft	**TOTAL DEPTH** 73.5 ft	**NORTHING** 544,361	**EASTING** 1,448,134	**24 HR.** 17.2
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 03/16/17	**COMP. DATE** 03/16/17	**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)
720											
										719.7	0.0
										GROUND SURFACE	
	718.7	1.0	4	6	8	14		M		718.7 **ARTIFICIAL FILL** BLACK AND GRAY, SILTY FINE SAND WITH SOME GRAVEL	1.0
715	716.3	3.4	4	6	7	13		M		**RESIDUAL** RED, TAN AND WHITE, CLAYEY SILT WITH TRACE OF MICA	
	714.3	5.4	3	5	6	11		M			
710	711.3	8.4	5	5	4	9		M			
	706.3	13.4	3	4	5	9	SS-21	28%			
705	701.3	18.4	6	10	14	24				703.2	16.5
700	696.3	23.4	3	6	7	13		M		TAN AND WHITE, FINE SANDY SILT WITH TRACE OF MICA AND MANGANESE	
695	691.3	28.4	6	7	13	20		M			
690	686.3	33.4	10	14	20	34		M			
685	681.3	38.4	8	10	12	22		M			
680	676.3	43.4	19	31	34	65		M			
675	671.3	48.4	15	21	32	53		M			
670	666.3	53.4	58	42/0.4		100/0.9				666.7	53.0
665	661.3	58.4	100/0.3			100/0.3				**WEATHERED ROCK** (META-GRANODIORITE)	
660	656.3	63.4	100/0.2			100/0.2					
655	651.3	68.4	60/0.1			60/0.1				651.3	68.4
650	646.3	73.4	60/0.1			60/0.1				**CRYSTALLINE ROCK** (META-GRANODIORITE)	
645										646.2	73.5
										Boring Terminated with Standard Penetration Test Refusal at Elevation 646.2 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)	

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S1.GPJ NC_DOT.GDT 12/6/17

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** SCHLEMM, T.S.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-				**GROUND WTR (ft)**
BORING NO. B2-C	**STATION** 23+40	**OFFSET** 10 ft LT	**ALIGNMENT** -S1-	**0 HR.** 13.0
COLLAR ELEV. 722.1 ft	**TOTAL DEPTH** 79.0 ft	**NORTHING** 544,350	**EASTING** 1,448,144	**24 HR.** 12.0
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M.A.	**START DATE** 08/30/17	**COMP. DATE** 09/05/17	**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)
725											
										722.1 GROUND SURFACE	0.0
	721.1	1.0	9	7	6	13		M		**ARTIFICIAL FILL** RED-BROWN, BROWN AND GRAY, SILTY CLAY, TRACE GRAVEL	
720	718.7	3.4	3	6	7	13		M			
	715.9	6.2	4	5	8	13		M		716.6 **RESIDUAL** BROWN AND LIGHT BROWN, CLAYEY SILT	5.5
715	714.0	8.1	5	10	14	24		M			
710	709.0	13.1	5	9	12	21		M			
										705.1 BROWN, LIGHT BROWN AND ORANGE, SILTY FINE TO COARSE SAND	17.0
705	704.0	18.1	7	9	13	22		M			
										701.1 BROWN AND WHITE, FINE TO COARSE SANDY SILT	21.0
700	699.0	23.1	5	7	9	16		M			
695	694.0	28.1									
			8	9	11	20		M		693.6 BROWN AND WHITE, SILTY FINE TO COARSE SAND	28.5
690	689.0	33.1									
			12	10	11	21		M			
685	684.0	38.1								685.1 BROWN AND WHITE, FINE TO COARSE SANDY SILT	37.0
			10	10	17	27		M			
680	679.0	43.1									
			8	8	12	20		M			
675	674.0	48.1									
			20	67	33/0.2	100/.7				673.5 672.8 **WEATHERED ROCK** (BROWN AND WHITE, META-GRANODIORITE)	48.6 49.3
	671.1	51.0	33	67/0.4		100/.9				**WEATHERED ROCK** (BROWN AND WHITE, META-GRANODIORITE)	
670										666.6 **WEATHERED ROCK** (BROWN, DIABASE)	55.5
665	664.6	57.5	33	67/0.4		100/.9					
										659.6	62.5
660										658.1 **WEATHERED ROCK** (BROWN AND WHITE, META-GRANODIORITE)	64.0
	658.7	63.4	75	25/0.1		100/.6				654.4 **CRYSTALLINE ROCK** BROWN, WHITE, AND BLACK, META-GRANODIORITE	67.7
655										652.6 **CRYSTALLINE ROCK** GREEN AND BLACK, OLIVINE DIABASE	69.5
	653.1	69.0	60/0.0			60/0.0				**CRYSTALLINE ROCK** BROWN, WHITE, AND GREEN META-GRANODIORITE WITH GREEN-BLACK OLIVINE DIABASE DIKE	
650										643.1 Boring Terminated at Elevation 643.1 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)	79.0
645											

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S1.GPJ NC_DOT.GDT 12/6/17

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** SCHLEMM, T.S.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-				**GROUND WTR (ft)**
BORING NO. B2-C	**STATION** 23+40	**OFFSET** 10 ft LT	**ALIGNMENT** -S1-	**0 HR.** 13.0
COLLAR ELEV. 722.1 ft	**TOTAL DEPTH** 79.0 ft	**NORTHING** 544,350	**EASTING** 1,448,144	**24 HR.** 12.0
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M.A.	**START DATE** 08/30/17	**COMP. DATE** 09/05/17	**SURFACE WATER DEPTH** N/A	
CORE SIZE HQ3	**TOTAL RUN** 26.7 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
672.8											Begin Coring @ 49.3 ft	
	672.8	49.3	1.7	1:44/0.7	(0.0)	(0.0)		(1.7)			672.8 **WEATHERED ROCK** (BROWN AND WHITE, META-GRANODIORITE)	49.3
670	671.1	51.0		2:38/1.0	0%	0%		27%				
	669.6	52.5		*N=100/.9*							666.6 **WEATHERED ROCK** (BROWN, DIABASE)	55.5
			5.0	1:12/1.0	(2.7)	(0.0)						
				0:40/1.0								
665				0:41/1.0	54%	0%		(1.9)				
	664.6	57.5		1:04/1.0				27%				
	663.7	58.4		1:57/1.0								
				N=100/.9							659.6	62.5
			5.0	2:55/1.0	(0.9)	(0.0)					658.1 **WEATHERED ROCK** (BROWN AND WHITE, META-GRANODIORITE)	64.0
660				2:31/1.0	18%	0%					**CRYSTALLINE ROCK** BROWN, WHITE AND BLACK, MODERATE TO MODERATELY SEVERE WEATHERING, MODERATELY HARD TO HARD, CLOSELY FRACTURED, META-GRANODIORITE GSI 45 - 50	
				1:17/1.0								
				1:50/1.0								
	658.7	63.4		2:03/1.0				(0.0)				
	658.1	64.0		*N=100/.6*				0%				
			5.0	1:56/1.0	(4.3)	(2.7)		(3.0)	(2.9)			
655				3:41/1.0	86%	54%		81%	78%			
				2:55/1.0							654.4	67.7
				2:49/1.0				(1.8)	(0.0)		652.6 **CRYSTALLINE ROCK** GREEN AND BLACK, MODERATELY SEVERE, HARD, CLOSELY FRACTURED, OLIVINE DIABASE WITH QUARTZ VEINS GSI 45 - 50	69.5
	653.1	69.0		4:44/1.0				100%	0%			
			5.0	*N=60/0.0*	(5.0)	(3.1)		(9.4)	(5.7)			
650				7:50/1.0	100%	62%		99%	60%			
				7:41/1.0								
	648.1	74.0		8:27/1.0								
			5.0	6:32/1.0								
				8:20/1.0	(4.9)	(2.6)						
645				8:29/1.0	98%	52%						
				7:57/1.0								
				4:53/1.0								
	643.1	79.0		5:01/1.0							643.1	79.0
				5:29/1.0							Boring Terminated at Elevation 643.1 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)	

NCDOT CORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S1.GPJ NC_DOT.GDT 12/6/17

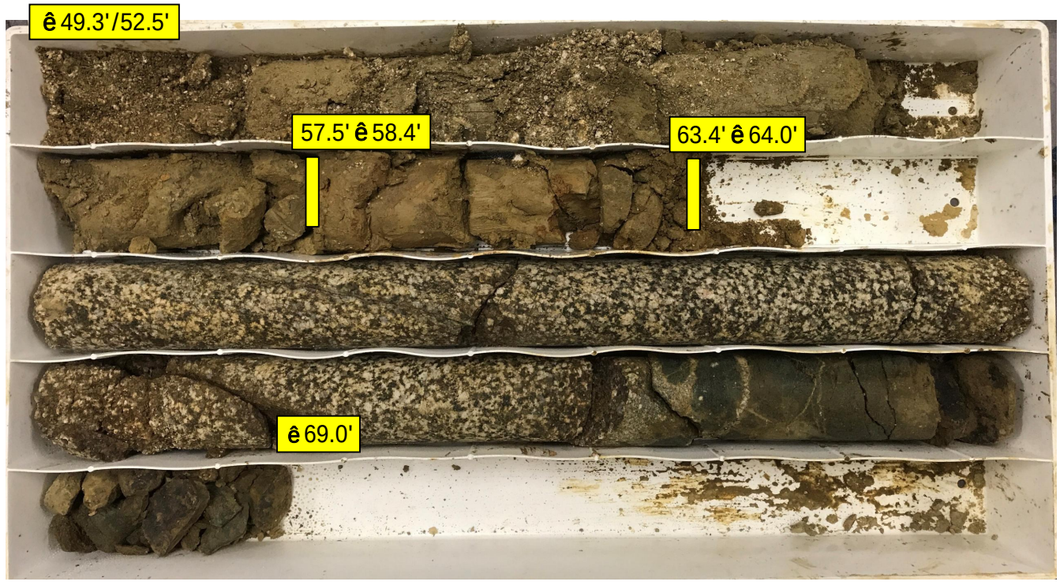
CORE PHOTOGRAPHS

Project No. 44475.1.2 (P-5705B)

Charlotte Gateway Station- W. Trade Street Bridge -S1-

B2-C

BOX 1: 49.3 - 69.0 FEET



B2-C

BOX 2: 69.0 - 74.0 FEET

B2-C

BOX 3: 74.0 - 79.0 FEET

0012DEL_P28

Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** SCHLEMM, T.S.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-				**GROUND WTR (ft)**
BORING NO. B2-D	**STATION** 23+39	**OFFSET** 12 ft RT	**ALIGNMENT** -S1-	**0 HR.** 18
COLLAR ELEV. 721.7 ft	**TOTAL DEPTH** 80.1 ft	**NORTHING** 544,366	**EASTING** 1,448,129	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M.A.	**START DATE** 09/05/17	**COMP. DATE** 09/08/17	**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)
725										721.7 GROUND SURFACE	0.0
	718.7	3.0	3	5	7	12		M		**ARTIFICIAL FILL** BROWN AND LIGHT GRAY, SILTY CLAY	
720	716.7	5.0	4	4	5	9		M			
	712.7	9.0	2	2	4	6		M		714.7 **RESIDUAL** LIGHT TO DARK BROWN, COARSE TO FINE, SANDY SILT	7.0
715	707.7	14.0	3	2	3	5		M			
710	702.7	19.0	2	3	7	10		M			
705	697.7	24.0	4	6	7	13		M			
700	692.7	29.0	6	12	18	30		M		693.7 BROWN, SILTY CLAY	28.0
695	687.7	34.0	5	6	10	16		M			
690	682.7	39.0	35	65/0.4		100/0.9				682.2 **WEATHERED ROCK** (BROWN, META-GRANODIORITE)	39.5
685	680.7	41.0	15	17	49	66		M		681.7 **WEATHERED ROCK** (BROWN, META-GRANODIORITE)	40.0
680	675.7	46.0	12	36	56	92		M		680.7 **RESIDUAL** BROWN, FINE SANDY SILT	41.0
675	670.7	51.0	100/0.4			100/0.4				670.7 **WEATHERED ROCK** (BROWN AND GREEN-BLACK, DIABASE)	51.0
670	667.2	54.5								667.2 **CRYSTALLINE ROCK** BROWN AND GREEN-BLACK, OLIVINE DIABASE	54.5
665	665.7	56.0								665.7 **CRYSTALLINE ROCK** BROWN AND GREEN-BLACK, OLIVINE DIABASE	56.0
660	660.7	61.0	60/0.0			60/0.0					
655											
650											
645											
	641.6	80.1	60/0.0			60/0.0				641.6 Boring Terminated at Elevation 641.6 ft IN CRYSTALLINE ROCK (BROWN AND GREEN-BLACK OLIVINE DIABASE) 24 Hr Water Level Caved Dry at 15.5'	80.1

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S1.GPJ NC_DOT.GDT 12/6/17

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** SCHLEMM, T.S.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-				**GROUND WTR (ft)**
BORING NO. B2-D	**STATION** 23+39	**OFFSET** 12 ft RT	**ALIGNMENT** -S1-	**0 HR.** 18
COLLAR ELEV. 721.7 ft	**TOTAL DEPTH** 80.1 ft	**NORTHING** 544,366	**EASTING** 1,448,129	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M.A.	**START DATE** 09/05/17	**COMP. DATE** 09/08/17	**SURFACE WATER DEPTH** N/A	
CORE SIZE HQ3	**TOTAL RUN** 25.7 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
681.7											Begin Coring @ 40.0 ft	
680	681.7	40.0	1.0	4:23/1.0	(0.0) 0%	(0.0) 0%		(0.0) 0%			681.7 **WEATHERED ROCK** (BROWN, META-GRANODIORITE)	40.0
	680.7	41.0		*N=66*							680.7 **RESIDUAL** BROWN, FINE SANDY SILT	41.0
675				*N=92*								
670				*N=100/0.4*							670.7 **WEATHERED ROCK** (BROWN AND GREEN-BLACK, DIABASE)	51.0
	667.2	54.5									667.2 **CRYSTALLINE ROCK** BROWN AND GREEN-BLACK, MODERATELY SEVERE WEATHERING, SOFT, CLOSELY FRACTURED, OLIVINE DIABASE GSI 40-50	54.5
665	666.2	55.5	1.0	5:47/1.0	(0.3) 30%	(0.0) 0%		(0.3) 20%	(0.0) 0%		665.7 **CRYSTALLINE ROCK** BROWN AND GREEN-BLACK, MODERATELY SEVERE TO SLIGHTLY WEATHERED, MEDIUM HARD TO HARD, CLOSLEY FRACTURED, OLIVINE DIABASE GSI 45 - 50	56.0
	665.7	56.0	5.0	6:42/1.0 7:36/1.0 6:25/1.0 3:42/1.0 9:09/1.0	(3.8) 76%	(3.4) 68%		(17.1) 71%	(11.1) 46%			
660	660.7	61.0		*N=60/0.0*								
	660.3	61.4	5.0	8:10/1.0 8:04/1.0 5:55/1.0 6:02/1.0 9:53/1.0	(3.0) 60%	(2.0) 40%						
655	655.3	66.4	3.0	4:52/1.0 6:31/1.0 16:37/1.0	(2.7) 90%	(2.1) 70%						
	652.3	69.4	5.0	5:32/1.0 6:13/1.0 8:27/1.0 12:17/1.0 4:45/1.0	(2.3) 46%	(1.4) 28%						
650	647.3	74.4	2.2	9:24/1.0 8:29/1.0 3:48/0.4	(1.9) 86%	(1.2) 55%						
645	645.1	76.6	3.5	5:06/1.0 6:18/1.0 7:04/1.0 3:01/0.5	(3.4) 97%	(1.0) 29%						
	641.6	80.1		*N=60/0.0*							641.6 Boring Terminated at Elevation 641.6 ft IN CRYSTALLINE ROCK (BROWN AND GREEN-BLACK OLIVINE DIABASE) 24 Hr Water Level Caved Dry at 15.5'	80.1

NCDOT CORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S1.GPJ NC_DOT.GDT 12/6/17

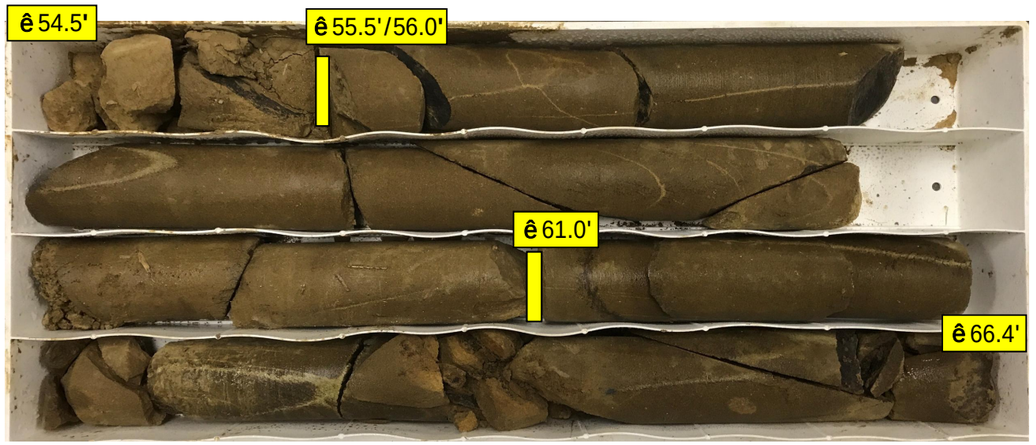
CORE PHOTOGRAPHS

Project No. 44475.1.2 (P-5705B)

Charlotte Gateway Station- W. Trade Street Bridge -S1-

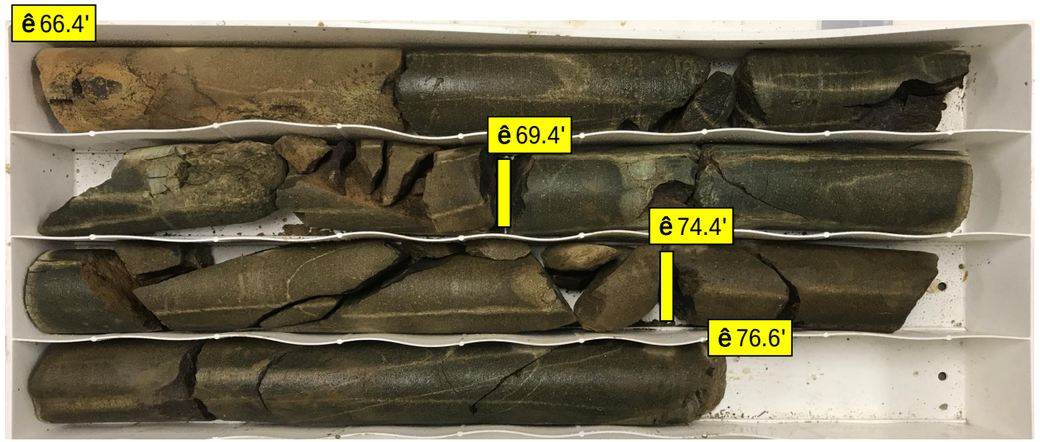
B2-D

BOX 1: 54.5 - 66.4 FEET



B2-D

BOX 2: 66.4 - 76.6 FEET



B2-D

BOX 3: 76.6 - 80.1 FEET

0012DEL_P28

Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-			**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 23+82	**OFFSET** 32 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 722.5 ft	**TOTAL DEPTH** 83.6 ft	**NORTHING** 544,304	**EASTING** 1,448,131	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic
DRILLER TURNAGE, J. R.	**START DATE** 03/23/17	**COMP. DATE** 03/24/17	**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)
										GROUND SURFACE	722.5	0.0
	721.5	1.0	4	6	4	10		M		**ARTIFICIAL FILL** RED TO BROWN, CLAYEY SAND WITH TRACE OF ROCK FRAGMENTS	720.5	2.0
	719.2	3.3	4	5	5	10		M		**RESIDUAL** ORANGE, TAN AND WHITE, CLAYEY FINE SAND		
	717.2	5.3	6	7	9	16		M		TAN AND WHITE, SILTY FINE SAND	715.5	7.0
	714.2	8.3	6	7	8	15		M			711.5	11.0
	709.2	13.3	5	6	7	13	SS-23	24%		ORANGE AND TAN, SILTY CLAY		
	704.2	18.3	4	5	8	13	SS-24	21%			705.0	17.5
	699.2	23.3	7	7	12	19		M		TAN AND WHITE, FINE SANDY CLAY		
	694.2	28.3	17	20	79	99		M				
	689.2	33.3	50	50/.04		100/0.9				**WEATHERED ROCK** (META-GRANODIORITE)	689.5	33.0
	684.2	38.3	30	31	40	71		M		**RESIDUAL** TAN AND WHITE, SILTY FINE SAND	684.5	38.0
	679.2	43.3	23	24	36	60		M				
	674.2	48.3	30	37	50	87		M				
	669.2	53.3	30	58	42/0.4	100/0.9				**WEATHERED ROCK** (META-GRANODIORITE)	668.7	53.8
	664.2	58.3	20	23	32	55		M		**RESIDUAL** TAN AND ORANGE, CLAYEY SAND WITH TRACE OF MANGANESE	664.5	58.0
	659.2	63.3	20	20	26	46		M				
	654.2	68.3	100/0.2			100/0.2				**WEATHERED ROCK** (META-GRANODIORITE)	654.5	68.0
	649.2	73.3	100/0.2			100/0.2						
	644.2	78.3	100/0.4			100/0.4						
	639.2	83.3	100/0.3			100/0.3					638.9	83.6
										Boring Terminated at Elevation 638.9 ft IN WEATHERED ROCK (META-GRANODIORITE)		

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S1.GPJ NC_DOT.GDT 12/6/17

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-			**GROUND WTR (ft)**
BORING NO. B3-B	**STATION** 23+86	**OFFSET** 2 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 719.4 ft	**TOTAL DEPTH** 78.7 ft	**NORTHING** 544,322	**EASTING** 1,448,106	**24 HR.** 19.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic
DRILLER TURNAGE, J. R.	**START DATE** 03/28/17	**COMP. DATE** 03/28/17	**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)
										GROUND SURFACE	719.4	0.0
	718.4	1.0	5	7	5	12		M		**ARTIFICIAL FILL** RED AND BLACK, FINE SANDY CLAY WITH TRACE OF ROCK FRAGMENTS	715.4	4.0
	715.3	4.1	4	4	7	11		M		**RESIDUAL** TAN, ORANGE AND WHITE, CLAYEY FINE SAND WITH TRACE OF MANGANESE		
	713.3	6.1	5	5	6	11		M				
	710.7	8.7	4	5	8	13		M				
	705.7	13.7	6	10	12	22		M				
	700.7	18.7	5	10	12	22		M				
	695.7	23.7	11	18	29	47		M				
	690.7	28.7	12	20	27	47		M				
	685.7	33.7	10	12	15	27		M				
	680.7	38.7	10	12	14	26		M				
	675.7	43.7	9	10	15	25		M				
	670.7	48.7	13	15	19	34		M				
	665.7	53.7	22	23	24	47		M				
	660.7	58.7	17	23	23	46		M				
	655.7	63.7	69	31/0.4		100/0.9					655.9	63.5
	650.7	68.7	15	10	28	38		M		**WEATHERED ROCK** (META-GRANODIORITE)	650.9	68.5
	645.7	73.7	100/0.3			100/0.3				**RESIDUAL** TAN AND WHITE, SILTY FINE SAND	645.9	73.5
	640.7	78.7	60/0.0			60/0.0				**WEATHERED ROCK** (META-GRANODIORITE)	640.7	78.7
										Boring Terminated with Standard Penetration Test Refusal at Elevation 640.7 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)		

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S1.GPJ NC_DOT.GDT 12/6/17

GEOTECHNICAL BORING REPORT
BORE LOG

Terracon Consulting Engineers & Scientists

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 24+32	**OFFSET** 26 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 725.6 ft	**TOTAL DEPTH** 48.9 ft	**NORTHING** 544,273	**EASTING** 1,448,091	**24 HR.** 22.0
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/28/17	**COMP. DATE** 03/28/17	**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)
										725.6 PAVEMENT SURFACE	0.0
	724.6	1.0						M		724.5 **ROADWAY EMBANKMENT** **PAVEMENT** 0.6' ASPHALT AND 0.5' STONE	1.1
	722.6	3.0	15	15	18	33		M		**ARTIFICIAL FILL** GRAY, SILTY FINE TO COARSE SAND WITH SOME GRAVEL	
720			12	14	13	27		M		717.6 GRAY, SILTY FINE TO COARSE SAND WITH TRACE OF GRAVEL	8.0
	716.6	9.0								714.1	11.5
715			WOH	1	1	2		W		713.6 **CONCRETE SLAB**	12.0
	712.6	13.0	2	2	3	5		M		**RESIDUAL** BROWN AND WHITE, FINE SANDY SILT	
710											
	707.6	18.0	3	6	14	20		M			
705											
	702.6	23.0	5	9	19	28		M			
700											
	697.6	28.0	8	12	24	36		M		695.6 BROWN AND WHITE, SILTY FINE SAND	30.0
695											
	692.6	33.0	22	45	48	93		M		689.6 **WEATHERED ROCK** (META-GRANODIORITE)	36.0
690											
	687.6	38.0	100/0.4			100/0.4					
685											
	682.6	43.0	38	36	64/0.3	100/0.8					
680											
	677.6	48.0	43	57/0.4		100/0.9				676.7 Boring Terminated at Elevation 676.7 ft IN WEATHERED ROCK (META-GRANODIORITE)	48.9

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S1.GPJ NC_DOT.GDT 12/6/17

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S1-				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 24+29	**OFFSET** 1 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 722.6 ft	**TOTAL DEPTH** 73.2 ft	**NORTHING** 544,292	**EASTING** 1,448,076	**24 HR.** 19.8
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/27/17	**COMP. DATE** 03/28/17	**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)
										722.6 PAVEMENT SURFACE	0.0
	721.6	1.0						M		721.3 **PAVEMENT** 0.5' ASPHALT AND 0.8' STONE BASE	1.3
	719.6	3.0	4	3	3	6		M		719.5 **ROADWAY EMBANKMENT** GRAY, SILTY FINE SAND WITH SOME GRAVEL	3.1
720			3	3	5	8		M		**RESIDUAL** RED-BROWN, SILTY CLAY	
	716.6	6.0								712.6 BROWN, CLAYEY SILT	10.0
715			4	5	9	14		M			
	714.6	8.0									
			2	5	6	11		M			
710											
	709.6	13.0	2	4	6	10		M			
705											
	704.6	18.0	3	6	14	20					
700											
	699.6	23.0	4	6	11	17		M			
695											
	694.6	28.0	8	19	25	44		M		692.6 BROWN AND WHITE, SILTY FINE SAND	30.0
690											
	689.6	33.0	60	40/0.2		100/0.7				687.6 **WEATHERED ROCK** (META-GRANODIORITE)	35.0
685											
	684.6	38.0	43	30	29	59		M		**RESIDUAL** BROWN AND WHITE, SILTY FINE SAND	
680											
	679.6	43.0	30	46	54	100		M		676.6 **RESIDUAL** GRAY-BROWN, CLAYEY FINE SAND	46.0
675											
	674.6	48.0	11	25	45	70		M			
670											
	669.6	53.0	16	39	35	74		M			
665											
	664.6	58.0	19	32	40	72		M		662.6 **WEATHERED ROCK** (META-GRANODIORITE)	60.0
660											
	659.6	63.0	38	52	48/0.4	100/0.9					
655											
	654.6	68.0	100/0.5			100/0.5					
650											
	649.6	73.0	100/0.2			100/0.2				649.4 Boring Terminated at Elevation 649.4 ft IN WEATHERED ROCK (META-GRANODIORITE)	73.2

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S1.GPJ NC_DOT.GDT 12/6/17

LABORATORY TESTING SUMMARY

PROJECT NUMBER: 44475.1.2 **TIP:** P-5705B **COUNTY:** MECKLENBURG

DESCRIPTION: Charlotte Gateway Station and Track and Safety Improvements - West Trade Street Bridge on -S1-

Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic	Ave. Wet Unit Wt. (pcf)	Shear Strength Values			
								Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200				Total Cohesion (psf)	Total Friction (ϕ)	Effective Cohesion (psf)	Effective Friction (ϕ')
SS-16	-S1-	EB1-B	16' RT	18.6-20.1	A-5 (1)	42	9	38.7	23.1	25.8	12.4	0	95	67	42	40.6	N/D	N/D	N/D	N/D	N/D	N/D
SS-17	-S1-	B1-B	16' RT	13.2-14.7	A-7-6 (3)	42	12	37.5	20.7	26.4	15.4	0	96	69	46	29.9	N/D	N/D	N/D	N/D	N/D	N/D
SS-18	-S1-	B1-B	16' RT	33.2-34.7	A-4 (0)	34	5	43.8	24.4	21.3	10.5	0	95	64	36	18.8	N/D	N/D	N/D	N/D	N/D	N/D
SS-20	-S1-	B2-A	29' LT	13.5-15.0	A-4 (0)	22	NP	45.7	22.3	22.0	10.0	0	100	68	37	15.3	N/D	N/D	N/D	N/D	N/D	N/D
SS-21	-S1-	B2-B	5' RT	13.4-14.9	A-5 (2)	42	9	34.9	21.5	29.5	14.1	0	96	70	48	27.7	N/D	N/D	N/D	N/D	N/D	N/D
SS-23	-S1-	B3-A	32' LT	13.3-14.8	A-7-6 (5)	42	16	36.5	19.4	27.0	17.1	0	96	68	48	23.8	N/D	N/D	N/D	N/D	N/D	N/D
SS-24	-S1-	B3-A	32' LT	18.3-19.8	A-6 (1)	40	11	43.7	22.1	22.4	11.8	0	93	60	37	21.3	N/D	N/D	N/D	N/D	N/D	N/D

N/D - NOT DETERMINED

Stephanie H. Huffman

Certified Lab Technician Signature

114-01-1203

Certification Number

SITE PHOTOGRAPHS
CHARLOTTE GATEWAY STATION AND TRACK IMPROVEMENTS - WEST TRADE STREET BRIDGE ON -S1-

PHOTOGRAPH NO. 1: EAST APPROACH TO END BENT NO. 1 ON -S1- ALIGNMENT, LOOKING WEST

PHOTOGRAPH NO. 3: ON WEST TRADE MEDIAN, NORTHWEST OF -S1- ALIGNMENT, LOOKING SOUTHEAST

PHOTOGRAPH NO. 2: ON WEST TRADE STREET MEDIAN, SOUTHEAST OF -S1- ALIGNMENT, LOOKING NORTHWEST

PHOTOGRAPH NO. 4: WEST APPROACH TO END BENT NO.2 ON -S1- ALIGNMENT, LOOKING EAST

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REFERENCE: P-5705B

PROJECT: 44475

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5705B	1	24

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY MECKLENBURG

PROJECT DESCRIPTION CHARLOTTE GATEWAY STATION AND TRACK AND SAFETY IMPROVEMENTS

SITE DESCRIPTION BRIDGE ON STATION TRACK 2 (-S2-) OVER WEST TRADE STREET BETWEEN WEST 4TH STREET AND WEST 5TH STREET

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2-2A	SOIL & ROCK, AND GSI LEGEND
3	SITE PLAN
4-8	CROSS SECTIONS
9-22	BORE LOGS & CORE LOGS
23	SOIL TEST RESULTS
24	SITE PHOTOGRAPHS

CAUTION NOTICE

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NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
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PERSONNEL

RIGGS, A. F.	DUGGINS, W. T.
WERITZ, M. A.	J. R. TURNAGE
WEAVER, L. A.	MASHBURN, S. R.
SCHLEMM, T. S.	McMILLIAN, M. F.
	COGAR, T. E.

INVESTIGATED BY TERRACON CONSULTANTS

DRAWN BY FIELDS, W. D.

CHECKED BY RIGGS, A. F.

SUBMITTED BY TERRACON CONSULTANTS

DATE DECEMBER 2017

Prepared in the Office of:

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SIGNATURE DATE
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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED 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 THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR 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
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 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 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 ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 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 SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES 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 WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

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
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
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:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [X] ACKER (TER92-0)
- [X] D-50 (TER373)
- [X] D-50 (TER346)

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2⅝ " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [X] CORE BIT
- [X] DRAG BIT

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [X] -H 03
- [ ] -N _____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. 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 "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD 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 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 FOOT
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 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, SUCH 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: BM4: N-544,771; E-1,448,453
STATION 51+04.00 - 2' RIGHT CHISELED SQUARE (5TH STREET BRIDGE)
ELEVATION: 738.12 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

PROJECT WAS DRAFTED USING NCDOT PROVIDED TIN FILE
FILE: p5705b_ls_tin (DATED: 01/12/2017)

DATE: 8-15-14

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities

BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets

VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets

BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity

DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces

LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

A. *Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.*

B. *Sandstone with thin interlayers of siltstone*

C. *Sandstone and siltstone in similar amounts*

D. *Siltstone or silty shale with sandstone layers*

E. *Weak siltstone or clayey shale with sandstone layers*

C, D, E, and **G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H.**

F. *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*

G. *Undisturbed silty or clayey shale with or without a few very thin sandstone layers*

H. ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***

→ Means deformation after tectonic disturbance

DATE: 8-19-16

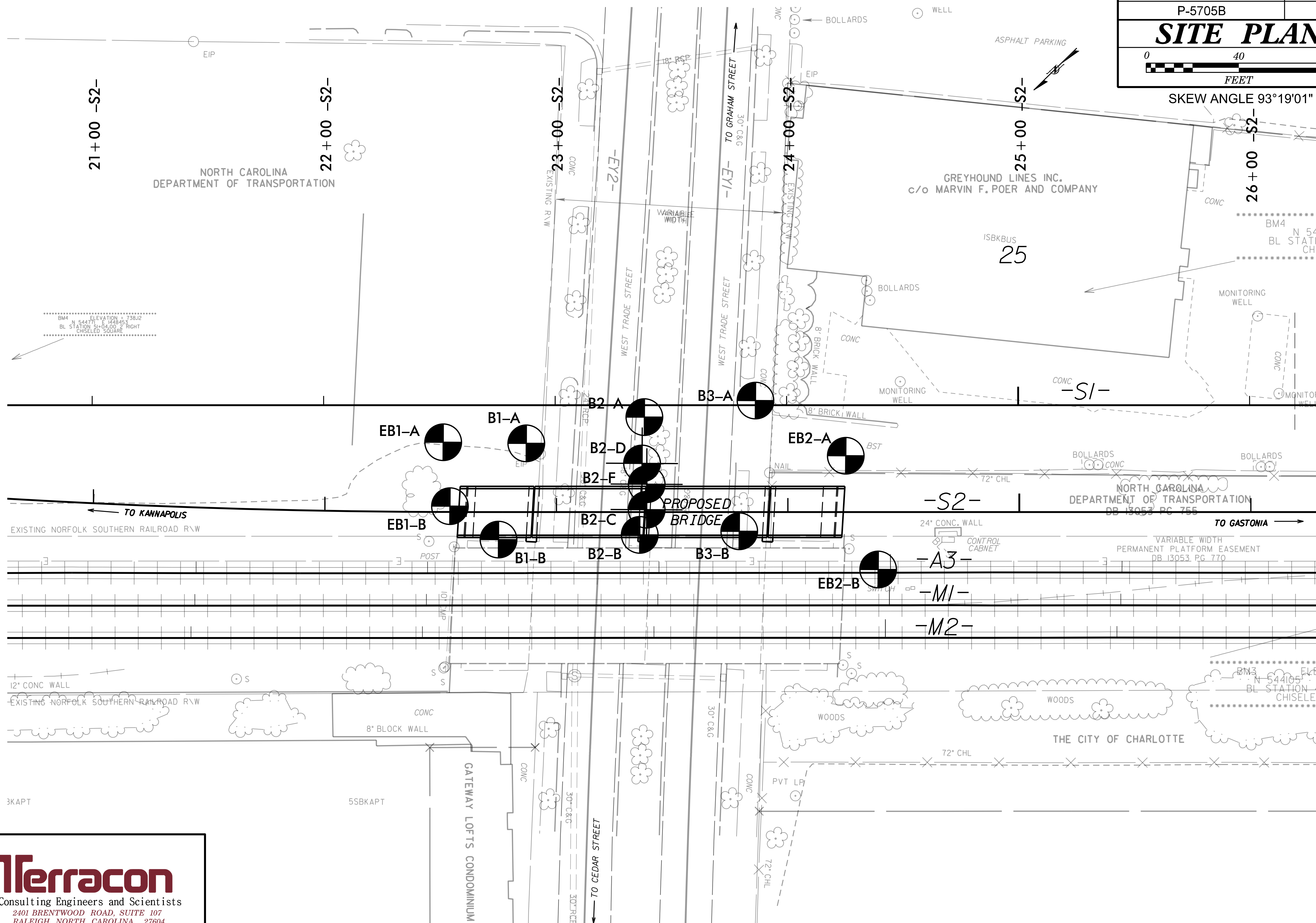
0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	3

SITE PLAN

0 40 80
FEET

SKEW ANGLE 93°19'01"



21+00 -S2-
22+00 -S2-
23+00 -S2-
24+00 -S2-
25+00 -S2-
26+00 -S2-
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GREYHOUND LINES INC. c/o MARVIN F. POER AND COMPANY
ISBKBUS
25
BOLLARDS
ASPHALT PARKING
EIP
WELL
TO GRAHAM STREET
WEST TRADE STREET
-EY2-
-EY1-
EXISTING R/W
VARIABLE WIDTH
CONC
MONITORING WELL
8' BRICK WALL
-S1-
-S2-
EB1-A
B1-A
B2-A
B2-D
B2-F
B2-C
B2-B
B3-A
B3-B
B1-B
EB1-B
EB2-A
EB2-B
PROPOSED BRIDGE
TO KANNAPOLIS
TO GASTONIA
EXISTING NORFOLK SOUTHERN RAILROAD R\W
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DB 13053 PG 755
24" CONC. WALL
CONTROL CABNET
VARIABLE WIDTH PERMANENT PLATFORM EASEMENT DB 13053 PG 770
72" CHL
NAIL
BST
POST
-A3-
-M1-
-M2-
12" CONC WALL
8" BLOCK WALL
WOODS
THE CITY OF CHARLOTTE
GATEWAY LOFTS CONDOMINIUM
TO CEDAR STREET
30" C&G
30" RCP
PVT LP
5SBKAPT
3KAPT

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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	4

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0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH END BENT 1 AT STA. 22+56 –S2–

℄

EB1-A
22+51
30' LT

EB1-B
22+54
2' LT

EXISTING GROUND

ARTIFICIAL FILL, RED TO BROWN, STIFF TO VERY STIFF, MOIST, FINE SANDY CLAY WITH TRACE OF ROCK FRAGMENTS (A-6)

RESIDUAL, TAN AND WHITE, MEDIUM STIFF TO HARD, MOIST, FINE SANDY SILT AND CLAYEY SILT WITH TRACE TO SOME MANGANESE (A-4, A-5)

WEATHERED ROCK (META-GRANODIORITE)

RESIDUAL, TAN AND WHITE, HARD, MOIST, FINE SANDY SILT WITH TRACE OF MANGANESE (A-4)

EB1-A		EB1-B	
10		19	
6		13	
14		6	
11		12	
27		10	
7	03/17	12	
20		13	03/17
35		19	
60		33	
31		33	
100/0.9		66	
100/0.2		100/0.8	
100/0.9		41	
100/0.9		100/0.8	
BT		100/0.5	
		BT	

740 730 720 710 700 690 680 670 660

95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55

TYPICAL SKEW ANGLE 93°19'01"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	5

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NC REGISTERED GEOLOGIC FIRM: C-367

0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH BENT 1 AT STA. 22+90 -S2-

℄

EXISTING GROUND

ARTIFICIAL FILL, RED TO BROWN, VERY STIFF, MOIST, FINE SANDY CLAY (A-6)

B1-A
22+87
30' LT

B1-B
22+75
12' RT

ARTIFICIAL FILL, BLACK AND RED, MEDIUM STIFF, MOIST, CLAYEY, FINE SAND WITH TRACE OF ORGANICS (A-2-6)

RESIDUAL, TAN, MEDIUM (A-2-4)

DENSE, MOIST, SILTY FINE SAND

TAN, ORANGE AND GRAY, STIFF, MOIST, SILTY CLAY (A-7-6)

TAN, ORANGE, AND WHITE, FINE SANDY SILT WITH SOME TRACE OF ROCK FRAGMENTS

STIFF TO HARD, MOIST, MANGANESE AND (A-4)

TAN AND WHITE, MOIST, MEDIUM DENSE TO VERY DENSE, SILTY FINE SAND WITH TRACE OF MANGANESE (A-2-4)

03/17

WEATHERED ROCK

(META-GRANODIORITE)

CRYSTALLINE ROCK (META-GRANODIORITE)

AR

CAVED DRY @ 19' 03/17

BT

TYPICAL SKEW ANGLE 93°19'01"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

CROSS SECTION THROUGH BENT 2 AT STA. 23+38 -S2-

0 10 20
FEET
VE-1:1

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	6

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EXISTING GROUND

B2-A 23+38 41' LT | B2-D 23+37 21' LT | B2-E 23+39 12' LT | B2-C 23+39 1' LT | B2-B 23+36 10' RT

RESIDUAL, RED, TAN, BROWN, GRAY, WHITE, ORANGE-BROWN, AND LIGHT BROWN, TRACE MICA, TRACE MANGANESE

MEDIUM STIFF TO HARD, BROWN AND WHITE, MEDIUM DENSE TO VERY DENSE, MOIST, SILTY COARSE SAND ((A-2-4)

WEATHERED ROCK (META-GRANODIORITE)

ARTIFICIAL FILL, RED TO BROWN, LOOSE, MOIST, CLAYEY FINE SAND, TRACE ROCK FRAGMENTS (A-2-6).

RESIDUAL, TAN, AND WHITE, LOOSE TO MEDIUM DENSE, MOIST, CLAYEY FINE SAND AND SILTY FINE SAND, TRACE MANGANESE (A-2-6, A-2-4)

SILT AND FINE SANDY SILT, (META-GRANODIORITE)

03/17 09/17 09/17 09/17 03/17

AR BT BT BT BT

REC=26% RQD=12% GSI=40-50

REC=28% RQD=11% GSI=45-50

CRYSTALLINE ROCK (META-GRANODIORITE)

CRYSTALLLINE ROCK, BROWN AND WHITE, MODERATELY SEVERE WEATHERING, MODERATELY HARD, CLOSELY FRACTURED, META-GRANODIORITE

WEATHERED ROCK (DIABASE)

(A) ARTIFICIAL FILL, BLACK AND GRAY, MEDIUM DENSE, MOIST, SILTY FINE SAND, TRACE GRAVEL (A-2-4)

(B) ARTIFICIAL FILL, ORANGE-BROWN MEDIUM STIFF, MOIST, CLAYEY SILT (A-5, A-4)

(C) ARTIFICIAL FILL, BROWN AND RED-BROWN, MEDIUM STIFF TO STIFF, MOIST, SILTY CLAY, LITTLE GRAVEL (A-7-6)

(D) RESIDUAL, ORANGE AND LIGHT BROWN, MEDIUM DENSE, MOIST, SILTY FINE TO COARSE SAND (A-2-4)

(E) WEATHERED ROCK (DIABASE)

(F) RESIDUAL, BROWN AND WHITE, VERY DENSE, MOIST, SILTY FINE TO COARSE SAND (A-2-4)

(G) CRYSTALLINE ROCK, BROWN AND WHITE, MODERATELY SEVERE WEATHERING, SOFT TO MEDIUM HARD, VERY CLOSELY FRACTURED, META-GRANODIORITE REC=0%, RQD=0%, GSI=30-40

(H) WEATHERED ROCK (META-GRANODIORITE)

(I) CRYSTALLINE ROCK, DARK GREEN, SLIGHT TO MODERATELY SEVERE WEATHERING, VERY SOFT TO HARD, VERY CLOSE TO CLOSELY FRACTURED, OLIVINE DIABASE REC=100%, RQD=85%, GSI=45-50

TYPICAL SKEW ANGLE 93°19'01"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

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PROJECT REFERENCE NO.	SHEET NO.
P-5705B	7

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NC REGISTERED GEOLOGIC FIRM: C-367

0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH BENT 3 AT STA. 23+92 -S2-

℄

B3-A
23+86
48' LT

B3-B
23+79
9' RT

EXISTING GROUND

ARTIFICIAL FILL, (12, 11, 11, 13) RED, TAN AND BLACK, MEDIUM STIFF TO STIFF, MOIST, RESIDUAL, (6, 6, 6) FINE SANDY CLAY WITH TRACE OF ROCK FRAGMENTS (A-6)

RED AND TAN, MEDIUM STIFF, MOIST, CLAYEY SILT WITH TRACE OF MICA (A-5)

(8, 8, 8, 8, 16, 8)

RESIDUAL, TAN, WHITE AND ORANGE, LOOSE TO VERY DENSE, MOIST, SILTY AND CLAYEY FINE SAND WITH TRACE OF MANGANESE (A-2-6, A-2-4)

(22, 22, 47, 47, 27, 32, 25, 34, 47, 46)

03/17

(25, 68, 100/0.9, 100/0.9, 19, 100/0.8, 100/0.2, 60/0.1)

RESIDUAL, TAN, VERY STIFF, MOIST, CLAYEY SILT (A-5)

WEATHERED ROCK (META-GRANODIORITE)

RESIDUAL, TAN AND WHITE, MOIST, SILTY FINE SAND (A-2-4)

(38, 100/0.9, 100/0.3, 60/0.0)

DENSE, WEATHERED ROCK (META-GRANODIORITE)

CRYSTALLINE ROCK

AR

AR
FIAD
03/17

TYPICAL SKEW ANGLE 93°19'01"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

CROSS SECTION THROUGH END BENT 2 AT STA. 24+26 -S2-

0 10 20
FEET
VE-1:1

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	8

Terracon
Consulting Engineers and Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
NC REGISTERED ENGINEERING FIRM: F-0869
NC REGISTERED GEOLOGIC FIRM: C-367

EB2-A
24+25
24' LT

EB2-B
24+39
25' RT

EXISTING GROUND

RAILROAD BALLAST, CRUSHED STONE (A-1-b)

RAILROAD EMBANKMENT, RED AND TAN, CLAYEY FINE SAND, LOOSE TO MEDIUM DENSE, MOIST, WITH TRACE OF MICA AND ROCK FRAGMENTS (A-2-6)

RESIDUAL, RED AND BROWN, SILTY CLAY, MEDIUM STIFF, MOIST, (A-7-6)

RESIDUAL, TAN AND ORANGE, LOOSE TO MEDIUM DENSE, MOIST, CLAYEY FINE SAND (A-2-6)

03/17

GRAY, STIFF TO HARD, MOIST, CLAYEY SILT (A-5)

MOIST, SILTY FINE SAND (A-2-4, A-2-6)

GRAY, TAN, BROWN AND WHITE, MEDIUM DENSE TO VERY DENSE, AND CLAYEY FINE SAND WITH TRACE OF MANGANESE

WEATHERED ROCK (META-GRANODIORITE)

	EB2-A	EB2-B
5		5
12		12
12		12
9		9
7	7	
7	7	
6	6	
6	6	
10		10
15		15
13	13	
24		24
42	42	
26		26
71	71	
39		39
10	10	
25		25
10	10	
32		32
20	20	
34		34
52	52	
100/0.3		100/0.3
52	52	
100/0.8		100/0.8
72	72	
100/0.4		100/0.4
56	56	
100/0.5	100/0.5	
100/0.6	100/0.6	
100/0.2	100/0.2	

BT BT

FIAD 03/17

(J) ROADWAY EMBANKMENT, PAVEMENT (ASPHALT AND STONE BASE)

TYPICAL SKEW ANGLE 93°19'01"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

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Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 22+51	**OFFSET** 30 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 722.7 ft	**TOTAL DEPTH** 59.5 ft	**NORTHING** 544,431	**EASTING** 1,448,187	**24 HR.** 22.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 03/14/17	**COMP. DATE** 03/14/17	**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)
725												
	721.7	1.0								GROUND SURFACE	722.7	0.0
720			5	5	5	10		M		**ARTIFICIAL FILL** RED TO BROWN, FINE SANDY CLAY	720.2	2.5
	719.1	3.6	3	3	3	6 14		M		**RESIDUAL** TAN, FINE SANDY SILT WITH SOME MANGANESE		
	717.1	5.6	4	6	8			M				
715	714.1	8.6	3	5	6	11		41%				
710	709.1	13.6	7	11	16	27		M				
705	704.1	18.6	2	2	5	7	SS-16	M		TAN AND WHITE, CLAYEY SILT WITH SOME MANGANESE	704.2	18.5
700	699.1	23.6	4	7	13	20		M				
695	694.1	28.6	14	16	19	35		M				
690	689.1	33.6	23	27	33	60		M				
685	684.1	38.6	13	14	17	31		M				
680	679.1	43.6	54	46/0.4		100/0.9				**WEATHERED ROCK** (META-GRANODIORITE)	681.7	41.0
	674.1	48.6	100/0.2			100/0.2						
670	669.1	53.6	18	46	54/0.4	100/0.9						
665	664.1	58.6	57	43/0.4		100/0.9					663.2	59.5
										Boring Terminated at Elevation 663.2 ft IN WEATHERED ROCK (META-GRANODIORITE)		

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/6/17

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 22+54	**OFFSET** 3 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 726.7 ft	**TOTAL DEPTH** 64.1 ft	**NORTHING** 544,448	**EASTING** 1,448,165	**24 HR.** 22.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 03/14/17	**COMP. DATE** 03/14/17	**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)
730												
	725.7	1.0								GROUND SURFACE	726.7	0.0
725			4	8	11	19		M		**ARTIFICIAL FILL** RED TO BROWN, FINE SANDY CLAY WITH TRACE OF ROCK FRAGMENTS	721.2	5.5
	723.1	3.6	6	7	6	13		M		**RESIDUAL** TAN AND WHITE, FINE SANDY SILT WITH TRACE OF MANGANESE		
720	721.1	5.6	2	2	4	6		M				
	718.1	8.6	3	5	7	12		M				
715	713.1	13.6	2	4	6	10		M				
710	708.1	18.6	4	5	7	12		M				
705	703.1	23.6	5	5	8	13		M				
700	698.1	28.6	6	7	12	19		M				
695	693.1	33.6	11	11	22	33		M				
690	688.1	38.6	13	15	18	33		M				
685	683.1	43.6	21	26	40	66		M				
680	678.1	48.6	54	46/0.3		100/0.8				**WEATHERED ROCK** (META-GRANODIORITE)	678.2	48.5
675	673.1	53.6	21	16	25	41		M		**RESIDUAL** TAN AND WHITE, FINE SANDY SILT WITH TRACE OF MANGANESE	673.2	53.5
670	668.1	58.6	54	46/0.3		100/0.8				**WEATHERED ROCK** (META-GRANODIORITE)	668.2	58.5
665	663.1	63.6	100/0.5			100/0.5					662.6	64.1
										Boring Terminated at Elevation 662.6 ft IN WEATHERED ROCK (META-GRANODIORITE)		

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/6/17

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Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 22+87	**OFFSET** 30 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 720.8 ft	**TOTAL DEPTH** 73.3 ft	**NORTHING** 544,406	**EASTING** 1,448,162	**24 HR.** 19.0 Caved
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 03/21/17	**COMP. DATE** 03/21/17	**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)
725											
720	719.8	1.0	5	7	11	18		M		720.8 GROUND SURFACE	0.0
	717.6	3.2	5	8	11	19		M		**ARTIFICIAL FILL** RED TO BROWN, FINE SANDY CLAY 718.3	2.5
715	715.6	5.2	5	7	10	17		M		**RESIDUAL** TAN, SILTY, FINE SAND	
	712.6	8.2	4	7	9	16		M		709.8	11.0
710	707.6	13.2	3	3	6	9	SS-17	30%		TAN AND ORANGE, SILTY CLAY	
705	702.6	18.2	5	8	8	16		M		703.8	17.0
700	697.6	23.2	7	13	19	32		M		TAN, ORANGE AND WHITE, FINE SANDY SILT WITH SOME MANGANESE AND TRACE OF ROCK FRAGMENTS	
695	692.6	28.2	10	11	15	26		M			
690	687.6	33.2	14	16	20	36	SS-18	19%			
685	682.6	38.2	21	31	33	64		M			
680	677.6	43.2	21	24	20	44		M			
675	672.6	48.2	17	42	43	85		M			
670	667.6	53.2	57	43/0.4		100/0.9				667.8	53.0
665	662.6	58.2	100/0.2			100/0.2				**WEATHERED ROCK** (META-GRANODIORITE)	
660	657.6	63.2	100/0.2			100/0.2					
655	652.6	68.2	100/0.3			100/0.3					
650	647.6	73.2	60/0.1			60/0.1				647.6 647.5 **CRYSTALLINE ROCK** (META-GRANODIORITE) 73.2 73.3	

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)
645						Match Line				Boring Terminated with Standard Penetration Test Refusal at Elevation 647.5 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)	
										24 Hr Water Level Caved Dry at 19.0'	

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/6/17

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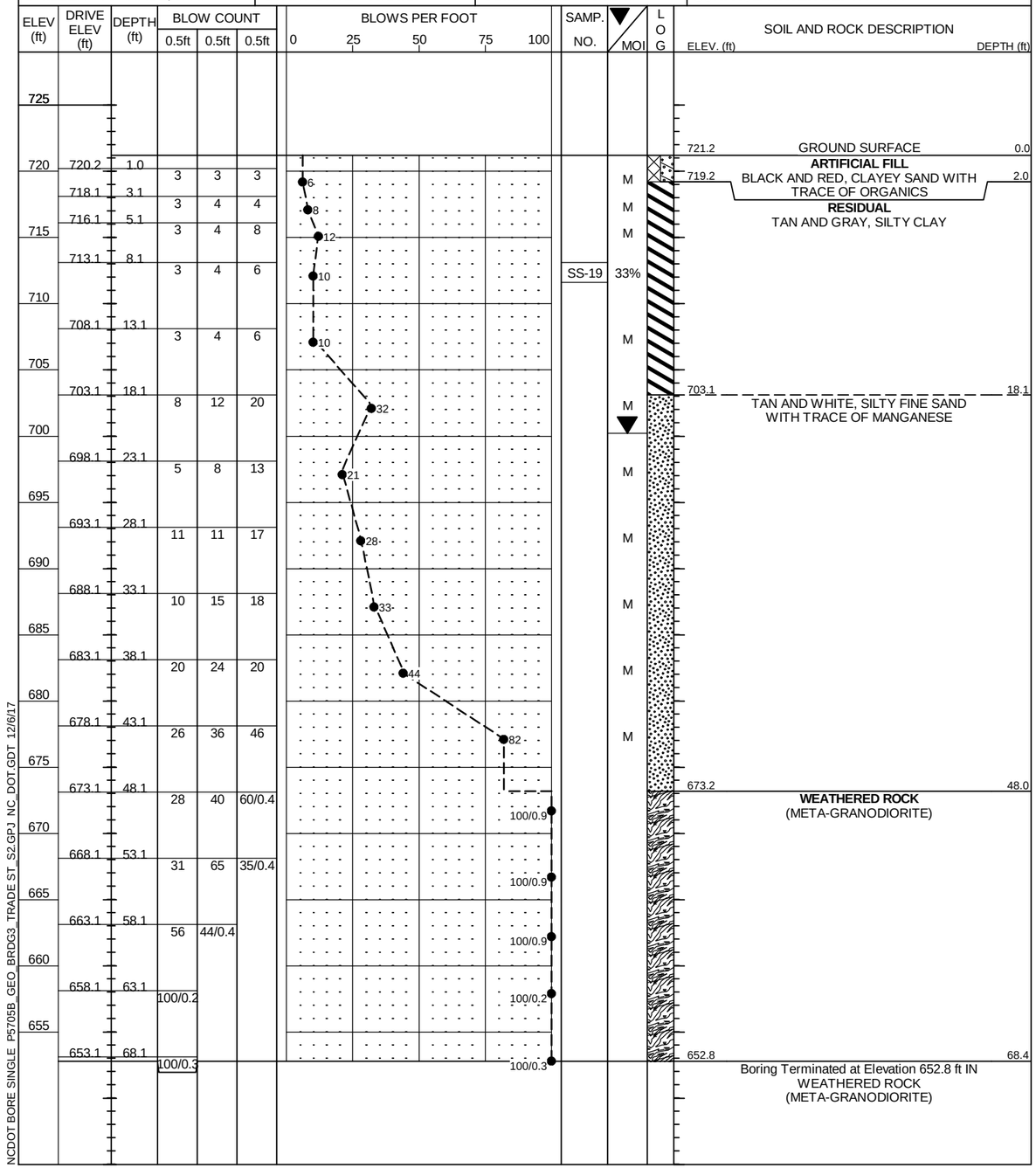
GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 22+75	**OFFSET** 12 ft RT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 721.2 ft	**TOTAL DEPTH** 68.4 ft	**NORTHING** 544,443	**EASTING** 1,448,140	**24 HR.** 21.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring		HAMMER TYPE Automatic
DRILLER TURNAGE, J. R.	**START DATE** 03/20/17	**COMP. DATE** 03/21/17	**SURFACE WATER DEPTH** N/A	



NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/6/17

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Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-			**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 23+38	**OFFSET** 41 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 721.1 ft	**TOTAL DEPTH** 73.5 ft	**NORTHING** 544,361	**EASTING** 1,448,134	**24 HR.** 17.2
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic
DRILLER TURNAGE, J. R.	**START DATE** 03/16/17	**COMP. DATE** 03/16/17	**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
725										
720	720.1	1.0	4	6	8	14		M		721.1 GROUND SURFACE 0.0 720.1 **ARTIFICIAL FILL** 1.0 BLACK AND GRAY, SILTY FINE SAND WITH SOME GRAVEL
	717.7	3.4	4	6	7	13		M		**RESIDUAL** RED, TAN AND WHITE, CLAYEY SILT WITH TRACE OF MICA
715	715.7	5.4	3	5	6	11		M		
	712.7	8.4	5	5	4	9		M		
710	707.7	13.4	3	4	5	9	SS-21	28%		
705										704.6 16.5 TAN AND WHITE, FINE SANDY SILT WITH TRACE OF MICA AND MANGANESE
	702.7	18.4	6	10	14	24				
700	697.7	23.4	3	6	7	13		M		
695	692.7	28.4	6	7	13	20		M		
690	687.7	33.4	10	14	20	34		M		
685	682.7	38.4	8	10	12	22		M		
680	677.7	43.4	19	31	34	65		M		
675	672.7	48.4	15	21	32	53		M		
670	667.7	53.4	58	42/0.4		100/0.9				668.1 53.0 **WEATHERED ROCK** (META-GRANODIORITE)
665										
	662.7	58.4	100/0.3			100/0.3				
660	657.7	63.4	100/0.2			100/0.2				
655										
	652.7	68.4	60/0.1			60/0.1				652.7 68.4 **CRYSTALLINE ROCK** (META-GRANODIORITE)
650	647.7	73.4	60/0.1			60/0.1				647.6 73.5 Boring Terminated with Standard Penetration Test Refusal at Elevation 647.6

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/6/17

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-			**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 23+38	**OFFSET** 41 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 721.1 ft	**TOTAL DEPTH** 73.5 ft	**NORTHING** 544,361	**EASTING** 1,448,134	**24 HR.** 17.2
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic
DRILLER TURNAGE, J. R.	**START DATE** 03/16/17	**COMP. DATE** 03/16/17	**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
645						Match Line				ft IN CRYSTALLINE ROCK (META-GRANODIORITE)

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/6/17

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Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 23+36	**OFFSET** 10 ft RT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 719.7 ft	**TOTAL DEPTH** 78.7 ft	**NORTHING** 544,398	**EASTING** 1,448,099	**24 HR.** 19.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 03/22/17	**COMP. DATE** 03/23/17	**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)
720												
										GROUND SURFACE	719.7	0.0
	718.7	1.0	3	4	2	6		M		**ARTIFICIAL FILL** RED TO BROWN, CLAYEY FINE SAND WITH TRACE OF ROCK FRAGMENETS		
	716.3	3.4	3	2	3	5		M				
715	714.3	5.4	3	3	3	6		M			714.7	5.0
	711.3	8.4	3	4	5	9		M		**RESIDUAL** TAN, RED AND WHITE, CLAYEY FINE SAND		
710												
	706.3	13.4	4	6	10	16		M			706.7	13.0
705										TAN AND WHITE, SILTY FINE SAND WITH TRACE OF MANGANESE		
	701.3	18.4	8	10	11	21						
700												
	696.3	23.4	8	10	12	22		M				
695												
	691.3	28.4	10	11	16	27		M				
690												
	686.3	33.4	12	13	16	29	SS-22	26%			687.7	32.0
685										TAN AND WHITE, FINE SANDY SILT WITH TRACE OF MANGANESE		
	681.3	38.4	12	11	14	25		M				
680												
	676.3	43.4	20	25	42	67		M				
675												
	671.3	48.4	25	29	62	91		M				
670												
	666.3	53.4	29	30	26	56		M				
665												
	661.3	58.4	70	30/0.3		100/0.8				**WEATHERED ROCK** (META-GRANODIORITE)	661.7	58.0
660												
	656.3	63.4	100/0.5			100/0.5						
655												
	651.3	68.4	100/0.3			100/0.3						
650												
	646.3	73.4	100/0.5			100/0.5						
645												
	641.3	78.4	100/0.3			100/0.3					641.0	78.7
										Boring Terminated at Elevation 641.0 ft IN		

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)
640						Match Line				WEATHERED ROCK (META-GRANODIORITE)		

GEOTECHNICAL BORING REPORT
BORE LOG

Terracon Consulting Engineers & Scientists

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** SCHLEMM, T.S.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. B2-C	**STATION** 23+39	**OFFSET** 1 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 720.0 ft	**TOTAL DEPTH** 91.4 ft	**NORTHING** 544,388	**EASTING** 1,448,105	**24 HR.** 16.0
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M.A.	**START DATE** 09/14/17	**COMP. DATE** 09/18/17	**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
720										ELEV. (ft) DEPTH (ft)
	719.0	1.0								720.0 GROUND SURFACE 0.0
			4	5	4	9		W		**ARTIFICIAL FILL** BROWN AND RED-BROWN, SILTY CLAY, LITTLE GRAVEL
	716.5	3.5								
715			3	2	5	7		W		
	714.0	6.0								713.5 6.5
			4	4	5	9		M		**RESIDUAL** RED-BROWN TO BROWN, FINE TO COARSE SANDY SILT, WITH CLAYEY SAND LAYERS
	711.5	8.5								
710			4	5	6	11		M		
	706.5	13.5								
			3	2	3	5				
705										
	702.0	18.0								
			5	5	5	10		M		
700										
	697.0	23.0								
			6	8	10	18		M		
695										
	692.0	28.0								
			6	7	11	18		M		
690										
	687.0	33.0								686.5 33.5
			18	30	70	100/1.0		M		BROWN AND WHITE, SILTY FINE TO COARSE SAND
685										
	682.0	38.0								
			12	16	44	60		M		
680										
	677.0	43.0								
			25	40	60	100/1.0		M		
675										
	672.0	48.0								
			20	37	63/0.3	100/0.8				671.0 49.0
670										670.0 **WEATHERED ROCK** (BROWN, META-GRANODIORITE) 50.0
										WEATHERED ROCK (BROWN, META-GRANODIORITE)
665										
	663.0	57.0								663.0 57.0
			16	30	44	74		M		**RESIDUAL** BROWN AND WHITE, SILTY FINE TO COARSE SAND
660										
	658.0	62.0								658.0 62.0
			100/0.4			100/0.4				**WEATHERED ROCK** (BROWN AND WHITE, META-GRANODIORITE)
655										
	652.6	67.4								
			36	64/0.4		100/0.9		M		
650										
645	644.5	75.5								
			100/0.2			100/0.2				
640										

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/6/17

0012DEL_P28

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** SCHLEMM, T.S.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. B2-C	**STATION** 23+39	**OFFSET** 1 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 720.0 ft	**TOTAL DEPTH** 91.4 ft	**NORTHING** 544,388	**EASTING** 1,448,105	**24 HR.** 16.0
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M.A.	**START DATE** 09/14/17	**COMP. DATE** 09/18/17	**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
640						Match Line				ELEV. (ft) DEPTH (ft)
	639.3	80.7								639.3 80.7
			60/0.1			60/0.1				**CRYSTALLINE ROCK** BROWN AND WHITE, META-GRANODIORITE
635										
	634.2	85.8								634.2 85.8
			100/0.3			100/0.3				**WEATHERED ROCK** (BROWN, META-GRANODIORITE) 88.1
630										**CRYSTALLINE ROCK** 629.9 (DARK GREEN, OLIVINE DIABASE) 90.1
										628.6 **WEATHERED ROCK** (BROWN, OLIVINE DIABASE) 91.4
										Boring Terminated at Elevation 628.6 ft IN WEATHERED ROCK (BROWN, OLIVINE DIABASE)

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/6/17

0012DEL_P28

Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** SCHLEMM, T.S.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-			**GROUND WTR (ft)**
BORING NO. B2-C	**STATION** 23+39	**OFFSET** 1 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 720.0 ft	**TOTAL DEPTH** 91.4 ft	**NORTHING** 544,388	**EASTING** 1,448,105	**24 HR.** 16.0
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic
DRILLER EKLUND, M.A.	**START DATE** 09/14/17	**COMP. DATE** 09/18/17	**SURFACE WATER DEPTH** N/A
CORE SIZE HQ3	**TOTAL RUN** 34.2 ft		

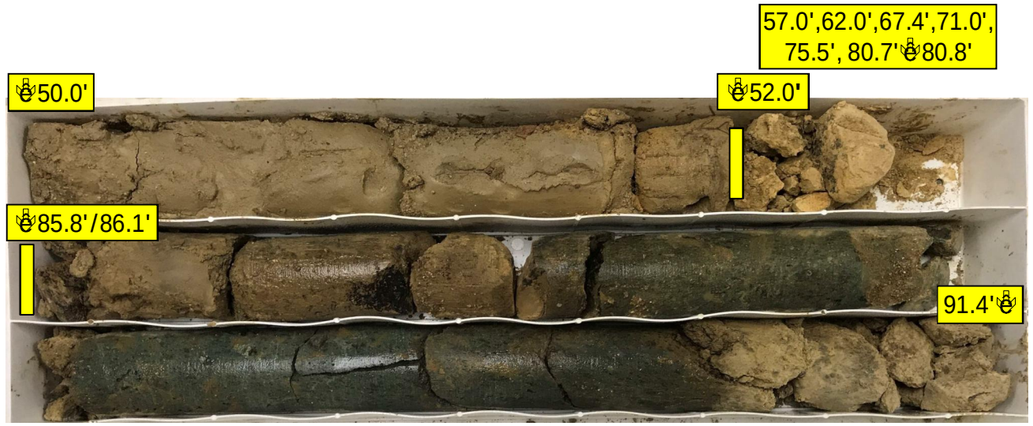
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS	ELEV. (ft)	DEPTH (ft)
670											Begin Coring @ 50.0 ft		
	670.0	50.0	2.0	3:42/1.0 2:07/1.0	(1.6) 80%	(0.0) 0%		(1.9) 27%			**WEATHERED ROCK** (BROWN, META-GRANODIORITE)	670.0	50.0
665	668.0	52.0	5.0	2:33/1.0 2:08/1.0 2:25/1.0 3:55/1.0 4:50/1.0	(0.3) 6%	(0.0) 0%							
	663.0	57.0		*N=74*							**RESIDUAL** BROWN AND WHITE, SILTY FINE TO COARSE SAND	663.0	57.0
660	657.6	62.4										658.0	62.0
			5.0	*N=100/0.4* 2:50/1.0 3:01/1.0 2:16/1.0 2:39/1.0 2:08/1.0	(0.0) 0%	(0.0) 0%		(0.0) 0%			**WEATHERED ROCK** (BROWN AND WHITE, META-GRANODIORITE)		
655	652.6	67.4											
	651.7	68.3		*N=100/0.9*									
650	649.0	71.0	2.7	2:01/0.7 2:40/1.0 2:38/1.0	(0.0) 0%	(0.0) 0%							
			4.5	4:08/1.0 5:16/1.0 5:05/1.0 8:16/1.0 4:32/0.5	(0.0) 0%	(0.0) 0%							
645	644.5	75.5											
	644.3	75.7	5.0	*N=100/0.2* 3:41/1.0 4:04/1.0 4:19/1.0 4:25/1.0 5:15/1.0	(0.0) 0%	(0.0) 0%							
640	639.3	80.7										639.3	80.7
	639.2	80.8	5.0	*N=60/0.1* 4:17/1.0 4:26/1.0 4:21/1.0 4:46/1.0 7:02/1.0	(0.0) 0%	(0.0) 0%		(0.0) 0%	(0.0) 0%		**CRYSTALLINE ROCK** BROWN AND WHITE, MODERATELY SEVERE WEATHERING, SOFT TO MEDIUM HARD, VERY CLOSELY FRACTURED, META-GRANODIORITE GSI 30 - 40		
635	634.2	85.8										634.2	85.8
	633.9	86.1	5.0	*N=100/0.3* 6:46/1.0 3:39/1.0 5:38/1.0 3:30/1.0 4:05/1.0	(3.8) 76%	(1.7) 34%		(1.2) 52%			**WEATHERED ROCK** (BROWN, META-GRANODIORITE)	631.9	88.1
630	628.9	91.1						(2.0) 100%	(1.7) 85%		**CRYSTALLINE ROCK** DARK GREEN, SLIGHT TO MODERATELY SEVERE WEATHERING, VERY SOFT TO HARD, VERY CLOSE TO CLOSELY FRACTURED, OLIVINE DIABASE GSI 45 - 50	629.9	90.1
								(0.6) 46%			**WEATHERED ROCK** (BROWN, OLIVINE DIABASE)	628.6	91.4
											Boring Terminated at Elevation 628.6 ft IN WEATHERED ROCK (BROWN, OLIVINE DIABASE)		

NCDOT CORE SINGLE_P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/11/17

CORE PHOTOGRAPHS

Project No. 44475.1.2 (P-5705B)
Charlotte Gateway Station- W. Trade Street Bridge -S2-

B2-C
BOX 1: 50.0 - 91.4 FEET



Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** DENICOLA, J.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-			**GROUND WTR (ft)**
BORING NO. B2-D	**STATION** 23+37	**OFFSET** 21 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 720.3 ft	**TOTAL DEPTH** 82.5 ft	**NORTHING** 544,376	**EASTING** 1,448,121	**24 HR.** 15.5
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic
DRILLER EKLUND, M.A.	**START DATE** 09/06/17	**COMP. DATE** 09/13/17	**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
725										ELEV. (ft) DEPTH (ft)
720										720.3 GROUND SURFACE 0.0
	716.8	3.5								**ARTIFICIAL FILL** ORANGE-BROWN, CLAYEY SILT, TRACE GRAVEL
715	714.3	6.0	2	2	3	5		M		713.8 6.5
	711.8	8.5	3	4	7	11		M		**RESIDUAL** ORANGE-BROWN AND GRAY, CLAYEY SILT
710			4	6	7	13		M		
	707.3	13.0								
705			3	6	7	13				
	702.3	18.0								
700			6	9	14	23		M		
	697.3	23.0								
695			5	5	12	17		M		
	692.3	28.0								693.8 26.5
690			5	9	13	22		M		BROWN AND WHITE, SILTY FINE TO COARSE SAND
	687.3	33.0								
685			5	10	15	25		M		
	682.3	38.0								
680			13	26	32	58		M		
	677.3	43.0								
675			12	17	42	59		M		
	672.3	48.0								671.8 48.5
670			11	43	57/0.3	100/0.8				**WEATHERED ROCK** (BROWN AND WHITE, META-GRANODIORITE)
	669.5	50.8								669.5 50.8
665										**WEATHERED ROCK** (BROWN AND WHITE, META-GRANODIORITE)
	664.5	55.8	49	51/0.2		100/0.7				
660										
	658.8	61.5	100/0.2			100/0.2				
655										
	653.6	66.7	100/0.4			100/0.4				
650										
	648.2	72.1	60/0.0			60/0.0				647.9 72.4
645										

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/6/17

Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** DENICOLA, J.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-			**GROUND WTR (ft)**
BORING NO. B2-D	**STATION** 23+37	**OFFSET** 21 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 720.3 ft	**TOTAL DEPTH** 82.5 ft	**NORTHING** 544,376	**EASTING** 1,448,121	**24 HR.** 15.5
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic
DRILLER EKLUND, M.A.	**START DATE** 09/06/17	**COMP. DATE** 09/13/17	**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
645						Match Line				ELEV. (ft) DEPTH (ft)
	642.9	77.4								**CRYSTALLINE ROCK** BROWN AND WHITE, META-GRANODIORITE *(continued)*
640			60/0.1			60/0.1				637.8 82.5
										Boring Terminated at Elevation 637.8 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/6/17

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Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** DENICOLA, J.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. B2-D	**STATION** 23+37	**OFFSET** 21 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 720.3 ft	**TOTAL DEPTH** 82.5 ft	**NORTHING** 544,376	**EASTING** 1,448,121	**24 HR.** 15.5
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M.A.	**START DATE** 09/06/17	**COMP. DATE** 09/13/17	**SURFACE WATER DEPTH** N/A	
CORE SIZE HQ3	**TOTAL RUN** 30.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
669.5											Begin Coring @ 50.8 ft
	669.5	50.8	5.0	1:50/1.0 5:30/1.0 3:22/1.0 2:37/1.0 2:25/1.0	(1.0) 20%	(0.9) 18%		(1.0) 5%			ELEV. (ft) 669.5 DEPTH (ft) 50.8 **WEATHERED ROCK** (BROWN AND WHITE, META-GRANODIORITE)
665	664.5 663.8	55.8 56.5		N=100/0.7							
			5.0	2:01/1.0 3:36/1.0 4:30/1.0 5:25/1.0 2:52/1.0	(0.0) 0%	(0.0) 0%					
660	658.8 658.6	61.5 61.7		N=100/0.2							
			5.0	2:48/1.0 3:22/1.0 2:50/1.0 3:47/1.0 3:37/1.0	(0.0) 0%	(0.0) 0%					
655	653.6 653.2	66.7 67.1		N=100/0.4							
			5.0	2:39/1.0 2:18/1.0 2:30/1.0 2:56/1.0 2:39/1.0	(0.0) 0%	(0.0) 0%					
650	648.2 647.6	72.1 72.4		N=60/0.0							647.9 72.4
			5.0	3:16/1.0 3:39/1.0 3:31/1.0 3:48/1.0 3:19/1.0	(0.0) 0%	(0.0) 0%		(2.6) 26%	(1.2) 12%		**CRYSTALLINE ROCK** BROWN AND WHITE, MODERATELY SEVERE WEATHERING, MODERATELY HARD, CLOSELY FRACTURED, META-GRANODIORITE GSI 40 - 50
645	642.9 642.8	77.4 77.5		N=60/0.1							
			5.0	3:26/1.0 3:18/1.0 3:38/1.0 3:41/1.0 3:31/1.0	(2.6) 52%	(1.2) 24%					
640	637.8	82.5									637.8 82.5 Boring Terminated at Elevation 637.8 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)

NCDOT CORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/11/17

CORE PHOTOGRAPHS

Project No. 44475.1.2 (P-5705B)
Charlotte Gateway Station- W. Trade Street Bridge -S2-

B2-D
BOX 1: 50.8 - 82.5 FEET

GEOTECHNICAL BORING REPORT
BORE LOG

Terracon Consulting Engineers & Scientists

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** SCHLEMM, T.S.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. B2-E	**STATION** 23+39	**OFFSET** 12 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 720.4 ft	**TOTAL DEPTH** 86.9 ft	**NORTHING** 544,381	**EASTING** 1,448,113	**24 HR.** 15.5
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M.A.	**START DATE** 09/13/17	**COMP. DATE** 09/14/17	**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)
725											
720	719.4	1.0	6	5	2	7 4		M		720.4 GROUND SURFACE	0.0
	716.9	3.5								**ARTIFICIAL FILL** RED-BROWN, SILTY CLAY, LITTLE GRAVEL	
715	714.4	6.0	2	2	2			M		715.4	5.0
	712.1	8.3	3	3	4	7		M		**RESIDUAL** BROWN, CLAYEY SILT	
710			5	5	6	11		M		712.4 ORANGE AND LIGHT BROWN, SILTY FINE TO COARSE SAND	8.0
	707.4	13.0									
705			5	6	7	13				706.4 BROWN AND WHITE, FINE TO COARSE SANDY SILT	14.0
	702.4	18.0	3	5	6	11		M			
700										699.4 BROWN AND WHITE, SILTY FINE TO COARSE SAND	21.0
	697.4	23.0	5	8	16	24		M			
695											
	692.4	28.0	9	16	24	40		M			
690											
	687.4	33.0	9	11	18	29		M			
685											
	682.4	38.0	9	11	14	25		M			
680											
	677.4	43.0	22	52	48/0.2	100/0.7				676.9 **WEATHERED ROCK** (BROWN, DIABASE)	43.5
675											
	671.6	48.8	28	47	53/0.3	100/0.8				670.3 **WEATHERED ROCK** (BROWN, DIABASE)	50.1
670											
665	665.3	55.1	22	78/0.4		100/0.9					
										661.7 **WEATHERED ROCK** (BROWN, META-GRANODIORITE)	58.7
660	659.7	60.7	100/0.3			100/0.3					
655											
	654.4	66.0	100/0.3			100/0.3					
650											
	649.1	71.3	100/0.3			100/0.3					
645											

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** SCHLEMM, T.S.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. B2-E	**STATION** 23+39	**OFFSET** 12 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 720.4 ft	**TOTAL DEPTH** 86.9 ft	**NORTHING** 544,381	**EASTING** 1,448,113	**24 HR.** 15.5
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M.A.	**START DATE** 09/13/17	**COMP. DATE** 09/14/17	**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)
645						Match Line					
	643.8	76.6	60/0.1			60/0.1				643.8 **CRYSTALLINE ROCK** BROWN AND WHITE, META-GRANODIORITE	76.6
640	638.7	81.7	60/0.1			60/0.1					
635	633.6	86.8	60/0.1			60/0.1				633.5 Boring Terminated with Standard Penetration Test Refusal at Elevation 633.5 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)	86.9

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Terracon Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
CORE LOG

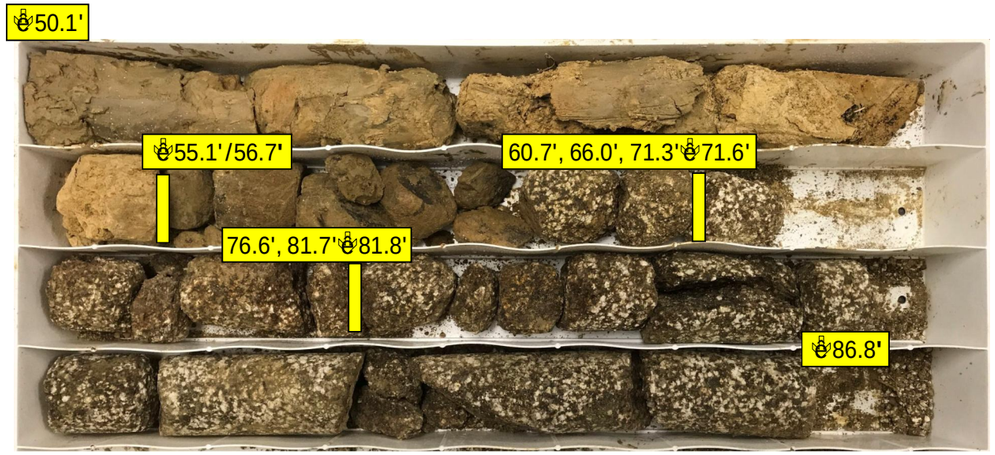
WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** SCHLEMM, T.S.
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-			**GROUND WTR (ft)**
BORING NO. B2-E	**STATION** 23+39	**OFFSET** 12 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 720.4 ft	**TOTAL DEPTH** 86.9 ft	**NORTHING** 544,381	**EASTING** 1,448,113	**24 HR.** 15.5
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD SPT Core Boring	HAMMER TYPE Automatic
DRILLER EKLUND, M.A.	**START DATE** 09/13/17	**COMP. DATE** 09/14/17	**SURFACE WATER DEPTH** N/A
CORE SIZE HQ3	**TOTAL RUN** 34.0 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
670											Begin Coring @ 50.1 ft
	670.3	50.1	5.0	3:47/1.0 4:01/1.0 3:57/1.0 4:33/1.0 3:02/1.0	(2.5) 50%	(0.0) 0%		(3.2) 37%			670.3 **WEATHERED ROCK** (BROWN, DIABASE) 50.1
665	665.3	55.1		*N=100/0.9*							
	663.7	56.7	4.0	4:26/1.0 4:36/1.0 2:54/1.0 3:55/1.0	(1.1) 28%	(0.0) 0%					661.7 58.7
660	659.7	60.7						(1.3) 7%			**WEATHERED ROCK** (BROWN, META-GRANODIORITE)
	659.4	61.0	5.0	*N=100/0.3* 1:58/1.0 2:43/1.0 3:27/1.0 3:27/1.0 3:15/1.0	(0.0) 0%	(0.0) 0%					
655	654.4	66.0									
	654.1	66.3	5.0	*N=100/0.3* 3:17/1.0 2:49/1.0 3:20/1.0 3:32/1.0 3:53/1.0	(0.0) 0%	(0.0) 0%					
650	649.1	71.3									
	648.8	71.6	5.0	*N=100/0.3* 3:00/1.0 2:31/1.0 2:38/1.0 3:39/1.0 2:31/1.0	(0.9) 18%	(0.0) 0%					
645	643.8	76.6									643.8 76.6
	643.7	76.7	5.0	*N=60/0.1* 4:31/1.0 4:49/1.0 5:30/1.0 5:20/1.0 5:42/1.0	(0.0) 0%	(0.0) 0%		(2.9) 28%	(1.1) 11%		**CRYSTALLINE ROCK** BROWN AND WHITE, MODERATELY SEVERE WEATHERING, MODERATELY HARD, CLOSELY FRACTURED, META-GRANODIORITE GSI 45 - 50
640	638.7	81.7									
	638.6	81.8	5.0	*N=60/0.1* 4:51/1.0 4:17/1.0 4:29/1.0 4:03/1.0 3:55/1.0	(2.9) 58%	(1.1) 22%					
635	633.6	86.8		*N=60/0.1*							633.5 86.9 Boring Terminated with Standard Penetration Test Refusal at Elevation 633.5 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)

CORE PHOTOGRAPHS

Project No. 44475.1.2 (P-5705B)
Charlotte Gateway Station- W. Trade Street Bridge -S2-

B2-E
BOX 1: 50.1 - 86.8 FEET



0 1 2

FEET

GEOTECHNICAL BORING REPORT
BORE LOG

Terracon Consulting Engineers & Scientists

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 23+86	**OFFSET** 48 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 721.6 ft	**TOTAL DEPTH** 78.7 ft	**NORTHING** 544,322	**EASTING** 1,448,106	**24 HR.** 19.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 03/28/17	**COMP. DATE** 03/28/17	**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
725										ELEV. (ft) DEPTH (ft)
										721.6 GROUND SURFACE 0.0
720	720.6	1.0	5	7	5	12		M		**ARTIFICIAL FILL** RED AND BLACK, FINE SANDY CLAY WITH TRACE OF ROCK FRAGMENTS
	717.5	4.1	4	4	7					717.6 4.0
715	715.5	6.1	5	5	6	11		M		**RESIDUAL** TAN, ORANGE AND WHITE, CLAYEY FINE SAND WITH TRACE OF MANGANESE
	712.9	8.7	4	5	8	11		M		
710						13		M		
	707.9	13.7	6	10	12	22		M		
705										
	702.9	18.7	5	10	12	22		M		
700										
	697.9	23.7	11	18	29	47		M		
695										
	692.9	28.7	12	20	27	47		M		
690										
	687.9	33.7	10	12	15	27		M		
685										684.6 37.0
	682.9	38.7	10	18	14	32		M		TAN AND WHITE, SILTY FINE SAND
680										
	677.9	43.7	9	10	15	25		M		
675										
	672.9	48.7	13	15	19	34		M		
670										
	667.9	53.7	22	23	24	47		M		
665										
	662.9	58.7	17	23	23	46		M		
660										
	657.9	63.7	69	31/0.4		100/0.9		M		658.1 63.5
655										**WEATHERED ROCK** (META-GRANODIORITE)
	652.9	68.7	15	10	28	38		M		653.1 68.5
650										**RESIDUAL** TAN AND WHITE, SILTY FINE SAND
	647.9	73.7	100/0.3			100/0.3		M		648.1 73.5
645										**WEATHERED ROCK** (META-GRANODIORITE)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 23+86	**OFFSET** 48 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 721.6 ft	**TOTAL DEPTH** 78.7 ft	**NORTHING** 544,322	**EASTING** 1,448,106	**24 HR.** 19.0
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 03/28/17	**COMP. DATE** 03/28/17	**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
645						Match Line				ELEV. (ft) DEPTH (ft)
	642.9	78.7	60/0.0			60/0.0				642.9 78.7
										Boring Terminated with Standard Penetration Test Refusal at Elevation 642.9 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)

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Terracon
Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. B3-B	**STATION** 23+79	**OFFSET** 8 ft RT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 719.4 ft	**TOTAL DEPTH** 68.4 ft	**NORTHING** 544,366	**EASTING** 1,448,070	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring		HAMMER TYPE Automatic
DRILLER TURNAGE, J. R.	**START DATE** 03/29/17	**COMP. DATE** 03/29/17		**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)
										719.4	
720										GROUND SURFACE	0.0
	718.4	1.0	2	2	4	6		M		**ARTIFICIAL FILL** RED AND TAN, FINE SANDY CLAY	
	716.1	3.3	2	3	3	6		M		715.4	4.0
715	714.1	5.3	2	3	3	6		M		**RESIDUAL** RED AND TAN, CLAYEY SILT WITH OF TRACE MICA	
	710.9	8.5	2	3	5	8		M		711.9	7.5
710										TAN AND WHITE, SILTY FINE SAND WITH TRACE OF MANGANESE	
	706.1	13.3	2	3	5	8		M			
705											
	701.1	18.3	2	2	6	8		M			
700											
	696.1	23.3	4	7	9	16		M			
695											
	691.1	28.3	3	3	5	8		M			
690											
	686.1	33.3	4	8	17	25		M		687.4	32.0
685										TAN, CLAYEY FINE SAND WITH TRACE OF MANGANESE	
	681.1	38.3	31	36	32	68		M			
680											
	676.1	43.3	88	12/0.4		100/0.9				676.9	42.5
675										**WEATHERED ROCK** (META-GRANODIORITE)	
	671.1	48.3	49	51/0.4		100/0.9					
670											
	666.1	53.3	6	7	12	19		M		666.9	52.5
665										**RESIDUAL** TAN, CLAYEY SILT	
	661.1	58.3	34	49	51/0.3	100/0.8				660.1	59.3
660										**WEATHERED ROCK** (META-GRANODIORITE)	
	656.1	63.3	100/0.2			100/0.2					
655											
	651.1	68.3	60/0.1			60/0.1				651.0	68.4
										Boring Terminated with Standard Penetration Test Refusal at Elevation 651.0 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)	

NCDOT BORE SINGLE P5705B_GEO_BRDG3_TRADE ST_S2.GPJ NC_DOT.GDT 12/6/17

GEOTECHNICAL BORING REPORT
BORE LOG

Terracon Consulting Engineers & Scientists

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 24+25	**OFFSET** 24 ft LT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 722.6 ft	**TOTAL DEPTH** 73.2 ft	**NORTHING** 544,311	**EASTING** 1,448,062	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/29/17	**COMP. DATE** 03/29/17	**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)
725										722.6 PAVEMENT SURFACE	0.0
	721.6	1.0						M		721.4 **PAVEMENT** 0.5' ASPHALT AND 0.7' STONE BASE	1.2
720	719.6	3.0	4	4	3	7		M		**RESIDUAL** RED AND BROWN, SILTY CLAY	
	716.6	6.0	2	3	4	7		M			
715	714.6	8.0	2	2	4	6		M			
			2	2	4	6		M		712.6 GRAY, CLAYEY SILT	10.0
710	709.6	13.0	3	5	8	13		M			
705	704.6	18.0	5	20	22	42		M			
700	699.6	23.0	28	35	36	71		M			
695	694.6	28.0	2	4	6	10		M		696.6 GRAY, BROWN AND WHITE, SILTY FINE SAND	26.0
690	689.6	33.0	2	3	7	10		M			
685	684.6	38.0	9	10	10	20		M			
680	679.6	43.0	7	21	31	52		M			
675	674.6	48.0	14	23	29	52		M			
670	669.6	53.0	14	28	44	72		M			
665	664.6	58.0	10	22	34	56		M			
660	659.6	63.0	100/0.5			100/0.5				661.6 **WEATHERED ROCK** (META-GRANODIORITE)	61.0
655	654.6	68.0	77	23/0.1		100/0.6					
650	649.6	73.0	100/0.2			100/0.2				649.4 Boring Terminated at Elevation 649.4 ft IN WEATHERED ROCK (META-GRANODIORITE)	73.2

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST TRADE STREET BRIDGE -S2-				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 24+39	**OFFSET** 25 ft RT	**ALIGNMENT** -S2-	**0 HR.** N/A
COLLAR ELEV. 738.5 ft	**TOTAL DEPTH** 67.8 ft	**NORTHING** 544,335	**EASTING** 1,448,017	**24 HR.** 19.8
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 05/02/17	**COMP. DATE** 05/02/17	**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)
740										738.5 GROUND SURFACE	0.0
	736.2	2.3	3	2	3	5		M		**RAILROAD BALLAST** CRUSHED STONE	
735	733.0	5.5	3	6	6	12		M		735.5 **RAILROAD EMBANKMENT** RED AND TAN, CLAYEY FINE SAND WITH TRACE OF MICA AND ROCK FRAGMENTS	3.0
730	731.5	7.0	3	5	7	12		M			
	726.1	12.4	3	3	6	9		M			
725	721.1	17.4	3	4	6	10				722.5 **RESIDUAL** TAN AND ORANGE, CLAYEY FINE SAND	16.0
720	716.1	22.4	4	7	8	15		M		717.5 TAN AND GRAY, SILTY FINE SAND WITH TRACE OF MANGANESE	21.0
715	711.1	27.4	6	9	15	24		M			
710	706.1	32.4	13	11	15	26		M			
705	701.1	37.4	17	18	21	39		M			
700	696.1	42.4	12	12	13	25		M		695.0 TAN, CLAYEY FINE SAND WITH TRACE OF MANGANESE	43.5
695	691.1	47.4	11	16	16	32		M			
690	686.1	52.4	7	12	22	34		M			
685	681.1	57.4	100/0.3			100/0.3				681.5 **WEATHERED ROCK** (META-GRANODIORITE)	57.0
680	676.1	62.4	33	48	52/0.3	100/0.8					
675	671.1	67.4	100/0.4			100/0.4				670.7 Boring Terminated at Elevation 670.7 ft IN WEATHERED ROCK (META-GRANODIORITE)	67.8

LABORATORY TESTING SUMMARY

PROJECT NUMBER: 44475.1.2 **TIP:** P-5705B **COUNTY:** MECKLENBURG

DESCRIPTION: Charlotte Gateway Station and Track and Safety Improvements - West Trade Street Bridge on -S2-

Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic	Ave. Wet Unit Wt. (pcf)	Shear Strength Values			
								Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200				Total Cohesion (psf)	Total Friction (ϕ)	Effective Cohesion (psf)	Effective Friction (ϕ')
SS-16	-S2-	EB1-A	30' LT	18.6-20.1	A-5 (1)	42	9	38.7	23.1	25.8	12.4	0	95	67	42	40.6	N/D	N/D	N/D	N/D	N/D	N/D
SS-17	-S2-	B1-A	30' LT	13.2-14.7	A-7-6 (3)	42	12	37.5	20.7	26.4	15.4	0	96	69	46	29.9	N/D	N/D	N/D	N/D	N/D	N/D
SS-18	-S2-	B1-A	30' LT	33.2-34.7	A-4 (0)	34	5	43.8	24.4	21.3	10.5	0	95	64	36	18.8	N/D	N/D	N/D	N/D	N/D	N/D
SS-19	-S2-	B1-B	12' RT	8.1-9.6	A-7-6 (13)	51	23	21.6	21.5	36.3	20.6	0	98	83	62	33.2	N/D	N/D	N/D	N/D	N/D	N/D
SS-21	-S2-	B2-A	41' LT	13.4-14.9	A-5 (2)	42	9	34.9	21.5	29.5	14.1	0	96	70	48	27.7	N/D	N/D	N/D	N/D	N/D	N/D
SS-22	-S2-	B2-B	10' RT	33.4-34.9	A-4 (6)	34	9	15.0	19.8	48.1	17.1	0	100	92	71	26.2	N/D	N/D	N/D	N/D	N/D	N/D

N/D - NOT DETERMINED

Stephanie H. Huffman

Certified Lab Technician Signature

114-01-1203

Certification Number

SITE PHOTOGRAPHS
CHARLOTTE GATEWAY STATION AND TRACK IMPROVEMENTS - WEST TRADE STREET BRIDGE ON -S2-

PHOTOGRAPH NO. 1: EAST APPROACH TO END BENT NO. 1 ON -S2- ALIGNMENT, LOOKING WEST

PHOTOGRAPH NO. 3: ON WEST TRADE MEDIAN, NORTHWEST OF -S2- ALIGNMENT, LOOKING SOUTHEAST

PHOTOGRAPH NO. 2: ON WEST TRADE STREET MEDIAN, SOUTHEAST OF -S2- ALIGNMENT, LOOKING NORTHWEST

PHOTOGRAPH NO. 4: WEST APPROACH TO END BENT NO.2 ON -S2- ALIGNMENT, LOOKING EAST

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REFERENCE: P-5705B

PROJECT: 44475

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	P-5705B	1	13

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *MECKLENBURG*

PROJECT DESCRIPTION *CHARLOTTE GATEWAY STATION AND TRACK AND SAFETY IMPROVEMENTS*

SITE DESCRIPTION *BRIDGE ON TRACK 1 (-S1-) OVER WEST 5TH STREET (-Y3-) BETWEEN WEST TRADE STREET AND WEST 6TH STREET*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4-7	CROSS SECTIONS
8-11	BORE LOGS
12	SOIL TEST RESULTS
13	SITE PHOTOGRAPHS

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. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

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

NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

RIGGS, A. F.	*DUGGINS, W. T.*
WERITZ, M. A.	*J. R. TURNAGE*
WEAVER, L. A.	*EKLUND, M. A.*
COGAR, T. E.	*MASHBURN, S. R.*
McMILLIAN, M.	*STUDNICKY, R. T.*

INVESTIGATED BY *TERRACON CONSULTANTS*

DRAWN BY *FIELDS, W. D.*

CHECKED BY *RIGGS, A. F.*

SUBMITTED BY *TERRACON CONSULTANTS*

DATE *JULY 2017*

Prepared in the Office of:

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NORTH CAROLINA PROFESSIONAL SEAL 014155 ENGINEER ABNER F. RIGGS, JR.

DocuSigned by:
Abner F. Riggs, Jr.
5228073BBA4F482...

7/20/2017

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED 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 THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR 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
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 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 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 ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 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 SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES 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 WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

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
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
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:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [X] ACKER (TER092-0)
- [X] D-50 (TER373
- [X] D-50 (TER346)

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2⅝ " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [ ] CORE BIT
- [X] 3¼" HOLLOW STEM AUGER

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. 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 "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD 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 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 FOOT
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 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, SUCH 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: BM4; N-544,771; E-1,448,453 BL STATION 51+04.00, 2' RIGHT CHISELED SQUARE
ELEVATION: 738.12 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	3

SITE PLAN

0 40 80
FEET

TYPICAL SKEW ANGLE 93°41'13"

TO GRAHAM STREET

-EY3-

-SI-

-IS-

17+00

18+00

19+00

20+00

21+00

NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

60" CHL

3' GUARD RAIL

CONC

3' GUARD RAIL

30" C&G

6" C&G

ASPHALT PARKING

GR

GR PARKING

BM4 ELEVATION = 738.12
N 544771 E 1448453
BL STATION 5I+04.00 2' RIGHT
CHISELED SQUARE

EB1-A

B1-A

B2-A

EB2-A

EB1-B

B1-B

PROPOSED
BRIDGE

B2-B

EB2-B

TO KANNAPOLIS

TO GASTONIA

DIR ONLY

24" RCP

ELCMP

EIP

WOODS

8" CONC WALL

15" CONC
WALL

CONTROL
CABNET

POST

BL-10

VARIABLE WIDTH
PERMANENT PLATFORM EASEMENT
DB 13053 PG 770

EXISTING NORFOLK SOUTHERN RAILROAD R\W

12" CONC WALL

6" CONC WALL

CONC

2SBKBUS

FAITH F S

30" C&G

TO 6TH STREET

6" C&G

5SBKAPT

Terracon
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PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED FIRM: F-0869

0012DEL_P28

CROSS SECTION THROUGH END BENT 1 AT STA. 18+22 –S1–

℄

0 10 20
FEET
VE–1:1

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	4

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75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

740 730 720 710 700 690 680 670 660

EB1-A
18+22
30' LT

EB1-B
18+24
1' LT

PAVEMENT
(ASPHALT AND STONE)

EXISTING GROUND

RAILROAD EMBANKMENT

Ⓐ

5 18 25 — RESIDUAL, TAN, MEDIUM STIFF TO HARD, MOIST, FINE SANDY CLAY (A-6)

25

26

18 — TAN, WHITE TO GRAY, MEDIUM DENSE TO VERY DENSE, MOIST, SILTY, FINE TO COARSE SAND

25

03/17 — WITH TRACE OF ROCK FRAGMENTS (A-2-4)

42 — TAN, HARD, MOIST, FINE SANDY CLAY (A-6)

100/0.5

100/0.3

100/0.3

BT

WEATHERED ROCK (META-GRANODIORITE)

7 34 31 28 94 99 65 39 40 47 21 57 100/0.9 100/0.7

03/17

97 — RESIDUAL, TAN AND WHITE, FINE TO COARSE, SAND ROCK FRAGMENTS

VERY DENSE, MOIST, SILTY, WITH TRACE OF (A-2-4)

BT

Ⓐ ROADWAY EMBANKMENT, BLACK AND GRAY, SILTY FINE SAND (A-2-4)

TYPICAL SKEW ANGLE 93°41'13"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THOUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	5

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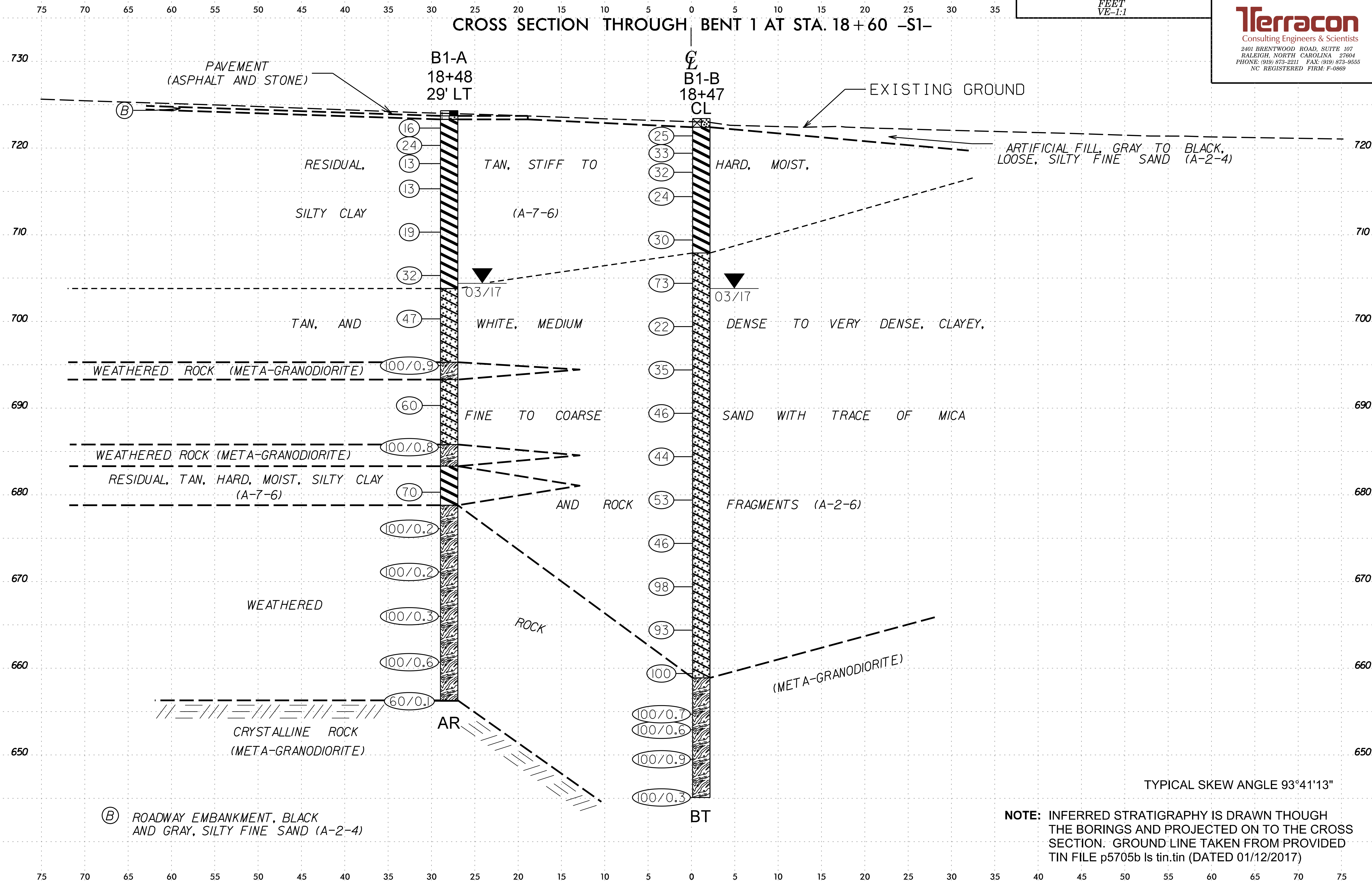
CROSS SECTION THROUGH BENT 1 AT STA. 18+60 -S1-


0 10 20
FEET
VE-1:1
B1-A
18+48
29' LT
℄
B1-B
18+47
CL
PAVEMENT
(ASPHALT AND STONE)
EXISTING GROUND
ARTIFICIAL FILL, GRAY TO BLACK, LOOSE, SILTY FINE SAND (A-2-4)
RESIDUAL, TAN, STIFF TO HARD, MOIST, SILTY CLAY (A-7-6)
03/17
03/17
TAN, AND WHITE, MEDIUM DENSE TO VERY DENSE, CLAYEY, FINE TO COARSE SAND WITH TRACE OF MICA AND ROCK FRAGMENTS (A-2-6)
WEATHERED ROCK (META-GRANODIORITE)
WEATHERED ROCK (META-GRANODIORITE)
RESIDUAL, TAN, HARD, MOIST, SILTY CLAY (A-7-6)
WEATHERED ROCK (META-GRANODIORITE)
CRYSTALLINE ROCK (META-GRANODIORITE)
AR
BT
16
24
13
13
19
32
47
100/0.9
60
100/0.8
70
100/0.2
100/0.2
100/0.3
100/0.6
60/0.1
25
33
32
24
30
73
22
35
46
44
53
46
98
93
100
100/0.7
100/0.6
100/0.9
100/0.3
730
720
710
700
690
680
670
660
650
75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
B ROADWAY EMBANKMENT, BLACK AND GRAY, SILTY FINE SAND (A-2-4)

TYPICAL SKEW ANGLE 93°41'13"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THOUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	6

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED FIRM: F-0869

0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH BENT 2 AT STA. 19+04 -S1-

℄

B2-A
19+18
29' LT

B2-B
19+12
6' LT

ARTIFICIAL FILL, BROWN, MEDIUM STIFF TO STIFF MOIST, FINE SANDY SILT (A-4) — 4, 10, 5

RESIDUAL, BROWN, TAN HARD, MOIST, — 6, 58, 95

WEATHERED ROCK (META-GRANODIORITE) — 100/0.8

RESIDUAL, GRAY-BROWN, HARD, FINE SANDY CLAY — 49, 100

WEATHERED ROCK (META-GRANODIORITE) — 100/0.8

RESIDUAL, GRAY-BROWN, HARD, FINE SANDY CLAY (A-6) — 94, 100/0.9, 86

WEATHERED ROCK (META-GRANODIORITE) — 100/0.9, 100/0.5, 100/0.3, 100/0.3, 100/0.2

BT

GRAY-BROWN, FINE SANDY CLAY — MOIST, (A-6)

03/17

ARTIFICIAL FILL, GRAVEL

EXISTING GROUND

BROWN-TAN AND WHITE, MEDIUM STIFF TO (A-6) — 15, 15, 22, 26

03/17

RESIDUAL, BROWN, TAN AND WHITE, MEDIUM DENSE TO VERY DENSE, MOIST, CLAYEY, FINE TO COARSE SAND (A-2-6) — 37, 51, 54, 39, 62, 25, 89, 100/0.5, 100/0.9, 100/0.8, 100/0.3, 100/0.2

ROCK (META-GRANODIORITE)

BT

TYPICAL SKEW ANGLE 93°41'13"

NOTE: INFERRED STRATIGRAPHY IS DRAWN THOUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

0012DEL_P28

PROJECT REFERENCE NO.	SHEET NO.
P-5705B	7

Terracon
Consulting Engineers & Scientists
2401 BRENTWOOD ROAD, SUITE 107
RALEIGH, NORTH CAROLINA 27604
PHONE: (919) 873-2211 FAX: (919) 873-9555
NC REGISTERED FIRM: F-0869

0 10 20
FEET
VE-1:1

CROSS SECTION THROUGH END BENT 2 AT STA. 19+42 -S1-

℄

EB2-A
19+42
31' LT

EB2-B
19+38
16' RT

EXISTING GROUND

RAILROAD EMBANKMENT

RESIDUAL, GRAY-BROWN AND WHITE, VERY STIFF TO HARD, MOIST, FINE SANDY CLAY (A-6)

19
41
24
27
61
51
77
73
100/0.8
100/0.8
100/0.8

03/17

BROWN AND WHITE, DENSE TO VERY WET, SILTY, FINE TO COARSE WITH ROCK FRAGMENTS

WEATHERED ROCK

BT

23
27
24
38
48
49
53
47
81
80
100/0.6
100/0.4
100/0.3

03/17

DENSE, SAND (A-2-4)

WEATHERED ROCK (META-GRANODIORITE)

HARD, MOIST, FINE SANDY CLAY (A-6)

GRAY-BROWN, (META-GRANODIORITE)

BT

TYPICAL SKEW ANGLE 93°41'13"

Ⓒ ARTIFICIAL FILL, BROWN AND GRAY, MEDIUM DENSE, MOIST, SILTY FINE SAND WITH TRACE OF WOOD FRAGMENTS AND SOME GRAVEL (A-2-4)

NOTE: INFERRED STRATIGRAPHY IS DRAWN THOUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE p5705b ls tin.tin (DATED 01/12/2017)

Terracon
Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 5TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 18+22	**OFFSET** 30 ft LT	**ALIGNMENT** -S1-	**0 HR.** 24.5
COLLAR ELEV. 724.3 ft	**TOTAL DEPTH** 43.0 ft	**NORTHING** 544,708	**EASTING** 1,448,520	**24 HR.** 22.0
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/07/17	**COMP. DATE** 03/07/17	**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)
725											
	723.3	1.0	2	3	2	5		M		724.3 PAVEMENT SURFACE	0.0
	721.3	3.0	5	7	11	18		M		723.7 **PAVEMENT** ASPHALT 0.3' AND STONE 0.3'	0.6
720	719.5	4.8	6	11	14	25		M		**RESIDUAL** TAN, FINE SANDY CLAY	
	716.6	7.7	7	12	13	25		M			
715											
	711.6	12.7	9	13	13	26		M		709.3 TAN, SILTY, FINE TO COARSE SAND WITH TRACE OF ROCK FRAGMENTS	15.0
710											
	706.6	17.7	5	8	10	18		M			
705											
	701.6	22.7	9	12	13	25		M		699.3 TAN, FINE SANDY CLAY	25.0
700											
	696.6	27.7	12	20	22	42		M			
695											
	691.6	32.7	100/0.5			100/0.5				692.3 **WEATHERED ROCK** (META-GRANODIORITE)	32.0
690											
	686.6	37.7	100/0.3			100/0.3					
685											
	681.6	42.7	100/0.3			100/0.3				681.3 Boring Terminated at Elevation 681.3 ft IN WEATHERED ROCK (META-GRANODIORITE)	43.0

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 5TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 18+24	**OFFSET** 1 ft LT	**ALIGNMENT** -S1-	**0 HR.** 24.0
COLLAR ELEV. 723.5 ft	**TOTAL DEPTH** 64.6 ft	**NORTHING** 544,726	**EASTING** 1,448,498	**24 HR.** 22.0
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/07/17	**COMP. DATE** 03/08/17	**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
725										
	722.5	1.0	2	2	5	7		M		723.5 PAVEMENT SURFACE 0.0
	720.9	2.6	9	14	20	34		M		722.5 **PAVEMENT** ASPHALT 0.2' 1.0
720	717.6	5.9	5	12	19	31	SS-1	18%		**ROADWAY EMBANKMENT** BLACK AND GRAY, SILTY, FINE SAND
	715.4	8.1	5	12	16	28		M		**RESIDUAL** TAN, FINE SANDY CLAY
715										
	710.4	13.1	16	37	57	94	SS-2	M		712.5 WHITE TO GRAY, SILTY FINE SAND WITH TRACE OF ROCK FRAGMENTS 11.0
710										
	705.4	18.1	33	55	44	99		M		
705										
	700.4	23.1	14	35	30	65		M		699.5 TAN, FINE SANDY CLAY 24.0
700										
	695.4	28.1	10	17	22	39		M		695.5 TAN AND WHITE, SILTY, FINE TO COARSE SAND WITH TRACE OF ROCK FRAGMENTS 28.0
695										
	690.4	33.1	13	15	25	40		M		
690										
	685.4	38.1	15	24	23	47		M		
685										
	680.4	43.1	9	9	12	21		M		
680										
	675.4	48.1	12	23	34	57		M		
675										
	670.4	53.1	22	47	53/0.4	100/0.9				669.4 **WEATHERED ROCK** (META-GRANODIORITE) 54.1
670										
	665.4	58.1	31	62	38/0.2	100/0.7				661.5 **RESIDUAL** TAN AND WHITE, SILTY, FINE TO COARSE SAND WITH TRACE OF ROCK FRAGMENTS 62.0
665										
	660.4	63.1	33	52	45	97		M		658.9 Boring Terminated at Elevation 658.9 ft IN RESIDUAL SILTY, FINE TO COARSE SAND 64.6
660										

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 5TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 18+48	**OFFSET** 29 ft LT	**ALIGNMENT** -S1-	**0 HR.** 27.0
COLLAR ELEV. 724.3 ft	**TOTAL DEPTH** 68.1 ft	**NORTHING** 544,679	**EASTING** 1,448,490	**24 HR.** 19.9
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/08/17	**COMP. DATE** 03/09/17	**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)
725											
	723.3	1.0	2	6	10	16 24		M		724.3 PAVEMENT SURFACE	0.0
720	721.3	3.0	6	10	14			M		723.7 **PAVEMENT** ASPHALT 0.6'	0.6
	719.2	5.1	4	5	8	13	SS-3	25%		723.3 **ROADWAY EMBANKMENT** BLACK AND GRAY, SILTY, FINE SAND	1.0
715	716.3	8.0	4	5	8	13		M		**RESIDUAL** TAN, SILTY CLAY	
	711.3	13.0	5	7	12	19		M			
710											
	706.3	18.0	7	13	19	32					
705											
	701.3	23.0	9	22	25	47		M		703.8 TAN, CLAYEY, FINE TO COARSE SAND WITH TRACE OF ROCK FRAGMENTS	20.5
700											
	696.3	28.0	20	45	55/0.4	100/0.9				695.3 **WEATHERED ROCK** (META-GRANODIORITE)	29.0
695										693.3 **RESIDUAL** TAN, CLAYEY, FINE TO COARSE SAND WITH TRACE OF ROCK FRAGMENTS	31.0
	691.3	33.0	19	26	34	60		M			
690											
	686.3	38.0	36	64/0.3		100/0.8				685.8 **WEATHERED ROCK** (META-GRANODIORITE)	38.5
685										683.3 **RESIDUAL** TAN, SILTY CLAY	41.0
	681.3	43.0	22	29	41	70		M			
680										678.8 **WEATHERED ROCK** (META-GRANODIORITE)	45.5
	676.3	48.0	100/0.2			100/0.2					
675											
	671.3	53.0	100/0.2			100/0.2					
670											
	666.3	58.0	100/0.3			100/0.3					
665											
	661.3	63.0	30	70/0.1		100/0.6					
660											
	656.3	68.0	60/0.1			60/0.1				656.3 **CRYSTALLINE ROCK** (META-GRANODIORITE) Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 656.2 ft IN CRYSTALLINE ROCK (META-GRANODIORITE)	68.0 / 68.1

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WEAVER, L. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 5TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 18+47	**OFFSET** CL	**ALIGNMENT** -S1-	**0 HR.** 19.0
COLLAR ELEV. 723.4 ft	**TOTAL DEPTH** 78.3 ft	**NORTHING** 544,710	**EASTING** 1,448,480	**24 HR.** 19.6
DRILL RIG/HAMMER EFF./DATE TER92-0 ACKER RENEGADE 94% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER DUGGINS, W. T.	**START DATE** 03/08/17	**COMP. DATE** 03/09/17	**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	
725											
	722.4	1.0	4	10	15	25		M		723.4 GROUND SURFACE	0.0
720	720.4	3.0	7	16	17	33		M		722.4 **ARTIFICIAL FILL** GRAY TO BLACK, SILTY, FINE SAND	1.0
	718.2	5.2	8	13	19	32		M		**RESIDUAL** TAN, SILTY CLAY	
715	715.4	8.0	7	10	14	24		M			
	710.4	13.0	16	14	16	30		M			
710											
	705.4	18.0	10	35	38	73					
705											
	700.4	23.0	5	9	13	22		M			
700											
	695.4	28.0	6	15	20	35		W			
695											
	690.4	33.0	11	21	25	46		W			
690											
	685.4	38.0	11	20	24	44		W			
685											
	680.4	43.0	13	22	31	53		W			
680											
	675.4	48.0	13	21	25	46		W			
675											
	670.4	53.0	23	46	52	98		W			
670											
	665.4	58.0	26	42	51	93		W			
665											
	660.4	63.0	26	32	68	100		W		658.9 **WEATHERED ROCK** (META-GRANODIORITE)	64.5
660											
	655.4	68.0	52	48/0.2		100/0.7					
655	653.5	69.9	73	29/0.1		100/0.6					
	650.4	73.0	83	17/0.4		100/0.9					
650											
	645.4	78.0	100/0.3			100/0.3				645.1 Boring Terminated at Elevation 645.1 ft IN WEATHERED ROCK (META-GRANODIORITE)	78.3

NCDOT BORE DOUBLE P5705B_GEO_BRDG_5TH ST_S1.GPJ NC_DOT.GDT 7/19/17

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 5TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 19+18	**OFFSET** 29 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 724.2 ft	**TOTAL DEPTH** 78.7 ft	**NORTHING** 544,639	**EASTING** 1,448,461	**24 HR.** 20.8
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M. A.	**START DATE** 03/08/17	**COMP. DATE** 03/09/17	**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)
725										724.2 GROUND SURFACE	0.0
	723.2	1.0	5	2	2	4		M		**ARTIFICIAL FILL** BROWN, FINE SANDY SILT	
720	720.7	3.5	7	5	5	10		M			
	718.2	6.0	2	2	3	5		M		716.7 **RESIDUAL** GRAY-BROWN, FINE SANDY CLAY	7.5
715	715.7	8.5	2	2	4	6		M			
	710.7	13.5	17	24	34	58	SS-5	20%			
710											
	705.7	18.5	24	40	55	95				703.2 **WEATHERED ROCK** (META-GRANODIORITE)	21.0
705	700.7	23.5	25	56	44/0.3	100/0.8				698.2 **RESIDUAL** GRAY-BROWN, FINE SANDY CLAY	26.0
700	695.7	28.5	17	22	27	49		M			
695	690.7	33.5	20	38	62	100		M		689.2 **WEATHERED ROCK** (META-GRANODIORITE)	35.0
690	685.7	38.5	24	61	39/0.3	100/0.8				683.2 **RESIDUAL** GRAY-BROWN, FINE SANDY CLAY	41.0
685	680.7	43.5	28	40	54	94		M		678.2 **WEATHERED ROCK** (META-GRANODIORITE)	46.0
680	675.7	48.5	27	43	57/0.4	100/0.9				673.2 **RESIDUAL** GRAY-BROWN, FINE SANDY CLAY	51.0
675	670.7	53.5	20	33	53	86		M		668.2 **WEATHERED ROCK** (META-GRANODIORITE)	56.0
670	665.7	58.5	22	40	60/0.4	100/0.9					
665	660.7	63.5	100/0.5			100/0.5					
660	655.7	68.5	100/0.3			100/0.3					
655	650.7	73.5	100/0.3			100/0.3					
650	645.7	78.5	100/0.2			100/0.2				645.5 Boring Terminated at Elevation 645.5 ft IN WEATHERED ROCK (META-GRANODIORITE)	78.7

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** RIGGS, A. F.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 5TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 19+12	**OFFSET** 6 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 723.6 ft	**TOTAL DEPTH** 73.4 ft	**NORTHING** 544,658	**EASTING** 1,448,440	**24 HR.** 13.8
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/09/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER TURNAGE, J. R.	**START DATE** 03/10/17	**COMP. DATE** 03/10/17	**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
725										723.6 GROUND SURFACE 0.0
	722.6	1.0	6	6	9	15		M		**ARTIFICIAL FILL** GRAVEL
720	720.4	3.2	5	6	9	15		M		**RESIDUAL** BROWN-TAN AND WHITE, FINE SANDY CLAY
	718.4	5.2	6	9	13	22		M		715.6 8.0
715	715.4	8.2	8	12	14	26		M		BROWN, TAN AND WHITE, CLAYEY, FINE TO COARSE SAND
	710.4	13.2	13	15	22	37				
710										
	705.4	18.2	22	21	30	51	SS-6	M		
705	700.4	23.2	23	24	30	54		M		
700	695.4	28.2	26	21	18	39		M		
695	690.4	33.2	21	24	38	62		M		
690	685.4	38.2	10	10	15	25		M		
685	680.4	43.2	38	39	50	89		M		
680	675.4	48.2	100/0.5			100/0.5				675.6 **WEATHERED ROCK** (META-GRANODIORITE) 48.0
675	670.4	53.2	78	22/0.4		100/0.9				
670	665.4	58.2	56	44/0.3		100/0.8				
665	660.4	63.2	100/0.3			100/0.3				
660	655.4	68.2	100/0.2			100/0.2				
655	650.4	73.2	100/0.2			100/0.2				650.2 Boring Terminated at Elevation 650.2 ft IN WEATHERED ROCK (META-GRANODIORITE) 73.4

Terracon
Consulting Engineers & Scientists

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 5TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 19+42	**OFFSET** 31 ft LT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 725.7 ft	**TOTAL DEPTH** 44.8 ft	**NORTHING** 544,620	**EASTING** 1,448,437	**24 HR.** 17.5
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M. A.	**START DATE** 03/09/17	**COMP. DATE** 03/09/17	**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)
730											
725	724.3	1.4	4	7	12	19 41		M		725.7 GROUND SURFACE	0.0
	722.2	3.5	25	20	21			M		724.7 **ARTIFICIAL FILL** BROWN, SILTY FINE SAND WITH TRACE WOOD FRAGMENTS AND GRAVEL	1.0
720	719.7	6.0	6	10	14	24 27		M		**RESIDUAL** GRAY-BROWN AND WHITE, FINE SANDY CLAY	
	717.2	8.5	11	11	16			M			
715	712.2	13.5	18	25	36	61		M			
710	707.2	18.5	11	20	31	51		M			
705	702.2	23.5	19	28	49	77		M			
700	697.2	28.5	20	25	48	73		M		691.2 **WEATHERED ROCK** (META-GRANODIORITE)	34.5
695	692.2	33.5	27	47	53/0.3	100/0.8		M			
690	687.2	38.5	50	50/0.3		100/0.8		M			
685	682.2	43.5	17	34	66/0.3	100/0.8		M		680.9 Boring Terminated at Elevation 680.9 ft IN WEATHERED ROCK (META-GRANODIORITE)	44.8

WBS 44475.1.2	**TIP** P-5705B	**COUNTY** MECKLENBURG	**GEOLOGIST** WERITZ, M. A.	
SITE DESCRIPTION CHARLOTTE GATEWAY STATION AND SAFETY IMPROVEMENTS - WEST 5TH STREET BRIDGE ON -S1-				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 19+38	**OFFSET** 16 ft RT	**ALIGNMENT** -S1-	**0 HR.** N/A
COLLAR ELEV. 724.4 ft	**TOTAL DEPTH** 53.8 ft	**NORTHING** 544,656	**EASTING** 1,448,406	**24 HR.** 20.8
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD Wash Boring	HAMMER TYPE Automatic	
DRILLER EKLUND, M. A.	**START DATE** 03/10/17	**COMP. DATE** 03/13/17	**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
725										
	723.4	1.0	11	10	13	23		M		724.4 GROUND SURFACE 0.0
720	720.9	3.5	10	13	14	27		M		723.4 **ARTIFICIAL FILL** 1.0 GRAY, SILTY FINE SAND WITH SOME GRAVEL
	718.4	6.0	7	10	14	24		M		**RESIDUAL** BROWN AND WHITE, FINE SANDY CLAY
715	715.9	8.5	12	16	22	38		M		
710	710.9	13.5	15	20	28	48		M		707.4 17.0
705	705.9	18.5	14	24	25	49		W		BROWN AND WHITE, SILTY, FINE TO COARSE SAND WITH ROCK FRAGMENTS
700	700.9	23.5	15	22	31	53		W		
695	695.9	28.5	21	26	21	47		W		
690	690.9	33.5	23	29	52	81	SS-7	W		688.4 36.0 GRAY-BROWN, FINE SANDY CLAY
685	685.9	38.5	26	35	45	80		M		683.4 41.0 **WEATHERED ROCK** (META-GRANODIORITE)
680	680.9	43.5	76	24/0.1		100/0.6				
675	675.9	48.5	100/0.4			100/0.4				
	670.9	53.5	100/0.3			100/0.3				670.6 53.8 Boring Terminated at Elevation 670.6 ft IN WEATHERED ROCK (META-GRANODIORITE)

LABORATORY TESTING SUMMARY

PROJECT NUMBER: 44475.1.2 **TIP:** P-5705B **COUNTY:** MECKLENBURG

DESCRIPTION: Charlotte Gateway Station and Track and Safety Improvements - West 5th Street Bridge on -S1-

Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	% by Weight				% Retained #4 Sieve	% Passing (sieves)			% Moisture	% Organic	Ave. Wet Unit Wt. (pcf)	Shear Strength Values			
								Coarse Sand	Fine Sand	Silt	Clay		#10	#40	#200				Total Cohesion (psf)	Total Friction (ϕ)	Effective Cohesion (psf)	Effective Friction (ϕ')
SS-1	-S1-	18+24	1 LT	5.9-7.4	A-6 (8)	39	14	14.8	26.7	41.7	16.8	0	100	92	67	17.6	N/D	N/D	N/D	N/D	N/D	N/D
SS-2	-S1-	18+24	1 LT	13.1-14.6	A-2-4 (0)	19	NP	58.7	19.6	13.4	8.3	1	94	52	24	ND	N/D	N/D	N/D	N/D	N/D	N/D
SS-3	-S1-	18+48	29 LT	5.1-6.6	A-7-6 (15)	48	27	11	34.2	36.5	18.3	0	100	96	64	24.8	N/D	N/D	N/D	N/D	N/D	N/D
SS-5	-S1-	19+18	29 LT	13.5-15.0	A-6 (9)	40	19	20.9	25.4	33.8	19.9	0	100	88	59	19.8	N/D	N/D	N/D	N/D	N/D	N/D
SS-6	-S1-	19+12	6 LT	18.2-19.7	A-2-6 (0)	34	12	51.5	22.5	17.4	8.6	0	94	57	29	ND	N/D	N/D	N/D	N/D	N/D	N/D
SS-7	-S1-	19+38	16 RT	33.5-35.0	A-2-4 (0)	28	9	57.8	20.1	14.2	7.9	12	68	36	18	ND	N/D	N/D	N/D	N/D	N/D	N/D

N/D - NOT DETERMINED

Stephanie H. Huffman

Certified Lab Technician Signature

114-01-1203

Certification Number

SITE PHOTOGRAPHS
CHARLOTTE GATEWAY STATION AND TRACK IMPROVEMENTS - WEST 5th STREET BRIDGE ON -S1-

PHOTOGRAPH NO. 1: EAST APPROACH TO END BENT NO. 1 ON -S1- ALIGNMENT, LOOKING WEST

PHOTOGRAPH NO. 3: ON WEST 5TH STREET (-Y3-), NORTHWEST OF -S1- ALIGNMENT, LOOKING SOUTHEAST

PHOTOGRAPH NO. 2: ON WEST 5TH STREET (-Y3-), SOUTHEAST OF -S1- ALIGNMENT, LOOKING NORTHWEST

PHOTOGRAPH NO. 4: WEST APPROACH TO END BENT NO.2 ON -S1- ALIGNMENT, LOOKING EAST