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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5703	1	34

REFERENCE: R-5703

PROJECT: 46375

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *LENOIR*

PROJECT DESCRIPTION *C.F. HARVEY PARKWAY AND NC 58 TO INTERSECTION OF NC 11 AND GRANGER STATION ROAD GRADING, PAVING, DRAINAGE, STRUCTURES AND SIGNALS*

SITE DESCRIPTION *BRIDGE NO. 212 AND NO. 213 ON -L- (FELIX HARVEY PARKWAY) OVER -Y4- (WALLACE FAMILY ROAD)*

INVENTORY

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. 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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INVESTIGATED BY *S&ME, INC.*

DRAWN BY *C. CHANDLER*

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DATE *FEBRUARY, 2017*

NORTH CAROLINA PROFESSIONAL SEAL 031013 ENGINEER STEWART S. LANEY

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-5703	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 ____ 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
- [ ] PORTABLE HOIST
- [X] BK-51
- [X] D-50

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16" 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: 135.18 FEET RIGHT -L- 343+61, R57037 GPS MONUMENT

N 578,731.5020 E 2,447,574.9400 ELEVATION: 56.27 FEET

NOTES:
FIAD - FILLED IMMEDIATLEY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-5703	3

SITE PLAN

0 40 80
FEET

SKEW 82°11'36"
SITE 3

NC GRID
NAD 83/NSRS 2007

TO SR 1727

-L- POT Sta.200+91.89 =
-Y4- POT Sta.11+61.86

198 199 200 201 202 203

13 12 11 10

-Y4-

END BENT #1

END BENT #2

BRIDGE 212

BRIDGE 213

82°11'36"

B1

B2

EB1-A LT. LN.

EB2-A LT. LN.

EB1-B RT. LN.

EB2-B RT. LN.

SR 1004

-L-

SR 1733

SR 1732 (WALLACE FAMILY RD) 20' BST

TO SR 1742

PROJECT REFERENCE NO.	SHEET NO.
R-5703	4

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

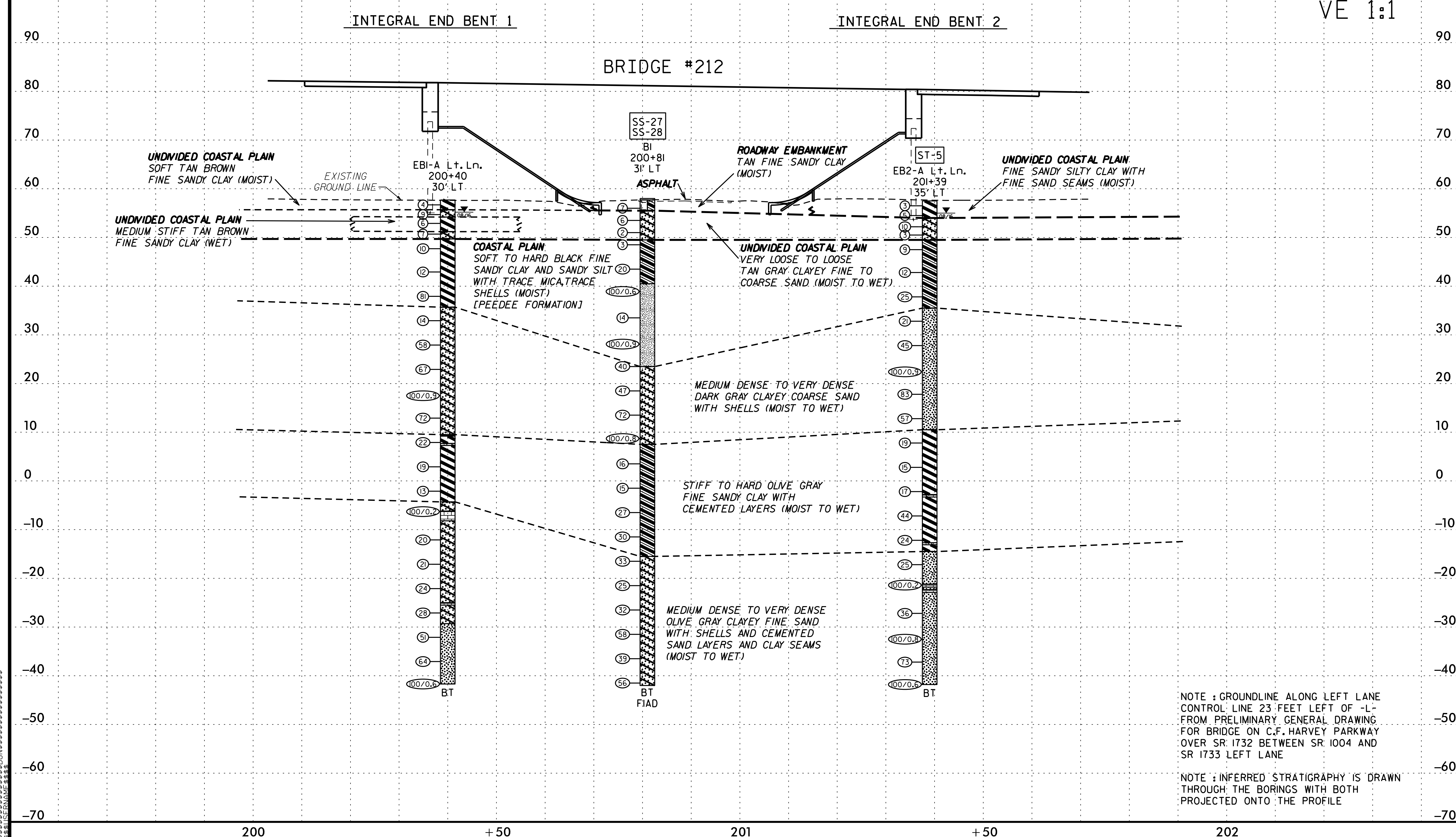
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)				% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	60	200		
SS-27	31' LT	200+81	1.0 – 2.5	A-6 (1)	24	11	19	49	16	19	99	89	80	39.1	13.9	ND
SS-28	31' LT	200+81	18.5 – 19.1	A-4 (0)	24	10	39	29	15	17	99	75	60	37.2	17.1	ND
ST-5	35' LT	201+39	10.0 – 12.0	A-6 (2)	34	15	29	38	12	21	100	90	71	38.6	19.3	ND

PROFILE THROUGH BORINGS PROJECTED ALONG LEFT LANE CONTROL LINE

VE 1:1



NOTE : GROUNDLINE ALONG LEFT LANE CONTROL LINE 23 FEET LEFT OF -L- FROM PRELIMINARY GENERAL DRAWING FOR BRIDGE ON C.F. HARVEY PARKWAY OVER SR 1732 BETWEEN SR 1004 AND SR 1733 LEFT LANE

NOTE : INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

5/14/99

$$$$$$SYSTIME$$$$$$ $$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$ $$$$$$USERNAME$$$$$$

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
R-5703	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)				% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	60	200		
SS-30	29' RT	201+55	0.2 - 1.7	A-4 (0)	18	8	23	40	16	21	99	89	76	39.6	11.6	ND
SS-31	29' RT	201+55	2.3 - 3.8	A-2-4 (0)	15	1	28	45	13	14	100	87	72	32.1	12.2	0.7
SS-32	29' RT	201+55	9.3 - 10.8	A-6 (3)	31	18	31	37	14	18	100	88	69	39.7	12.9	ND
SS-33	29' RT	201+55	48.6 - 50.1	A-6 (3)	33	16	25	38	10	27	100	91	75	41.2	20.3	1.8

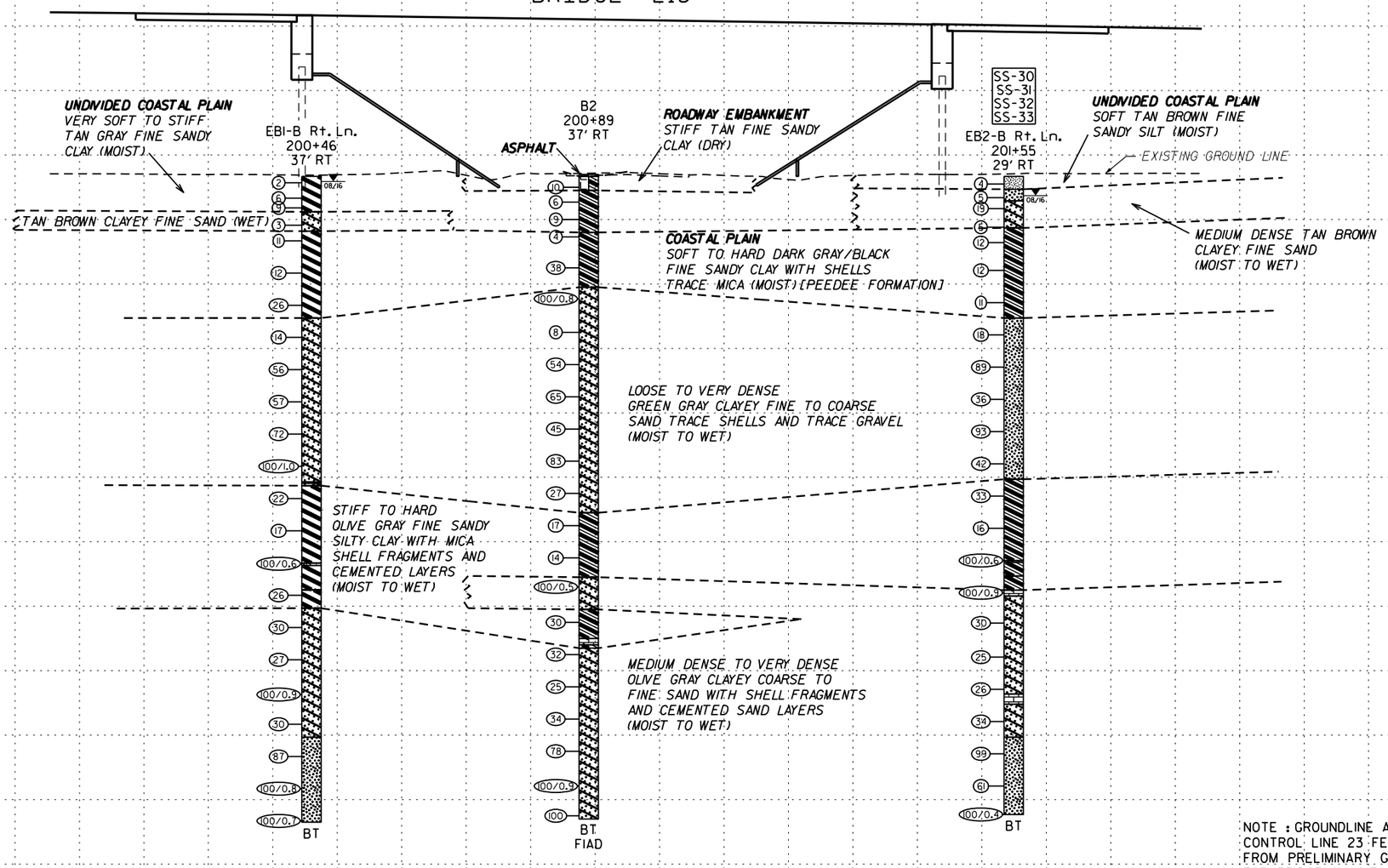
PROFILE THROUGH BORINGS PROJECTED ALONG RIGHT LANE CONTROL LINE

VE 1:1

INTEGRAL END BENT 1

INTEGRAL END BENT 2

BRIDGE #213



NOTE : GROUNDLINE ALONG RIGHT LANE CONTROL LINE 23 FEET RIGHT OF -L- FROM PRELIMINARY GENERAL DRAWING FOR BRIDGE ON C.F. HARVEY PARKWAY OVER SR 1732 BETWEEN SR 1004 AND SR 1733 LEFT LANE

NOTE : INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

$$$$$$$SYSTIME$$$$$
$$$$$$$USERNAME$$$$$
$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 212 on -L- (Felix Harvey Pkwy) over -Y4- (SR 1732)				**GROUND WTR (ft)**
BORING NO. EB1-A Lt. Ln.	**STATION** 200+40	**OFFSET** 30 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 57.7 ft	**TOTAL DEPTH** 99.4 ft	**NORTHING** 579,154	**EASTING** 2,433,589	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 08/24/16	**COMP. DATE** 08/24/16	**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)
60											
	57.7	0.0								57.7 GROUND SURFACE	0.0
			1	2	2	4		M		**UNDIVIDED COASTAL PLAIN**	
55	55.7	2.0								55.7 Tan Brown Fine Sandy CLAY	2.0
			3	4	5	9		W		54.2 Tan Brown Clayey Fine SAND	3.5
	53.9	3.8								Tan Brown Fine Sandy CLAY	
			1	2	4	6		W			
	51.7	6.0								51.2	6.5
			2	3	4	7		W		49.7 Tan Brown Clayey Fine SAND	8.0
50	48.7	9.0								**COASTAL PLAIN**	
			2	4	6	10		M		Olive Gray Fine Sandy Silty CLAY with Mica and Shells	
										[Peedee Formation]	
45	43.9	13.8									
			4	6	6	12		M			
40	38.9	18.8									
			30	60	21	81		M			
										35.7	22.0
35	33.9	23.8								Olive Gray Clayey Fine SAND with cemented sand layers	
			5	5	9	14		W			
30	28.9	28.8									
			16	26	32	58		W			
25	23.9	33.8									
			31	40	27	67		W			
20	18.9	38.8									
			23	45	55/0.4	100/0.9		W			
15	13.9	43.8									
			23	27	45	72		W			
10	8.9	48.8								9.5	48.2
			5	10	12	22		M		9.3 Olive Gray Fine Sandy CLAY with Shells	48.4
5										9.2 and cemented layers	48.5
										7.7	50.0
	3.9	53.8	6	7	12	19		M		7.3	50.4
0											
	-1.1	58.8	4	5	8	13		M			
-5										-4.3	62.0
	-6.1	63.8	100/0.2			100/0.2		W		-6.2 Olive Gray Clayey Fine SAND with Shells and Cemented sand layers	63.9
-10										-8.2	65.9
	-11.1	68.8	6	8	12	20		W			
-15											
	-16.1	73.8	9	9	12	21		W			
-20											

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 212 on -L- (Felix Harvey Pkwy) over -Y4- (SR 1732)				**GROUND WTR (ft)**
BORING NO. EB1-A Lt. Ln.	**STATION** 200+40	**OFFSET** 30 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 57.7 ft	**TOTAL DEPTH** 99.4 ft	**NORTHING** 579,154	**EASTING** 2,433,589	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 08/24/16	**COMP. DATE** 08/24/16	**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
-20						Match Line				
	-21.1	78.8	7	8	16	24		W		
-25										-25.0 82.7
	-26.1	83.8	10	10	18	28		W		-25.5 83.2
-30										-29.3 87.0
	-31.1	88.8	21	23	28	51		M		Gray Fine to Coarse SAND with Fine Gravel
-35										
	-36.1	93.8	19	24	40	64		M		
-40										
	-41.1	98.8	80	20/0.1		100/0.6		M		-41.7 99.4
										Boring Terminated at Elevation -41.7 ft in Very Dense Grey Fine to Coarse SAND with fine gravel

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION Bridge No. 212 on -L- (Felix Harvey Pkwy) over -Y4- (SR 1732)				**GROUND WTR (ft)**
BORING NO. B1	**STATION** 200+81	**OFFSET** 31 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 58.0 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 579,151	**EASTING** 2,433,630	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HPC0279 Diedrich D50 88% 12/09/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Cain, J.	**START DATE** 08/16/16	**COMP. DATE** 08/16/16	**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))
60										
	57.0	1.0	5	4	3	7				58.0 / 0.0 GROUND SURFACE
										57.5 / 0.5 ASPHALT
55	54.5	3.5	3	3	3	6	SS-27	14%	M	55.5 / 2.5 **ROADWAY EMBANKMENT** Tan Fine Sandy CLAY
	52.0	6.0								**UNDIVIDED COASTAL PLAIN** Tan Gray Clayey Fine to Coarse SAND
50	49.5	8.5	3	1	1	2			W	
			1	1	2	3			M	49.5 / 8.5 **COASTAL PLAIN** Black Fine Sandy CLAY, Trace Mica, Trace Shells [Peedee Formation]
45	44.5	13.5								
			13	10	10	20			M	
40	39.5	18.5								40.5 / 17.5 Dark Gray Clayey SILT with Shells
			90	10/0.1		100/0.6	SS-28	18%		
35	34.5	23.5							M	
			4	6	8	14				
30	29.5	28.5								
			30	48	52/0.4	100/0.9			M	
25	24.5	33.5								23.5 / 34.5 Dark Gray Clayey Coarse SAND with Shells
			15	21	19	40			M	
20	19.5	38.5								
			12	17	30	47			M	
15	14.5	43.5								
			28	35	37	72			M	
10	9.5	48.5								
			50	50/0.3		100/0.8			M	
5	4.5	53.5								7.5 / 50.5 Green Gray Fine Sandy CLAY, Trace Shells, Trace Mica
			5	8	8	16			M	
0	-0.5	58.5								
			7	7	8	15			M	
-5	-5.5	63.5								
			8	11	16	27			M	
-10	-10.5	68.5								
			7	12	18	30			M	
-15	-15.5	73.5								-15.5 / 73.5 Green Gray Clayey Fine to Coarse SAND, Trace Shells, Trace Mica
			9	13	20	33			M	
-20										

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
-20						Match Line				
	-20.5	78.5	8	10	15	25		W		Green Gray Clayey Fine to Coarse SAND, Trace Shells, Trace Mica *(continued)*
-25	-25.5	83.5	8	13	19	32		W		
-30	-30.5	88.5	27	28	30	58		M		
-35	-35.5	93.5	14	17	22	39		W		
-40	-40.5	98.5	20	20	36	56		W		-42.0 / 100.0 Boring Terminated at Elevation -42.0 ft in Very Dense Clayey Coarse SAND

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 212 on -L- (Felix Harvey Pkwy) over -Y4- (SR 1732)				**GROUND WTR (ft)**
BORING NO. EB2-A Lt. Ln.	**STATION** 201+39	**OFFSET** 32 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 57.5 ft	**TOTAL DEPTH** 99.3 ft	**NORTHING** 579,145	**EASTING** 2,433,688	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 08/24/15	**COMP. DATE** 08/24/16	**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)
60											
	57.5	0.0	2	2	1	3		M		57.5 GROUND SURFACE	0.0
55	55.5	2.0	2	1	4	5		M		**UNDIVIDED COASTAL PLAIN** Fine Sandy Silty CLAY with Fine Sand Seams	
	53.2	4.3	4	7	3	10		M		54.0 Tan Brown Clayey Fine SAND with Gravelly Sand Seams	3.5
50	51.5	6.0	3	2	1	3		W		49.5 **COASTAL PLAIN** Gray Fine Sandy Silty CLAY with Mica and Shells [Peedee Formation]	8.0
	48.5	9.0	2	3	6	9		M			
45	43.8	13.7	3	6	6	12		M			
40	38.8	18.7	17	12	13	25		M		35.5 Olive Gray Fine SAND with Little Clay	22.0
35	33.8	23.7	6	10	11	21		M			
30	28.8	28.7	16	22	23	45		M			
25	23.8	33.7	36	54	46/0.4	100/0.9		W			
20	18.8	38.7	34	41	42	83		M			
15	13.8	43.7	23	34	23	57		W		10.5 Olive Gray Fine Sandy Silty CLAY with Shells, Mica and Cemented Layers	47.0
10	8.8	48.7	6	8	11	19		W			
5	3.8	53.7	6	7	8	15		W			
0	-1.2	58.7	5	6	11	17		W		-2.8 Olive Gray Fine to Coarse SAND with Shells and Cemented sand Layers	60.3
-5	-6.2	63.7	18	31	13	44		W			
-10	-11.2	68.7	7	10	14	24		W		-12.7	70.2
-15	-16.2	73.7	9	10	15	25		W		-13.1 Olive Gray Fine to Coarse SAND with Shells and Cemented sand Layers	70.6
-20										-14.5	72.0

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 212 on -L- (Felix Harvey Pkwy) over -Y4- (SR 1732)				**GROUND WTR (ft)**
BORING NO. EB2-A Lt. Ln.	**STATION** 201+39	**OFFSET** 32 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 57.5 ft	**TOTAL DEPTH** 99.3 ft	**NORTHING** 579,145	**EASTING** 2,433,688	**24 HR.** 2.5
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 08/24/15	**COMP. DATE** 08/24/16	**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
-20						Match Line				
	-21.2	78.7	100/0.2			100/0.2		W		-21.2 78.7
-25	-26.2	83.7	9	14	22	36		W		-21.8 79.3
										-22.3 79.8
-30	-31.2	88.7	20	55	45/0.3	100/0.8		M		-22.9 80.4
-35	-36.2	93.7	30	36	37	73		M		
-40	-41.2	98.7	90	10/0.1		100/0.6		M		-41.8 99.3

Boring Terminated at Elevation -41.8 ft in Very Dense Grey Fine to Coarse SAND with Fine Gravel

ST-5 collected in offset boring at Station 201+39 Offset 35 ft LT

Other Samples:
ST-5 (10.0 - 12.0)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 213 on -L- (Felix Harvey Pkwy) over -Y4- (SR 1732)				**GROUND WTR (ft)**
BORING NO. EB1-B Rt. Ln.	**STATION** 200+46	**OFFSET** 37 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 56.7 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 579,087	**EASTING** 2,433,588	**24 HR.** 0.8
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 08/25/16	**COMP. DATE** 08/25/16	**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)
60											
	56.7	0.0	2	1	1	2		W		56.7 GROUND SURFACE	0.0
55	54.3	2.4	2	2	4	6		M		**UNDIVIDED COASTAL PLAIN** Tan Gray Fine Sandy Silty CLAY	
	52.8	3.9	2	4	5	9		M		51.2	5.5
50	50.1	6.6	1	2	1	3		W		Tan Brown Clayey Fine SAND	
	47.7	9.0	3	5	6	11		M		48.2	8.5
45										**COASTAL PLAIN** Olive Gray Fine Sandy Silty CLAY with Mica and Shell Fragments [Peedee Formation]	
	42.7	14.0	5	5	7	12		M			
40	37.7	19.0	21	13	13	26		M		34.7	22.0
35	32.7	24.0	4	6	8	14		W		Olive Gray Clayey Fine SAND with cemented sand layers	
30	27.7	29.0	8	25	31	56		M			
25	22.7	34.0	17	28	29	57		W			
20	17.7	39.0	23	31	41	72		W			
15	12.7	44.0	45	55/0.5		100/1.0		W			
10	7.7	49.0	5	11	11	22		M		9.3 / 9.1 / 8.7 Olive Gray Fine Sandy Silty CLAY with Mica, Shell Fragments, and Cemented Layers	47.4 / 47.6 / 48.0
5	2.7	54.0	5	8	9	17		M			
0	-2.3	59.0	5	5	95/0.1	100/0.6		M		-3.3 / -3.7	60.0 / 60.4
-5	-7.3	64.0	60	12	14	26		W		-7.4 / -7.5	64.1 / 64.2
-10	-12.3	69.0	9	13	17	30		W		-10.3 Olive Gray Clayey Fine SAND with Shell Fragments and Cemented Sand Layers	67.0
-15	-17.3	74.0	7	11	16	27		W			
-20											

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 213 on -L- (Felix Harvey Pkwy) over -Y4- (SR 1732)				**GROUND WTR (ft)**
BORING NO. EB1-B Rt. Ln.	**STATION** 200+46	**OFFSET** 37 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 56.7 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 579,087	**EASTING** 2,433,588	**24 HR.** 0.8
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 08/25/16	**COMP. DATE** 08/25/16	**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
-20						Match Line				
	-22.3	79.0	9	8	92/0.4	100/0.9		W		Olive Gray Clayey Fine SAND with Shell Fragments and Cemented Sand Layers *(continued)*
-25	-27.3	84.0	7	12	18	30		W		-30.3 87.0
-30	-32.3	89.0	34	42	45	87		W		Gray Fine to Coarse SAND with Little Fine Gravel
-35	-37.3	94.0	30	43	57/0.3	100/0.8		W		
-40	-42.3	99.0	18	50	50/0.2	100/0.7		W		-43.5 100.2
										Boring Terminated at Elevation -43.5 ft in Very Dense Fine to Coarse SAND with Little Fine Gravel

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION Bridge No. 213 on -L- (Felix Harvey Pkwy) over -Y4- (SR 1732)				**GROUND WTR (ft)**
BORING NO. B2	**STATION** 200+89	**OFFSET** 37 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 57.0 ft	**TOTAL DEPTH** 100.0 ft	**NORTHING** 579,083	**EASTING** 2,433,630	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HPC0279 Diedrich D50 88% 12/09/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Cain, J.	**START DATE** 08/16/16	**COMP. DATE** 08/16/16	**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)
60										
	57.0	0.0								GROUND SURFACE
	56.0	1.0								ASPHALT 0.3
55	53.7	3.3	6	6	4	10		D		**ROADWAY EMBANKMENT** Tan Fine Sandy CLAY 54.5 2.5
	51.0	6.0	1	3	3	6		M		**UNDIVIDED COASTAL PLAIN** Tan Gray Fine to Coarse Sandy CLAY
50	48.3	8.7	4	4	5	9		M		
			1	1	3	4		M		48.0 9.0
45	43.5	13.5	23	19	19	38		M		**COASTAL PLAIN** Dark Gray/Black Fine Sandy CLAY with Shells, Trace Mica [Peedee Formation]
40	38.5	18.5	50	50/0.3		100/0.8		W		39.5 17.5 Green Gray Clayey Fine to Coarse SAND, Trace Shells and Trace Gravel
35	33.5	23.5	5	6	2	8		W		
30	28.5	28.5	7	20	34	54		W		
25	23.5	33.5	27	33	32	65		M		
20	18.5	38.5	12	24	21	45		M		
15	13.5	43.5	32	32	51	83		M		
10	8.5	48.5	11	11	16	27		M		
5	3.5	53.5	7	8	9	17		M		4.5 52.5 Black to Green Gray Fine Sandy CLAY, Trace Gravel, Trace Mica, Trace Shells
0	-1.5	58.5	6	6	8	14		M		
-5	-6.5	63.5	100/0.5			100/0.5		W		-5.5 62.5 Green Gray Clayey Coarse SAND
-10	-11.5	68.5	9	13	17	30		W		-10.5 67.5 Green Gray Fine Sandy CLAY with Shells and cemented sand layers
-15	-16.5	73.5	10	13	19	32		M		-15.0 72.0 -16.0 73.0 -16.5 73.5 Green Gray Clayey Fine to Coarse SANDY, Trace Shells
-20										

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
-20						Match Line				
	-21.5	78.5	8	11	14	25		W		Green Gray Clayey Fine to Coarse SANDY, Trace Shells *(continued)*
-25	-26.5	83.5	9	14	20	34		M		
-30	-31.5	88.5	29	34	44	78		M		
-35	-36.5	93.5	34	54	46/0.4	100/0.9		M		
-40	-41.5	98.5	26	30	70	100		M		-43.0 100.0 Boring Terminated at Elevation -43.0 ft in Very Dense Clayey Coarse SAND, Trace Shells

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 213 on -L- (Felix Harvey Pkwy) over -Y4- (SR 1732)				**GROUND WTR (ft)**
BORING NO. EB2-B Rt. Ln.	**STATION** 201+55	**OFFSET** 29 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 56.7 ft	**TOTAL DEPTH** 99.0 ft	**NORTHING** 579,083	**EASTING** 2,433,697	**24 HR.** 3.0
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 08/23/16	**COMP. DATE** 08/24/16	**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)
60											
	56.5	0.2	1	2	2	4				56.7 GROUND SURFACE	0.0
55	54.4	2.3	1	2	3	5	SS-30	12%		**UNDIVIDED COASTAL PLAIN**	
	52.7	4.0	7	10	9	19	SS-31	12%		54.7 Tan Brown Fine Sandy SILT	2.0
50	49.8	6.9	3	3	2	5		W		52.9 Tan Brown Fine Clayey SAND	3.8
	47.4	9.3	5	6	6	12		W		Tan Brown Clayey Fine SAND with Silt	
45	43.1	13.6	4	5	7	12	SS-32	13%		48.7 **COASTAL PLAIN**	8.0
40	38.1	18.6	4	5	6	11		M		Olive Gray Fine Sandy CLAY with Shells and Mica [Peedee Formation]	
35	33.1	23.6	5	8	10	18		M		34.7 Olive Gray Fine SAND with Shells and Clay Seams	22.0
30	28.1	28.6	27	38	51	89		W			
25	23.1	33.6	12	22	14	36		W			
20	18.1	38.6	11	35	58	93		M			
15	13.1	43.6	26	20	22	42		M			
10	8.1	48.6	8	17	16	33	SS-33	20%		9.7 Olive Gray Fine Sandy CLAY with Mica and cemented layers	47.0
5	3.1	53.6	5	7	9	16		M			
0	-1.9	58.6	5	6	94/0.1	100/0.6		M		-2.9	59.6
-5	-6.9	63.6	12	88/0.4		100/0.9		M		-3.2 -5.3 Olive Gray Fine Sandy CLAY with Shells	59.9 62.0
-10	-11.6	68.3	8	12	18	30		W		-7.5 -8.4 Olive Gray Clayey Fine SAND with Shells and Cemented sand Layers	64.2 65.1
-15	-16.9	73.6	7	10	15	25		W			
-20											

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 213 on -L- (Felix Harvey Pkwy) over -Y4- (SR 1732)				**GROUND WTR (ft)**
BORING NO. EB2-B Rt. Ln.	**STATION** 201+55	**OFFSET** 29 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 56.7 ft	**TOTAL DEPTH** 99.0 ft	**NORTHING** 579,083	**EASTING** 2,433,697	**24 HR.** 3.0
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 08/23/16	**COMP. DATE** 08/24/16	**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
-20						Match Line				
	-21.9	78.6	7	12	14	26		W		-23.6 80.3
-25										-25.2 81.9
	-26.9	83.6	10	14	20	34		W		
-30										-30.3 87.0 Gray Fine to Coarse SAND
	-31.9	88.6	34	47	52	99		M		
-35										
	-36.9	93.6	21	32	29	61		M		
-40										
	-41.9	98.6	100/0.4			100/0.4		M		-42.3 99.0 Boring Terminated at Elevation -42.3 ft in Very Dense Grey Fine to Coarse SAND

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

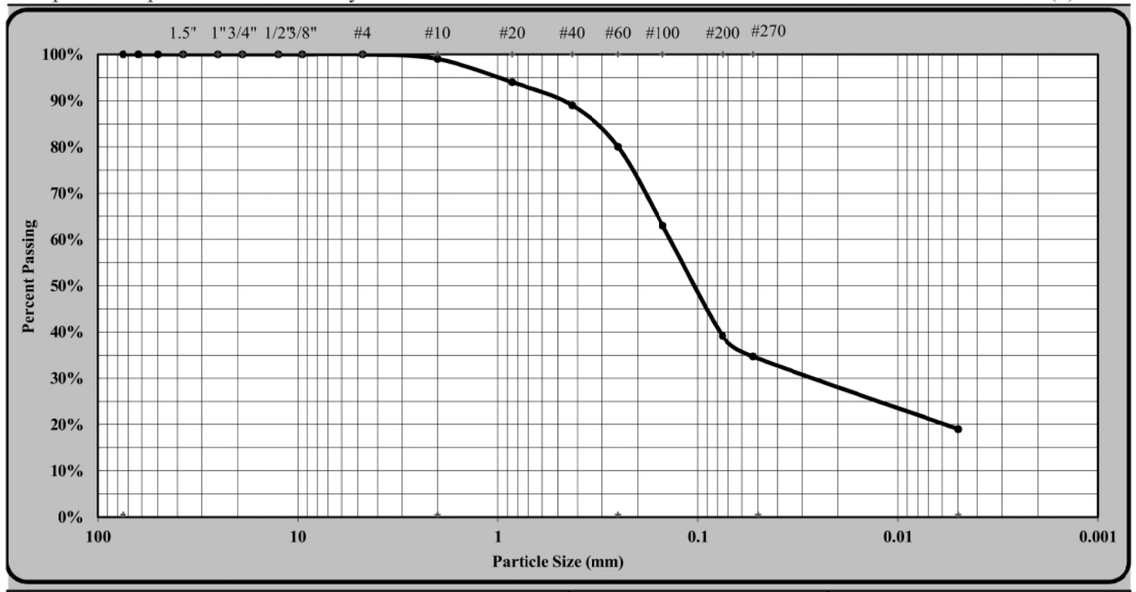
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	11/8/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	11/1-8/16
State Project #:	N/A F.A. Project No: N/A	TIP NO:	N/A
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B1 Sample #: SS-27	Sample Date:	N/A
Location:	Site-Borehole Offset: N/A	Depth (ft):	1.0-2.5'
Sample Description:	Tan fine sandy CLAY	0	A-6 (1)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	19%	Silt	16%
Gravel	1%	Fine Sand	45%	Clay	19%
Apparent Relative Density	2.650	Moisture Content	13.9%	% Passing #200	39.1%
Liquid Limit	24	Plastic Limit	13	Plastic Index	11

Soil Mortar (-#10 Sieve)

Coarse Sand	19%	Fine Sand	46%	Silt	16%	Clay	19%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☐		Weathered & Friable		☐

References / Comments / Deviations: ND=Not Determined.

Karen Warner	118-06-0305	Laboratory Technician	11/8/2016
Technician Name	*Certification No.*	*Position*	*Date*
Stewart Laney, P.E	_____	Senior Engineer	
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

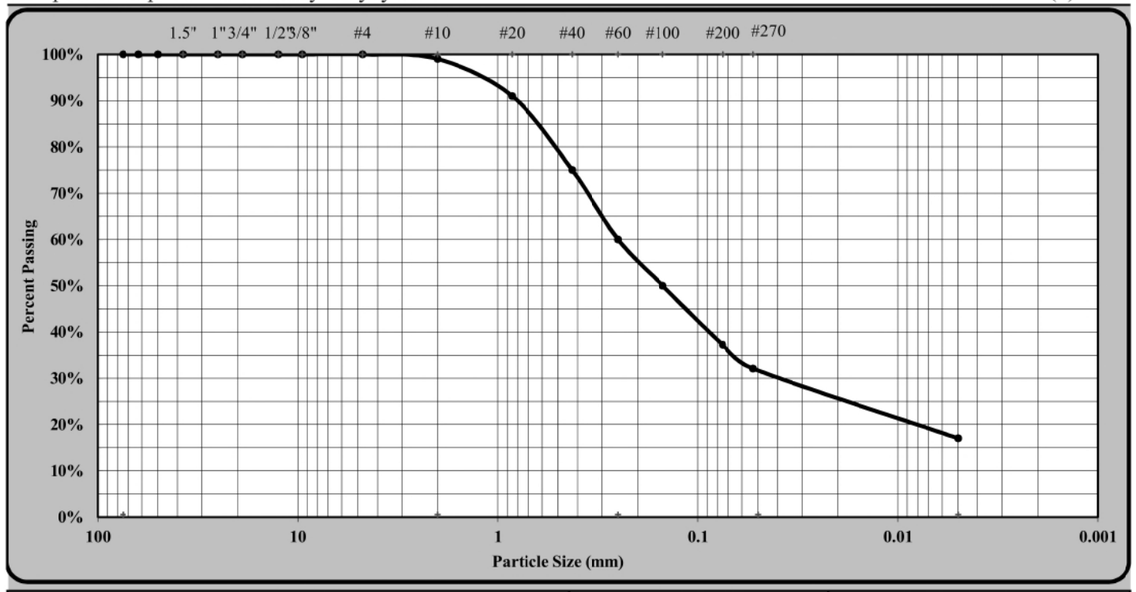
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	11/8/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	11/1-8/16
State Project #:	N/A F.A. Project No: N/A	TIP NO:	N/A
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B1 Sample #: SS-28	Sample Date:	N/A
Location:	Site-Borehole Offset: N/A	Depth (ft):	18.5-19.1'
Sample Description:	Dark Gray Clayey SILT	0	A-4 (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	39%	Silt	15%
Gravel	1%	Fine Sand	28%	Clay	17%
Apparent Relative Density	2.650	Moisture Content	17.1%	% Passing #200	37.2%
Liquid Limit	24	Plastic Limit	14	Plastic Index	10

Soil Mortar (-#10 Sieve)

Coarse Sand	39%	Fine Sand	29%	Silt	15%	Clay	17%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☐		Weathered & Friable		☐

References / Comments / Deviations: ND=Not Determined.

Karen Warner	118-06-0305	Laboratory Technician	11/8/2016
Technician Name	*Certification No.*	*Position*	*Date*
Stewart Laney, P.E	_____	Senior Engineer	
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

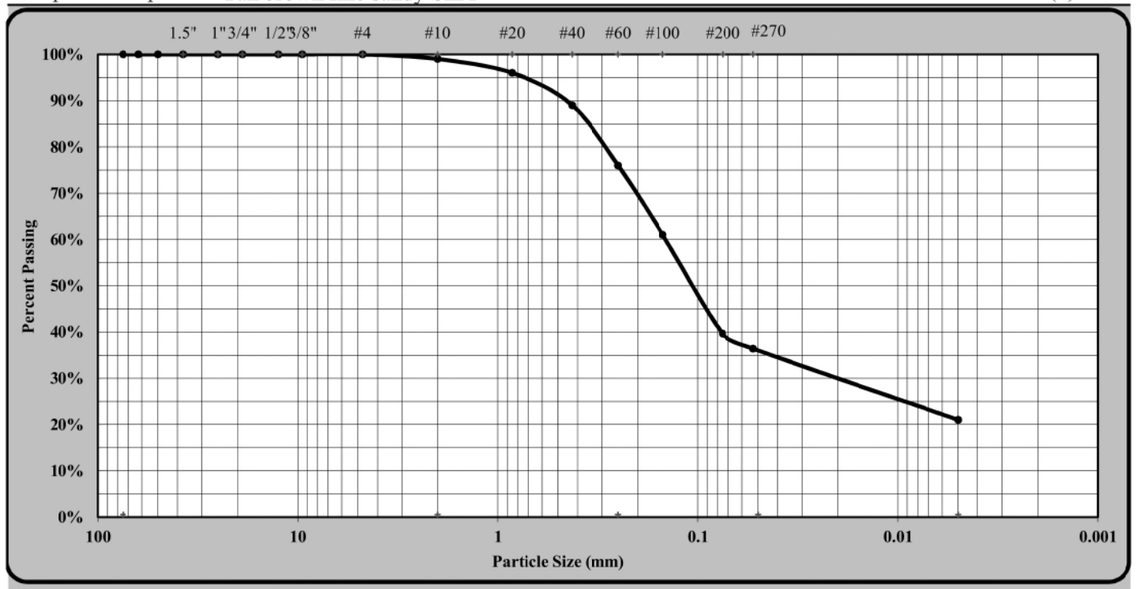
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010			Report Date:	11/8/16
Project Name:	C.F. Harvey Parkway Extension R-5703			Test Date(s):	11/1-8/16
State Project #:	N/A	F.A. Project No:	N/A	TIP NO:	N/A
Client Name:	Michael Baker Engineering				
Address:	Raleigh, NC				
Boring #:	EB2-B Rt. Ln.	Sample #:	SS-30	Sample Date:	N/A
Location:	Site-Borehole	Offset:	N/A	Depth (ft):	0.2-1.7'
Sample Description:	Tan brown fine sandy SILT			0	A-4 (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	23%	Silt	15%
Gravel	1%	Fine Sand	40%	Clay	21%
Apparent Relative Density	2.650	Moisture Content	11.6%	% Passing #200	39.6%
Liquid Limit	18	Plastic Limit	10	Plastic Index	8

Soil Mortar (-#10 Sieve)

Coarse Sand	23%	Fine Sand	40%	Silt	16%	Clay	21%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☐		Weathered & Friable		☐

References / Comments / Deviations: ND=Not Determined.

Karen Warner	118-06-0305	Laboratory Technician	11/8/2016
Technician Name	*Certification No.*	*Position*	*Date*
Stewart Laney, P.E		Senior Engineer	
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

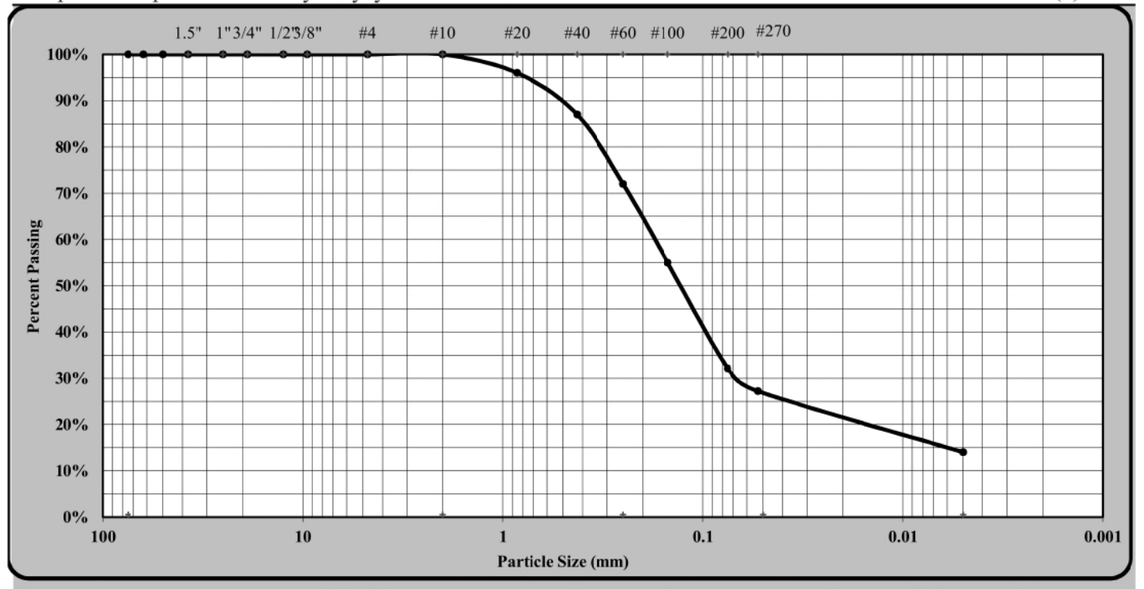
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010			Report Date:	11/14/16
Project Name:	C.F. Harvey Parkway Extension R-5703			Test Date(s):	10/7 - 11/14/16
State Project #:	N/A	F.A. Project No:	N/A	TIP NO:	N/A
Client Name:	Michael Baker Engineering				
Address:	Raleigh, NC				
Boring #:	EB2-B Rt. Ln.	Sample #:	SS-31	Sample Date:	N/A
Location:	Site-Borehole	Offset:	N/A	Depth (ft):	2.3 - 3.8
Sample Description:	Tan Silty Clayey Coarse to Fine SAND				A-2-4 (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	28%	Silt	13%
Gravel	0%	Fine Sand	45%	Clay	14%
Apparent Relative Density	ND	Moisture Content	ND	% Passing #200	32.1%
Liquid Limit	15	Plastic Limit	14	Plastic Index	1

Soil Mortar (-#10 Sieve)

Coarse Sand	28%	Fine Sand	45%	Silt	13%	Clay	14%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☐
Hard & Durable	☐	Soft	☐		Weathered & Friable		☐

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	11/14/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	11/14/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No: TR-T267
Revision No. 0
Revision Date: 07/10/08

Moisture, Ash, and Organic Matter

AASHTO T-267 — ***Quality Assurance***

S&ME, Inc. Raleigh, 3201 Spring Forest Raod, Raleigh, North Carolina 27616

Project #:	**6235-16-010**			Report Date:	10/21/16
Project Name:	C.F. Harvey Parkway Extension R-5703			Test Date(s):	10/18 - 10/21/16
Client Name:	Michael Baker Engineering				
Client Address:	Raleigh, NC				
Boring #:	EB2-B Rt. Ln.	Sample #:	SS-31	Sample Date:	N/A
Location:	Site-Borehole	Offset:	N/A	Depth (ft):	2.3 - 3.8
Sample Description:	Tan Silty Clayey Coarse to Fine SAND (A-2-4) (0)				

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*

Balance: *S&ME ID #:* ***1024*** *Cal. Date:* ***11/06/16*** *Due:* ***11/06/17***

Method A: Moisture Content Determination *Required Oven Temperature:105 ± 5° C*

	Oven Temperature: **105 °C**	*Tare #*	t
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	48.00
a	Mass of ***As-Received*** Specimen + Tare Wt.	*grams*	94.87
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	89.76
w	Water Weight	*(a-b)*	5.11
A	Mass of As-Received Specimen	*(a-t)*	46.87
B	Mass of Oven Dry Specimen	*(b-t)*	41.76
	% Moisture Content as a % of As Received or Total Mass	*(w/A)*100*	**10.9%**
	% Moisture Content as a % of Oven-dried Mass	*(w/B)*100*	**12.2%**

Oven *S&ME ID #:* ***1454*** *Cal. Date:* ***10/7/16*** *Due:* ***10/7/17***

Method C (440° C) or D (750° C): Ash Content and Organic Matter Determination

	Muffle Furnace: **455 °C**	*Tare #*	11
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	13.60
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	39.45
c	Ash Weight + Tare Wt.	*grams*	39.26
C	Ash Weight	*c-t*	25.66
B	Mass of Oven Dry Specimen	*(b-t)*	25.85
D	***% Ash Content***	*(C/B)*100*	**99.3%**
	% Organic Matter	*100-D*	**0.7%**

Muffle Furnace: *S&ME ID #:* ***00261***

Notes / Deviations / References:

Mal Krajan, ET — *Technical Responsibility*
Signature
Laboratory Manager — *Position*
11/14/2016 — *Date*

Form No: TR-T289-1
Revision No. 0
Revision Date: 07/10/08

pH of Soil

AASHTO T289 — ***Quality Assurance***

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

Project #:	**6235-16-010**			Report Date:	11/7/16
Project Name:	C.F. Harvey Parkway Extension R-5703			Test Date(s):	11/5 - 11/7/16
Client Name:	Michael Baker Engineering				
Client Address:	Raleigh, NC				
Boring #:	EB2-B Rt. Ln.	Sample #:	SS-31	Sample Date:	N/A
Location:	Site-Borehole	Offset:	N/A	Depth (ft):	2.3 - 3.8
Sample Description:	Tan Silty Clayey Coarse to Fine SAND (A-2-4) (0)				

Equipment:

Balance		*S&ME ID#*	*1024*	*Cal. Date:*	*11/6/16*	*Due:*	*11/6/17*
Sieve:	*#10*	*S&ME ID#*	*13223*	*Cal. Date:*	*6/11/16*	*Due:*	*6/11/17*
pH Meter:		*S&ME ID#*	*1365*	*Cal. Date:*	*11/7/16*	*Due:*	*NA*

pH Meter Calibration

Buffer Solution	***Results***
pH buffer 7.0	***7.02***
pH buffer 4.01	***4.01***
pH buffer 10.0	***10.03***
Buffer Temperature ^{0}C	***22.4***

Measuring pH of Soil

Measurements	
Weigtht of Air Dry Soil (g)	***20.01***
Distilled Water (g)	***20.02***
Temperature ^{0}C	***21.4***
pH Readings	***5.89***

Notes / Deviations / References: AASHTO T-289: Determining pH of Soil for Use in Corrosion Testing

Mal Krajan, ET — *Technical Responsibility*
Signature
Laboratory Manager — *Position*
11/14/2016 — *Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

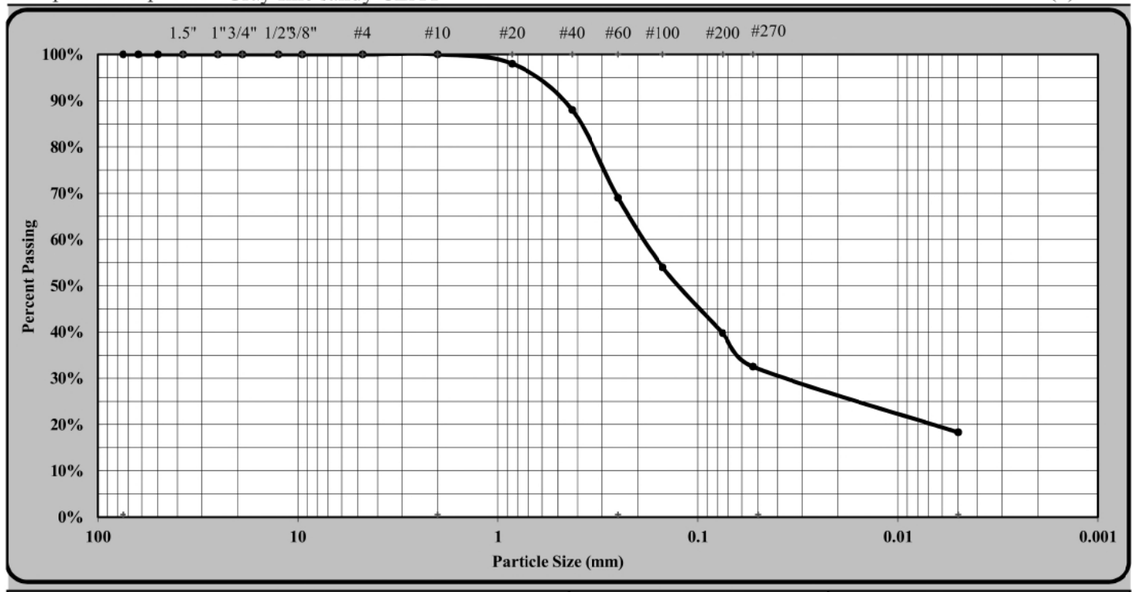
Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT

S&ME
Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010			Report Date:	11/8/16
Project Name:	C.F. Harvey Parkway Extension R-5703			Test Date(s):	11/1-8/16
State Project #:	N/A	F.A. Project No:	N/A	TIP NO:	N/A
Client Name:	Michael Baker Engineering				
Address:	Raleigh, NC				
Boring #:	EB2-B Rt. Ln.	Sample #:	SS-32	Sample Date:	N/A
Location:	Site-Borehole	Offset:	N/A	Depth (ft):	9.3-10.8'
Sample Description:	Gray fine sandy CLAY			0	A-6 (3)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#20	Coarse Sand	31%	Silt	14%
Gravel	0%	Fine Sand	37%	Clay	18%
Apparent Relative Density	2.650	Moisture Content	12.9%	% Passing #200	39.7%
Liquid Limit	31	Plastic Limit	13	Plastic Index	18

Soil Mortar (-#10 Sieve)

Coarse Sand	31%	Fine Sand	37%	Silt	14%	Clay	18%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☐		Weathered & Friable		☐

References / Comments / Deviations: ND=Not Determined.

Karen Warner	118-06-0305	Laboratory Technician	11/8/2016
Technician Name	*Certification No.*	*Position*	*Date*
Stewart Laney, P.E		Senior Engineer	
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

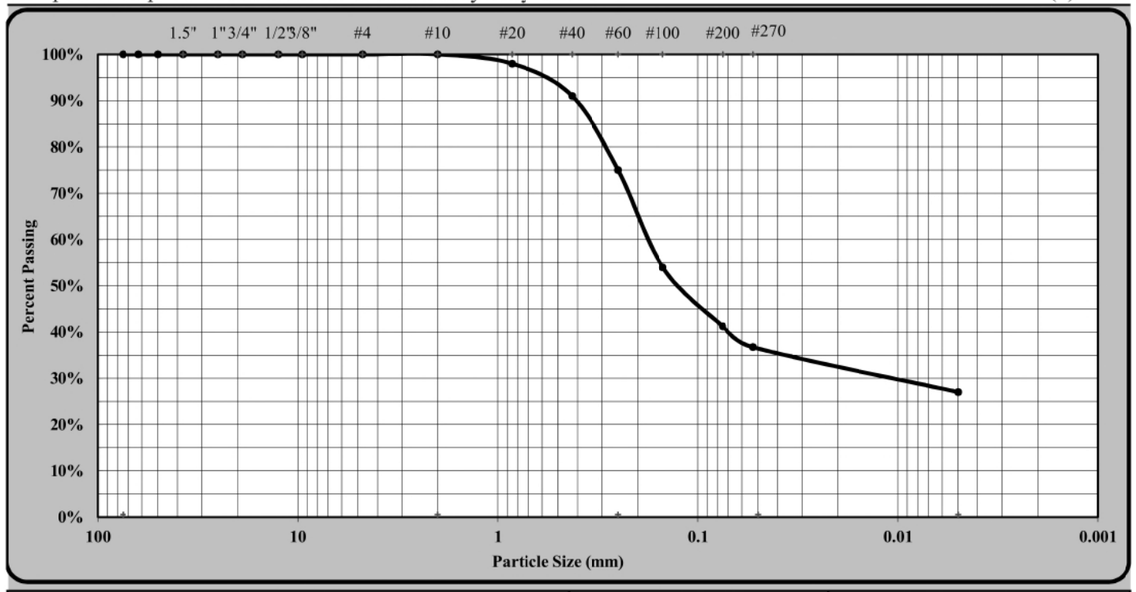
Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT

S&ME
Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010			Report Date:	11/14/16
Project Name:	C.F. Harvey Parkway Extension R-5703			Test Date(s):	10/7 - 11/14/16
State Project #:	N/A	F.A. Project No:	N/A	TIP NO:	N/A
Client Name:	Michael Baker Engineering				
Address:	Raleigh, NC				
Boring #:	EB2-B Rt. Ln.	Sample #:	SS-33	Sample Date:	N/A
Location:	Site-Borehole	Offset:	N/A	Depth (ft):	48.6 - 50.1
Sample Description:	Brown Coarse to Fine Sandy Silty CLAY				A-6 (3)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	25%	Silt	10%
Gravel	0%	Fine Sand	38%	Clay	27%
Apparent Relative Density	ND	Moisture Content	ND	% Passing #200	41.2%
Liquid Limit	33	Plastic Limit	17	Plastic Index	16

Soil Mortar (-#10 Sieve)

Coarse Sand	25%	Fine Sand	38%	Silt	10%	Clay	27%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☐
Hard & Durable	☐	Soft	☐		Weathered & Friable		☐

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	11/14/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	11/14/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No: TR-T267
Revision No. 0
Revision Date: 07/10/08

Moisture, Ash, and Organic Matter

AASHTO T-267 — ***Quality Assurance***

S&ME, Inc. Raleigh, 3201 Spring Forest Raod, Raleigh, North Carolina 27616

Project #:	**6235-16-010**			Report Date:	10/21/16
Project Name:	C.F. Harvey Parkway Extension R-5703			Test Date(s):	10/18 - 10/21/16
Client Name:	Michael Baker Engineering				
Client Address:	Raleigh, NC				
Boring #:	EB2-B Rt. Ln.	Sample #:	SS-33	Sample Date:	N/A
Location:	Site-Borehole	Offset:	N/A	Depth (ft):	48.6 - 50.1
Sample Description:	Brown Coarse to Fine Sandy Silty CLAY (A-6) (3)				

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*

Balance: *S&ME ID #:* ***1024*** *Cal. Date:* ***11/06/16*** *Due:* ***11/06/17***

Method A: Moisture Content Determination *Required Oven Temperature:105 ± 5° C*

	Oven Temperature: **105 °C**	*Tare #*	ae
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	45.80
a	Mass of ***As-Received*** Specimen + Tare Wt.	*grams*	106.52
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	96.29
w	Water Weight	*(a-b)*	10.23
A	Mass of As-Received Specimen	*(a-t)*	60.72
B	Mass of Oven Dry Specimen	*(b-t)*	50.49
	% Moisture Content as a % of As Received or Total Mass	*(w/A)*100*	**16.8%**
	% Moisture Content as a % of Oven-dried Mass	*(w/B)*100*	**20.3%**

Oven *S&ME ID #:* ***1454*** *Cal. Date:* ***10/7/16*** *Due:* ***10/7/17***

Method C (440° C) or D (750° C): Ash Content and Organic Matter Determination

	Muffle Furnace: **455 °C**	*Tare #*	200
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	48.84
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	85.98
c	Ash Weight + Tare Wt.	*grams*	85.30
C	Ash Weight	*c-t*	36.46
B	Mass of Oven Dry Specimen	*(b-t)*	37.14
D	***% Ash Content***	*(C/B)*100*	**98.2%**
	% Organic Matter	*100-D*	**1.8%**

Muffle Furnace: *S&ME ID #:* ***00261***

Notes / Deviations / References:

Mal Krajan, ET — *Technical Responsibility*
Signature
Laboratory Manager — *Position*
11/14/2016 — *Date*

Form No: TR-T289-1
Revision No. 0
Revision Date: 07/10/08

pH of Soil

AASHTO T289 — ***Quality Assurance***

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

Project #:	**6235-16-010**			Report Date:	11/7/16
Project Name:	C.F. Harvey Parkway Extension R-5703			Test Date(s):	11/5 - 11/7/16
Client Name:	Michael Baker Engineering				
Client Address:	Raleigh, NC				
Boring #:	EB2-B Rt. Ln.	Sample #:	SS-33	Sample Date:	N/A
Location:	Site-Borehole	Offset:	N/A	Depth (ft):	48.6 - 50.1
Sample Description:	Brown Coarse to Fine Sandy Silty CLAY (A-6) (3)				

Equipment:

Balance		*S&ME ID#*	*1024*	*Cal. Date:*	*11/6/16*	*Due:*	*11/6/17*
Sieve:	*#10*	*S&ME ID#*	*13223*	*Cal. Date:*	*6/11/16*	*Due:*	*6/11/17*
pH Meter:		*S&ME ID#*	*1365*	*Cal. Date:*	*11/7/16*	*Due:*	*NA*

pH Meter Calibration

Buffer Solution	***Results***
pH buffer 7.0	***7.02***
pH buffer 4.01	***4.01***
pH buffer 10.0	***10.03***
Buffer Temperature °C	***22.4***

Measuring pH of Soil

Measurements	
Weigtht of Air Dry Soil (g)	***30.10***
Distilled Water (g)	***30.11***
Temperature °C	***21.9***
pH Readings	***5.36***

Notes / Deviations / References: AASHTO T-289: Determining pH of Soil for Use in Corrosion Testing

Mal Krajan, ET — *Technical Responsibility*
Signature
Laboratory Manager — *Position*
11/14/2016 — *Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

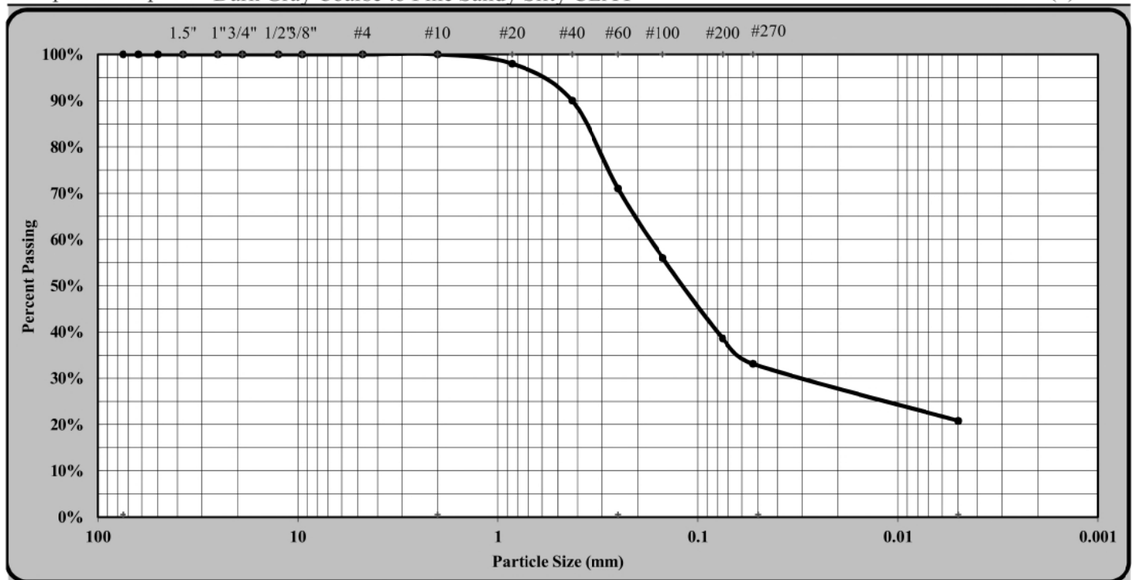
Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT

S&ME
Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	9/20/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	9/12 - 9/20/16
State Project #:	N/A F.A. Project No: N/A	TIP NO:	N/A
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	EB2-A Lt. Ln. Sample #: ST-5	Sample Date:	N/A
Location:	Station 201+39 Offset: 35 ft LT	Depth (ft):	10 - 12 ft.
Sample Description:	Dark Gray Coarse to Fine Sandy Silty CLAY		A-6 (2)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	29%	Silt	12%
Gravel	0%	Fine Sand	38%	Clay	21%
Apparent Relative Density	ND	Moisture Content	ND	% Passing #200	38.6%
Liquid Limit	34	Plastic Limit	19	Plastic Index	15

Soil Mortar (-#10 Sieve)

Coarse Sand	29%	Fine Sand	38%	Silt	12%	Clay	21%
Description of Sand & Gravel Particles:		Rounded	☐			Angular	☒
Hard & Durable	☒	Soft	☒			Weathered & Friable	☒

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	9/12/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET	*Signature*	Laboratory Manager	9/26/2016
Technical Responsibility		*Position*	*Date*

Oedometer Settlement Tests

Sample details

Sketch showing specimen location in original Sample

Depth	10 - 12 ft.
Description:	Dark Gray Coarse to Fine Sandy Silty CLAY (A-6) (2)
Type	Undisturbed
Height H_0 (in)	0.999
Diameter D_0 (in)	2.501
Weight W_0 (gr)	159.64
Bulk Density ρ (PCF)	123.92
Particle Density ρ_s	2.661 (measured)

Initial Conditions

Settlement Channel	1001
Moisture Content w_0%	19.3
Dry Density ρ_d (PCF)	103.86
Voids Ratio e_0	0.5987
Deg of Saturation S_0%	85.8
Swelling Pressure Ss (TSF)	0.000

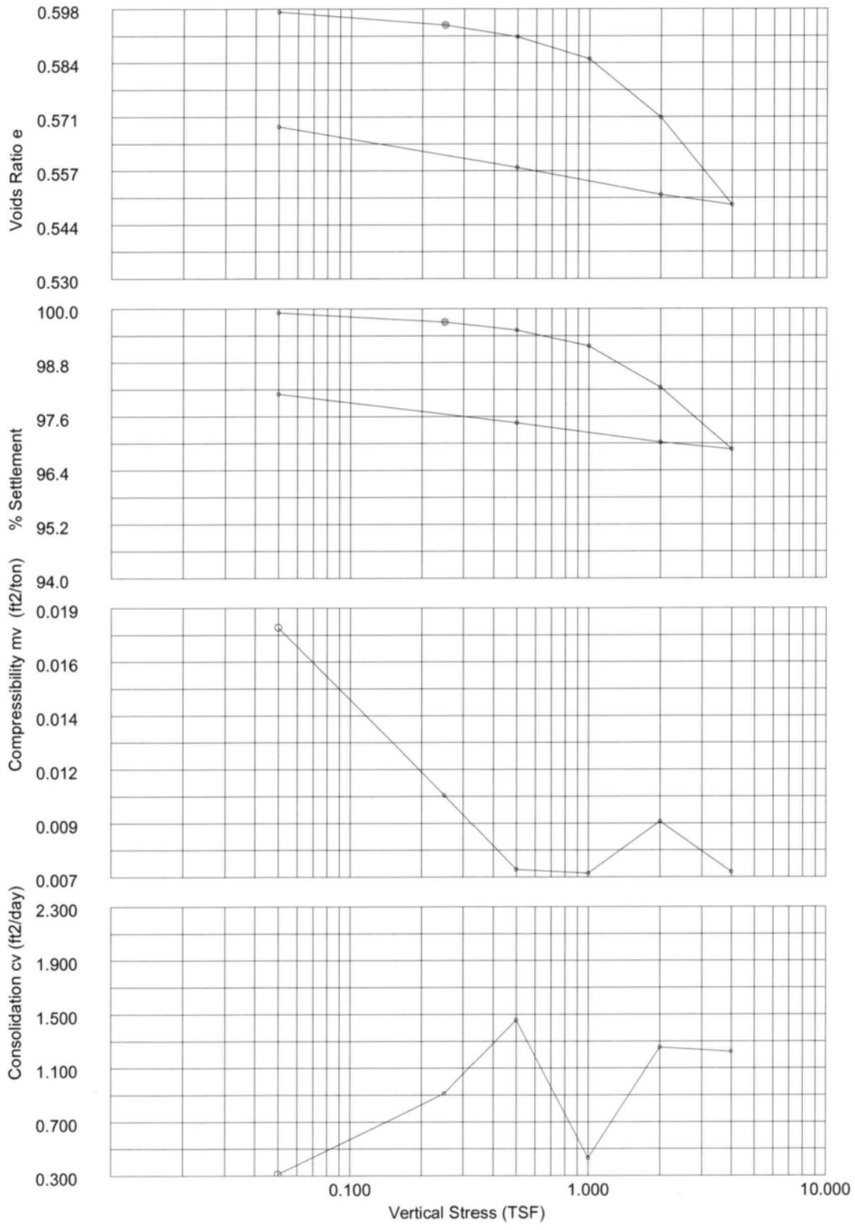
Final Conditions

Moisture Content w_f%	22.4
Dry Density ρ_d (PCF)	105.88
Voids Ratio e_f	0.5683
Deg of Saturation S_f%	100.00
Settlement: (in)	0.019
Compression Index C_c	0.076
Notes:	Test specimen taken from the middle of UD tube.

S&ME

ASTM D2435-96		Test name	Consolidation
		Date of Test:	9-22-16
Site Reference:	C.F. Harvey Parkway	Sample:	ST-5
Jobfile:	E:\62351601.JOB	Borehole:	EB2-A Lt. Ln.
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

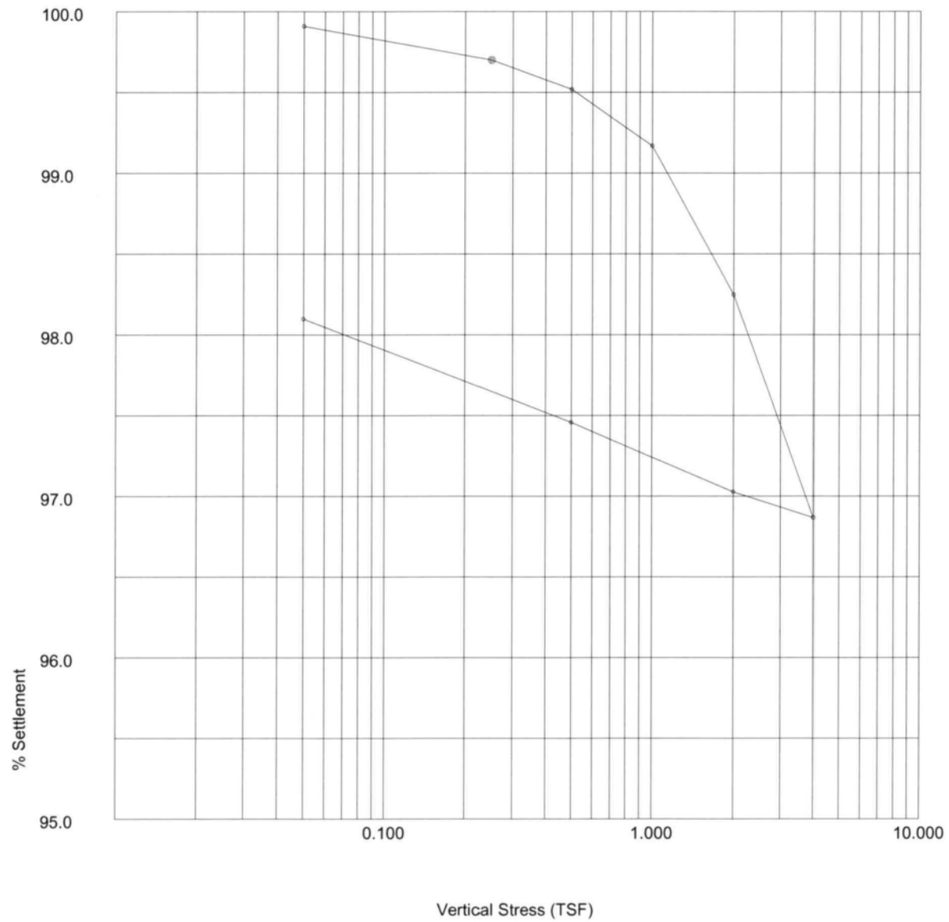


S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	9-22-16
	Site Reference: C.F. Harvey Parkway	Sample:	ST-5
	Jobfile: E:\62351601.JOB	Borehole:	EB2-A Lt. Ln.
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests

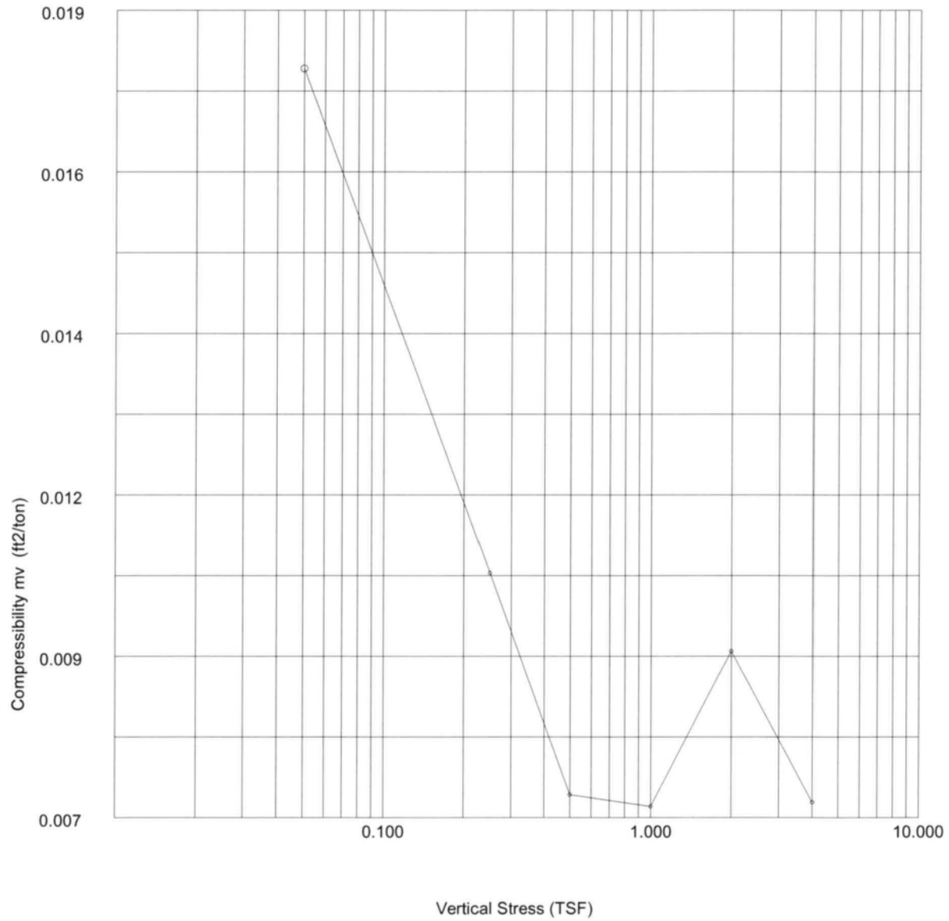
S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	9-22-16
	Site Reference: C.F. Harvey Parkway	Sample:	ST-5
	Jobfile: E:\62351601.JOB	Borehole:	EB2-A Lt. Ln.
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests



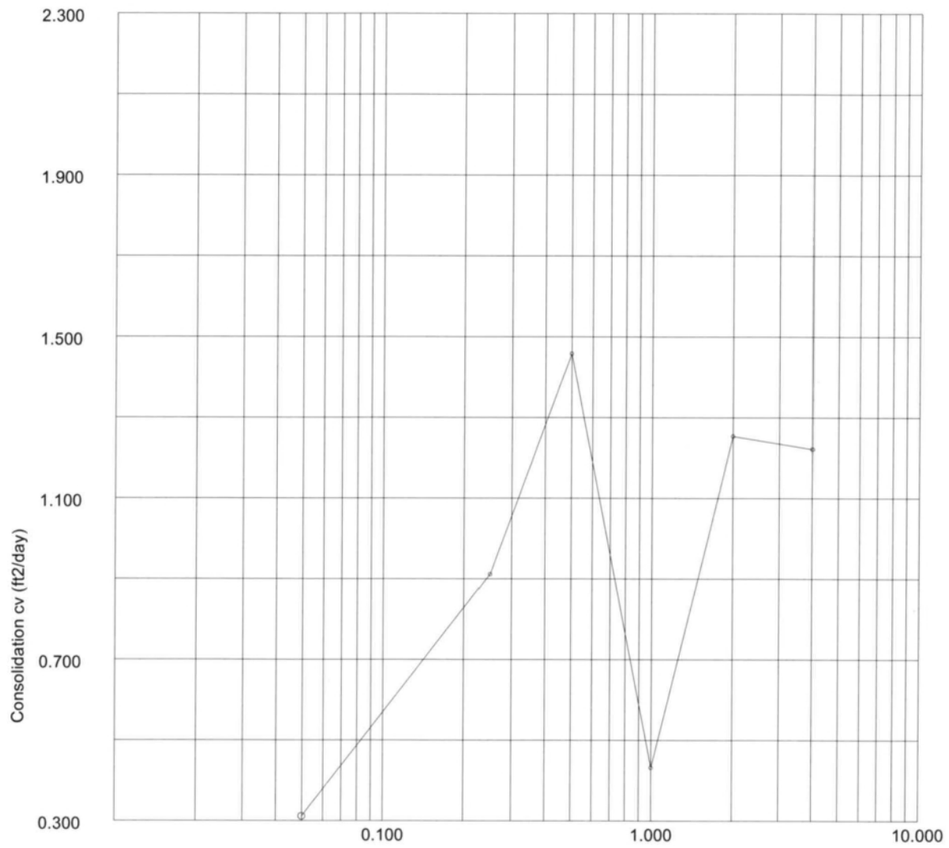
S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	9-22-16
	Site Reference: C.F. Harvey Parkway	Sample:	ST-5
	Jobfile: E:\62351601.JOB	Borehole:	EB2-A Lt. Ln.
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests



S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	9-22-16
	Site Reference: C.F. Harvey Parkway	Sample:	ST-5
	Jobfile: E:\62351601.JOB	Borehole:	EB2-A Lt. Ln.
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests



S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	9-22-16
	Site Reference: C.F. Harvey Parkway	Sample:	ST-5
	Jobfile: E:\62351601.JOB	Borehole:	EB2-A Lt. Ln.
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests

Stress (TSF)	Initial Temp. oC	Settlement Total (in)	Cal Corr. (in)	Final Temp. oC	Voids Ratio e_f	t_{90} (mins)	Secondary Compr C_{sec}	c_v (ft2/day)	m_v (ft2/ton)
0.050	20.0	0.0009	0.0	20.0	0.5973	6.794	0.00	0.311	0.018
0.250	20.0	0.0030	0.0	20.0	0.5939	2.312	0.00	0.911	0.011
0.500	20.0	0.0048	0.0	20.0	0.5910	1.439	0.00	1.458	0.007
1.000	20.0	0.0083	0.0	20.0	0.5854	4.834	0.00	0.432	0.007
2.000	20.0	0.0175	0.0	20.0	0.5707	1.644	0.00	1.254	0.009
4.000	20.0	0.0313	0.0	20.0	0.5486	1.648	0.00	1.222	0.007
2.000	20.0	0.0297	0.0	20.0	0.5512				0.001
0.500	20.0	0.0254	0.0	20.0	0.5580				0.003
0.050	20.0	0.0190	0.0	20.0	0.5683				0.015

S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	9-22-16
	Site Reference: C.F. Harvey Parkway	Sample:	ST-5
	Jobfile: E:\62351601.JOB	Borehole:	EB2-A Lt. Ln.
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	0	0.0000	0.0000
2	0.017	1	0.0001	0.0001
3	0.167	2	0.0002	0.0002
4	0.416	2	0.0002	0.0002
5	0.917	3	0.0003	0.0003
6	1.917	4	0.0004	0.0004
7	3.917	6	0.0006	0.0006
8	7.917	7	0.0007	0.0007
9	14.917	8	0.0008	0.0008
10	29.917	9	0.0009	0.0009
11	55.113	9	0.0009	0.0009

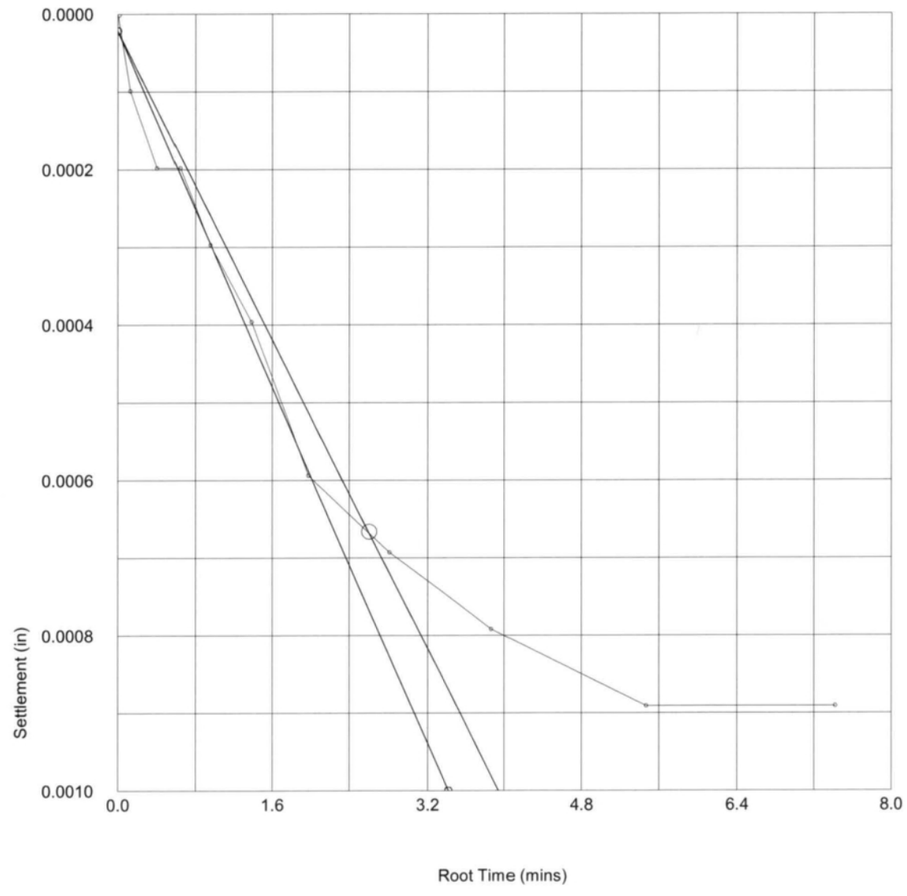
S&ME

ASTM D2435-96		Test name: Consolidation Load: 0.050 (TSF)	
Site Reference: C.F. Harvey Parkway		Date of Test: 9-22-16	
Jobfile: E:\62351601.JOB		Sample: ST-5	
		Borehole: EB2-A Lt. Ln.	
Operator: MK	Checked: MK		Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0009
Voids Ratio e	0.5973
Final Temp oC	0.0
t_{90} (mins)	6.79
c_v (ft2/day)	0.311
m_v (ft2/ton)	0.018
Sec Compression C_{sec}	0.00



S&ME

ASTM D2435-96		Test name: Consolidation	
Site Reference: C.F. Harvey Parkway		Date of Test: 9-22-16	
Jobfile: E:\62351601.JOB		Sample: ST-5	
		Borehole: EB2-A Lt. Ln.	
Operator: MK	Checked: MK		Approved:

Oedometer Settlement Tests

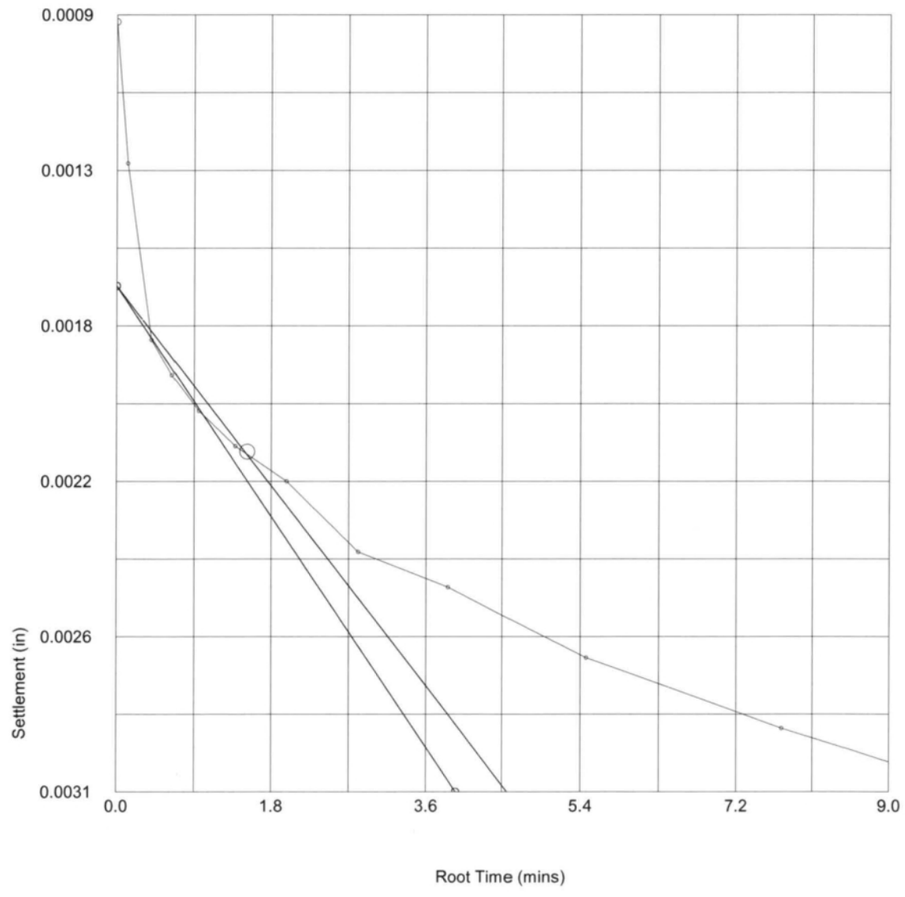
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	9	0.0009	0.0009
2	0.017	13	0.0013	0.0013
3	0.167	18	0.0018	0.0018
4	0.417	19	0.0019	0.0019
5	0.917	20	0.0020	0.0020
6	1.917	21	0.0021	0.0021
7	3.917	22	0.0022	0.0022
8	7.917	24	0.0024	0.0024
9	14.917	25	0.0025	0.0025
10	29.917	27	0.0027	0.0027
11	59.917	29	0.0029	0.0029
12	82.233	30	0.0030	0.0030

S&ME	ASTM D2435-96	Test name: Consolidation Load: 0.250 (TSF)	Date of Test: 9-22-16
	Site Reference: C.F. Harvey Parkway	Sample: ST-5	
	Jobfile: E:\62351601.JOB	Borehole: EB2-A Lt. Ln.	
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.250
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0021
Voids Ratio e	0.5939
Final Temp oC	0.0
t_{90} (mins)	2.31
c_v (ft2/day)	0.911
m_v (ft2/ton)	0.011
Sec Compression C_{sec}	0.00



S&ME	ASTM D2435-96	Test name: Consolidation	Date of Test: 9-22-16
	Site Reference: C.F. Harvey Parkway	Sample: ST-5	
	Jobfile: E:\62351601.JOB	Borehole: EB2-A Lt. Ln.	
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests

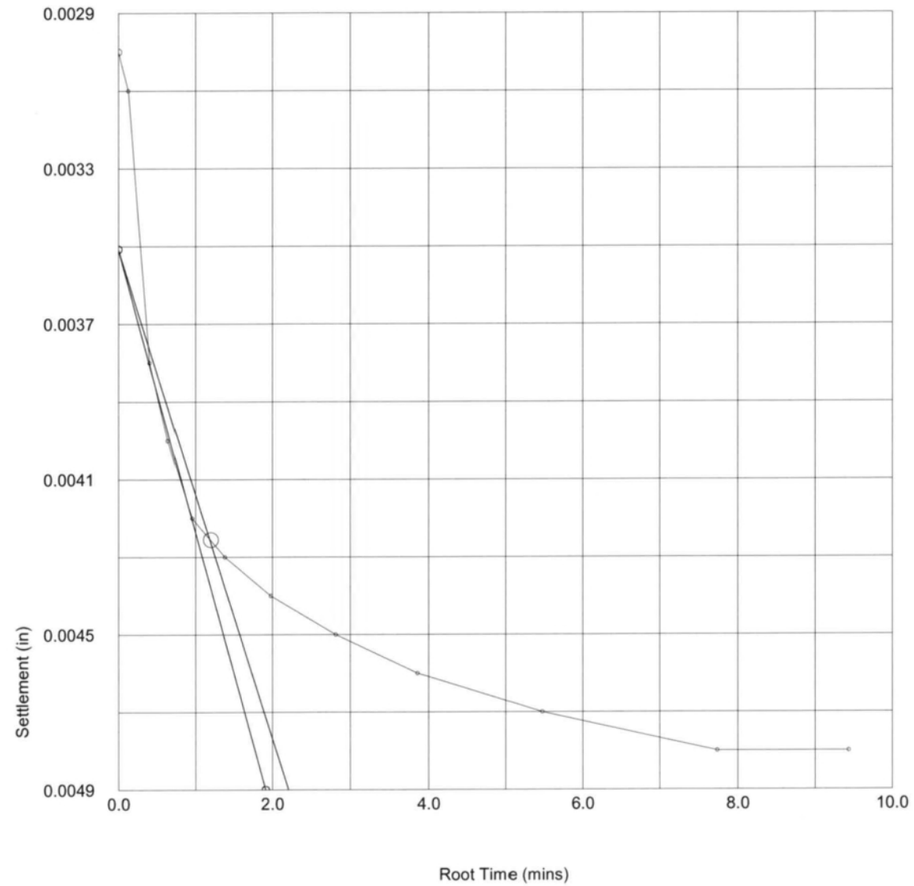
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	30	0.0030	0.0030
2	0.017	31	0.0031	0.0031
3	0.167	38	0.0038	0.0038
4	0.417	40	0.0040	0.0040
5	0.917	42	0.0042	0.0042
6	1.917	43	0.0043	0.0043
7	3.917	44	0.0044	0.0044
8	7.917	45	0.0045	0.0045
9	14.917	46	0.0046	0.0046
10	29.917	47	0.0047	0.0047
11	59.917	48	0.0048	0.0048
12	88.933	48	0.0048	0.0048

S&ME	ASTM D2435-96		Test name	Consolidation Load: 0.500 (TSF)
			Date of Test:	9-22-16
	Site Reference:	C.F. Harvey Parkway	Sample:	ST-5
	Jobfile:	E:\62351601.JOB	Borehole:	EB2-A Lt. Ln.
	Operator: MLL	Checked: MLC		Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0018
Voids Ratio e	0.5910
Final Temp oC	0.0
t_{90} (mins)	1.44
c_v (ft2/day)	1.458
m_v (ft2/ton)	0.007
Sec Compression C_{sec}	0.00



S&ME	ASTM D2435-96		Test name	Consolidation
			Date of Test:	9-22-16
	Site Reference:	C.F. Harvey Parkway	Sample:	ST-5
	Jobfile:	E:\62351601.JOB	Borehole:	EB2-A Lt. Ln.
	Operator: MLL	Checked: MLC		Approved:

Oedometer Settlement Tests

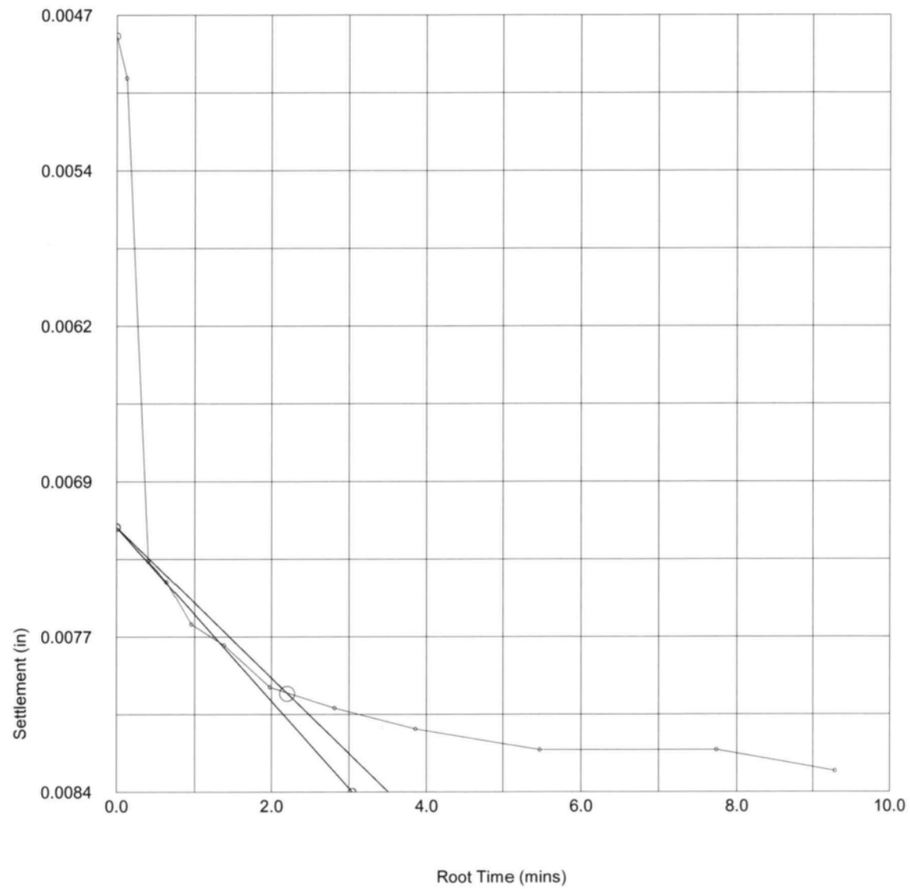
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	48	0.0048	0.0048
2	0.017	50	0.0050	0.0050
3	0.167	73	0.0073	0.0073
4	0.417	74	0.0074	0.0074
5	0.917	76	0.0076	0.0076
6	1.917	77	0.0077	0.0077
7	3.917	79	0.0079	0.0079
8	7.917	80	0.0080	0.0080
9	14.917	81	0.0081	0.0081
10	29.917	82	0.0082	0.0082
11	59.917	82	0.0082	0.0082
12	86.330	83	0.0083	0.0083

S&ME	ASTM D2435-96	Test name: Consolidation Load: 1.000 (TSF)	
	Site Reference: C.F. Harvey Parkway	Sample: ST-5	
	Jobfile: E:\62351601.JOB	Borehole: EB2-A Lt. Ln.	
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	1.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0035
Voids Ratio e	0.5854
Final Temp oC	0.0
t_{90} (mins)	4.83
c_v (ft2/day)	0.432
m_v (ft2/ton)	0.007
Sec Compression C_{sec}	0.00



S&ME	ASTM D2435-96	Test name: Consolidation	
	Site Reference: C.F. Harvey Parkway	Sample: ST-5	
	Jobfile: E:\62351601.JOB	Borehole: EB2-A Lt. Ln.	
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests

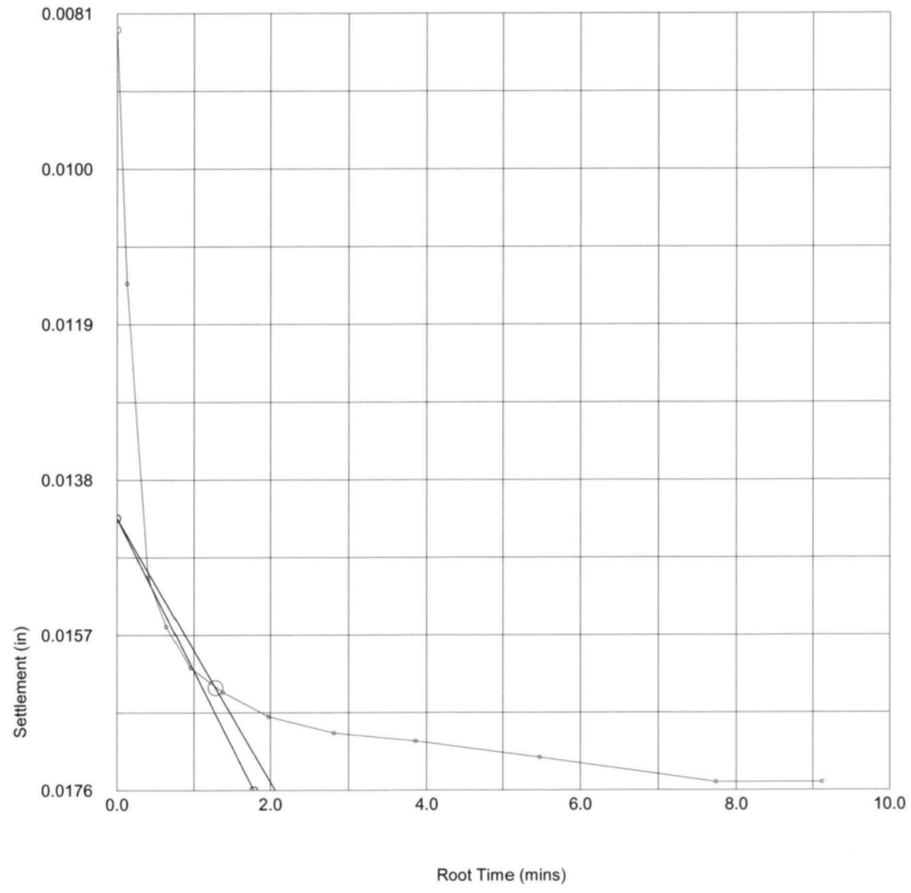
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	83	0.0083	0.0083
2	0.017	114	0.0114	0.0114
3	0.167	150	0.0150	0.0150
4	0.417	156	0.0156	0.0156
5	0.917	161	0.0161	0.0161
6	1.917	164	0.0164	0.0164
7	3.917	167	0.0167	0.0167
8	7.917	169	0.0169	0.0169
9	14.917	170	0.0170	0.0170
10	29.917	172	0.0172	0.0172
11	59.917	175	0.0175	0.0175
12	83.233	175	0.0175	0.0175

S&ME	ASTM D2435-96		Test name: Consolidation Load: 2.000 (TSF)	
	Site Reference: C.F. Harvey Parkway		Sample: ST-5	
	Jobfile: E:\62351601.JOB		Borehole: EB2-A Lt. Ln.	
	Operator: MK	Checked: MK		Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0092
Voids Ratio e	0.5707
Final Temp oC	0.0
t_{90} (mins)	1.64
c_v (ft2/day)	1.254
m_v (ft2/ton)	0.009
Sec Compression C_{sec}	0.00



S&ME	ASTM D2435-96		Test name: Consolidation	
	Site Reference: C.F. Harvey Parkway		Sample: ST-5	
	Jobfile: E:\62351601.JOB		Borehole: EB2-A Lt. Ln.	
	Operator: MK	Checked: MK		Approved:

Oedometer Settlement Tests

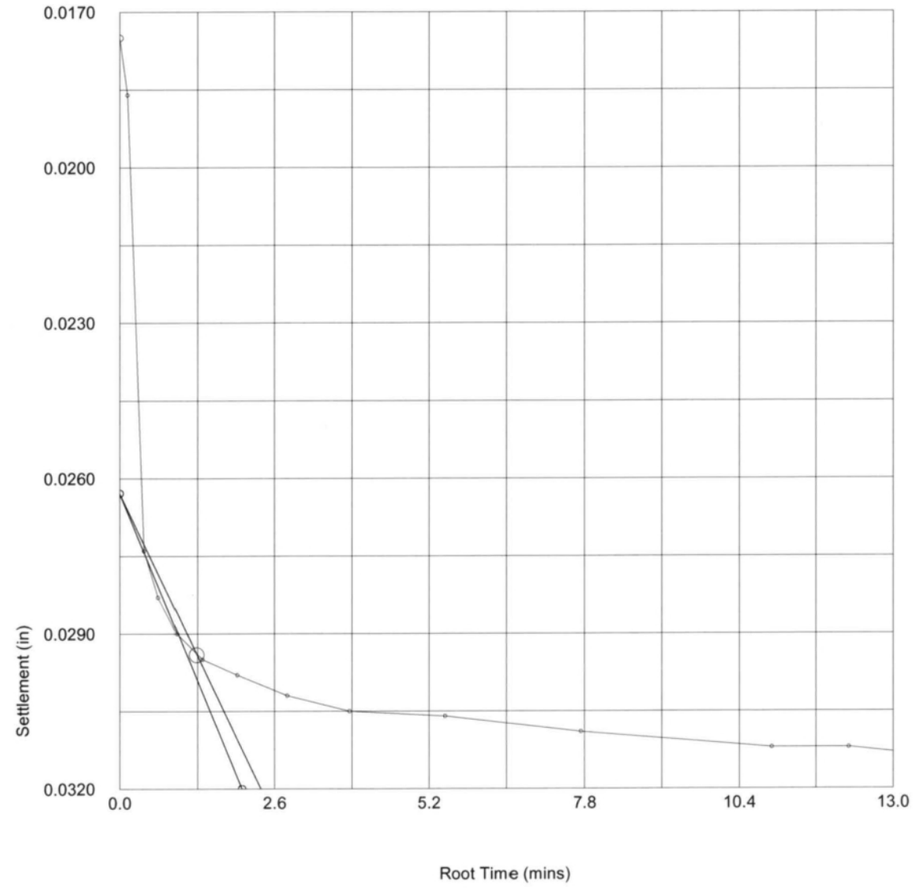
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	175	0.0175	0.0175
2	0.017	186	0.0186	0.0186
3	0.167	274	0.0274	0.0274
4	0.417	283	0.0283	0.0283
5	0.917	290	0.0290	0.0290
6	1.917	295	0.0295	0.0295
7	3.917	298	0.0298	0.0298
8	7.917	302	0.0302	0.0302
9	14.917	305	0.0305	0.0305
10	29.917	306	0.0306	0.0306
11	59.917	309	0.0309	0.0309
12	119.917	312	0.0312	0.0312
13	149.917	312	0.0312	0.0312
14	170.500	313	0.0313	0.0313

S&ME	ASTM D2435-96	Test name: Consolidation Load: 4.000 (TSF)	Date of Test: 9-22-16
Site Reference: C.F. Harvey Parkway	Jobfile: E:\62351601.JOB	Sample: ST-5	Borehole: EB2-A Lt. Ln.
Operator: MK	Checked: MK	Approved:	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	4.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0138
Voids Ratio e	0.5486
Final Temp oC	0.0
t_{90} (mins)	1.65
c_v (ft2/day)	1.222
m_v (ft2/ton)	0.007
Sec Compression C_{sec}	0.00



S&ME	ASTM D2435-96	Test name: Consolidation	Date of Test: 9-22-16
Site Reference: C.F. Harvey Parkway	Jobfile: E:\62351601.JOB	Sample: ST-5	Borehole: EB2-A Lt. Ln.
Operator: MK	Checked: MK	Approved:	

Oedometer Settlement Tests

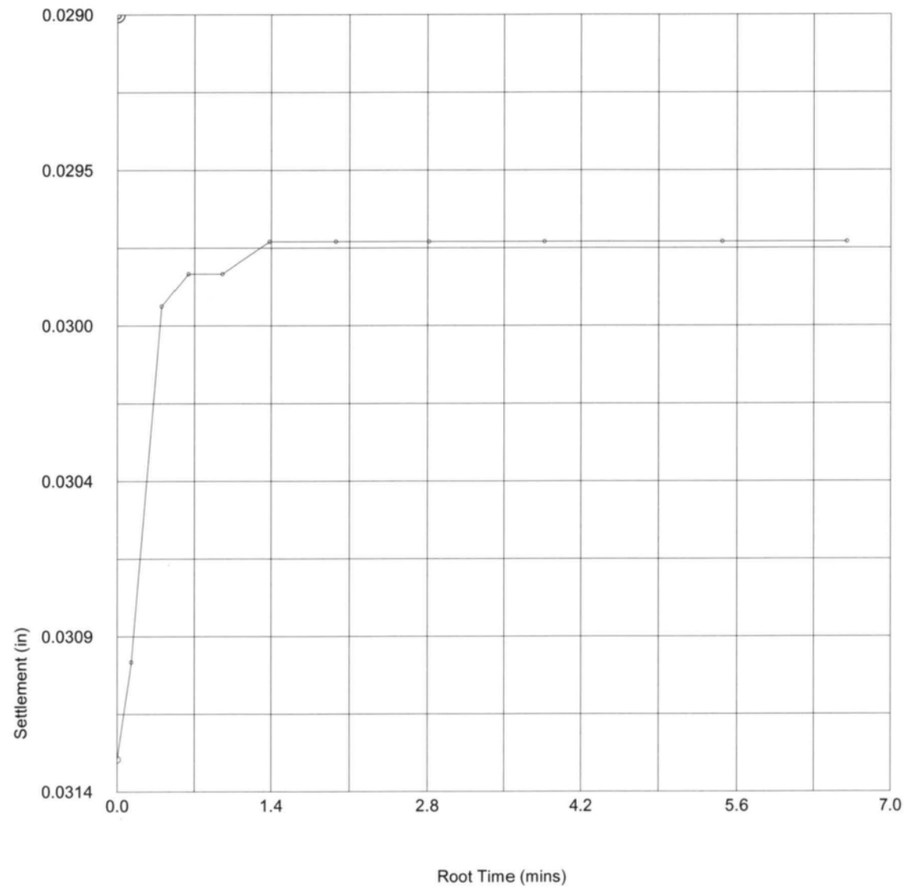
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	313	0.0313	0.0313
2	0.017	310	0.0310	0.0310
3	0.167	299	0.0299	0.0299
4	0.417	298	0.0298	0.0298
5	0.917	298	0.0298	0.0298
6	1.917	297	0.0297	0.0297
7	3.917	297	0.0297	0.0297
8	7.917	297	0.0297	0.0297
9	14.917	297	0.0297	0.0297
10	29.917	297	0.0297	0.0297
11	43.533	297	0.0297	0.0297

S&ME	ASTM D2435-96		Test name: Consolidation Load: 2.000 (TSF)	
	Site Reference: C.F. Harvey Parkway		Sample: ST-5	
	Jobfile: E:\62351601.JOB		Borehole: EB2-A Lt. Ln.	
	Operator: MLL	Checked: MLL		Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0016
Voids Ratio e	0.5512
Final Temp oC	
t_{90} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



S&ME	ASTM D2435-96		Test name: Consolidation	
	Site Reference: C.F. Harvey Parkway		Sample: ST-5	
	Jobfile: E:\62351601.JOB		Borehole: EB2-A Lt. Ln.	
	Operator: MLL	Checked: MLL		Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	297	0.0297	0.0297
2	0.017	287	0.0287	0.0287
3	0.167	268	0.0268	0.0268
4	0.417	265	0.0265	0.0265
5	0.917	262	0.0262	0.0262
6	1.917	259	0.0259	0.0259
7	3.917	257	0.0257	0.0257
8	7.917	257	0.0257	0.0257
9	14.917	256	0.0256	0.0256
10	29.917	255	0.0255	0.0255
11	59.917	255	0.0255	0.0255
12	91.217	254	0.0254	0.0254

S&ME

ASTM D2435-96 | Test name Consolidation Load: 0.500 (TSF) | Date of Test: 9-22-16

Site Reference: C.F. Harvey Parkway | Sample: ST-5

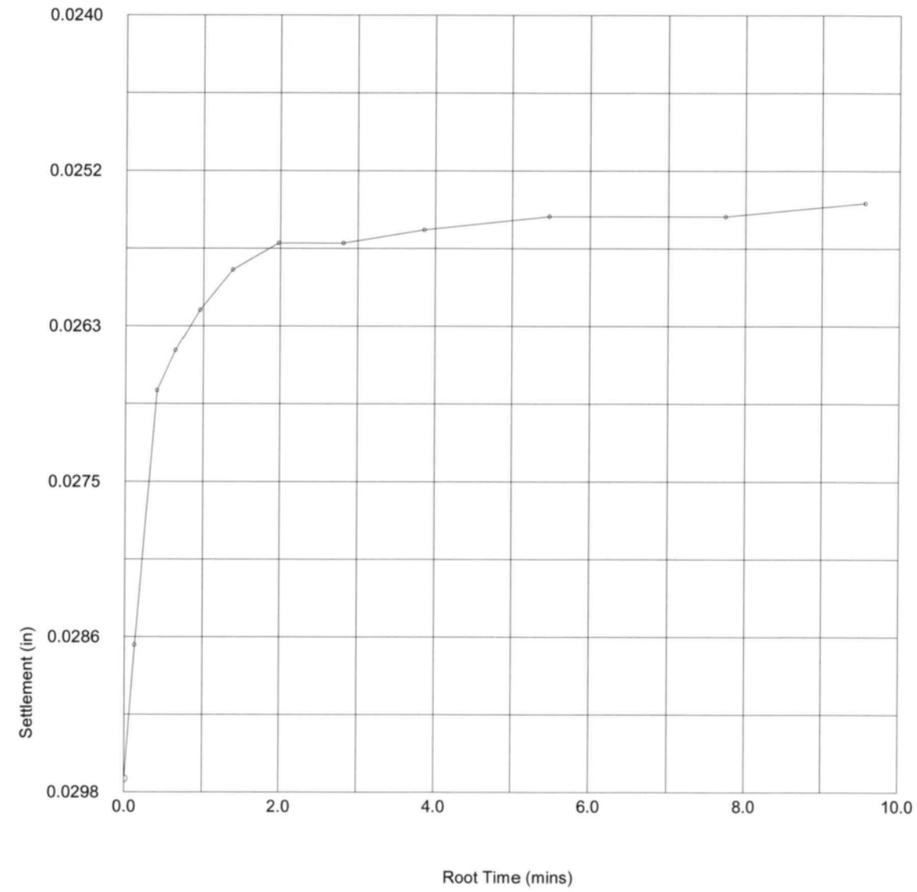
Jobfile: E:\62351601.JOB | Borehole: EB2-A Lt. Ln.

Operator: MK | Checked: MK | Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0043
Voids Ratio e	0.5580
Final Temp oC	
t_{90} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



S&ME

ASTM D2435-96 | Test name Consolidation | Date of Test: 9-22-16

Site Reference: C.F. Harvey Parkway | Sample: ST-5

Jobfile: E:\62351601.JOB | Borehole: EB2-A Lt. Ln.

Operator: MK | Checked: MK | Approved:

Oedometer Settlement Tests

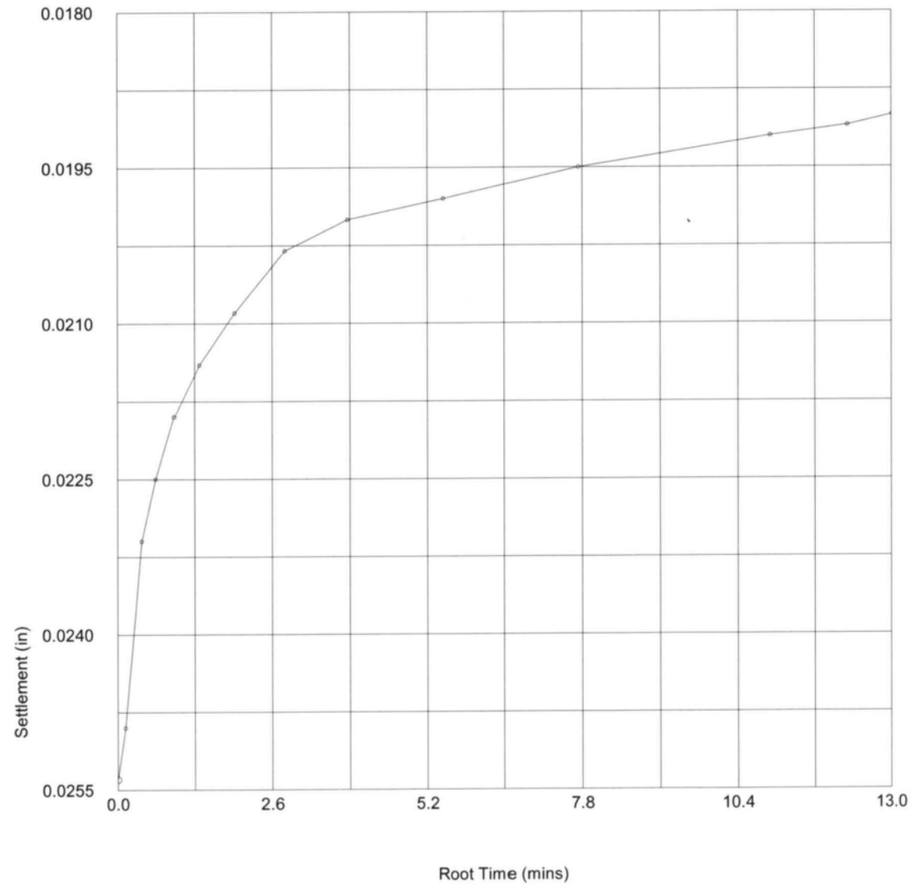
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	254	0.0254	0.0254
2	0.017	249	0.0249	0.0249
3	0.167	231	0.0231	0.0231
4	0.417	225	0.0225	0.0225
5	0.917	219	0.0219	0.0219
6	1.917	214	0.0214	0.0214
7	3.917	209	0.0209	0.0209
8	7.917	203	0.0203	0.0203
9	14.917	200	0.0200	0.0200
10	29.917	198	0.0198	0.0198
11	59.917	195	0.0195	0.0195
12	119.917	192	0.0192	0.0192
13	149.917	191	0.0191	0.0191
14	169.330	190	0.0190	0.0190

S&ME	ASTM D2435-96	Test name: Consolidation Load: 0.050 (TSF)	Date of Test: 9-22-16
	Site Reference: C.F. Harvey Parkway	Sample: ST-5	
	Jobfile: E:\62351601.JOB	Borehole: EB2-A Lt. Ln.	
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	20.0
Correction (in)	0.0
Settlement (in)	0.0064
Voids Ratio e	0.5683
Final Temp oC	
t_{90} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



S&ME	ASTM D2435-96	Test name: Consolidation	Date of Test: 9-22-16
	Site Reference: C.F. Harvey Parkway	Sample: ST-5	
	Jobfile: E:\62351601.JOB	Borehole: EB2-A Lt. Ln.	
	Operator: MK	Checked: MK	Approved:

Effective Stress Triaxial Compression

Consolidated Undrained

Sample details

Sketch showing specimen location in original Sample

Depth 10 - 12 ft.
Description: Dark Gray Coarse to Fine Sandy Silty CLAY (A-6) (2)

	Specimen 1	Specimen 2	Specimen 3
Type	Undisturbed	Undisturbed	Undisturbed
Height H_0 (in)	5.844	6.022	5.811
Diameter D_0 (in)	2.861	2.863	2.864
Weight W_0 (gr)	1200.1	1251.3	1199.3
Bulk Density ρ (PCF)	121.69	122.96	122.04
Particle Density ρ_s	2.661 (measured)	2.661 (measured)	2.661 (measured)

Initial Conditions

	Specimen 1	Specimen 2	Specimen 3
Cell Pressure σ_3 (lbf/in2)	4.0	13.0	21.0
Pore Pressure u (lbf/in2)	0.0	0.0	0.0
Machine Speed d_r(in/min)	0.0073	0.0067	0.0082
No. of Membranes	1	1	1
Total Thickness (in)	0.012	0.012	0.012
Strain Channel	1798	1798	1798
Load Channel	1776	1776	1776
Pore P. Channel	1779	1779	1779
Volume Channel	Volume Chang	Volume Chang	Volume Chang
Moisture Content w_0%	18.9	19.7	19.5
Dry Density ρ_{d0} (PCF)	102.32	102.74	102.09
Voids Ratio e_0	0.62	0.62	0.63
Deg of Saturation S_0%	80.89	85.00	83.03
Final B Value	0.99	0.95	0.96

Final Conditions

	Specimen 1	Specimen 2	Specimen 3
Moisture Content w_f%	22.1	21.6	20.7
Dry Density ρ_d (PCF)	103.36	104.96	105.90
Voids Ratio e_f	0.61	0.58	0.57
Deg of Saturation S_f%	96.82	98.77	97.13
Failure Criteria	Mx Stress Ratio	Mx Stress Ratio	Mx Stress Ratio
Axial Strain ε_f%	2.0	4.0	2.0
Corr Dev Stress $(\sigma_1 - \sigma_3)f$ (lbf/in2)	25.2	39.2	51.3
Minor Stress σ_{3f} (lbf/in2)	1.8	6.7	10.8
Major Stress σ_{1f} (lbf/in2)	27.0	45.9	62.1
Stress Ratio $(\sigma_1/\sigma_3)_f$	15.0	6.9	5.8

Notes:

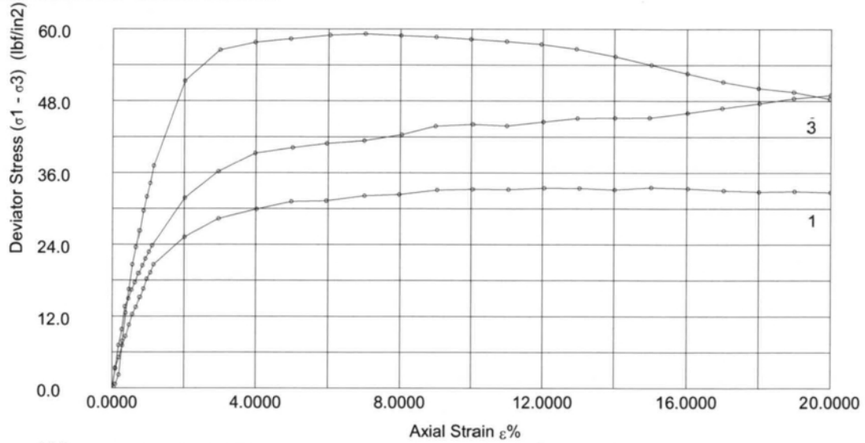
Failure Sketch

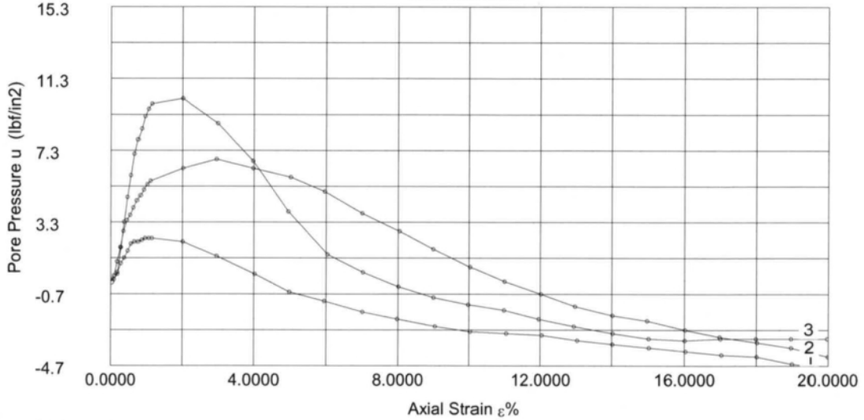
Sp 1 Sp 2

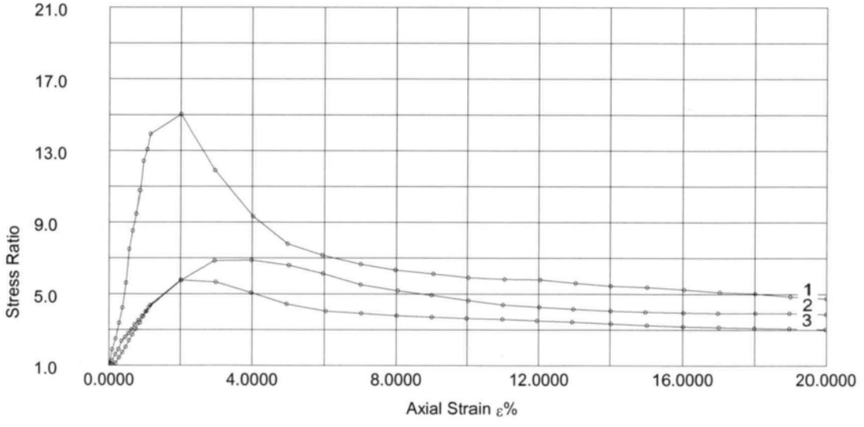
Sp 3

Surface Inclination

S&ME	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)	
	Site Reference: C.F. Harvey Parkway	Sample: ST-5	
	Jobfile: E:\62351601.JOB	Borehole: EB2-A Lt. Ln.	
	Operator: MK	Checked: MLC	Approved:







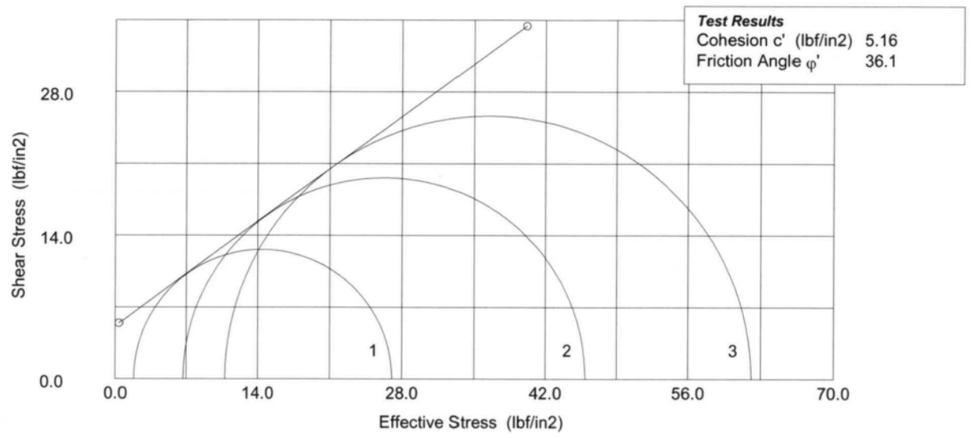
Effective Stress Triaxial Compression

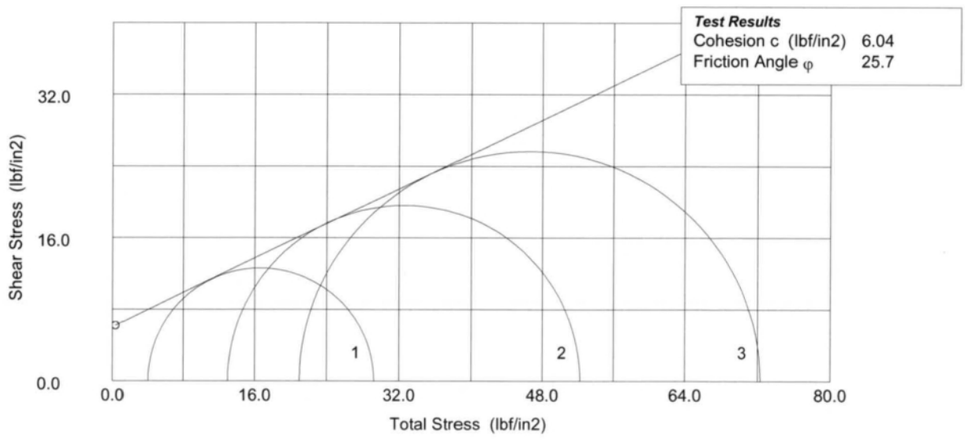
Consolidated Undrained

S&ME	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)	
	Site Reference: C.F. Harvey Parkway	Sample: ST-5	
	Jobfile: E:\62351601.JOB	Borehole: EB2-A Lt. Ln.	
	Operator: MK	Checked: MLC	Approved:

Effective Stress Triaxial Compression

Consolidated Undrained

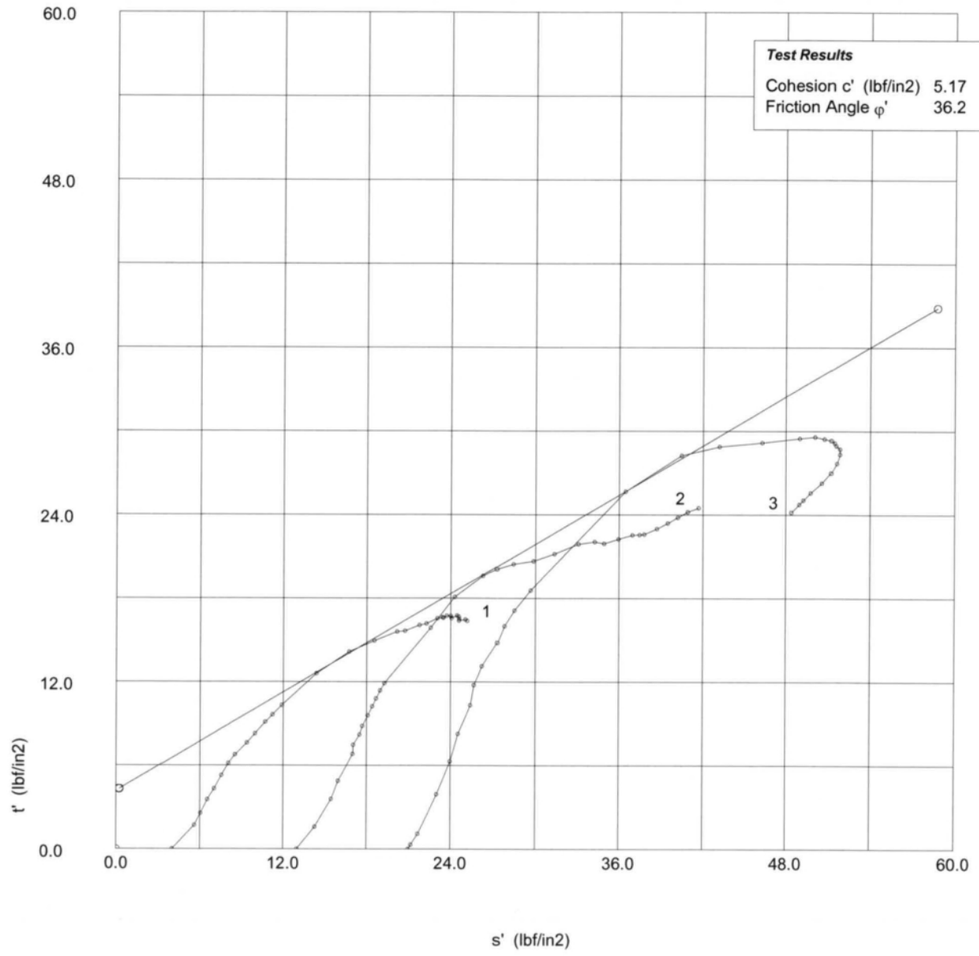




S&ME	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)	Date of Test: 9-20-16
	Site Reference: C.F. Harvey Parkway	Sample: ST-5	
	Jobfile: E:\62351601.JOB	Borehole: EB2-A Lt. Ln.	
	Operator: MK	Checked: MK	Approved:

Effective Stress Triaxial Compression

Consolidated Undrained



S&ME	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)	Date of Test: 9-20-16
	Site Reference: C.F. Harvey Parkway	Sample: ST-5	
	Jobfile: E:\62351601.JOB	Borehole: EB2-A Lt. Ln.	
	Operator: MK	Checked: MK	Approved:

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 1)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	144	0.00	544	0.0	0	0.0	0.0	0.0	4.00	4.00	1.00
2	199	0.09	761	21.7	1	0.1	3.4	3.4	3.90	7.29	1.87
3	256	0.19	872	32.8	5	0.5	5.1	5.1	3.50	8.63	2.46
4	311	0.29	997	45.3	10	1.0	7.1	7.1	3.00	10.07	3.36
5	366	0.38	1099	55.5	13	1.3	8.7	8.7	2.70	11.36	4.21
6	423	0.48	1222	67.8	17	1.7	10.6	10.6	2.30	12.86	5.59
7	478	0.57	1345	80.1	21	2.1	12.5	12.3	1.90	14.21	7.48
8	532	0.67	1423	87.9	22	2.2	13.7	13.5	1.80	15.31	8.51
9	591	0.77	1533	98.9	22	2.2	15.4	15.2	1.80	17.00	9.45
10	645	0.86	1622	107.8	23	2.3	16.7	16.6	1.70	18.27	10.75
11	698	0.95	1730	118.6	24	2.4	18.4	18.2	1.60	19.83	12.39
12	758	1.05	1799	125.5	24	2.4	19.4	19.3	1.60	20.88	13.05
13	812	1.15	1888	134.4	24	2.4	20.8	20.6	1.60	22.24	13.90
14	1315	2.01	2206	166.2	22	2.2	25.5	25.2	1.80	27.02	15.01
15	1873	2.97	2431	188.7	14	1.4	28.7	28.3	2.60	30.91	11.89
16	2490	4.03	2567	202.3	4	0.4	30.4	29.9	3.60	33.52	9.31
17	3048	4.99	2678	213.4	-6	-0.6	31.7	31.2	4.60	35.78	7.78
18	3608	5.95	2714	217.0	-11	-1.1	32.0	31.3	5.10	36.41	7.14
19	4228	7.01	2802	225.8	-17	-1.7	32.9	32.2	5.70	37.85	6.64
20	4791	7.98	2845	230.1	-21	-2.1	33.1	32.4	6.10	38.45	6.30
21	5409	9.04	2932	238.8	-25	-2.5	34.0	33.1	6.50	39.63	6.10
22	5987	10.03	2973	242.9	-28	-2.8	34.2	33.3	6.80	40.06	5.89
23	6575	11.04	3002	245.8	-29	-2.9	34.2	33.2	6.90	40.10	5.81
24	7165	12.05	3056	251.2	-30	-3.0	34.6	33.5	7.00	40.47	5.78
25	7743	13.04	3087	254.3	-33	-3.3	34.6	33.4	7.30	40.74	5.58
26	8313	14.02	3100	255.6	-35	-3.5	34.4	33.1	7.50	40.64	5.42
27	8899	15.03	3163	261.9	-37	-3.7	34.8	33.5	7.70	41.22	5.35
28	9486	16.04	3188	264.4	-39	-3.9	34.8	33.4	7.90	41.28	5.22
29	10063	17.03	3199	265.5	-41	-4.1	34.5	33.0	8.10	41.14	5.08
30	10637	18.01	3218	267.4	-42	-4.2	34.3	32.8	8.20	41.01	5.00
31	11215	19.00	3263	271.9	-46	-4.6	34.5	32.9	8.60	41.52	4.83
32	11794	20.00	3287	274.3	-48	-4.8	34.4	32.8	8.80	41.56	4.72

S&ME

Test Method: ASTM D4767-95
Test name: CU Triaxial (SS, MS) Shear (Specimen 1)
Date of Test: 9-20-16
Site Reference: C.F. Harvey Parkway
Jobfile: E:\62351601.JOB
Sample: ST-5
Borehole: EB2-A Lt. Ln.
Operator: MK
Checked: MK
Approved:

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 3)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	9	0.00	780	0.0	0	0.0	0.0	0.0	21.00	21.00	1.00
2	63	0.09	819	3.9	1	0.1	0.6	0.6	20.90	21.52	1.03
3	117	0.19	917	13.7	4	0.4	2.2	2.2	20.60	22.78	1.11
4	174	0.29	1275	49.5	19	1.9	7.9	7.9	19.10	26.95	1.41
5	226	0.38	1573	79.3	33	3.3	12.6	12.6	17.70	30.27	1.71
6	281	0.47	1823	104.3	47	4.7	16.5	16.5	16.30	32.81	2.01
7	338	0.57	2095	131.5	59	5.9	20.8	20.6	15.10	35.74	2.37
8	391	0.67	2279	149.9	71	7.1	23.7	23.5	13.90	37.43	2.69
9	444	0.76	2454	167.4	79	7.9	26.4	26.3	13.10	39.37	3.01
10	503	0.86	2668	188.8	85	8.5	29.8	29.6	12.50	42.11	3.37
11	555	0.95	2821	204.1	92	9.2	32.2	32.0	11.80	43.80	3.71
12	610	1.05	2965	218.5	96	9.6	34.4	34.2	11.40	45.63	4.00
13	669	1.15	3151	237.1	99	9.9	37.3	37.1	11.10	48.22	4.34
14	1166	2.02	4091	331.1	102	10.2	51.6	51.3	10.80	62.13	5.75
15	1730	3.00	4466	368.6	88	8.8	56.9	56.5	12.20	68.71	5.63
16	2291	3.97	4594	381.4	67	6.7	58.3	57.8	14.30	72.08	5.04
17	2856	4.96	4677	389.7	39	3.9	58.9	58.4	17.10	75.46	4.41
18	3476	6.04	4769	398.9	15	1.5	59.6	59.0	19.50	78.48	4.02
19	4041	7.02	4830	405.0	5	0.5	59.9	59.2	20.50	79.68	3.89
20	4610	8.01	4861	408.1	-3	-0.3	59.7	58.9	21.30	80.22	3.77
21	5176	9.00	4894	411.4	-9	-0.9	59.5	58.7	21.90	80.57	3.68
22	5738	9.98	4919	413.9	-13	-1.3	59.3	58.3	22.30	80.61	3.61
23	6309	10.97	4944	416.4	-16	-1.6	59.0	57.9	22.60	80.53	3.56
24	6874	11.96	4963	418.3	-21	-2.1	58.6	57.5	23.10	80.57	3.49
25	7441	12.95	4958	417.8	-25	-2.5	57.9	56.7	23.50	80.18	3.41
26	8065	14.03	4924	414.4	-29	-2.9	56.7	55.4	23.90	79.31	3.32
27	8633	15.02	4874	409.4	-32	-3.2	55.3	54.0	24.20	78.22	3.23
28	9202	16.01	4819	403.9	-33	-3.3	54.0	52.6	24.30	76.88	3.16
29	9770	17.00	4766	398.6	-32	-3.2	52.6	51.2	24.20	75.37	3.11
30	10337	17.99	4738	395.8	-32	-3.2	51.6	50.1	24.20	74.32	3.07
31	10905	18.98	4741	396.1	-32	-3.2	51.0	49.5	24.20	73.69	3.05
32	11475	19.97	4705	392.5	-32	-3.2	50.0	48.4	24.20	72.57	3.00

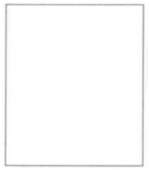
S&ME

Test Method: ASTM D4767-95
Test name: CU Triaxial (SS, MS) Shear (Specimen 3)
Date of Test: 9-20-16
Site Reference: C.F. Harvey Parkway
Jobfile: E:\62351601.JOB
Sample: ST-5
Borehole: EB2-A Lt. Ln.
Operator: MK
Checked: MK
Approved:

Oedometer Settlement Tests

Sample details

Sketch showing specimen location in original Sample



Depth	10 - 12 ft.
Description:	Dark Gray Coarse to Fine Sandy Silty CLAY (A-6) (2)
Type	Undisturbed
Height H_0 (in)	0.999
Diameter D_0 (in)	2.501
Weight W_0 (gr)	159.64
Bulk Density ρ (PCF)	123.92
Particle Density ρ_s	2.661 (measured)

Initial Conditions

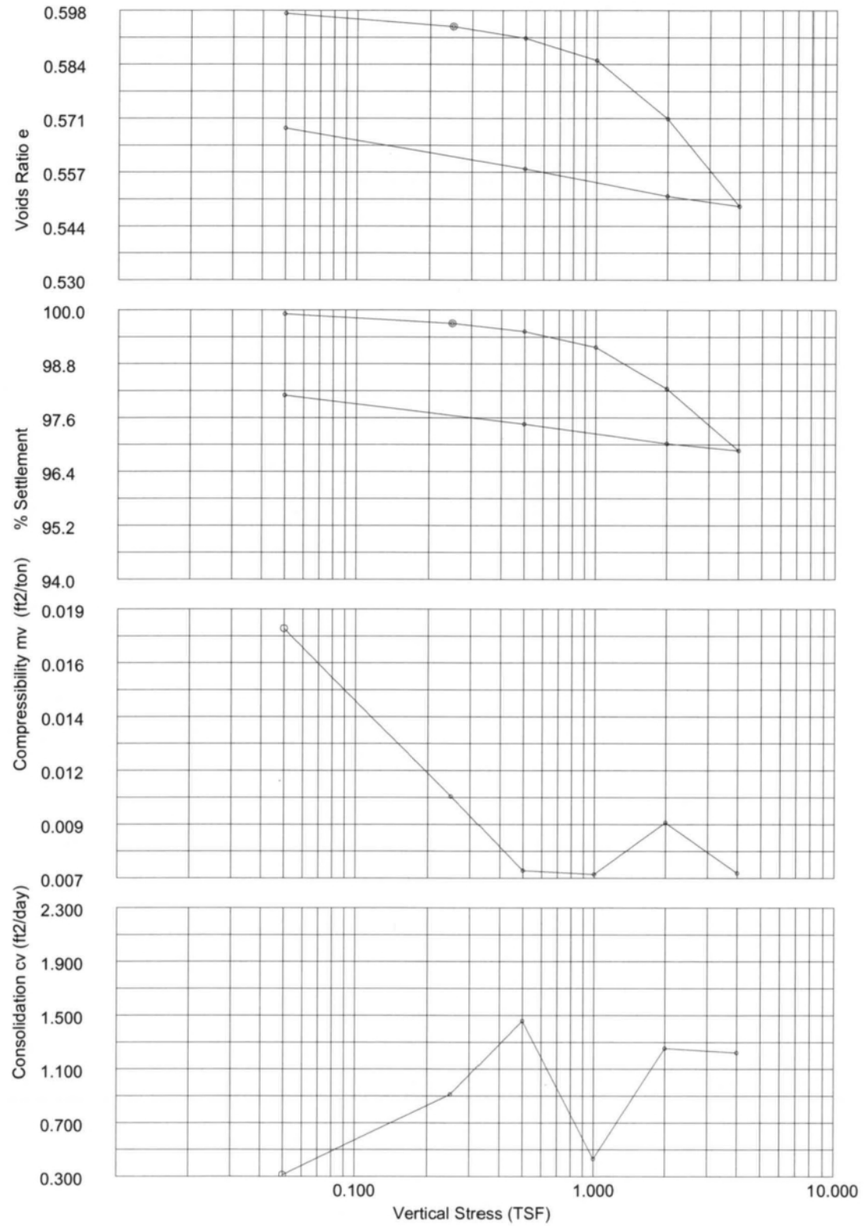
Settlement Channel	1001
Moisture Content w_0%	19.3
Dry Density ρ_d (PCF)	103.86
Voids Ratio e_0	0.5987
Deg of Saturation S_0%	85.8
Swelling Pressure Ss (TSF)	0.000

Final Conditions

Moisture Content w_f%	22.4
Dry Density ρ_d (PCF)	105.88
Voids Ratio e_f	0.5683
Deg of Saturation S_f%	100.00
Settlement: (in)	0.019
Compression Index C_c	0.076
Notes:	Test specimen taken from the middle of UD tube.

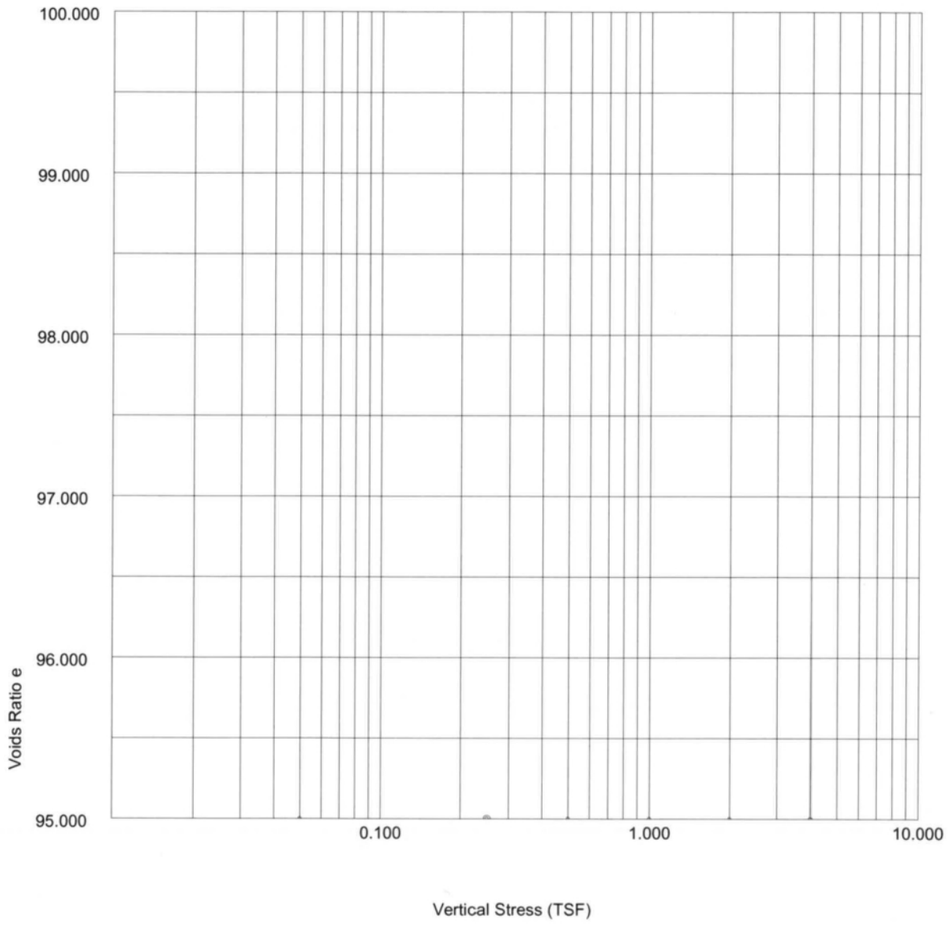
S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	9-22-16
	Site Reference: C.F. Harvey Parkway	Sample:	ST-5
	Jobfile: E:\62351601.JOB	Borehole:	EB2-A Lt. Ln.
	Operator: MLL	*Checked:* MLK	*Approved:*

Oedometer Settlement Tests



S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	9-22-16
	Site Reference: C.F. Harvey Parkway	Sample:	ST-5
	Jobfile: E:\62351601.JOB	Borehole:	EB2-A Lt. Ln.
	Operator: MLK	*Checked:* MLK	*Approved:*

Oedometer Settlement Tests



S&ME	ASTM D2435-96	Test name: Consolidation Date of Test: 9-22-16	
	Site Reference: C.F. Harvey Parkway Jobfile: E:\62351601.JOB	Sample: ST-5 Borehole: EB2-A Lt. Ln.	
	Operator: MK	*Checked:* MK	*Approved:*

REFERENCE: R-5703

PROJECT: 46375

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY LENOIR

PROJECT DESCRIPTION C.F. HARVEY PARKWAY AND NC 58 TO INTERSECTION OF NC 11 AND GRANGER STATION ROAD GRADING, PAVING, DRAINAGE, STRUCTURES AND SIGNALS

SITE DESCRIPTION BRIDGE NO. 214 AND NO. 215 ON -L- (FELIX HARVEY PARKWAY) OVER STONYTON CREEK

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5703	1	59

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. 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

S. LANEY

K. HILL

S. MITCHELL

S. TIERNAN

C. CHANDLER

F. WRIGHT

E. BLONSHINE

J. PEELE

M. RAWLS

INVESTIGATED BY S&ME, INC.

DRAWN BY C. CHANDLER

CHECKED BY S. MITCHELL

SUBMITTED BY S&ME, INC.

DATE MAY 2017

NORTH CAROLINA PROFESSIONAL SEAL 031013 ENGINEER STEWART S. LANEY

SIGNATURE 9-15-17 DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
R-5703	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) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
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 ____ 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 / OPT / 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
- [ ] PORTABLE HOIST
- [X] BK-51
- [X] D-25

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16" 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: BMI4 : 340.30 FEET RIGHT -L- 224+52 RR SPIKE IN BASE OF 12" PINE
N 579,195.2330 E 2,436,020.6560 ELEVATION: 64.40 FEET

NOTES:
FIAD - FILLED IMMEDIATLEY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-5703	3

SITE PLAN

0 100 200

FEET

SKEW 0°

SITE 4

NC GRID
NAD 83/NSRS 2007

BM#14

212 213 214 215 216 217 218 219 220 221 222 223 224 225 226

INTEGRAL END BENT #1

EB1-A LT LN

BRIDGE 214

BENT #1 B1-A LT LN

BENT #2 B2-A LT LN

BENT #3 B3-A LT LN

BENT #4 B4-A LT LN

BENT #5 B5-A LT LN

BENT #6 B6-A LT LN

BENT #7 B7-A LT LN

BENT #8 B8-A LT LN

INTEGRAL END BENT #2

EB2-A LT LN

STONYTON CREEK

TO SR 1732

-L-

LEFT CONTROL LINE

RIGHT CONTROL LINE

TO SR 1735

EB1-B RT LN

BRIDGE 215

BENT #1 B1-B RT LN

BENT #2

BENT #3 B3-B RT LN

BENT #4 B4-B RT LN

BENT #5 B5-B RT LN

BENT #6 B6-B RT LN

BENT #7 B7-B RT LN

BENT #8 B8-B RT LN

BENT #9 B9-B RT LN

INTEGRAL END BENT #1

INTEGRAL END BENT #2

EB2-B RT LN

PROJECT REFERENCE NO.	SHEET NO.
R-5703	4

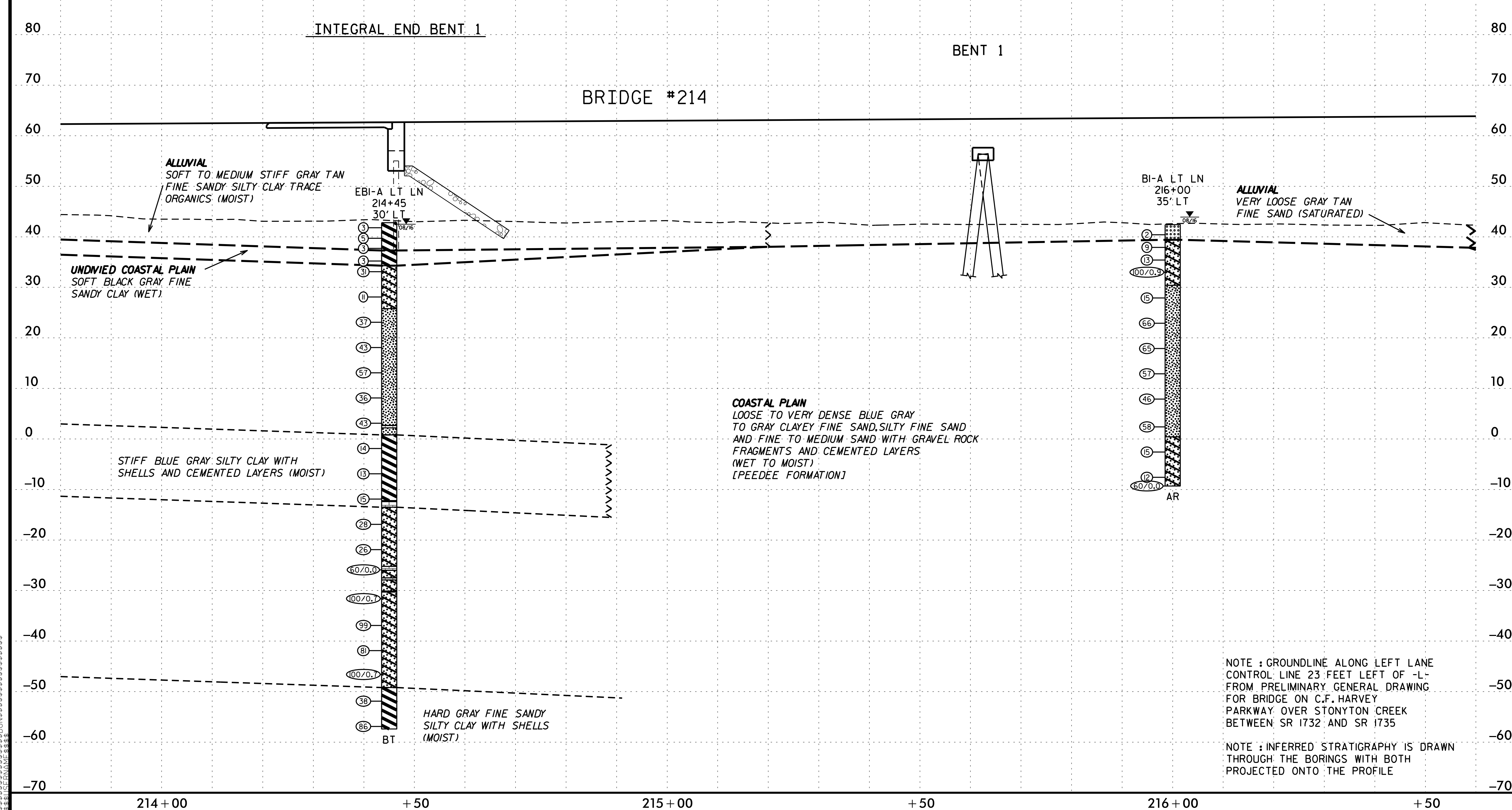
ROADWAY DESIGN ENGINEER | HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROFILE THROUGH BORINGS PROJECTED ALONG LEFT LANE CONTROL LINE

VE 1:1



NOTE : GROUNDLINE ALONG LEFT LANE CONTROL LINE 23 FEET LEFT OF -L- FROM PRELIMINARY GENERAL DRAWING FOR BRIDGE ON C.F. HARVEY PARKWAY OVER STONYTON CREEK BETWEEN SR 1732 AND SR 1735

NOTE : INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

PROJECT REFERENCE NO.	SHEET NO.
R-5703	5

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

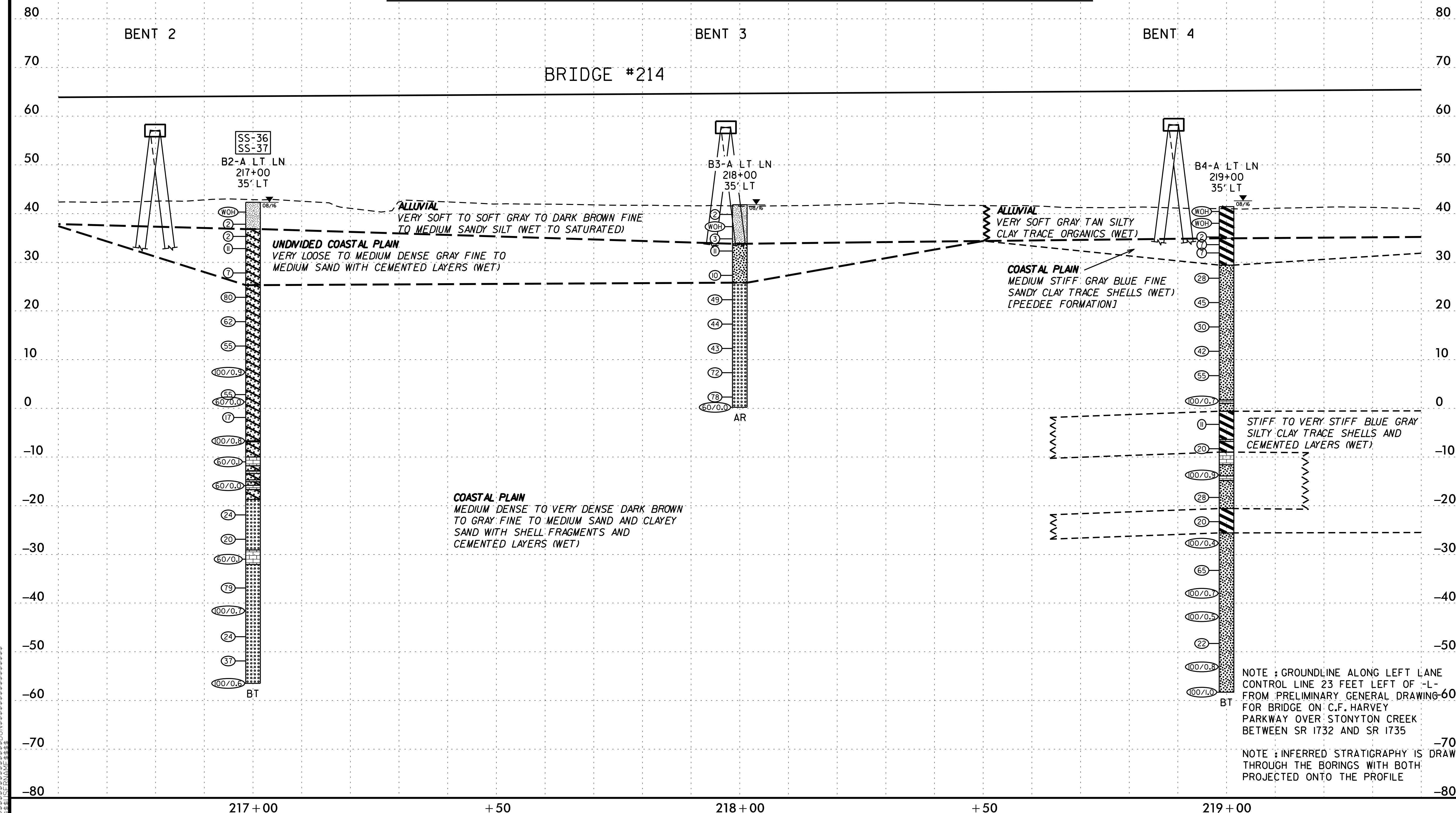
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)				% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	60	200		
SS-36	35' LT	217+00	3.5 – 5.0	A-4 (0)	15	NP	11	42	22	25	100	98	89	50.8	17.0	ND
SS-37	35' LT	217+00	48.2 – 49.1	A-2-6 (0)	31	14	30	41	10	18	99	80	69	31.6	22.4	ND

PROFILE THROUGH BORINGS PROJECTED ALONG LEFT LANE CONTROL LINE

VE 1:1



NOTE : GROUNDLINE ALONG LEFT LANE CONTROL LINE 23 FEET LEFT OF -L- FROM PRELIMINARY GENERAL DRAWING FOR BRIDGE ON C.F. HARVEY PARKWAY OVER STONYTON CREEK BETWEEN SR 1732 AND SR 1735

NOTE : INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

5/14/99
$$$$SYSTIME$$$$
$$$$DGN$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-5703	6

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

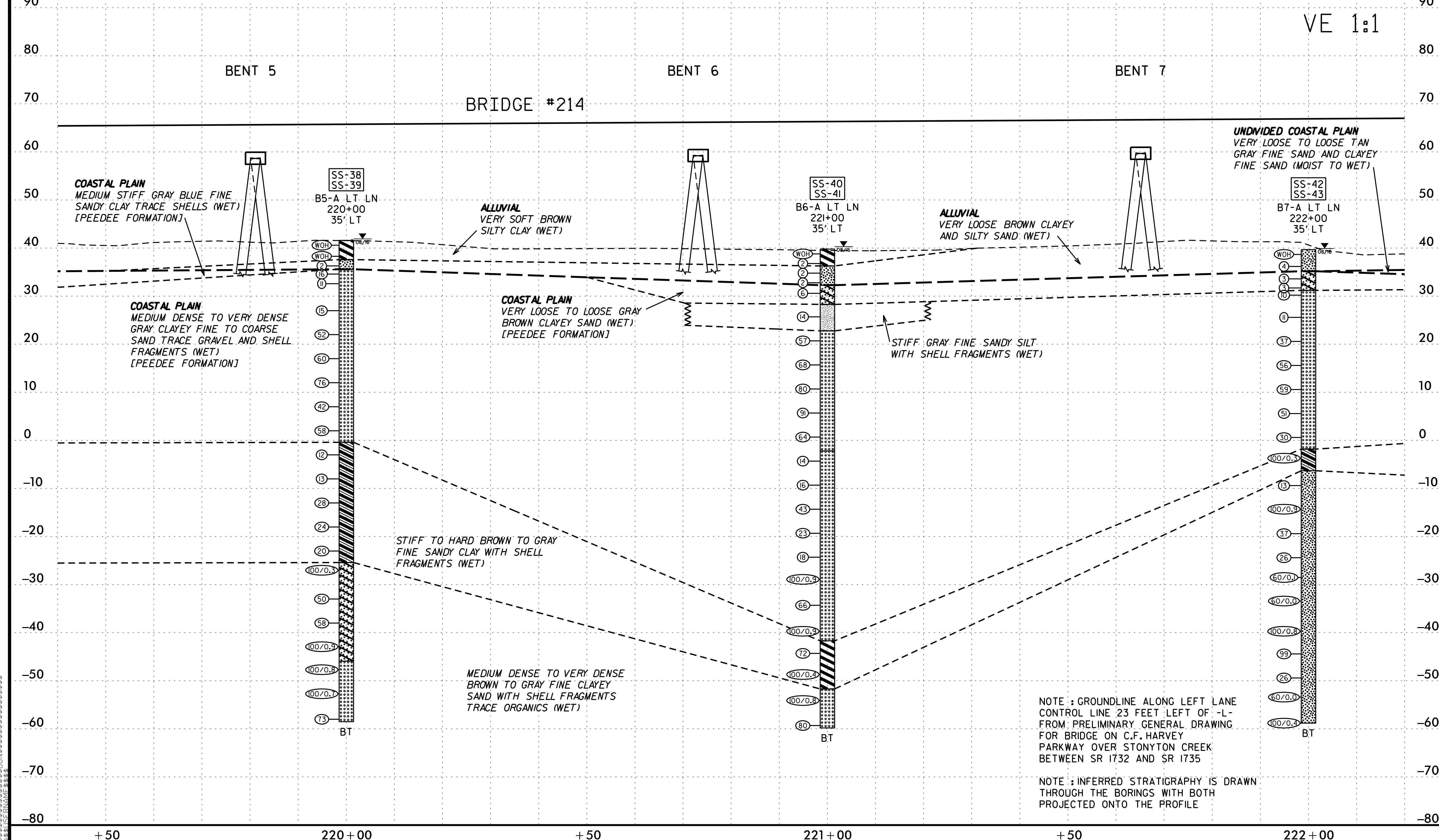
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

5/14/99

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)				% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	60	200		
SS-38	35' LT	220+00	2.2 – 3.8	A-7-6 (8)	47	18	11	36	29	24	100	95	89	56.4	87.6	ND
SS-39	35' LT	220+00	48.6 – 50.1	A-6 (3)	28	12	15	32	29	19	95	92	80	52.7	24.0	ND
SS-40	35' LT	221+00	8.2 – 9.7	A-2-6 (1)	38	22	48	21	9	21	98	69	50	31.9	20.9	ND
SS-41	35' LT	221+00	13.1 – 14.6	A-4 (0)	18	NP	44	19	28	7	98	71	54	37.6	20.7	ND
SS-42	35' LT	222+00	2.5 – 4.0	A-2-4 (0)	27	3	18	57	15	10	100	98	82	28.0	79.9	ND
SS-43	35' LT	222+00	8.5 – 10.0	A-3 (0)	19	NP	29	65	3	3	100	91	71	8.4	26.4	ND

PROFILE THROUGH BORINGS PROJECTED ALONG LEFT LANE CONTROL LINE



PROJECT REFERENCE NO.	SHEET NO.
R-5703	7

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

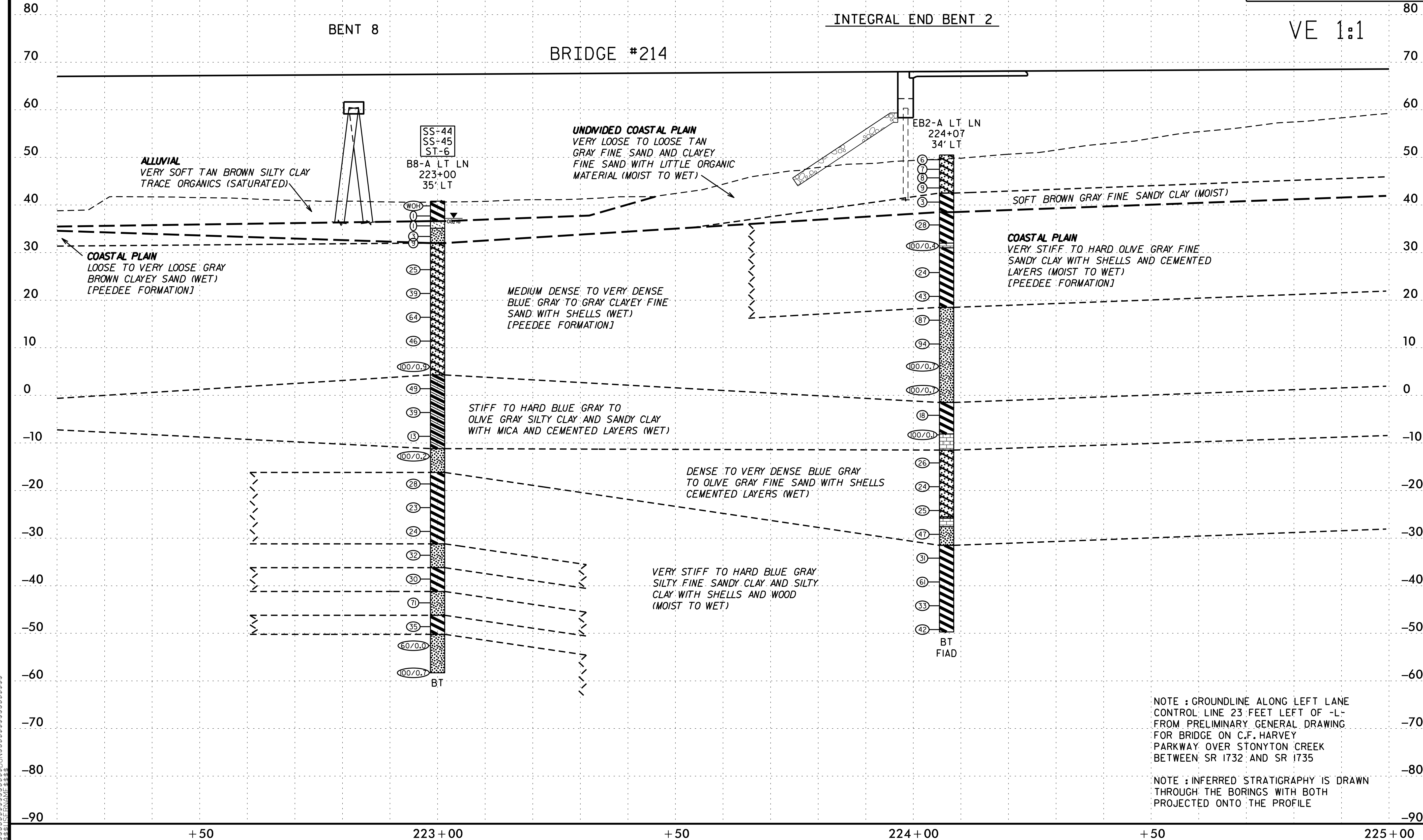
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	60	200	% MOISTURE	% ORGANIC
SS-44	35' LT	223+00	4.2 - 5.7	A-2-4 (0)	29	NP	6	78	6	10	100	99	94	20.0	37.8	3.3
SS-45	35' LT	223+00	43.4 - 44.9	A-6 (2)	33	14	22	44	14	20	100	94	78	42.4	25.2	2.0
ST-6	38' LT	223+00	9.7 - 11.7	A-2-6 (2)	47	22	48	21	6	24	99	71	51	33.3	18.9	

PROFILE THROUGH BORINGS PROJECTED ALONG LEFT LANE CONTROL LINE



NOTE : GROUNDLINE ALONG LEFT LANE CONTROL LINE 23 FEET LEFT OF -L- FROM PRELIMINARY GENERAL DRAWING FOR BRIDGE ON C.F. HARVEY PARKWAY OVER STONYTON CREEK BETWEEN SR 1732 AND SR 1735

NOTE : INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

5/14/99

$$$$$$SYSTIME$$$$$ $$$$$$DGN$$$$$$$$$$$$$$$$$$ $$$$$USERNAME$$$$

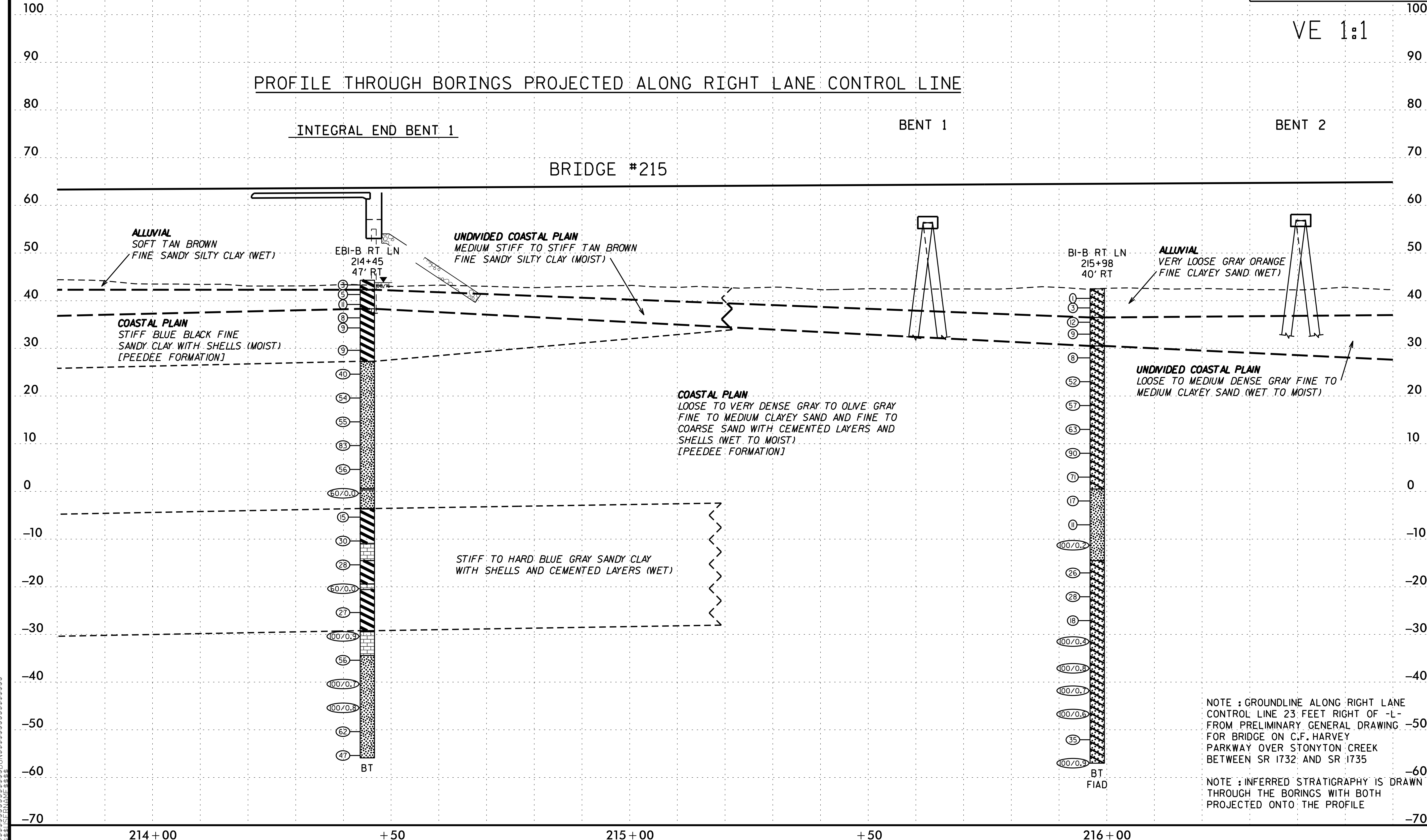
PROJECT REFERENCE NO.	SHEET NO.
R-5703	8

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



PROJECT REFERENCE NO.	SHEET NO.
R-5703	9

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

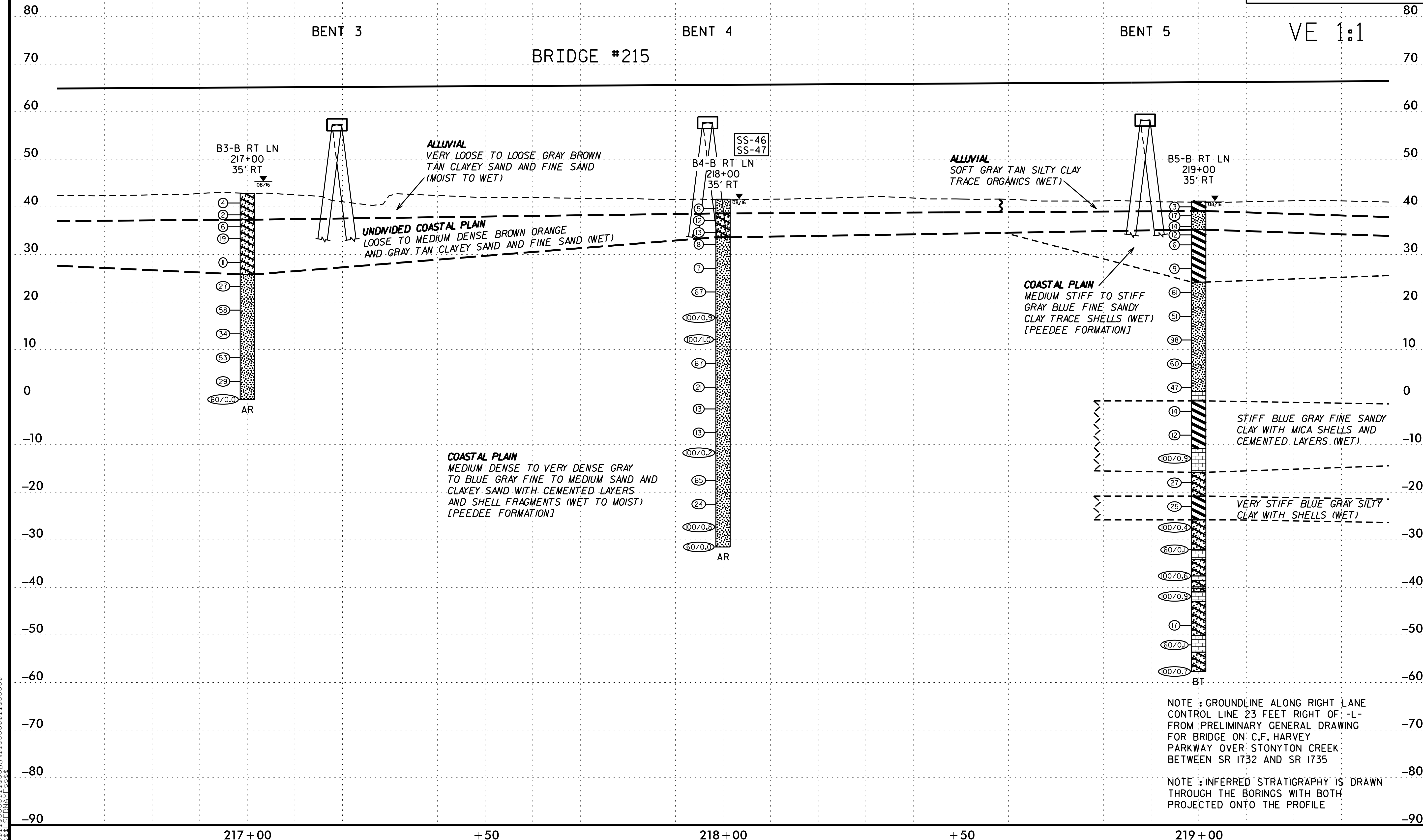
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)				% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	60	200		
SS-46	35' RT	218+00	1.0 – 2.5	A-2-4 (0)	20	3	21	51	13	15	100	92	79	32.0	16.5	1.5
SS-47	35' RT	218+00	58.1 – 59.6	A-2-4 (0)	20	NP	38	51	5	6	100	90	62	13.2	27.1	0.7

PROFILE THROUGH BORINGS PROJECTED ALONG RIGHT LANE CONTROL LINE



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$$$$$SYSTIME$$$$$
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$$$$USERNAME$$$$

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
R-5703	10

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

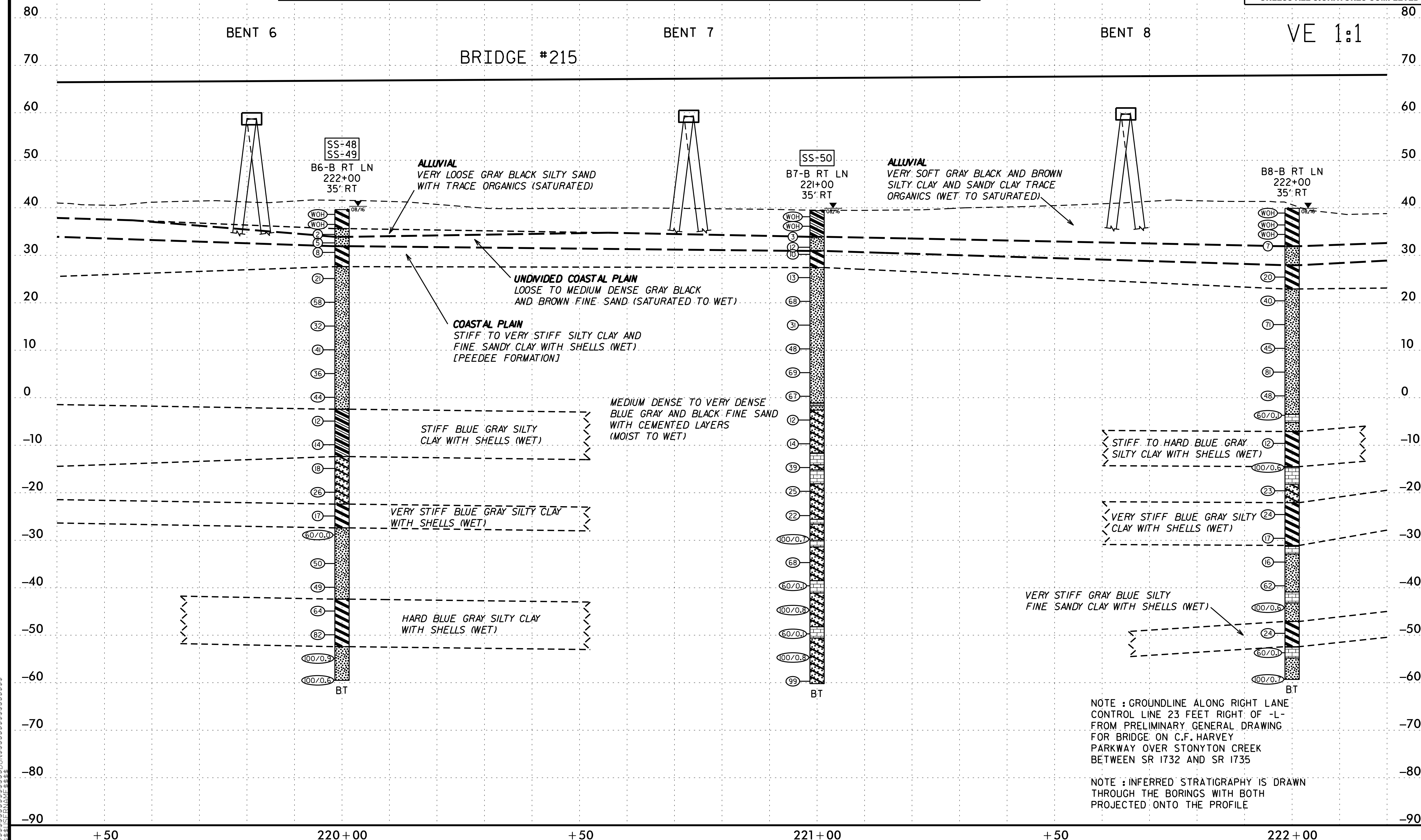
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)				% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	60	200		
SS-48	35' RT	220+00	4.2 – 5.7	A-2-4 (0)	22	9	32	39	16	13	100	84	68	31.1	24.4	ND
SS-49	35' RT	220+00	48.5 – 50.0	A-6 (3)	28	12	15	32	29	19	95	92	80	52.7	24.0	ND
SS-50	35' RT	221+00	0.3 – 1.8	A-6 (8)	40	11	10	20	35	35	100	97	90	74.2	70.2	ND

PROFILE THROUGH BORINGS PROJECTED ALONG RIGHT LANE CONTROL LINE



NOTE : GROUNDLINE ALONG RIGHT LANE CONTROL LINE 23 FEET RIGHT OF -L- FROM PRELIMINARY GENERAL DRAWING FOR BRIDGE ON C.F. HARVEY PARKWAY OVER STONYTON CREEK BETWEEN SR 1732 AND SR 1735

NOTE : INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$$
$$$$$USERNAME$$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-5703	11

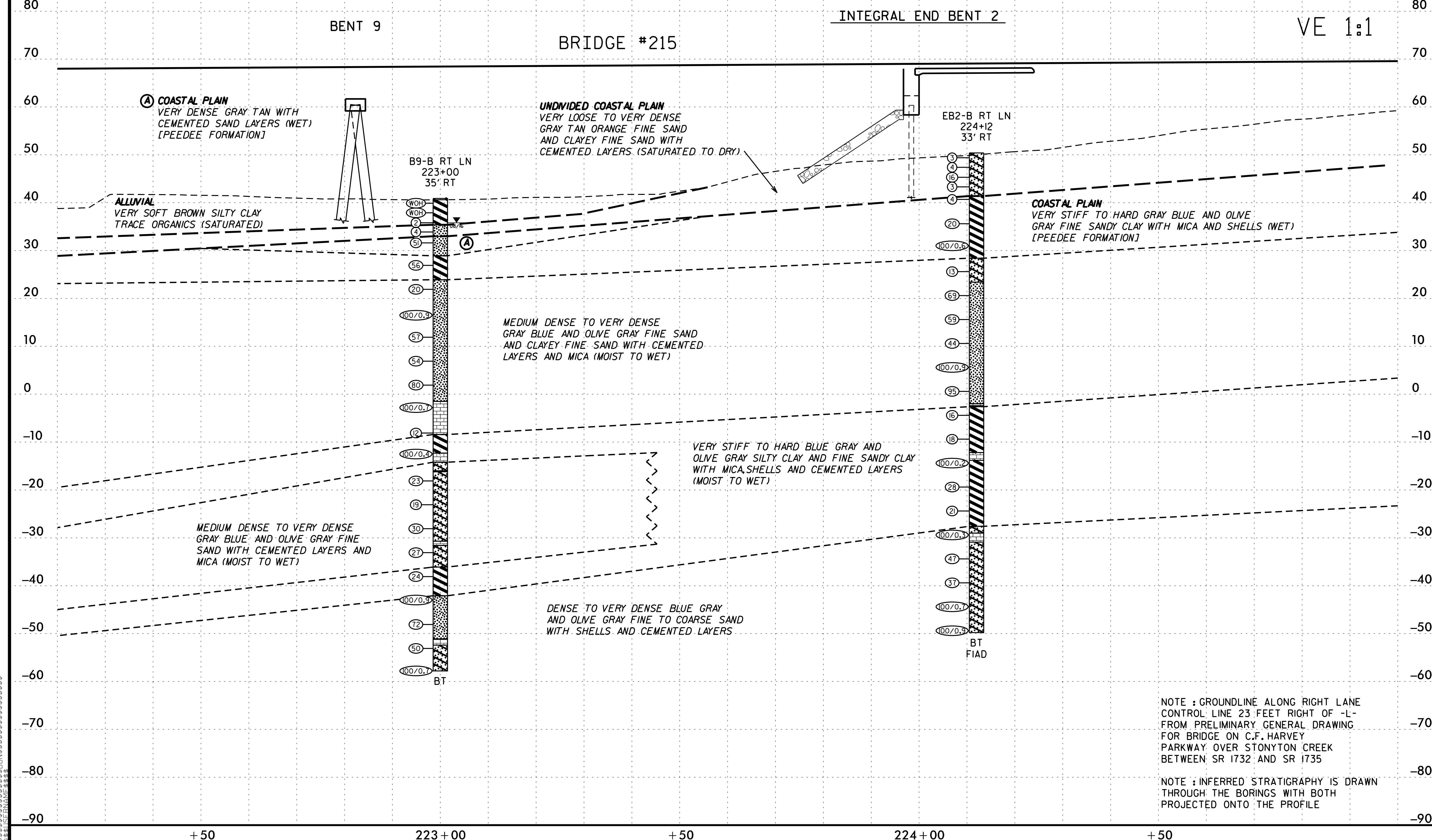
ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

PROFILE THROUGH BORINGS PROJECTED ALONG RIGHT LANE CONTROL LINE



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. EB1-A LT LN	**STATION** 214+45	**OFFSET** 30 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 42.8 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 579,003	**EASTING** 2,434,991	**24 HR.** 0.3
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 08/22/16	**COMP. DATE** 08/22/16	**SURFACE WATER DEPTH** N/A	

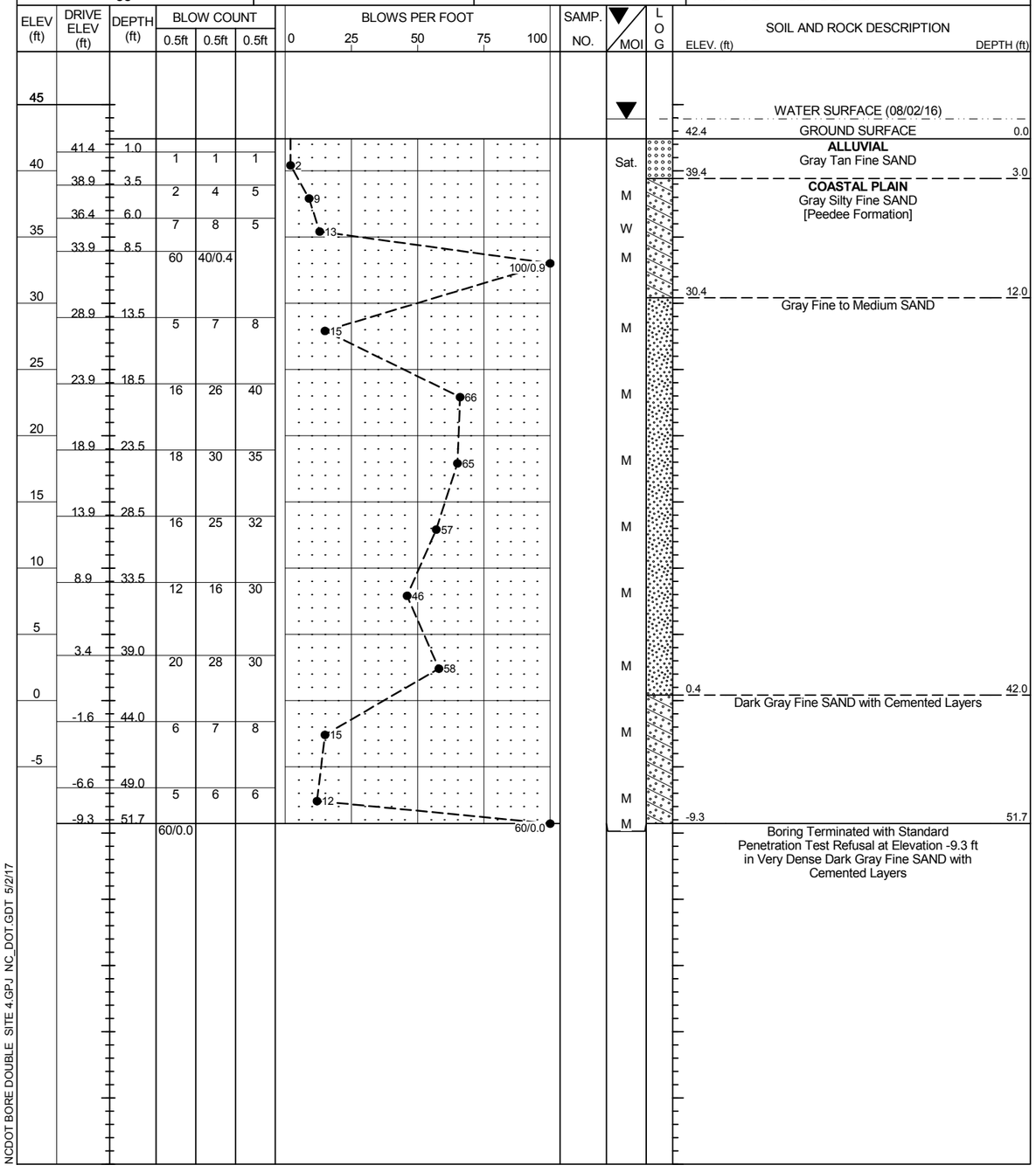
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
45											
	42.8	0.0	1	1	2	3		M		42.8 GROUND SURFACE	0.0
40	40.7	2.1	1	1	4	5		M		**ALLUVIAL** Gray Tan Fine Sandy Silty CLAY, Trace Organics	
	38.7	4.1	WOH	1	2	3		W		37.3	5.5
35	36.2	6.6	1	1	2	3		W		**UNDIVIDED COASTAL PLAIN** Black Gray Fine Sandy CLAY with Silt	
	34.1	8.7	28	16	15	31		W		34.3	8.5
30										**COASTAL PLAIN** Blue Gray Clayey Fine SAND with Fine Gravel and Rock Fragments [Peedee Formation]	
	29.1	13.7	5	5	6	11		W			
25										25.8	17.0
	24.1	18.7	12	15	22	37		M		Gray Fine SAND with Clay Seams and Cemented Sand Layers	
20											
	19.1	23.7	14	20	23	43		M			
15											
	14.1	28.7	9	25	32	57		M			
10											
	9.1	33.7	11	12	24	36		M			
5											
	4.1	38.7	16	28	15	43		M		2.7	40.1
0										2.2	40.6
	-0.9	43.7	5	6	8	14		M		0.8	42.0
-5										Blue Gray Silty CLAY with Fine Sand with Shells	
	-5.9	48.7	4	6	7	13		M			
-10											
	-10.9	53.7	14	6	9	15		M		-12.2	55.0
-15										-12.4	55.2
	-15.9	58.7	8	12	16	28		W		-13.5 Blue Gray Clayey Fine SAND with Shells, with Cemented Sand Layers	56.3
-20											
	-20.9	63.7	10	11	15	26		W			
-25										-25.2	68.0
	-25.9	68.7	60/0.0			60/0.0		W		-26.0	68.8
-30										-27.5	70.3
	-30.9	73.7	6	94/0.2		100/0.7		W		-27.9	70.7
-35										-30.1	72.9
										-30.3	73.1

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. EB1-A LT LN	**STATION** 214+45	**OFFSET** 30 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 42.8 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 579,003	**EASTING** 2,434,991	**24 HR.** 0.3
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 08/22/16	**COMP. DATE** 08/22/16	**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
-35						Match Line				
	-35.9	78.7	28	42	57	99		W		
-40										
	-40.9	83.7	26	40	41	81		M		
-45										
	-45.9	88.7	56	44/0.2		100/0.7		M		
-50										-49.2 92.0
	-50.9	93.7	24	26	12	38		M		Blue Gray Fine Sandy Silty CLAY with Shells
-55										
	-55.9	98.7	11	34	52	86		M		-57.4 100.2
										Boring Terminated at Elevation -57.4 ft in Hard Blue Gray Fine Sandy Silty CLAY with Shells

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B1-A LT LN	**STATION** 216+00	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 42.4 ft	**TOTAL DEPTH** 51.7 ft	**NORTHING** 578,986	**EASTING** 2,435,140	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Wiggins, M.	**START DATE** 08/02/16	**COMP. DATE** 08/02/16	**SURFACE WATER DEPTH** 1.5ft	



NCDOT BORE DOUBLE SITE 4.GPJ NC_DOT.GDT 5/2/17

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B2-A LT LN	**STATION** 217+00	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** 0.0
COLLAR ELEV. 42.3 ft	**TOTAL DEPTH** 98.8 ft	**NORTHING** 578,975	**EASTING** 2,435,240	**24 HR.** 0.0
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 08/03/16	**COMP. DATE** 08/03/16	**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)
45											
	41.3	1.0	WOH	WOH	WOH	0		W		42.3 GROUND SURFACE	0.0
40	38.8	3.5	2	1	1	2	SS-36	17%		**ALLUVIAL** Gray Fine to Medium Sandy SILT	
	36.3	6.0	2	1	1	2		W		36.8	5.5
35	33.8	8.5	3	5	6	11		W		**UNDIVIDED COASTAL PLAIN** Gray Fine to Medium SAND	
30	28.8	13.5	3	3	4	7		W			
25	23.8	18.5	22	30	50	80		W		25.3	17.0
20	18.8	23.5	5	22	40	62		W		**COASTAL PLAIN** Dark Brown to Gray Fine SAND with Clay, Shell Fragments and Cemented Sand Layers [Peedee Formation]	
15	13.8	28.5	24	28	27	55		W			
10	8.8	33.5	40	56	44/0.4	100/0.9		W			
5	3.8	38.5	23	15	40	55		W			
0	1.3	41.0	60/0.0			60/0.0		W			
-5	-0.9	43.2	6	8	9	17		W			
	-5.9	48.2	5	95/0.3		100/0.8	SS-37	22%		-6.7 49.0 -6.9 49.2	
-10	-10.9	53.2	60/0.1			60/0.1		W		-10.0 52.3 -11.8 54.1 -12.8 55.1 -13.4 55.7	
-15	-15.9	58.2	60/0.0			60/0.0		W		-14.7 57.0 -15.1 57.4 -15.8 58.1 -16.7 59.0	
-20	-20.9	63.2	5	9	15	24		W		-18.7 61.0 Dark Gray Fine SAND with Clay and Shell Fragments and Cemented Sand layers	
-25	-25.9	68.2	6	8	12	20		W			
-30	-30.9	73.2	60/0.1			60/0.1		W		-29.1 71.4 -32.1 74.4	
-35											

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
-35						Match Line				
	-35.9	78.2	35	41	38	79		W		
-40	-40.9	83.2	54	46/0.2		100/0.7		W		
-45	-45.9	88.2	8	11	13	24		W		
-50	-50.9	93.2	9	14	23	37		W		
-55	-55.9	98.2	64	36/0.1		100/0.6		W		-56.5 98.8 Boring Terminated at Elevation -56.5 ft in Hard Dark Gray SAND with Clay, Shell Fragments

NCDOT BORE DOUBLE SITE 4.GPJ NC_DOT.GDT 5/2/17

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B3-A LT LN	**STATION** 218+00	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** 0.0
COLLAR ELEV. 41.8 ft	**TOTAL DEPTH** 41.6 ft	**NORTHING** 578,964	**EASTING** 2,435,339	**24 HR.** 0.0
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 08/05/16	**COMP. DATE** 08/05/16	**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)
45										
								▼		41.8 GROUND SURFACE 0.0
40	40.8	1.0	WOH	1	1	2		W		**ALLUVIAL** Dark Brown Fine Sandy SILT
	38.3	3.5	1	WOH	WOH	0		Sat.		
35	35.8	6.0	WOH	WOH	3	3		Sat.		33.8 8.0
	33.3	8.5	10	5	6	11		W		**UNDIVIDED COASTAL PLAIN** Dark Gray Silty Fine SAND with Cemented Layers
30	28.3	13.5	3	4	6	10		W		
25										25.8 16.0
	23.3	18.5	11	24	25	49		W		**COASTAL PLAIN** Gray Fine to Medium SAND with Cemented Layers
20	18.3	23.5	14	20	24	44		W		
15	13.3	28.5	16	20	23	43		W		
10	8.3	33.5	20	34	38	72		W		
5	3.3	38.5	30	34	44	78		W		
	0.2	41.6	60/0.0			60/0.0		W		0.2 41.6 Boring Terminated with Standard Penetration Test Refusal at Elevation 0.2 ft in Very Dense Gray Fine to Medium SAND with Cemented Layers

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B4-A LT LN	**STATION** 219+00	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 41.4 ft	**TOTAL DEPTH** 99.7 ft	**NORTHING** 578,953	**EASTING** 2,435,438	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/09/16	**COMP. DATE** 08/10/16	**SURFACE WATER DEPTH** 1.2ft	

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))
45										
										WATER SURFACE (08/09/16)
	41.4	0.0								GROUND SURFACE 0.0
40			WOH	WOH	WOH	0		W		**ALLUVIAL** Gray Tan Silty CLAY, with Fine Sand, Trace Organics
	39.0	2.4	WOH	WOH	WOH	0		W		
	36.2	5.2								
35	34.6	6.8	1	1	1	2		W		34.9 6.5
	32.9	8.5	2	3	4	7		W		**COASTAL PLAIN** Gray Blue Fine Sandy CLAY, with Silt, Trace Shells [Peedee Formation]
30			WOH	3	4	7		W		
	27.7	13.7	5	7	21	28		W		29.4 12.0 Gray Blue Fine SAND, with Clay, Trace Shells and cemented sand layers
25										
	22.7	18.7	18	24	21	45		W		
20										
	17.7	23.7	8	11	19	30		W		
15										
	12.7	28.7	10	17	25	42		W		
10										
	7.7	33.7	23	27	28	55		W		
5										
	2.7	38.7	27	37	63/0.2	100/0.7		W		1.7 39.7
0										1.0 40.4
	-2.3	43.7	4	5	6	11		W		-0.6 42.0 Blue Gray Silty CLAY with Fine Sand, Trace Shells and cemented sand layers
-5										
	-7.3	48.7	5	7	13	20		W		-6.4 47.8
-10										-6.8 48.2
	-12.3	53.7	10	12	88/0.4	100/0.9		W		-9.0 50.4 Gray Clayey Fine SAND, with Trace Shells and Cemented Sand Layers, and Clay Seams
-15										-11.6 53.0
	-17.3	58.7	10	12	16	28		W		-13.9 55.3
-20										-14.8 56.2
	-22.3	63.7	5	6	14	20		W		-20.6 62.0 Blue Gray Silty CLAY with Fine Sand, Trace Shells
-25										
	-27.3	68.7	100/0.4			100/0.4		W		-25.6 67.0 Blue Gray Fine SAND with Clay Seams, Trace Shells and Cemented Sand Layers
-30										
	-32.3	73.7	17	32	33	65		W		
-35										

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B4-A LT LN	**STATION** 219+00	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 41.4 ft	**TOTAL DEPTH** 99.7 ft	**NORTHING** 578,953	**EASTING** 2,435,438	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/09/16	**COMP. DATE** 08/10/16	**SURFACE WATER DEPTH** 1.2ft	

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
-35						Match Line				
	-37.3	78.7	58	42/0.2		100/0.7		W		Blue Gray Fine SAND with Clay Seams, Trace Shells and Cemented Sand Layers *(continued)*
-40										
	-42.3	83.7	100/0.5			100/0.5		W		
-45										
	-47.3	88.7	7	10	12	22		W		
-50										
	-52.3	93.7	31	69/0.3		100/0.8		W		
-55										
	-57.3	98.7	47	53/0.5		100/1.0		W		-58.3 99.7 Boring Terminated at Elevation -58.3 ft in Very Dense Fine SAND

NCDOT BORE DOUBLE SITE 4.GPJ NC_DOT.GDT 5/2/17

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B5-A LT LN	**STATION** 220+00	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 41.6 ft	**TOTAL DEPTH** 100.1 ft	**NORTHING** 578,942	**EASTING** 2,435,538	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/24/16	**COMP. DATE** 08/25/16	**SURFACE WATER DEPTH** 0.3ft	

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))
45										
	41.6	0.0	WOH	WOH	WOH	0		W		41.6 / 0.0 WATER SURFACE (08/24/16)
40	39.3	2.3	WOH	WOH	WOH	0		W		**ALLUVIAL** Brown Silty CLAY
	37.3	4.3	WOH	WOH	2	2	SS-38	88%		37.6 / 4.0
35	35.6	6.0	3	7	9	16		W		Brown to Gray Clayey SAND
	33.6	8.0	5	6	5	11		W		35.6 / 6.0 **COASTAL PLAIN** Gray Clayey Fine to Coarse SAND, Trace Gravel [Peedee Formation]
30	28.0	13.6	3	5	10	15		W		
25	23.0	18.6	26	29	23	52		W		
20	18.0	23.6	15	25	35	60		W		
15	13.0	28.6	25	36	40	76		W		
10	8.0	33.6	16	20	22	42		W		
5	3.0	38.6	15	31	27	58		W		
0	-2.0	43.6	4	5	7	12		W		-0.4 / 42.0 Brown to Gray Fine Sandy CLAY with Shell Fragments
-5	-7.0	48.6	5	6	7	13	SS-39	24%		
-10	-12.0	53.6	34	15	13	28		W		
-15	-17.0	58.6	7	10	14	24		W		
-20	-22.0	63.6	5	7	13	20		W		
-25	-26.7	68.3	100/0.3			100/0.3		W		-25.4 / 67.0 Brown to Gray Fine Clayey SAND with Shell Fragments
-30	-32.0	73.6	15	23	27	50		W		
-35										

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
-35						Match Line				
	-37.0	78.6	22	26	32	58		W		Brown to Gray Fine Clayey SAND with Shell Fragments *(continued)*
-40	-42.0	83.6	52	48/0.4		100/0.9		W		
-45	-47.0	88.6	8	92/0.3		100/0.8		W		-45.9 / 87.5 Dark Brown to Dark Gray Fine Clayey SAND with Shell Fragments
-50	-52.0	93.6	46	54/0.2		100/0.7		W		
-55	-57.0	98.6	23	31	42	73		W		-58.5 / 100.1 Boring Terminated at Elevation -58.5 ft in Very Dense Gray Fine SAND with Clay Seams and Shell Fragments

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B6-A LT LN	**STATION** 221+00	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.8 ft	**TOTAL DEPTH** 99.6 ft	**NORTHING** 578,931	**EASTING** 2,435,537	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/23/16	**COMP. DATE** 08/24/16	**SURFACE WATER DEPTH** 0.5ft	

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)
40										WATER SURFACE (08/23/16)
	39.8	0.0	WOH	WOH	WOH	0		W		39.8 / 0.0 GROUND SURFACE
	37.8	2.0								**ALLUVIAL** Brown Silty CLAY, trace Organics
			WOH	1	1	2		W		
35	35.8	4.0								36.3 / 3.5 Brown Clayey Fine SAND, Trace Organics
			1	1	1	2		W		
	33.8	6.0								
			1	1	1	2		W		32.3 / 7.5 **COASTAL PLAIN** Gray Fine SAND with Shell Fragments and Clay Seams [Peedee Formation]
	31.6	8.2								
30			3	2	4	6	SS-40	21%		28.3 / 11.5 Gray Fine Sandy SILT with Shell Fragments
	26.7	13.1								
			5	6	8	14	SS-41	21%		
25										
						57				22.8 / 17.0 Gray Fine SAND, with Shell Fragments, Clay Seams
	21.7	18.1								
20			17	29	28			W		
	16.7	23.1								
			24	33	35	68				
15								W		
	11.7	28.1								
			18	32	48	80		W		
10										
	6.7	33.1								
			32	49	42	91		W		
5										
	1.7	38.1								
			32	38	26	64		W		
0										
	-3.3	43.1								-2.2 / 42.0 Gray Fine SAND with Shell Fragments and Clay Seams
			6	7	7	14		W		
-5										
	-8.3	48.1								
			5	7	9	16		W		
-10										
	-13.3	53.1								
			9	10	33	43		W		
-15										
	-18.3	58.1								
			8	11	12	23		W		
-20										
	-23.3	63.1								
			5	6	12	18		W		
-25										
	-28.3	68.1								
			20	80/0.4		100/0.9		W		
-30										
	-33.3	73.1								
			19	23	43	66		W		
-35										
	-38.3	78.1								
			18	40	60/0.4	100/0.9		W		
-40										

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
-40						Match Line				
	-43.3	83.1	40	46	26	72		W		-41.7 / 81.5 Gray Sandy CLAY with Shell Fragments
-45										
	-48.3	88.1	100/0.4			100/0.4		W		
-50										
	-53.3	93.1	50	50/0.3		100/0.8		W		-51.7 / 91.5 Gray Fine SAND with Shell Fragments
-55										
	-58.3	98.1	29	40	40	80		W		-59.8 / 99.6 Boring Terminated at Elevation -59.8 ft in Very Dense Gray Fine SAND with Shell Fragments

NCDOT BORE DOUBLE SITE 4.GPJ NC_DOT.GDT 5/2/17

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B7-A LT LN	**STATION** 222+00	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.7 ft	**TOTAL DEPTH** 98.5 ft	**NORTHING** 578,920	**EASTING** 2,435,737	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/22/16	**COMP. DATE** 08/23/16	**SURFACE WATER DEPTH** 0.2ft	

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)
40										39.7 / 0.0 WATER SURFACE (08/22/16)
	39.7	0.0	1	WOH	WOH	0		W		**ALLUVIAL** Brown Silty SAND
	37.2	2.5	WOH	2	2	4	SS-42	80% W		
35	34.6	5.1	3	2	1	3		W		35.2 / 4.5 **COASTAL PLAIN** Gray Brown Clayey SAND [Peedee Formation]
	32.7	7.0	2	1	2	3		W		
	31.2	8.5	4	4	6	10	SS-43	26%		31.2 / 8.5 Gray Fine SAND
30	26.6	13.1	3	6	5	11		W		
25	21.6	18.1	11	13	24	37		W		
20	16.6	23.1	13	25	31	56		W		
15	11.6	28.1	18	28	31	59		W		
10	6.6	33.1	16	25	26	51		W		
5	1.6	38.1	10	12	18	30		W		
0	-3.4	43.1	100/0.3			100/0.3		M		-1.8 / 41.5 Dark Gray Silty CLAY
-5	-8.4	48.1	5	6	7	13		W		-6.3 / 46.0 Dark Gray Fine SAND with Clay Seams, Shell Fragments and trace organics
-10	-13.4	53.1	8	94/0.4		100/0.9		W		
-15	-18.4	58.1	11	16	21	37		W		
-20	-23.4	63.1	7	11	15	26		W		
-25	-28.4	68.1	60/0.1			60/0.1		W		
-30	-33.4	73.1	60/0.0			60/0.0		W		
-35	-38.4	78.1	37	56	44/0.3	100/0.8		W		
-40										

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B7-A LT LN	**STATION** 222+00	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.7 ft	**TOTAL DEPTH** 98.5 ft	**NORTHING** 578,920	**EASTING** 2,435,737	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/22/16	**COMP. DATE** 08/23/16	**SURFACE WATER DEPTH** 0.2ft	

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
-40						Match Line				Dark Gray Fine SAND with Clay Seams, Shell Fragments and trace organics *(continued)*
	-43.4	83.1	6	56	43	99		W		
-45	-48.4	88.1	6	11	15	26		W		
-50	-53.4	93.1	60/0.0			60/0.0		W		
-55	-58.4	98.1	100/0.4			100/0.4		W		-58.8 / 98.5 Boring Terminated at Elevation -58.8 ft in Very Dense Gray Fine SAND with Shell Fragmentsand Organics

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B8-A LT LN	**STATION** 223+00	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 40.8 ft	**TOTAL DEPTH** 99.1 ft	**NORTHING** 578,909	**EASTING** 2,435,836	**24 HR.** 3.6
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/19/16	**COMP. DATE** 08/19/16	**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)
45										
40	40.8	0.0	WOH	WOH	WOH	0		Sat.		40.8 0.0 GROUND SURFACE **ALLUVIAL** Tan Brown Silty CLAY with Fine Sand, Trace Organics
	38.7	2.1	WOH	WOH	1	1		Sat.		
	36.6	4.2	1	WOH	1	1				36.6 4.2 **UNDIVIDED COASTAL PLAIN**
35	34.4	6.4					SS-44	38%		35.1 5.7 Tan Gray Fine SAND with little organic material
	33.0	7.8	3	1	2	3 9		W		
			1	2	7			W		32.0 8.8 **COASTAL PLAIN** Blue Gray clayey Fine SAND, shells [Peedee Formation]
30	27.4	13.4	11	13	12	25		19%		
25	22.4	18.4	11	15	24	39		W		
20	17.4	23.4	21	30	34	64		W		
15	12.4	28.4	17	20	26	46		W		
10	7.4	33.4	30	46	54/0.4	100/0.9		W		
5	2.4	38.4	26	26	23	49		W		4.3 36.5 Blue Gray Silty CLAY with Mica
0	-2.6	43.4	17	14	25	39	SS-45	25%		
-5	-7.6	48.4	4	6	7	13		W		
-10	-12.6	53.4	100/0.2			100/0.2		W		-11.2 52.0 Blue Gray Fine SAND with Shells and Cemented Sand
-15	-17.6	58.4	10	12	16	28		W		-16.2 57.0 Blue Gray Silty Fine Sandy CLAY with Shells and Clayey Fine Sand Seams
-20	-22.6	63.4	8	8	15	23		W		
-25	-27.6	68.4	8	8	16	24		W		-31.2 72.0 Gray Fine SAND with Shells
-30	-32.6	73.4	10	15	17	32		W		
-35										

NCDOT BORE DOUBLE SITE 4.GPJ NC_DOT.GDT 5/2/17

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B8-A LT LN	**STATION** 223+00	**OFFSET** 35 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 40.8 ft	**TOTAL DEPTH** 99.1 ft	**NORTHING** 578,909	**EASTING** 2,435,836	**24 HR.** 3.6
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/19/16	**COMP. DATE** 08/19/16	**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
-35						Match Line				
	-37.6	78.4	8	10	20	30		W		-36.2 77.0 Blue Gray Silty CLAY with Fine Sand and Shells
-40	-42.6	83.4	23	32	39	71		W		-41.2 82.0 Gray Fine SAND with Shells
-45	-47.6	88.4	8	11	24	35		W		-46.2 87.0 Blue Gray Fine Sandy CLAY with Shells and Wood
-50	-52.6	93.4	60/0.0			60/0.0		W		-50.2 91.0 Gray Fine SAND with CLAY and Shells
-55	-57.6	98.4	66	34/0.2		100/0.7		W		-58.3 99.1 Boring Terminated at Elevation -58.3 ft in Very Dense Fine SAND ST-6 Recovered from offset boring Station 223+00 Offest 38 ft Left Other Samples: ST-6 (9.7 - 11.7)

NCDOT GEOTECHNICAL ENGINEERING UNIT
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WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. EB2-A LT LN	**STATION** 224+07	**OFFSET** 34 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 50.5 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 578,898	**EASTING** 2,435,935	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 09/09/16	**COMP. DATE** 09/09/16	**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))
55										
50	50.5	0.0	2	3	3	6		M		50.5 / 0.0 GROUND SURFACE
	48.5	2.0	3	4	3	7		M		**UNDIVIDED COASTAL PLAIN** Tan Clayey Fine SAND with Clay Seams
	46.7	3.8	4	4	4	8		W		
45	44.6	5.9	2	4	5	9		W		
	41.6	8.9	1	1	2	3		M		42.5 / 8.0 Brown Gray Fine Sandy CLAY
40	36.8	13.7	11	17	11	28		W		38.5 / 12.0 **COASTAL PLAIN** Olive Gray Fine Sandy CLAY with Shells and cemented sand layers [Peedee Formation]
35	31.8	18.7	100/0.4			100/0.4				32.0 / 18.5
30	26.8	23.7	22	12	12	24		M		31.0 / 19.5
25	21.8	28.7	10	17	26	43		M		18.5 / 32.0 Gray Fine to Coarse SAND
20	16.8	33.7	23	35	52	87		M		
15	11.8	38.7	38	52	42	94		M		
10	6.8	43.7	50	50/0.2		100/0.7				
5	1.8	48.7	60	40/0.2		100/0.7				
0	-3.2	53.7	8	9	9	18		M		-1.5 / 52.0 Olive Gray Fine Sandy CLAY with Mica and Shells and cemented sand layers
-5	-8.2	58.7	100/0.1			100/0.1				-8.1 / 58.6
-10	-13.2	63.7	9	11	15	26		W		-11.5 / 62.0 Olive Gray Clayey Fine SAND with Shells
-15	-18.2	68.7	6	10	14	24		W		
-20	-23.2	73.7	9	10	15	25		W		
-25										

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 214 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. EB2-A LT LN	**STATION** 224+07	**OFFSET** 34 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 50.5 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 578,898	**EASTING** 2,435,935	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 09/09/16	**COMP. DATE** 09/09/16	**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
-25						Match Line				
	-28.2	78.7	17	25	22	47		W		-25.5 / 76.0 Gray Fine to Coarse SAND and cemented sand layers
-30										-25.8 / 76.3
	-33.2	83.7	10	15	16	31		W		-27.6 / 78.1
-35										-31.5 / 82.0 Fine Sandy CLAY with Fine to Coarse Sand Seams
	-38.2	88.7	9	19	42	61		M		
-40										
	-43.2	93.7	9	13	20	33		M		
-45										
	-48.2	98.7	10	17	25	42		M		-49.7 / 100.2 Boring Terminated at Elevation -49.7 ft in Hard Fine Sandy CLAY

NCDOT GEOTECHNICAL ENGINEERING UNIT
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WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek			**GROUND WTR (ft)**
BORING NO. EB1-B RT LN	**STATION** 214+45	**OFFSET** 47 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 44.3 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 578,933	**EASTING** 2,434,983	**24 HR.** 0.5
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Eister, G.	**START DATE** 08/22/16	**COMP. DATE** 08/23/16	**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)
45											
	44.3	0.0	1	1	2	3		W		44.3 GROUND SURFACE	0.0
	42.3	2.0								**ALLUVIAL**	
			1	2	3	5		M		42.3 Tan Brown Fine Sandy Silty CLAY	2.0
40	40.2	4.1								**UNDIVIDED COASTAL PLAIN**	
			2	4	7	11		M		Tan Brown Fine Sandy Silty CLAY	
	37.4	6.9								38.3	6.0
			6	4	4	8		M		**COASTAL PLAIN**	
35	35.3	9.0								Blue Black Fine Sandy CLAY with Shells	
			3	4	5	9		M		[Peedee Formation]	
30	30.6	13.7	4	4	5	9		M			
										27.3	17.0
25	25.6	18.7	11	17	23	40		W		Gray Fine SAND with Cemented Sand Layers	
20	20.6	23.7	20	27	27	54		M			
15	15.6	28.7	23	31	24	55		M			
10	10.6	33.7	32	42	41	83		M			
5	5.6	38.7	12	16	40	56		M			
0	0.6	43.7	60/0.0			60/0.0		M		0.6	43.7
										0.3	44.0
-5	-4.4	48.7	5	6	9	15		M		-3.6	47.9
										-3.7 Blue Gray Sandy CLAY with Shells, Cemented Sand Layers	48.0
-10	-9.4	53.7	6	12	18	30		W		-10.9	55.2
										-14.5	58.8
-15	-14.4	58.7	18	11	17	28		W			
										-19.4	63.7
-20	-19.4	63.7	60/0.0			60/0.0		W		-20.6	64.9
-25	-24.4	68.7	7	11	16	27		W			
										-29.2	73.5
-30	-29.4	73.7	8	92/0.4		100/0.9		W		-29.4 Green Gray Clayey Coarse SAND with Shells and Cemented Sand Layers	73.7
-35	-34.4	78.7								-34.4	78.7

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek			**GROUND WTR (ft)**
BORING NO. EB1-B RT LN	**STATION** 214+45	**OFFSET** 47 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 44.3 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 578,933	**EASTING** 2,434,983	**24 HR.** 0.5
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Eister, G.	**START DATE** 08/22/16	**COMP. DATE** 08/23/16	**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
-35			16	22	34	Match Line 56		W		
-40	-39.4	83.7	50	50/0.2		100/0.7		W		
-45	-44.4	88.7	56	44/0.3		100/0.8		W		
-50	-49.4	93.7	28	28	34	62		W		
-55	-54.4	98.7	14	17	30	47		W		-55.9 100.2
										Boring Terminated at Elevation -55.9 ft in Dense Green Gray Clayey Fine SAND wtih Shells

NCDOT BORE DOUBLE SITE 4.GPJ NC_DOT.GDT 5/2/17

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B1-B RT LN	**STATION** 215+98	**OFFSET** 40 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 42.5 ft	**TOTAL DEPTH** 99.5 ft	**NORTHING** 578,917	**EASTING** 2,435,132	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 08/03/16	**COMP. DATE** 08/03/16	**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))
45										
	41.5	1.0	WOH	WOH	1	1		W		42.5 / 0.0 GROUND SURFACE **ALLUVIAL** Gray Orange Fine Clayey SAND
40	39.5	3.0	1	2	1	3		W		
	36.5	6.0	3	4	8	12		W		36.5 / 6.0 **UNDIVIDED COASTAL PLAIN** Gray Fine to Medium Clayey SAND
35	34.0	8.5	3	4	5	9		M		
	29.0	13.5	4	4	4	8		M		30.5 / 12.0 **COASTAL PLAIN** Gray Fine to Medium clayey SAND [Peedee Formation]
30	24.0	18.5	15	22	30	52		W		
25	19.0	23.5	18	25	32	57		W		
20	14.0	28.5	16	29	34	63		W		
15	9.0	33.5	40	40	50	90		W		
10	4.0	38.5	15	28	43	71		W		
5	-1.0	43.5	6	8	9	17		M		0.5 / 42.0 Dark Gray Fine SAND with Silt
0	-6.0	48.5	5	5	6	11		M		
-5	-11.1	53.6	100/0.2			100/0.2				
-10	-16.1	58.6	8	13	13	26		W		-14.5 / 57.0 Olive Gray Clayey Fine to coase Clayey SAND with Shells
-15	-21.1	63.6	8	12	16	28		W		
-20	-26.1	68.6	7	8	10	18		W		
-25	-31.1	73.6	100/0.4			100/0.4				
-30										
-35										

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B1-B RT LN	**STATION** 215+98	**OFFSET** 40 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 42.5 ft	**TOTAL DEPTH** 99.5 ft	**NORTHING** 578,917	**EASTING** 2,435,132	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 08/03/16	**COMP. DATE** 08/03/16	**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
-35						Match Line				
	-36.1	78.6	29	47	54/0.3	100/0.8				Olive Gray Clayey Fine to coase Clayey SAND with Shells *(continued)*
-40	-41.1	83.6	69	31/0.2		100/0.7				
-45	-46.1	88.6	70	30/0.1		100/0.6				
-50	-51.1	93.6	7	13	22	35		M		
-55	-56.1	98.6	38	62/0.4		100/0.9				-57.0 / 99.5 Boring Terminated at Elevation -57.0 ft in Very Dense Clayey Fine SAND

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B3-B RT LN	**STATION** 217+00	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 42.8 ft	**TOTAL DEPTH** 43.3 ft	**NORTHING** 578,906	**EASTING** 2,435,232	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Wiggins, M.	**START DATE** 08/04/16	**COMP. DATE** 08/04/16	**SURFACE WATER DEPTH** 2.5ft	

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)
45										WATER SURFACE (08/04/16)
										42.8 GROUND SURFACE 0.0
	41.8	1.0								**ALLUVIAL** Gray/Brown Clayey SAND
40	39.3	3.5	1	2	2	4		M		
	36.8	6.0	1	1	1	2		W		37.3 5.5
35	34.3	8.5	3	3	3	6		W		**UNDIVIDED COASTAL PLAIN** Brown/Orange Fine to Very Fine Clayey SAND
30	29.3	13.5	3	6	13	19		W		
			4	5	6	11		W		
25	24.3	18.5								25.8 17.0
			12	13	14	27		W		**COASTAL PLAIN** Gray Fine to Medium SAND with Cemented Layers [Peedee Formation]
20	19.3	23.5	23	26	32	58		W		
15	14.3	28.5	18	13	21	34		W		
10	9.3	33.5	18	23	30	53		W		
5	4.3	38.5	15	13	16	29		W		
0	-0.5	43.3	60/0.0			60/0.0		W		-0.5 43.3 Boring Terminated with Standard Penetration Test Refusal at Elevation -0.5 ft in Very Dense Gray Fine to Medium SAND

NCDOT BORE DOUBLE SITE 4.GPJ NC_DOT.GDT 5/2/17

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B4-B RT LN	**STATION** 218+00	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** 0.0
COLLAR ELEV. 41.6 ft	**TOTAL DEPTH** 73.1 ft	**NORTHING** 578,895	**EASTING** 2,435,331	**24 HR.** 0.0
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Wiggins, M.	**START DATE** 08/04/16	**COMP. DATE** 08/04/16	**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)
45										
										41.6 GROUND SURFACE 0.0
40	40.6	1.0	WOH	2	3	5	SS-46	17%		**ALLUVIAL** Brown/Tan Fine SAND with Silt
	38.1	3.5	3	5	7	12		W		38.6 3.0 **UNDIVIDED COASTAL PLAIN** Tan Fine to Medium Clayey SAND
35	35.6	6.0	5	5	8	13		W		
	33.1	8.5	3	4	4	8		W		33.6 8.0 **COASTAL PLAIN** Dark Gray Fine Clayey SAND with shell fragments and Cemented Layers [Peedee Formation]
30	28.1	13.5	3	3	4	7		W		
25	23.1	18.5	14	29	38	67		W		
20	18.1	23.5	32	47	60/0.4	100/0.9		W		
15	13.1	28.5	27	47	53	100/1.0		W		
10	8.1	33.5	22	27	40	67		W		
5	3.1	38.5	7	8	13	21		W		
0	-1.1	42.7	60/0.0			60/0.0		W		
	-1.5	43.1	5	6	7	13		W		
-5	-6.5	48.1	5	5	8	13		W		
-10	-11.5	53.1	100/0.2			100/0.2		W		
-15	-16.5	58.1	9	34	31	65	SS-47	27%		
-20	-21.5	63.1	7	10	14	24		W		
-25	-26.5	68.1	6	94/0.3		100/0.8		W		
-30	-31.5	73.1	60/0.0			60/0.0		W		-31.5 73.1 Boring Terminated with Standard Penetration Test Refusal at Elevation -31.5 ft in Very Dense Dark Gray to Black SAND

NCDOT BORE DOUBLE SITE 4.GPJ NC_DOT.GDT 5/2/17

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B5-B RT LN	**STATION** 219+00	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** 0.0
COLLAR ELEV. 41.2 ft	**TOTAL DEPTH** 98.9 ft	**NORTHING** 578,884	**EASTING** 2,435,431	**24 HR.** 0.0
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/08/16	**COMP. DATE** 08/09/16	**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)
45										
	41.0	0.2	2	1	2	3		W		41.2 / 0.0 GROUND SURFACE **ALLUVIAL** Gray Tan Silty CLAY with Fine Sand, Trace Organics
40	39.1	2.1	4	8	9	17		W		39.1 / 2.1 **UNDIVIDED COASTAL PLAIN** Gray Tan Fine SAND, Trace Silt
	36.9	4.3	5	5	9	14		W		Gravel and Coarse Sand layer at 5.8 feet
35	35.1	6.1	3	6	6	12		W		35.2 / 6.0 **COASTAL PLAIN** Gray Blue Fine Sandy CLAY with Silt, Trace Shells [Peedee Formation]
	33.0	8.2	2	3	3	6		W		
30	28.0	13.2	3	4	5	9		W		
25	23.0	18.2	21	27	34	61		W		24.2 / 17.0 Blue Gray Fine Silty SAND with cemented sand layers
20	18.0	23.2	18	21	30	51		W		
15	13.0	28.2	30	42	56	98		W		
10	8.0	33.2	20	25	35	60		W		
5	3.0	38.2	17	24	23	47		W		1.2 / 40.0
0	-2.0	43.2	4	6	8	14		W		-0.8 / 42.0 Fine Sandy CLAY with Mica and Shells and Cemented Layers
-5	-7.0	48.2	4	5	7	12		W		
-10	-12.0	53.2	46	54/0.3		100/0.9		W		-10.8 / 52.0 Mudstone / Limestone fragments
-15	-17.0	58.2	9	12	15	27		W		-15.8 / 57.0 Blue Gray Clayey Fine SAND, with Shells
-20	-22.0	63.2	6	9	16	25		W		-20.8 / 62.0 Blue Gray Silty CLAY with Fine Sand and Shells
-25	-27.0	68.2	100/0.4			100/0.4		W		-25.8 / 67.0 Gray Black Fine Clayey SAND with Shells, cemented sand layers and mudstone fragments
-30	-32.0	73.2	60/0.1			60/0.1		W		-32.0 / 73.2 -34.1 / 75.3

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
-35						Match Line				
	-37.0	78.2	22	78/0.1		100/0.6		W		-37.6 / 78.8 -38.6 / 79.8
-40	-41.0	82.2	45	55/0.4		100/0.9		W		-39.9 / 81.1 -40.2 / 81.4 -40.8 / 82.0
-45	-47.0	88.2	5	7	10	17		W		-43.0 / 84.2
-50	-52.0	93.2	60/0.1			60/0.1		W		-50.1 / 91.3 Mudstone / Limestone fragments -53.6 / 94.8
-55	-57.0	98.2	70	30/0.2		100/0.7		W		-57.7 / 98.9 Boring Terminated at Elevation -57.7 ft in Cemented SAND

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WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B6-B RT LN	**STATION** 220+00	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.6 ft	**TOTAL DEPTH** 99.1 ft	**NORTHING** 578,872	**EASTING** 2,435,530	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/11/16	**COMP. DATE** 08/12/16	**SURFACE WATER DEPTH** 0.7ft	

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)
40										WATER SURFACE (08/11/16)
	39.6	0.0	WOH	WOH	WOH	0		Sat.		GROUND SURFACE 39.6 / 0.0
	37.5	2.1	WOH	WOH	WOH	0		Sat.		**ALLUVIAL** Gray Black Silty CLAY with Fine Sand, Trace Organics
35	35.4	4.2	WOH	WOH	2	2	SS-48	25%		35.6 / 4.0 Gray Black Silty SAND with Trace Organics
	33.6	6.0	1	2	3	5		Sat.		33.9 / 5.7 **UNDIVIDED COASTAL PLAIN** Gray Black Fine SAND, with Wood Fragments, Silt and Clay
	31.6	8.0	3	3	5	8		W		31.9 / 7.7 **COASTAL PLAIN** Blue Gray Silty CLAY, with Fine Sand [Peedee Formation]
30										27.6 / 12.0 Blue Gray Fine SAND, with Clay Seams
	26.1	13.5	5	7	14	21		W		
25										
	21.1	18.5	17	23	35	58		W		
20										
	16.1	23.5	5	12	20	32		W		
15										
	11.1	28.5	15	17	24	41		W		
10										
	6.1	33.5	20	16	20	36		W		
5										
	1.1	38.5	11	20	24	44		W		
0										
	-3.9	43.5	4	6	6	12		W		-2.4 / 42.0 Blue Gray Silty CLAY, with Fine Sand and Shells
-5										
	-8.9	48.5	5	6	8	14	SS-49	24%		
-10										-12.4 / 52.0 Gray Clayey Fine SAND, with Shells and Clay Seams
	-13.9	53.5	11	8	10	18		W		
-15										
	-18.9	58.5	8	10	16	26		W		
-20										-22.4 / 62.0 Blue Gray Silty CLAY, with Fine Sand and Shells
	-23.9	63.5	6	6	11	17		W		
-25										-27.4 / 67.0 Fine SAND with Shells, Cemented Sand Layers and Clay Seams
	-28.9	68.5	60/0.0			60/0.0		W		
-30										
	-33.9	73.5	18	22	28	50		W		
-35										
	-38.9	78.5	17	22	27	49		W		
-40										

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B6-B RT LN	**STATION** 220+00	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.6 ft	**TOTAL DEPTH** 99.1 ft	**NORTHING** 578,872	**EASTING** 2,435,530	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/11/16	**COMP. DATE** 08/12/16	**SURFACE WATER DEPTH** 0.7ft	

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
-40						Match Line				
	-43.9	83.5	50	44	20	64		W		Fine SAND with Shells, Cemented Sand Layers and Clay Seams *(continued)*
-45										-42.4 / 82.0 Blue Gray Silty CLAY with Fine Sand and Shells
	-48.9	88.5	15	17	65	82		W		
-50										
	-53.9	93.5	36	23	77/0.4	100/0.9		W		-52.4 / 92.0 Blue Gray Silty Fine SAND, with Shells and Wood
-55										
	-58.9	98.5	77	23/0.1		100/0.6		W		-59.5 / 99.1 Boring Terminated at Elevation -59.5 ft in Very Dense Fine SAND

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WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B7-B RT LN	**STATION** 221+00	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.4 ft	**TOTAL DEPTH** 99.6 ft	**NORTHING** 578,861	**EASTING** 2,435,629	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/15/16	**COMP. DATE** 08/16/16	**SURFACE WATER DEPTH** 0.5ft	

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)
40										WATER SURFACE (08/15/16)	
	39.1	0.3	WOH	WOH	WOH	0				GROUND SURFACE	39.4 / 0.0
	37.1	2.3	WOH	WOH	WOH	0	SS-50	24%		**ALLUVIAL** Gray Black Silty CLAY with Fine Sand and Trace Organics	
35	34.9	4.5	WOH	1	2	3		Sat.			
	32.7	6.7	4	5	7	12		Sat.			33.9 / 5.5
	31.2	8.2	2	5	5	10		W		**UNDIVIDED COASTAL PLAIN** Gray Black Fine SAND with Fine Gravel	30.9 / 8.5
30								W		**COASTAL PLAIN** Blue Gray Silty CLAY with Fine Sand and Shells [Peedee Formation]	27.4 / 12.0
	26.3	13.1	4	5	8	13		W		Gray Black Fine SAND with Clay Seams	
25											
	21.3	18.1	15	30	38	68		W			
20											
	16.3	23.1	8	11	20	31		W			
15											
	11.3	28.1	15	20	28	48		W			
10											
	6.3	33.1	25	32	37	69		W			
5											
	1.3	38.1	25	44	23	67		W			
0											
	-3.7	43.1	5	6	6	12		W		Gray to Black Silty Clayey SAND with Shell Fragments	-1.1 / 40.5
-5											-1.7 / 41.1
	-8.7	48.1	6	6	8	14		W			-2.6 / 42.0
-10											
	-13.7	53.1	49	21	18	39		W			-11.6 / 51.0
-15										Gray Black Clayey SAND with Cemented Sand Layers, Shells, and Clay Seams	-11.7 / 51.1
	-18.7	58.1	10	12	13	25		W			-14.1 / 53.5
-20											-15.2 / 54.6
	-23.8	63.2	6	8	14	22		W			-18.1 / 57.5
-25											
	-28.8	68.2	6	18	82/0.2	100/0.7		W			-25.6 / 65.0
-30											-26.6 / 66.0
	-33.7	73.1	24	41	27	68		W			-30.0 / 69.4
-35											-31.4 / 70.8
	-38.6	78.0	60/0.1			60/0.1		W			-38.5 / 77.9
-40											

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B7-B RT LN	**STATION** 221+00	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 39.4 ft	**TOTAL DEPTH** 99.6 ft	**NORTHING** 578,861	**EASTING** 2,435,629	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/15/16	**COMP. DATE** 08/16/16	**SURFACE WATER DEPTH** 0.5ft	

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
-40						Match Line				-41.1 / 80.5
	-43.7	83.1	42	58/0.3		100/0.8		W		-48.2 / 87.6
-45										
	-48.7	88.1	60/0.1			60/0.1		W		-50.6 / 90.0
-50										
	-53.7	93.1	27	39	61/0.3	100/0.8		W		
-55										
	-58.7	98.1	36	44	55	99		W		-60.2 / 99.6
-60										Boring Terminated at Elevation -60.2 ft in Very Dense Gray Fine to Medium SAND with Cemented Sand Layers, Trace Shells

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WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B8-B RT LN	**STATION** 222+00	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** 0.0
COLLAR ELEV. 39.9 ft	**TOTAL DEPTH** 99.2 ft	**NORTHING** 578,850	**EASTING** 2,435,729	**24 HR.** 0.0
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/16/16	**COMP. DATE** 08/17/16	**SURFACE WATER DEPTH** 0.0ft	

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)
40											
	39.9	0.0	WOH	WOH	WOH	0		W		39.9 WATER SURFACE (08/16/16)	0.0
	37.4	2.5	WOH	WOH	WOH	0		W		**ALLUVIAL** Brown Sandy CLAY, Trace Wood	
35	35.4	4.5	WOH	WOH	WOH	0		W			
	32.9	7.0	WOH	1	6	7		W		31.9	8.0
30										**UNDIVIDED COASTAL PLAIN** Gray Brown Fine SAND	
	26.4	13.5	4	7	13	20		W		27.9	12.0
25										**COASTAL PLAIN** Blue Gray Fine Sandy CLAY with Silt [Peedee Formation]	
	21.4	18.5	13	19	21	40		W		22.9 Gray Black Fine SAND, with cemented sand layers	17.0
20											
	16.4	23.5	23	29	42	71		W			
15											
	11.4	28.5	14	15	30	45		W			
10											
	6.4	33.5	22	38	43	81		W			
5											
	1.4	38.5	15	21	27	48		W			
0											
	-3.6	43.5	60/0.1			60/0.1		W		-3.5	43.4
-5										-5.2	45.1
	-8.6	48.5	4	5	7	12		W		-7.1 Blue Gray Silty CLAY with Fine Sand and Shells	47.0
-10											
	-13.6	53.5	6	92	8/0.1	100/0.6		W		-14.5	54.4
-15										-14.6 Gray Blue Clayey Fine SAND with Shells and cemented sand layers	54.5
	-18.6	58.5	9	10	13	23		W		-18.2	58.1
-20											
	-23.6	63.5	7	9	15	24		W		-22.1 Gray Blue Silty CLAY with Fine Sand and Shells	62.0
-25											
	-28.6	68.5	16	6	11	17		W			
-30											
	-33.6	73.5	7	7	9	16		W		-31.1	71.0
-35										-31.3 -32.9 Gray Fine SAND, with Clay, shells and cemented sand layers	71.2 72.8
	-38.6	78.5	18	26	36	62		W			
-40											

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
-40						Match Line				
	-43.6	83.5	80	20/0.1		100/0.6		W		-40.9 80.8
-45										-43.2 83.1
	-48.6	88.5	7	11	13	24		W		-47.1 Gray Blue Silty Fine Sandy CLAY with Shells 87.0
-50										
	-53.6	93.5	60/0.1			60/0.1		W		-52.4 92.3
-55										-52.5 Gray Blue Fine SAND with Little Clay, Shells, and cemented sand layers 92.4
	-58.6	98.5	35	65/0.2		100/0.7		W		-54.8 94.7
										-59.3 99.2
										Boring Terminated at Elevation -59.3 ft in Very Dense Fine SAND

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B8-B RT LN	**STATION** 222+00	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** 0.0
COLLAR ELEV. 39.9 ft	**TOTAL DEPTH** 99.2 ft	**NORTHING** 578,850	**EASTING** 2,435,729	**24 HR.** 0.0
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/16/16	**COMP. DATE** 08/17/16	**SURFACE WATER DEPTH** 0.0ft	

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WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B9-B RT LN	**STATION** 223+00	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 40.9 ft	**TOTAL DEPTH** 98.7 ft	**NORTHING** 578,839	**EASTING** 2,435,828	**24 HR.** 5.1
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/18/16	**COMP. DATE** 08/18/16	**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)
40	40.9	0.0	WOH	WOH	WOH	0		Sat.		40.9 0.0 GROUND SURFACE
	38.9	2.0	WOH	WOH	WOH	0		Sat.		**ALLUVIAL** Brown Silty CLAY with Fine Sand, Trace Organics
	36.8	4.1	WOH	1	1	2		Sat.		35.4 5.5
35	34.9	6.0	3	2	2	4		Sat.		**UNDIVIDED COASTAL PLAIN** Gray Tan Fine SAND
	32.6	8.3	1	1	50	51		W		33.0 7.9 **COASTAL PLAIN** Gray Tan Fine SAND, with cemented sand layers [Peedee Formation]
30	27.9	13.0	3	28	28	56		W		28.9 12.0 Gray Blue Silty Fine Sandy CLAY, with Shells
25	22.9	18.0	7	10	10	20		W		23.9 17.0 Gray Blue Fine SAND, with Clay and Cemented Sand Layers
20	17.9	23.0	15	47	53/0.4	100/0.9		W		
15	12.9	28.0	15	25	32	57		W		
10	7.9	33.0	20	20	34	54		W		
5	2.9	38.0	18	38	42	80		W		
0	-2.1	43.0	55	45/0.2		100/0.7		W		-1.5 42.4
-5	-7.1	48.0	5	5	7	12		W		-8.4 49.3 Blue Gray Silty CLAY with Fine Sand and Shells
-10	-12.1	53.0	100/0.4			100/0.4		W		-12.3 53.2 Blue Gray Clayey Fine SAND, with Shells and cemented sand layers
-15	-17.1	58.0	9	11	12	23		W		-14.2 55.1 -16.0 56.9 -16.2 57.1
-20	-22.1	63.0	5	8	11	19		W		
-25	-27.1	68.0	13	15	15	30		W		
-30	-32.1	73.0	9	12	15	27		W		-30.7 71.6 -31.6 72.5
-35										

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. B9-B RT LN	**STATION** 223+00	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 40.9 ft	**TOTAL DEPTH** 98.7 ft	**NORTHING** 578,839	**EASTING** 2,435,828	**24 HR.** 5.1
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 86% 08/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Coogan, M.	**START DATE** 08/18/16	**COMP. DATE** 08/18/16	**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
-35						Match Line				
	-37.1	78.0	8	10	14	24		W		-36.1 77.0 Blue Gray Silty CLAY with Fine Sand Seams and Shells
-40	-42.1	83.0	56	44/0.4		100/0.9		W		-42.1 83.0 Blue Gray Fine SAND with Shells, Clay Seams and Cemented Sand
-45	-47.1	88.0	13	26	46	72		W		
-50	-52.1	93.0	43	18	32	50		W		-51.1 92.0 -52.4 93.3
-55	-57.1	98.0	50	50/0.2		100/0.7		W		-57.8 98.7 Boring Terminated at Elevation -57.8 ft in Very Dense Fine SAND

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WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. EB2-B RT LN	**STATION** 224+12	**OFFSET** 33 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 50.4 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 578,828	**EASTING** 2,435,928	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 09/08/16	**COMP. DATE** 09/09/16	**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))
55										
50	50.4	0.0	1	2	1	3 4 16		D		50.4 / 0.0 GROUND SURFACE
	48.4	2.0	1	2	2			D		**UNDIVIDED COASTAL PLAIN** Tan Orange Clayey Fine SAND with Clay Seams
	46.3	4.1	4	7	9			M		
45	44.3	6.1	2	1	2	3		W		
	41.7	8.7	2	2	2	4		W		41.4 / 9.0 **COASTAL PLAIN** Olive Gray Fine Sandy CLAY, with Mica [Peedee Formation]
40	36.6	13.8	5	10	10	20		W		
35	31.6	18.8	95	5/0.1		100/0.6				28.4 / 22.0 Olive Gray Clayey Fine SAND with Mica
30	26.6	23.8	5	6	7	13		W		23.4 / 27.0 Gray Fine SAND, Little Clay
25	21.6	28.8	17	21	48	69		M		
20	16.6	33.8	24	34	25	59		M		
15	11.6	38.8	19	21	23	44		M		
10	6.6	43.8	35	60	40/0.4	100/0.9				
5	1.6	48.8	30	40	55	95		W		
0	-3.4	53.8	6	7	9	16		M		-2.0 / 52.4 -2.4 / 52.8 -2.6 / 53.0 Olive Gray Fine Sandy CLAY, with Mica Shells and Cemented Layers
-5	-8.4	58.8	8	6	12	18		M		
-10	-13.4	63.8	100/0.2			100/0.2				-12.2 / 62.6 -13.8 / 64.2
-15	-18.4	68.8	12	14	14	28		W		
-20	-23.4	73.8	6	8	13	21		W		
-25								M		

NCDOT BORE DOUBLE SITE 4.GPJ NC_DOT.GDT 5/2/17

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Wright, F.K.	
SITE DESCRIPTION Bridge No. 215 on -L- (Felix Harvey Pkwy) over Stonyton Creek				**GROUND WTR (ft)**
BORING NO. EB2-B RT LN	**STATION** 224+12	**OFFSET** 33 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 50.4 ft	**TOTAL DEPTH** 100.2 ft	**NORTHING** 578,828	**EASTING** 2,435,928	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Eister, G.	**START DATE** 09/08/16	**COMP. DATE** 09/09/16	**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
-25						Match Line				
-30	-28.4	78.8	8	92/0.3		100/0.3				
-35	-33.4	83.8	21	24	23	47		W		
-40	-38.4	88.8	10	15	22	37		W		
-45	-43.4	93.8	28	58	42/0.2	100/0.7				
	-48.4	98.8	10	15	85/0.4	100/0.9				

-27.6 / 78.0 -29.0 / 79.4 -30.9 / 81.3 Olive Gray Clayey Fine to course SAND, with Shells and Cemented Sand Layers

-49.8 / 100.2 Boring Terminated at Elevation -49.8 ft in Very Dense Fine to Coarse SAND

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

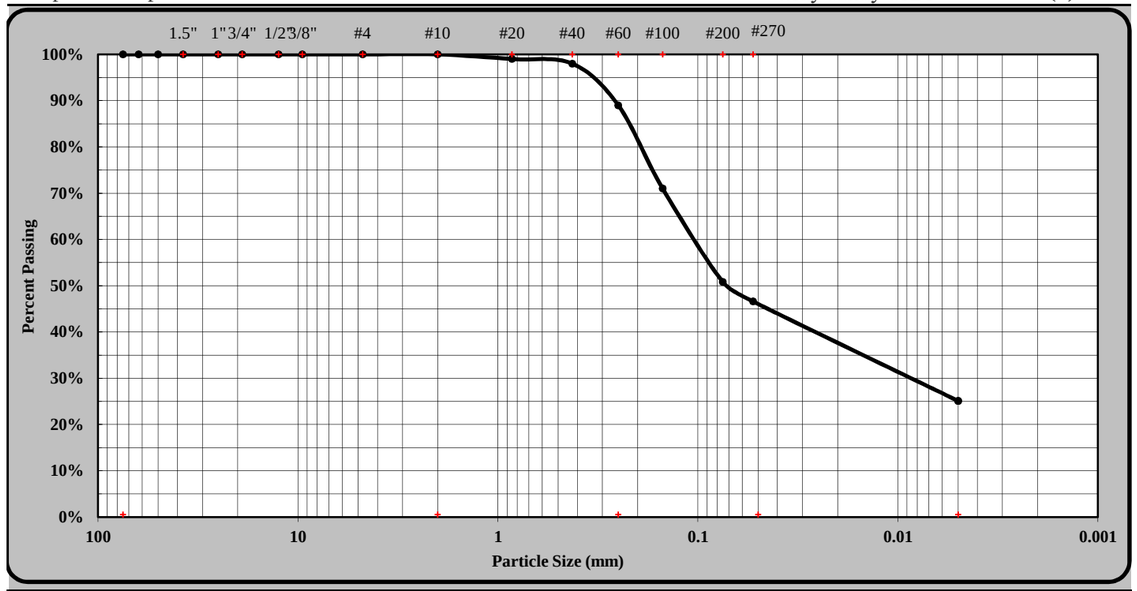
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	11/8/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	11/1-8/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B2-A LT LN Sample #: SS-36	Sample Date:	8/3/16
Location:	217+00 Offset: 35' LT	Depth (ft):	3.5-5.0'
Sample Description:		Gray sandy SILT	A-4 (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	11%	Silt	22%
Gravel	0%	Fine Sand	42%	Clay	25%
Apparent Relative Density	2.650	Moisture Content	17.0%	% Passing #200	50.8%
Liquid Limit	15	Plastic Limit	0	Plastic Index	N.P.

Soil Mortar (-#10 Sieve)

Coarse Sand	11%	Fine Sand	42%	Silt	22%	Clay	25%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☐		Weathered & Friable		☐

References / Comments / Deviations: ND=Not Determined.

Karen Warner	118-06-0305	Laboratory Technician	11/8/2016
Technician Name	*Certification No.*	*Position*	*Date*
Stewart Laney, P.E	_____	Senior Engineer	
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

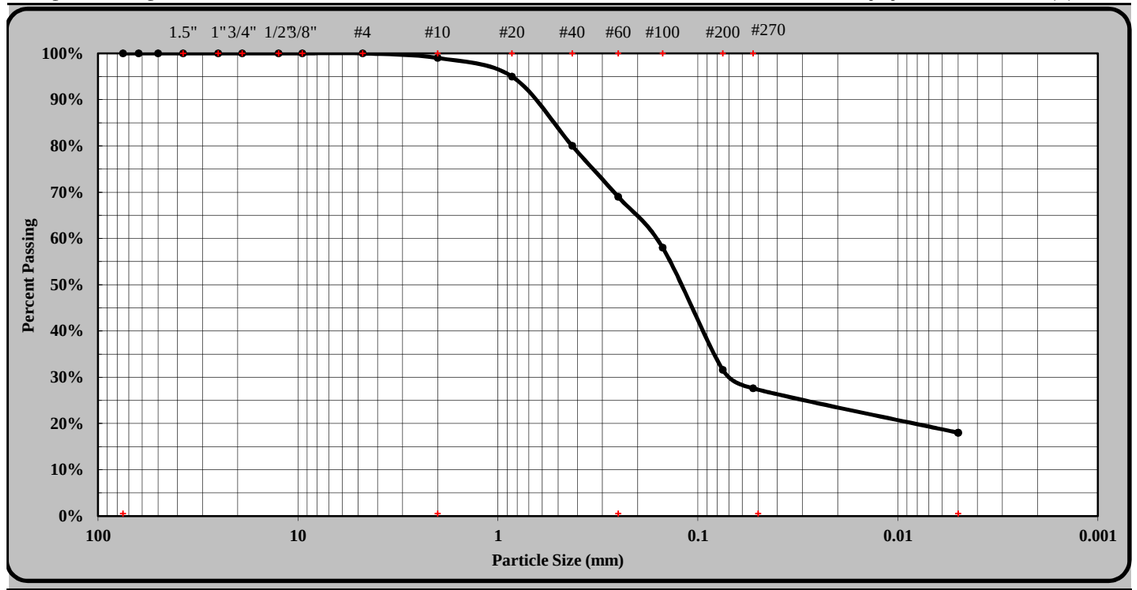
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	11/8/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	11/1-8/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B2-A LT LN Sample #: SS-37	Sample Date:	8/3/16
Location:	217+00 Offset: 35' LT	Depth (ft):	48.2-49.1'
Sample Description:		Brown Clayey Sand	A-2-6 (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	30%	Silt	10%
Gravel	1%	Fine Sand	41%	Clay	18%
Apparent Relative Density	2.650	Moisture Content	22.4%	% Passing #200	31.6%
Liquid Limit	31	Plastic Limit	17	Plastic Index	14

Soil Mortar (-#10 Sieve)

Coarse Sand	30%	Fine Sand	42%	Silt	10%	Clay	18%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☐		Weathered & Friable		☐

References / Comments / Deviations: ND=Not Determined.

Karen Warner	118-06-0305	Laboratory Technician	11/8/2016
Technician Name	*Certification No.*	*Position*	*Date*
Stewart Laney, P.E	_____	Senior Engineer	
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

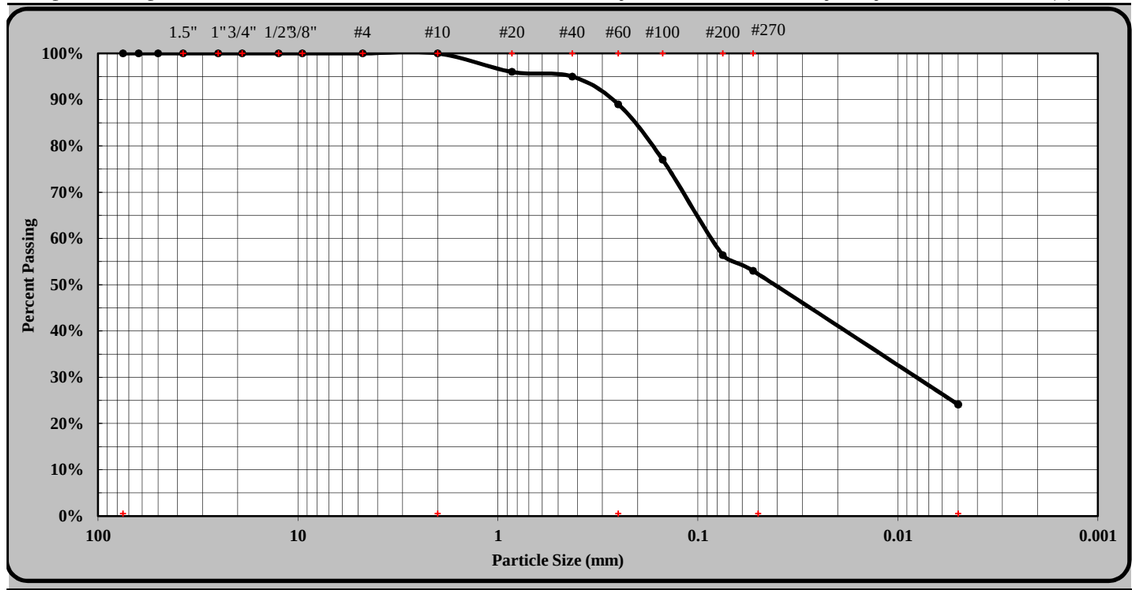
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	9/20/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	9/12 - 9/20/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B5-A LT LN Sample #: SS-38	Sample Date:	8/24/16
Location:	220+00 Offset: 35' LT	Depth (ft):	2.3 - 3.8
Sample Description:	Dark Gray Coarse to Fine Sandy Silty CLAY	A-7-6	(8)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	11%	Silt	29%
Gravel	0%	Fine Sand	36%	Clay	24%
Apparent Relative Density	ND	Moisture Content	87.6%	% Passing #200	56.4%
Liquid Limit	47	Plastic Limit	29	Plastic Index	18

Soil Mortar (-#10 Sieve)

Coarse Sand	11%	Fine Sand	36%	Silt	29%	Clay	24%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☒		Weathered & Friable		☒

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	9/12/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	9/26/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

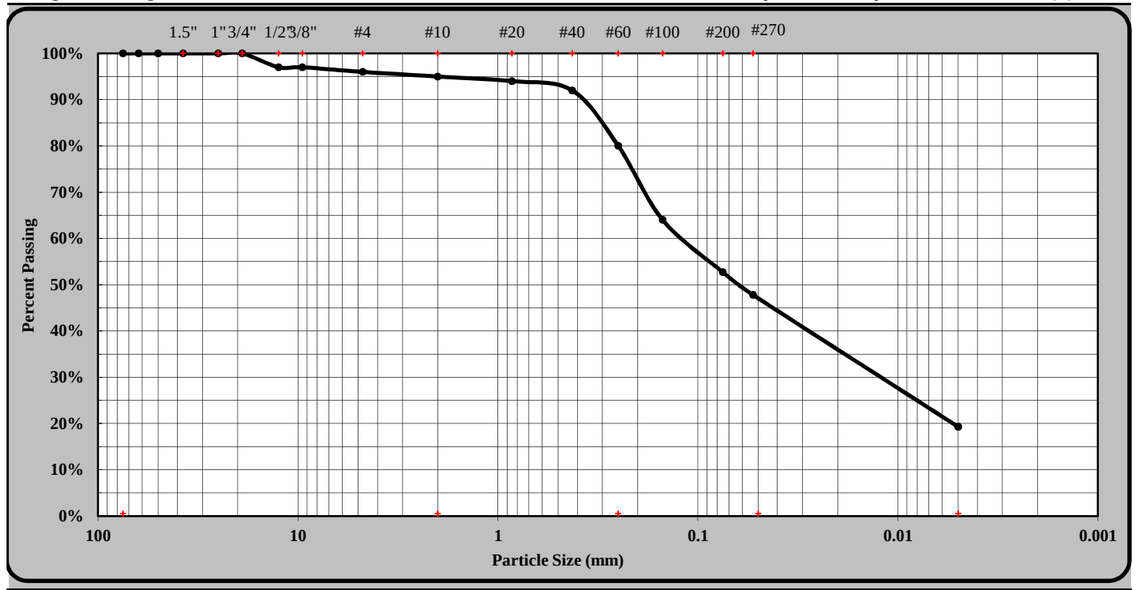
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	11/8/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	11/1-8/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B5-A LL Sample #: SS-39	Sample Date:	8/24/16
Location:	220+00 Offset: 35' LT	Depth (ft):	48.6-50.1
Sample Description:	Brown Gray Fine Sandy CLAY	A-6	(3)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	1/2"	Coarse Sand	15%	Silt	29%
Gravel	5%	Fine Sand	32%	Clay	19%
Apparent Relative Density	2.650	Moisture Content	24.0%	% Passing #200	52.7%
Liquid Limit	28	Plastic Limit	16	Plastic Index	12

Soil Mortar (-#10 Sieve)

Coarse Sand	16%	Fine Sand	34%	Silt	30%	Clay	20%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☐		Weathered & Friable		☐

References / Comments / Deviations: ND=Not Determined.

Karen Warner	118-06-0305	Laboratory Technician	11/8/2016
Technician Name	*Certification No.*	*Position*	*Date*
Stewart Laney, P.E	_____	Senior Engineer	
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

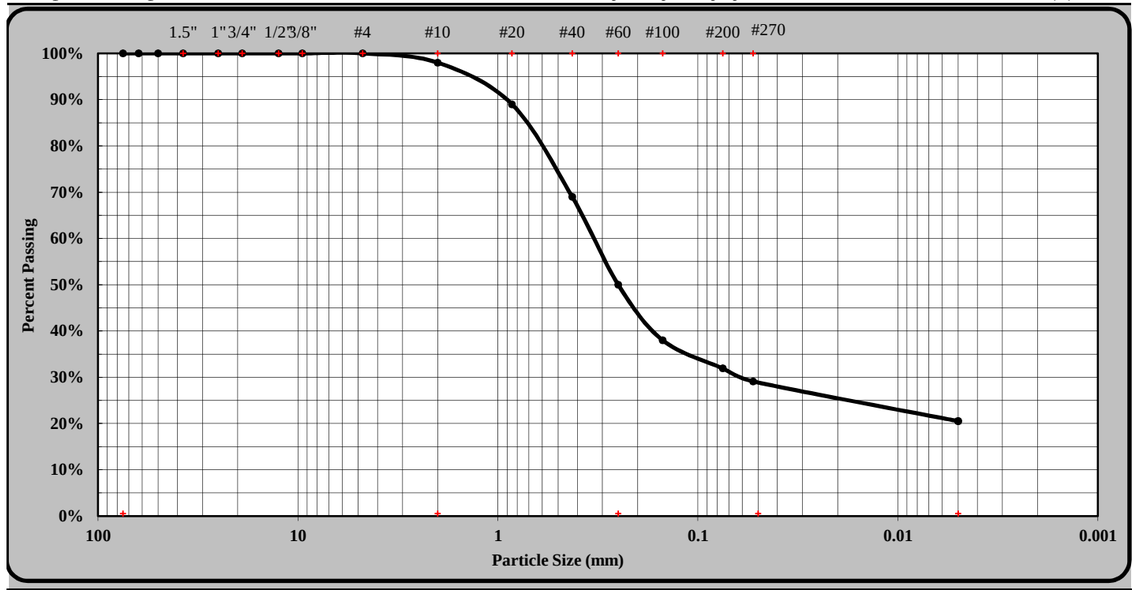
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	9/20/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	9/12 - 9/20/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B6-A LT LN Sample #: SS-40	Sample Date:	8/23/16
Location:	221+00 Offset: 35' LT	Depth (ft):	8.2 - 9.7
Sample Description:	Dark Gray Silty Clayey Fine to Coarse SAND	A-2-6	(1)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	48%	Silt	9%
Gravel	2%	Fine Sand	21%	Clay	21%
Apparent Relative Density	ND	Moisture Content	20.9%	% Passing #200	31.9%
Liquid Limit	38	Plastic Limit	16	Plastic Index	22

Soil Mortar (-#10 Sieve)

Coarse Sand	49%	Fine Sand	21%	Silt	9%	Clay	21%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☒		Weathered & Friable		☒

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	9/12/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	9/26/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

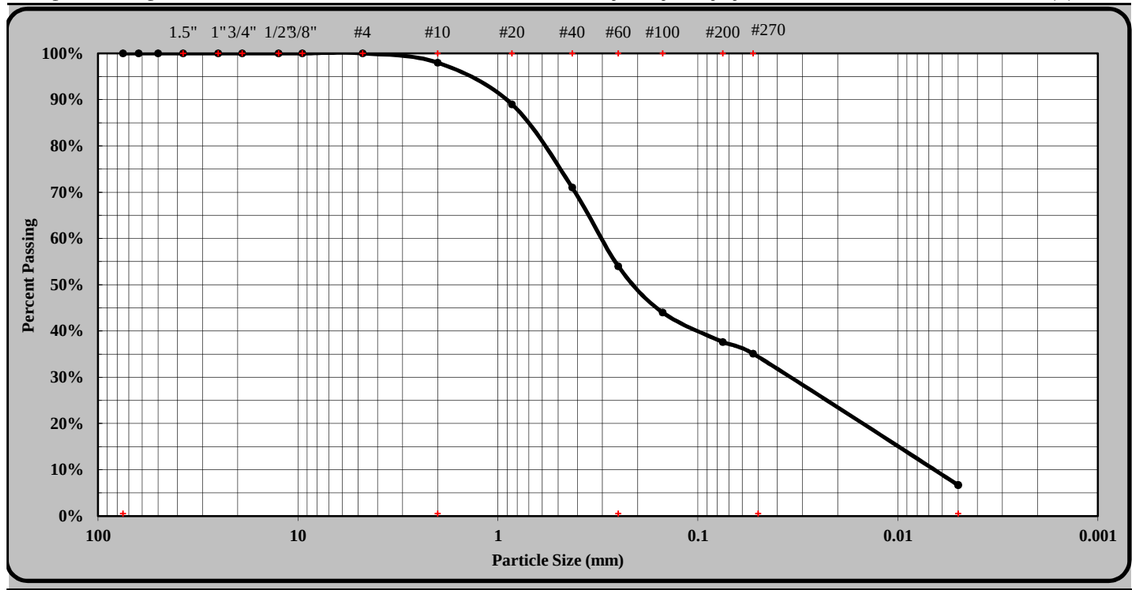
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	9/20/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	9/12 - 9/20/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B6-A LT LN Sample #: SS-41	Sample Date:	8/23/16
Location:	221+00 Offset: 35' LT	Depth (ft):	13.1 - 14.6
Sample Description:	Dark Gray Silty Clayey Fine to Coarse SAND	A-4	(0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	44%	Silt	28%
Gravel	2%	Fine Sand	19%	Clay	7%
Apparent Relative Density	ND	Moisture Content	20.7%	% Passing #200	37.6%
Liquid Limit	18	Plastic Limit	0	Plastic Index	N.P.

Soil Mortar (-#10 Sieve)

Coarse Sand	45%	Fine Sand	19%	Silt	29%	Clay	7%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☒		Weathered & Friable		☒

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	9/12/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	9/26/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

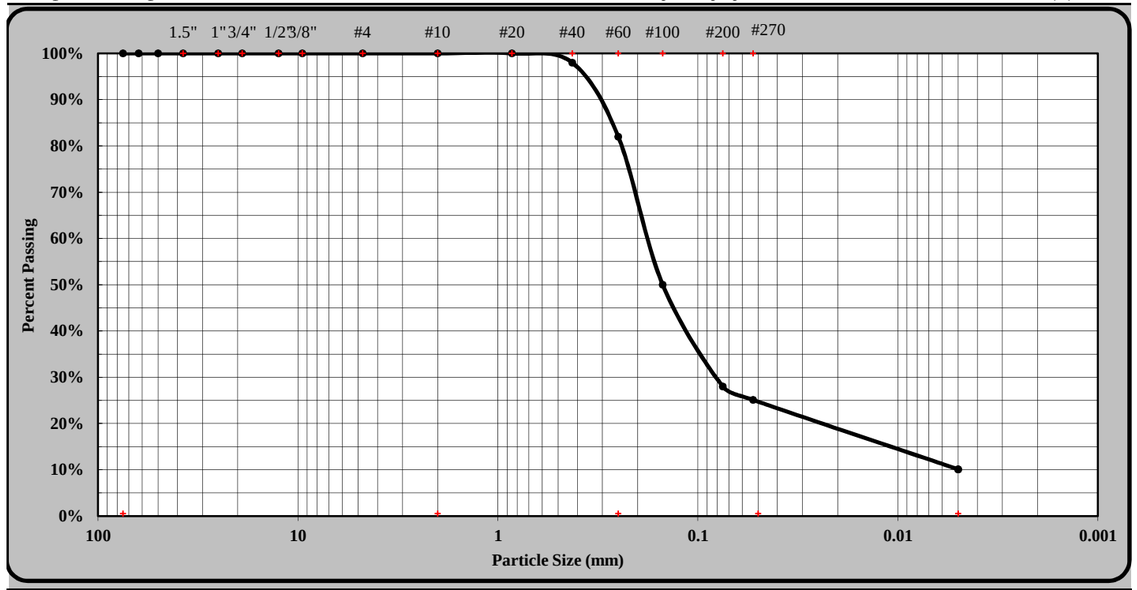
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	9/20/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	9/12 - 9/20/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B7-A LT LN Sample #: SS-42	Sample Date:	8/22/16
Location:	222+00 Offset: 35' LT	Depth (ft):	2.5 - 4.0
Sample Description:	Dark Brown Silty Clayey Coarse to Fine SAND	A-2-4	(0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	18%	Silt	15%
Gravel	0%	Fine Sand	57%	Clay	10%
Apparent Relative Density	ND	Moisture Content	79.9%	% Passing #200	28.0%
Liquid Limit	27	Plastic Limit	24	Plastic Index	3

Soil Mortar (-#10 Sieve)

Coarse Sand	18%	Fine Sand	57%	Silt	15%	Clay	10%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☒		Weathered & Friable		☒

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	9/12/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	9/26/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

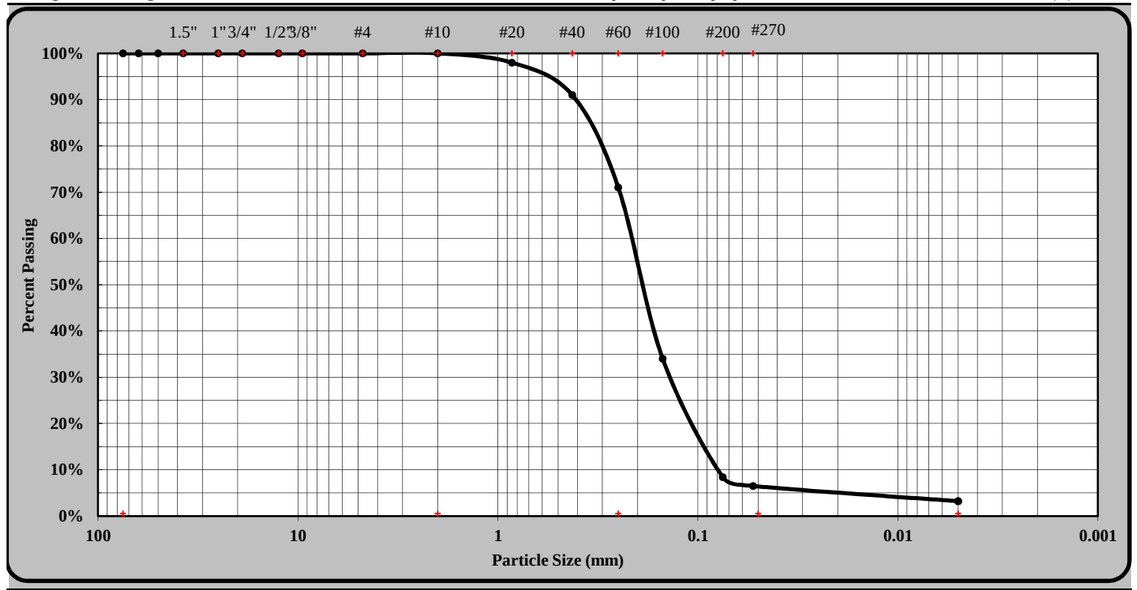
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	9/20/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	9/12 - 9/20/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B7-A LT LN Sample #: SS-43	Sample Date:	8/22/16
Location:	222+00 Offset: 35' LT	Depth (ft):	8.5 - 10
Sample Description:	Gray Silty Clayey Coarse to Fine SAND	A-3	(0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	29%	Silt	3%
Gravel	0%	Fine Sand	65%	Clay	3%
Apparent Relative Density	ND	Moisture Content	26.4%	% Passing #200	8.4%
Liquid Limit	19	Plastic Limit	0	Plastic Index	N.P.

Soil Mortar (-#10 Sieve)

Coarse Sand	29%	Fine Sand	65%	Silt	3%	Clay	3%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☒		Weathered & Friable		☒

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	9/12/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	9/26/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

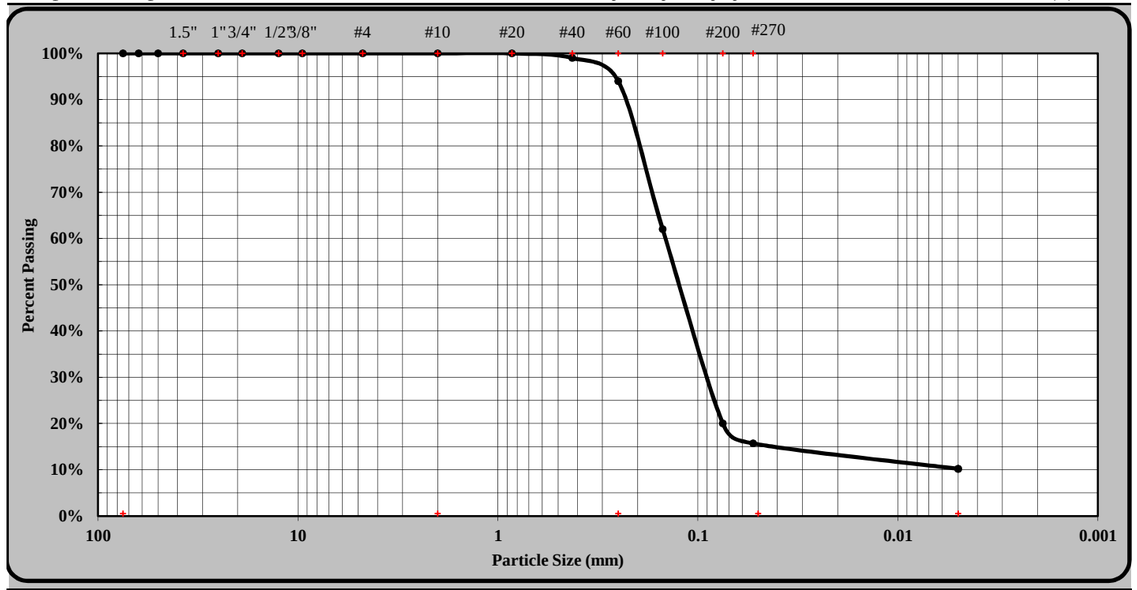
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	11/14/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	10/7 - 11/14/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B8-A LT LN Sample #: SS-44	Sample Date:	8/19/16
Location:	223+00 Offset: 35' LT	Depth (ft):	4.2 - 5.7
Sample Description:	Gray Silty Clayey Coarse to Fine SAND A-2-4 (0)		



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	6%	Silt	6%
Gravel	0%	Fine Sand	78%	Clay	10%
Apparent Relative Density	ND	Moisture Content	37.8%	% Passing #200	20.0%
Liquid Limit	29	Plastic Limit	0	Plastic Index	N.P.

Soil Mortar (-#10 Sieve)							
Coarse Sand	6%	Fine Sand	78%	Silt	6%	Clay	10%
Description of Sand & Gravel Particles:		Rounded	☐			Angular	☐
Hard & Durable	☐	Soft	☐			Weathered & Friable	☐

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	10/7/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	11/14/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No: TR-T267
Revision No. 0
Revision Date: 07/10/08

Moisture, Ash, and Organic Matter

AASHTO T-267

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Raod, Raleigh, North Carolina 27616

Project #:	**6235-16-010**	Report Date:	10/21/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	10/18 - 10/21/16
Client Name:	Michael Baker Engineering		
Client Address:	Raleigh, NC		
Boring #:	B8-A LT LN Sample #: SS-44	Sample Date:	8/19/16
Location:	223+00 Offset: 35' LT	Depth (ft):	4.2 - 5.7
Sample Description:	Gray Silty Clayey Coarse to Fine SAND (A-2-4) (A)		

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*
Balance: *S&ME ID #:* ***1024*** *Cal. Date:* ***11/06/16*** *Due:* ***11/06/17***

Method A: Moisture Content Determination *Required Oven Temperature:105 ± 5 °C*

Oven Temperature: **105 °C**		*Tare #*	1
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	46.08
a	Mass of ***As-Received*** Specimen + Tare Wt.	*grams*	91.85
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	79.30
w	Water Weight	*(a-b)*	12.55
A	Mass of As-Received Specimen	*(a-t)*	45.77
B	Mass of Oven Dry Specimen	*(b-t)*	33.22
% Moisture Content as a % of As Received or Total Mass		*(w/A)*100*	**27.4%**
% Moisture Content as a % of Oven-dried Mass		*(w/B)*100*	**37.8%**

Oven *S&ME ID #:* ***1454*** *Cal. Date:* ***10/7/16*** *Due:* ***10/7/17***

Method C (440° C) or D (750° C): Ash Content and Organic Matter Determination

Muffle Furnace: **455 °C**		*Tare #*	44
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	50.03
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	83.23
c	Ash Weight + Tare Wt.	*grams*	82.14
C	Ash Weight	*c-t*	32.11
B	Mass of Oven Dry Specimen	*(b-t)*	33.20
D	***% Ash Content***	*(C/B)*100*	**96.7%**
	% Organic Matter	*100-D*	**3.3%**

Muffle Furnace: *S&ME ID #:* ***00261***

Notes / Deviations / References:

Mal Krajan, ET		Laboratory Manager	11/14/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No: TR-T289-1
Revision No. 0
Revision Date: 07/10/08

pH of Soil

AASHTO T289

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

Project #:	**6235-16-010**	Report Date:	11/7/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	11/5 - 11/7/16
Client Name:	Michael Baker Engineering		
Client Address:	Raleigh, NC		

Boring #:	B8-A LT LN	Sample #:	SS-44	Sample Date:	8/19/16
Location:	223+00	Offset:	35' LT	Depth (ft):	4.2 - 5.7
Sample Description:		Gray Silty Clayey Coarse to Fine SAND (A-2-4) (0)			

Equipment:

Balance		*S&ME ID#*	*1024*	*Cal. Date:*	*11/6/16*	*Due:*	*11/6/17*
Sieve:	*#10*	*S&ME ID#*	*13223*	*Cal. Date:*	*6/11/16*	*Due:*	*6/11/17*
pH Meter:		*S&ME ID#*	*1365*	*Cal. Date:*	*11/7/16*	*Due:*	*NA*

pH Meter Calibration

Buffer Solution	*Results*
pH buffer 7.0	***7.02***
pH buffer 4.01	***4.01***
pH buffer 10.0	***10.03***
Buffer Temperature ^{0}C	***22.4***

Measuring pH of Soil

Measurements	
Weigtht of Air Dry Soil (g)	***30.01***
Distilled Water (g)	***30.02***
Temperature ^{0}C	***22.7***
pH Readings	***5.88***

Notes / Deviations / References: AASHTO T-289: Determining pH of Soil for Use in Corrosion Testing

Mal Krajan, ET		Laboratory Manager	11/14/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

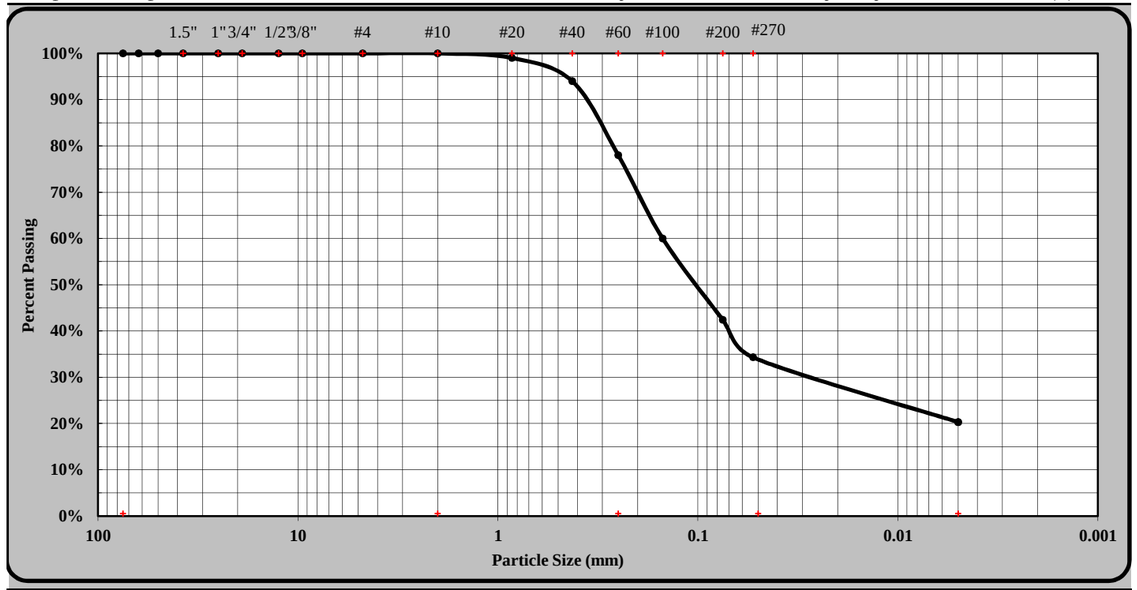
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010			Report Date:	11/14/16
Project Name:	C.F. Harvey Parkway Extension R-5703			Test Date(s):	10/7 - 11/14/16
State Project #:	46375.1.1	F.A. Project No:	N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering				
Address:	Raleigh, NC				
Boring #:	B8-A LT LN	Sample #:	SS-45	Sample Date:	8/19/16
Location:	223+00	Offset:	35' LT	Depth (ft):	43.4 - 44.9
Sample Description:			Dark Gray Coarse to Fine Sandy Silty CLAY	A-6	(2)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	22%	Silt	14%
Gravel	0%	Fine Sand	44%	Clay	20%
Apparent Relative Density	ND	Moisture Content	25.2%	% Passing #200	42.4%
Liquid Limit	33	Plastic Limit	19	Plastic Index	14

Soil Mortar (-#10 Sieve)

Coarse Sand	22%	Fine Sand	44%	Silt	14%	Clay	20%

Description of Sand & Gravel Particles:		Rounded	☐	Angular	☐
Hard & Durable	☐	Soft	☐	Weathered & Friable	☐

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	11/14/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	11/14/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No: TR-T267
Revision No. 0
Revision Date: 07/10/08

Moisture, Ash, and Organic Matter

AASHTO T-267 — *Quality Assurance*

S&ME, Inc. Raleigh, 3201 Spring Forest Raod, Raleigh, North Carolina 27616

Project #:	**6235-16-010**	Report Date:	10/21/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	10/18 - 10/21/16
Client Name:	Michael Baker Engineering		
Client Address:	Raleigh, NC		

Boring #:	B8-A LT LN	Sample #:	SS-45	Sample Date:	8/19/16
Location:	223+00	Offset:	35' LT	Depth (ft):	43.4 - 44.9
Sample Description:	Dark Gray Coarse to Fine Sandy Silty CLAY (A-6) (2)				

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*

Balance: *S&ME ID #:* ***1024*** *Cal. Date:* ***11/06/16*** *Due:* ***11/06/17***

Method A: Moisture Content Determination *Required Oven Temperature:105 ± 5 °C*

	Oven Temperature: **105 °C**	*Tare #*	2
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	47.05
a	Mass of ***As-Received*** Specimen + Tare Wt.	*grams*	100.89
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	90.07
w	Water Weight	*(a-b)*	10.82
A	Mass of As-Received Specimen	*(a-t)*	53.84
B	Mass of Oven Dry Specimen	*(b-t)*	43.02
% Moisture Content as a % of As Received or Total Mass		*(w/A)*100*	**20.1%**
% Moisture Content as a % of Oven-dried Mass		*(w/B)*100*	**25.2%**

Oven *S&ME ID #:* ***1454*** *Cal. Date:* ***10/7/16*** *Due:* ***10/7/17***

Method C (440 ° C) or D (750 ° C): Ash Content and Organic Matter Determination

	Muffle Furnace: **455 °C**	*Tare #*	2
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	13.61
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	38.57
c	Ash Weight + Tare Wt.	*grams*	38.08
C	Ash Weight	*c-t*	24.47
B	Mass of Oven Dry Specimen	*(b-t)*	24.96
D	***% Ash Content***	*(C/B)*100*	**98.0%**
	% Organic Matter	*100-D*	**2.0%**

Muffle Furnace: *S&ME ID #:* ***00261***

Notes / Deviations / References:

Mal Krajan, ET — *Technical Responsibility*
Signature
Laboratory Manager — *Position*
11/14/2016 — *Date*

Form No: TR-T289-1
Revision No. 0
Revision Date: 07/10/08

pH of Soil

AASHTO T289 — *Quality Assurance*

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

Project #:	**6235-16-010**	Report Date:	11/7/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	11/5 - 11/7/16
Client Name:	Michael Baker Engineering		
Client Address:	Raleigh, NC		

Boring #:	B8-A LT LN	Sample #:	SS-45	Sample Date:	8/19/16
Location:	223+00	Offset:	35' LT	Depth (ft):	43.4 - 44.9
Sample Description:	Dark Gray Coarse to Fine Sandy Silty CLAY (A-6) (2)				

Equipment:

Balance		*S&ME ID#*	*1024*	*Cal. Date:*	*11/6/16*	*Due:*	*11/6/17*
Sieve:	*#10*	*S&ME ID#*	*13223*	*Cal. Date:*	*6/11/16*	*Due:*	*6/11/17*
pH Meter:		*S&ME ID#*	*1365*	*Cal. Date:*	*11/7/16*	*Due:*	*NA*

pH Meter Calibration

Buffer Solution	***Results***
pH buffer 7.0	***7.02***
pH buffer 4.01	***4.01***
pH buffer 10.0	***10.03***
Buffer Temperature ^{0}C	***22.4***

Measuring pH of Soil

Measurements	
Weigtht of Air Dry Soil (g)	***30.03***
Distilled Water (g)	***30.03***
Temperature ^{0}C	***22.4***
pH Readings	***5.61***

Notes / Deviations / References: AASHTO T-289: Determining pH of Soil for Use in Corrosion Testing

Mal Krajan, ET — *Technical Responsibility*
Signature
Laboratory Manager — *Position*
11/14/2016 — *Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

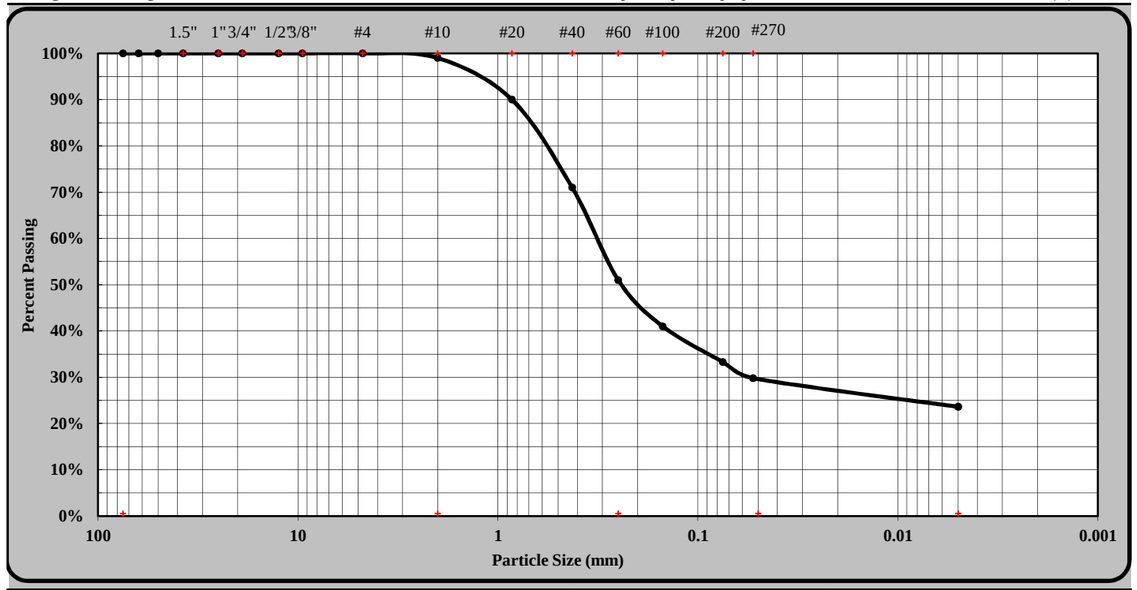
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	12/27/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	12/24 - 12/27/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B8-A LT LN Sample #: ST-6	Sample Date:	8/19/16
Location:	223+00 Offset: 38' LT	Depth (ft):	9.7 - 11.7 ft.
Sample Description:	Dark Gray Silty Clayey Fine to Coare SAND A-2-6 (2)		



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	48%	Silt	6%
Gravel	1%	Fine Sand	21%	Clay	24%
Apparent Relative Density	ND	Moisture Content	18.9%	% Passing #200	33.3%
Liquid Limit	37	Plastic Limit	15	Plastic Index	22

Soil Mortar (-#10 Sieve)

Coarse Sand	48%	Fine Sand	22%	Silt	6%	Clay	24%
Description of Sand & Gravel Particles:		Rounded	☐			Angular	☒
Hard & Durable	☒	Soft	☐			Weathered & Friable	☐

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	12/27/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	9/26/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Oedometer Settlement Tests

Sample details

Sketch showing specimen location in original Sample

Depth	9.7 - 11.7 ft.
Description:	Dark Gray Silty Clayey Fine to Coarse SAND (A-2-6) (0)
Type	Undisturbed
Height H_0 (in)	0.997
Diameter D_0 (in)	2.501
Weight W_0 (gr)	165.58
Bulk Density ρ (PCF)	128.79
Particle Density ρ_s	2.667 (measured)

Initial Conditions

Settlement Channel	1942
Moisture Content w_0%	19.1
Dry Density ρ_d (PCF)	108.17
Voids Ratio e_0	0.5385
Deg of Saturation S_0%	94.4
Swelling Pressure Ss (TSF)	0.000

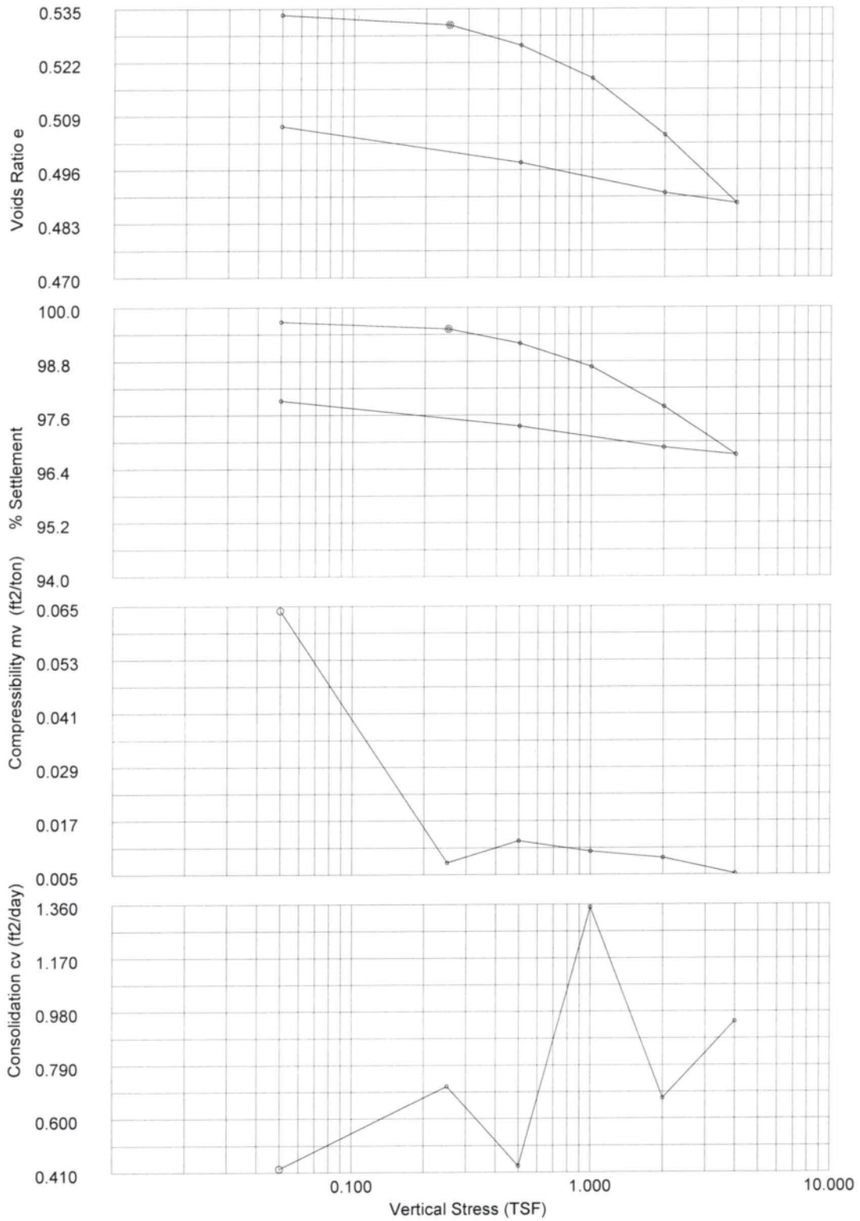
Final Conditions

Moisture Content w_f%	22.4
Dry Density ρ_d (PCF)	110.46
Voids Ratio e_f	0.5066
Deg of Saturation S_f%	100.00
Settlement: (in)	0.021
Compression Index C_c	0.060
Notes:	Test specimen taken from the middle portion of UD tube.

S&ME

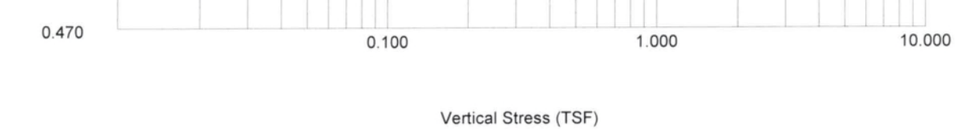
ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-6-16
Site Reference:	C.F. Harvey	Sample:	ST-6
Jobfile:	E:\16010.JOB	Borehole:	B8-A LT LN
Operator: MK	Checked: MK	Approved:	

Oedometer Settlement Tests



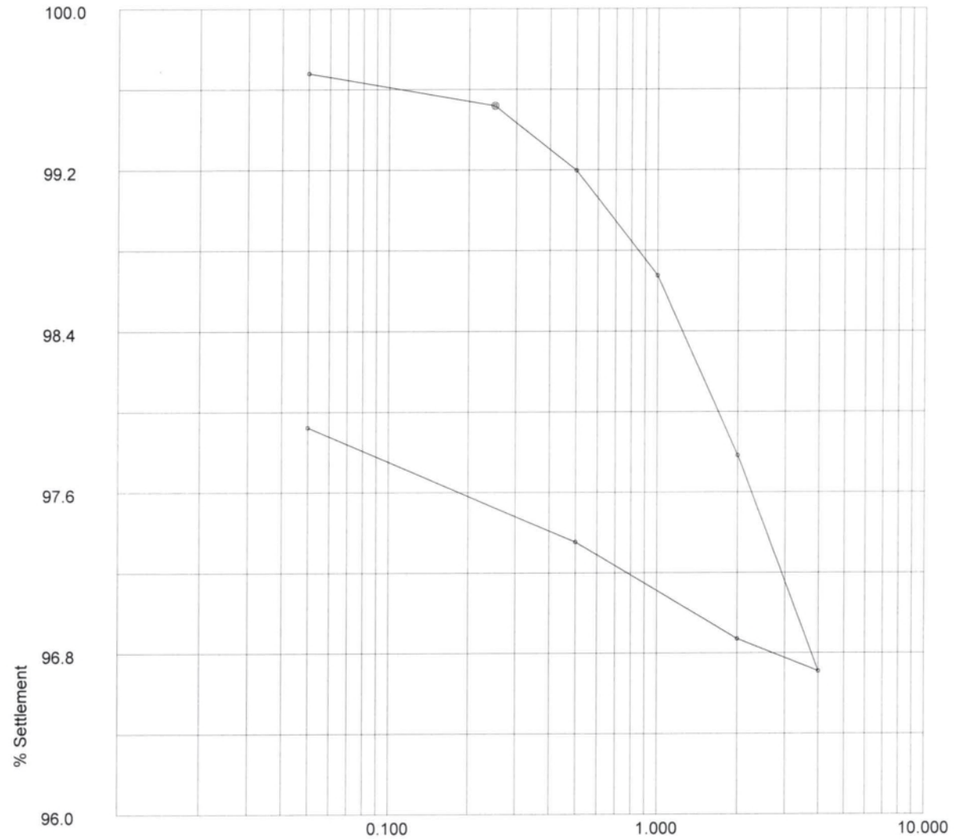
S&ME	ASTM D2435-96	Test name: Consolidation	
		Date of Test: 12-6-16	
	Site Reference: C.F. Harvey	Sample: ST-6	
	Jobfile: E:\16010.JOB	Borehole: B8-A LT LN	
	Operator: MLC	Checked: MLC	Approved:

Oedometer Settlement Tests



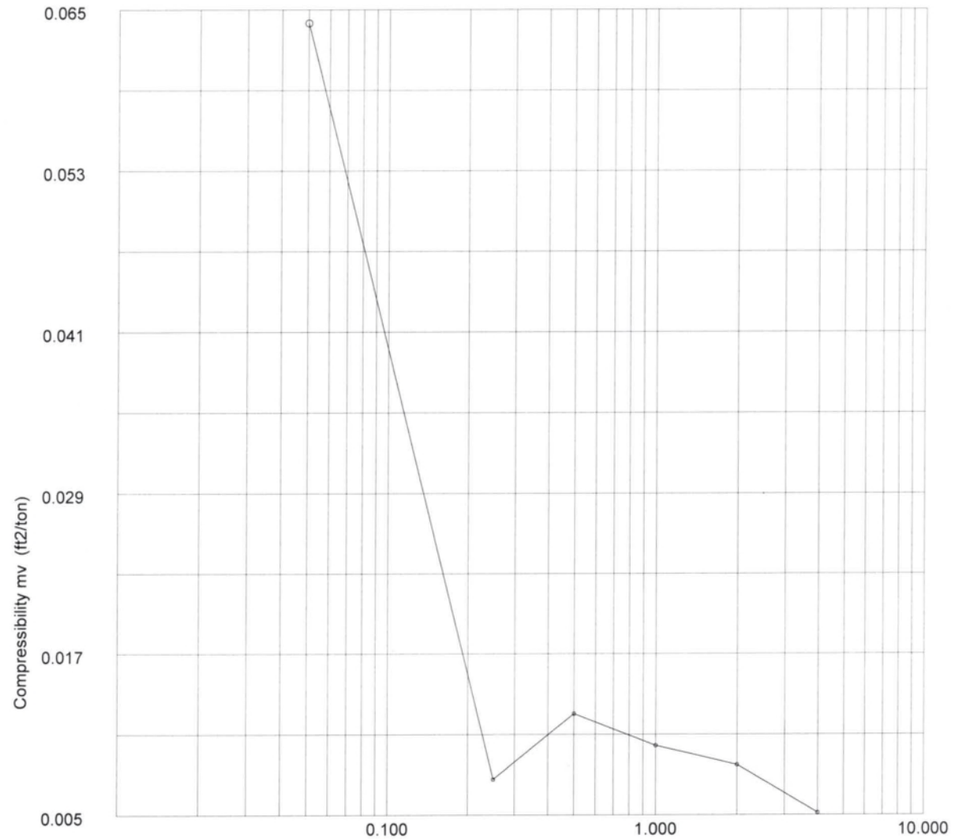
S&ME	ASTM D2435-96	Test name: Consolidation	
		Date of Test: 12-6-16	
	Site Reference: C.F. Harvey	Sample: ST-6	
	Jobfile: E:\16010.JOB	Borehole: B8-A LT LN	
	Operator: MLC	Checked: MLC	Approved:

Oedometer Settlement Tests



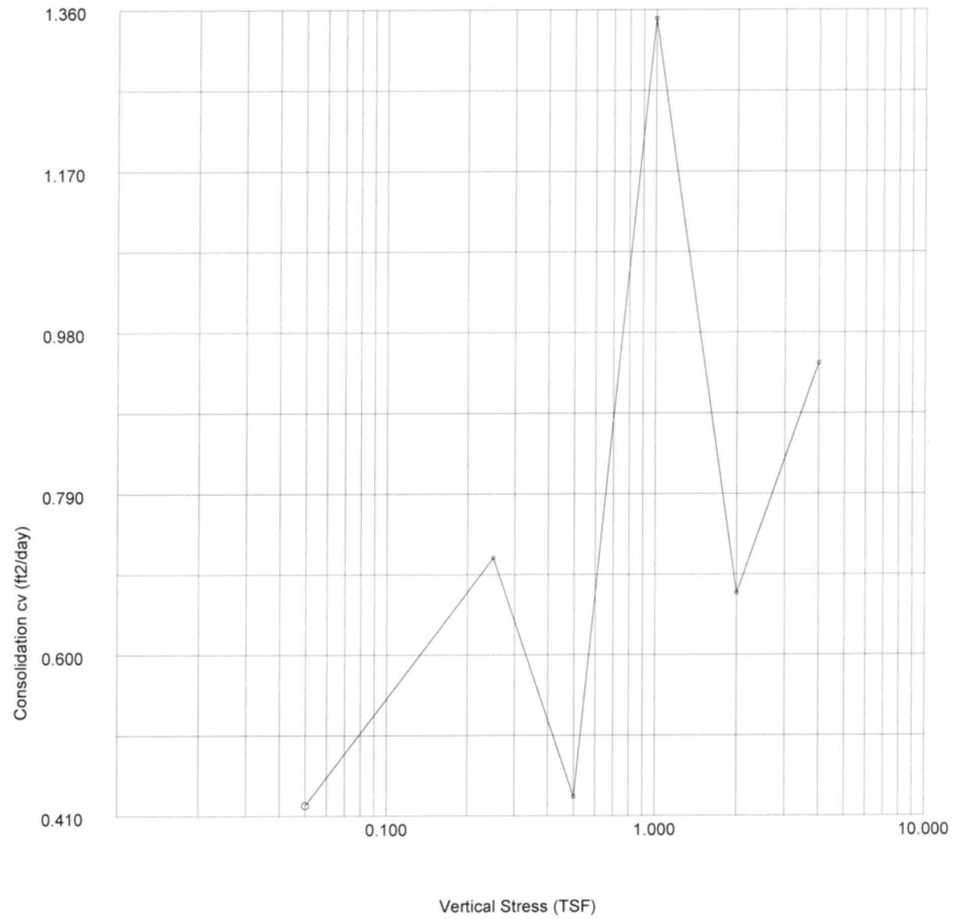
S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-6-16
	Site Reference: C.F. Harvey	Sample:	ST-6
	Jobfile: E:\16010.JOB	Borehole:	B8-A LT LN
	Operator: MLC	Checked: MLC	Approved:

Oedometer Settlement Tests



S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-6-16
	Site Reference: C.F. Harvey	Sample:	ST-6
	Jobfile: E:\16010.JOB	Borehole:	B8-A LT LN
	Operator: MLC	Checked: MLC	Approved:

Oedometer Settlement Tests



Stress (TSF)	Initial Temp. oC	Settlement Total (in)	Cal Corr. (in)	Final Temp. oC	Voids Ratio e_f	t_{90} (mins)	Secondary Compr C_{sec}	c_v (ft2/day)	m_v (ft2/ton)
0.050	21.6	0.0032	0.0	21.6	0.5336	4.974	0.00	0.422	0.064
0.250	21.6	0.0048	0.0	21.6	0.5311	2.926	0.00	0.714	0.008
0.500	21.6	0.0080	0.0	21.6	0.5262	4.808	0.00	0.433	0.013
1.000	21.6	0.0132	0.0	21.6	0.5181	1.528	0.00	1.350	0.011
2.000	21.6	0.0221	0.0	21.6	0.5044	3.021	0.00	0.673	0.009
4.000	21.6	0.0328	0.0	21.6	0.4879	2.111	0.00	0.944	0.006
2.000	21.6	0.0312	0.0	21.6	0.4904				0.001
0.500	21.6	0.0264	0.0	21.6	0.4978				0.003
0.050	21.6	0.0207	0.0	21.6	0.5066				0.013

S&ME

ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-6-16
Site Reference:	C.F. Harvey	Sample:	ST-6
Jobfile:	E:\16010.JOB	Borehole:	B8-A LT LN
Operator: MLC	Checked: MLC	Approved:	

Oedometer Settlement Tests

S&ME

ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-6-16
Site Reference:	C.F. Harvey	Sample:	ST-6
Jobfile:	E:\16010.JOB	Borehole:	B8-A LT LN
Operator: MLC	Checked: MLC	Approved:	

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	0	0.0000	0.0000
2	0.017	5	0.0005	0.0005
3	0.167	8	0.0008	0.0008
4	0.417	13	0.0013	0.0013
5	0.917	16	0.0016	0.0016
6	1.917	21	0.0021	0.0021
7	3.917	26	0.0026	0.0026
8	7.917	29	0.0029	0.0029
9	14.917	31	0.0031	0.0031
10	29.917	32	0.0032	0.0032
11	38.567	32	0.0032	0.0032

S&ME

ASTM D2435-96

Test name: Consolidation Load: 0.050 (TSF)
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

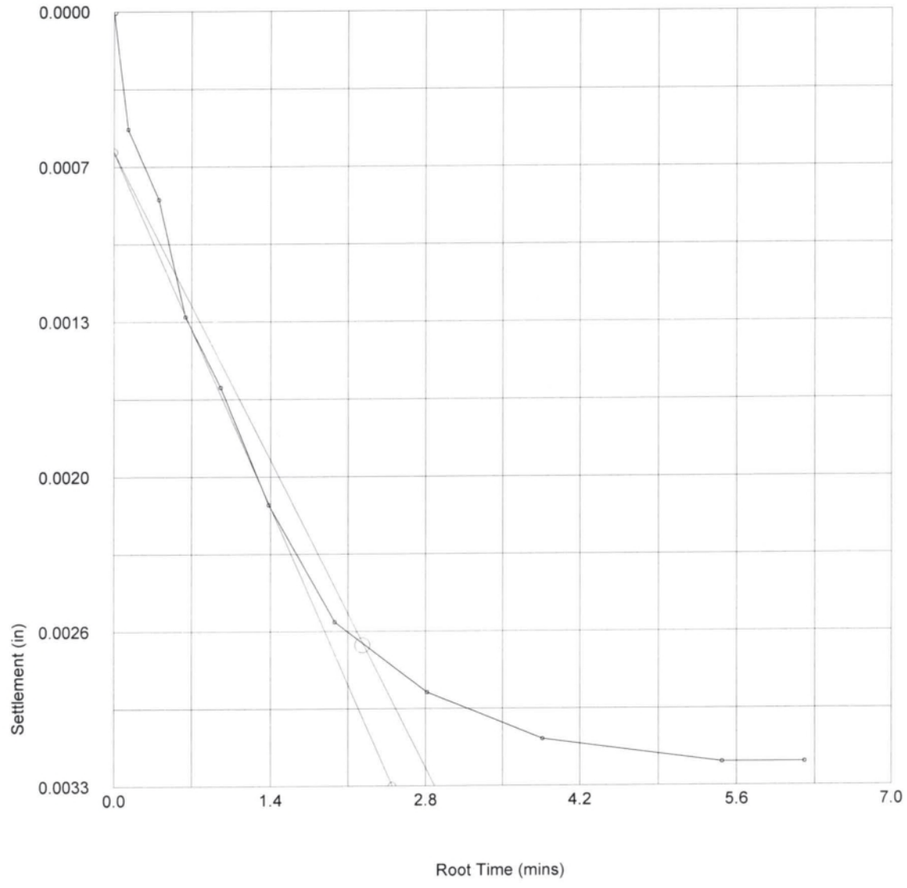
Sample: ST-6
Borehole: B8-A LT LN

Operator: MLC Checked: MLC Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0032
Voids Ratio e	0.5336
Final Temp oC	0.0
t_{90} (mins)	4.97
c_v (ft2/day)	0.422
m_v (ft2/ton)	0.064
Sec Compression C_{sec}	0.00



S&ME

ASTM D2435-96

Test name: Consolidation
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-6
Borehole: B8-A LT LN

Operator: MLC Checked: MLC Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	32	0.0032	0.0032
2	0.017	36	0.0036	0.0036
3	0.167	40	0.0040	0.0040
4	0.417	41	0.0041	0.0041
5	0.917	43	0.0043	0.0043
6	1.917	45	0.0045	0.0045
7	3.917	46	0.0046	0.0046
8	7.917	46	0.0046	0.0046
9	14.917	47	0.0047	0.0047
10	29.917	48	0.0048	0.0048
11	42.383	48	0.0048	0.0048

S&ME

ASTM D2435-96

Test name Consolidation Load: 0.250 (TSF)
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

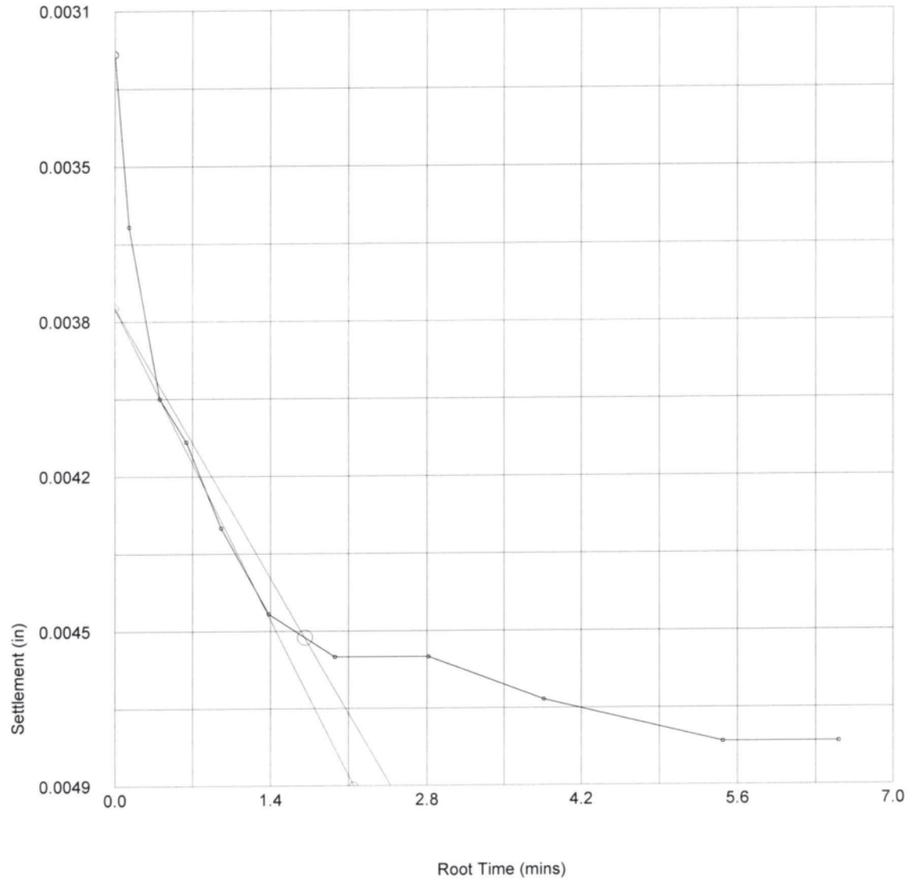
Sample: ST-6
Borehole: B8-A LT LN

Operator: MK Checked: MK Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.250
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0016
Voids Ratio e	0.5311
Final Temp oC	0.0
t_{90} (mins)	2.93
c_v (ft2/day)	0.714
m_v (ft2/ton)	0.008
Sec Compression C_{sec}	0.00



S&ME

ASTM D2435-96

Test name Consolidation
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-6
Borehole: B8-A LT LN

Operator: MK Checked: MK Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	48	0.0048	0.0048
2	0.017	52	0.0052	0.0052
3	0.167	69	0.0069	0.0069
4	0.417	71	0.0071	0.0071
5	0.917	72	0.0072	0.0072
6	1.917	73	0.0073	0.0073
7	3.917	74	0.0074	0.0074
8	7.917	75	0.0075	0.0075
9	14.917	76	0.0076	0.0076
10	29.917	76	0.0076	0.0076
11	59.917	77	0.0077	0.0077
12	119.917	78	0.0078	0.0078
13	149.917	79	0.0079	0.0079
14	179.917	79	0.0079	0.0079
15	209.917	80	0.0080	0.0080
16	239.917	80	0.0080	0.0080

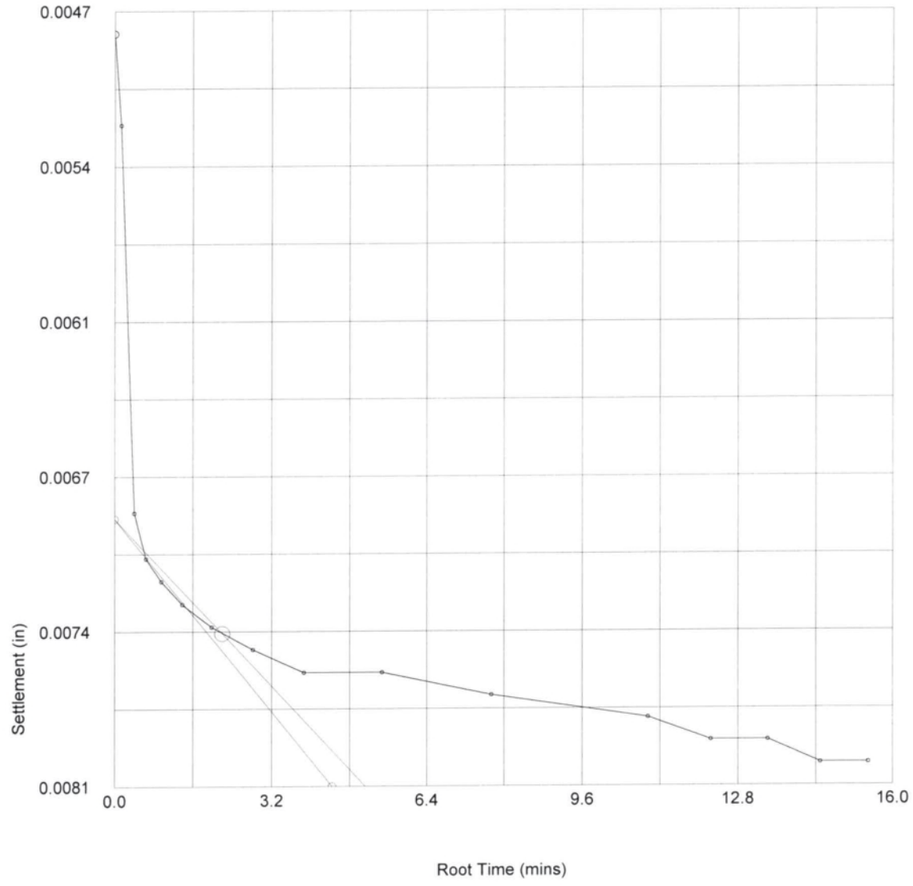
S&ME

ASTM D2435-96		Test name	Consolidation Load: 0.500 (TSF)
		Date of Test:	12-6-16
Site Reference:	C.F. Harvey	Sample:	ST-6
Jobfile:	E:\16010.JOB	Borehole:	B8-A LT LN
Operator: MLL	*Checked:* MLL		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0032
Voids Ratio e	0.5262
Final Temp oC	0.0
t_{90} (mins)	4.81
c_v (ft2/day)	0.433
m_v (ft2/ton)	0.013
Sec Compression C_{sec}	0.00



S&ME

ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-6-16
Site Reference:	C.F. Harvey	Sample:	ST-6
Jobfile:	E:\16010.JOB	Borehole:	B8-A LT LN
Operator: MLL	*Checked:* MLL		*Approved:*

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	80	0.0080	0.0080
2	0.017	88	0.0088	0.0088
3	0.167	112	0.0112	0.0112
4	0.417	117	0.0117	0.0117
5	0.917	120	0.0120	0.0120
6	1.917	122	0.0122	0.0122
7	3.917	125	0.0125	0.0125
8	7.917	127	0.0127	0.0127
9	14.917	127	0.0127	0.0127
10	29.917	129	0.0129	0.0129
11	59.917	130	0.0130	0.0130
12	111.567	132	0.0132	0.0132

S&ME

ASTM D2435-96

Test name Consolidation Load: 1.000 (TSF)
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

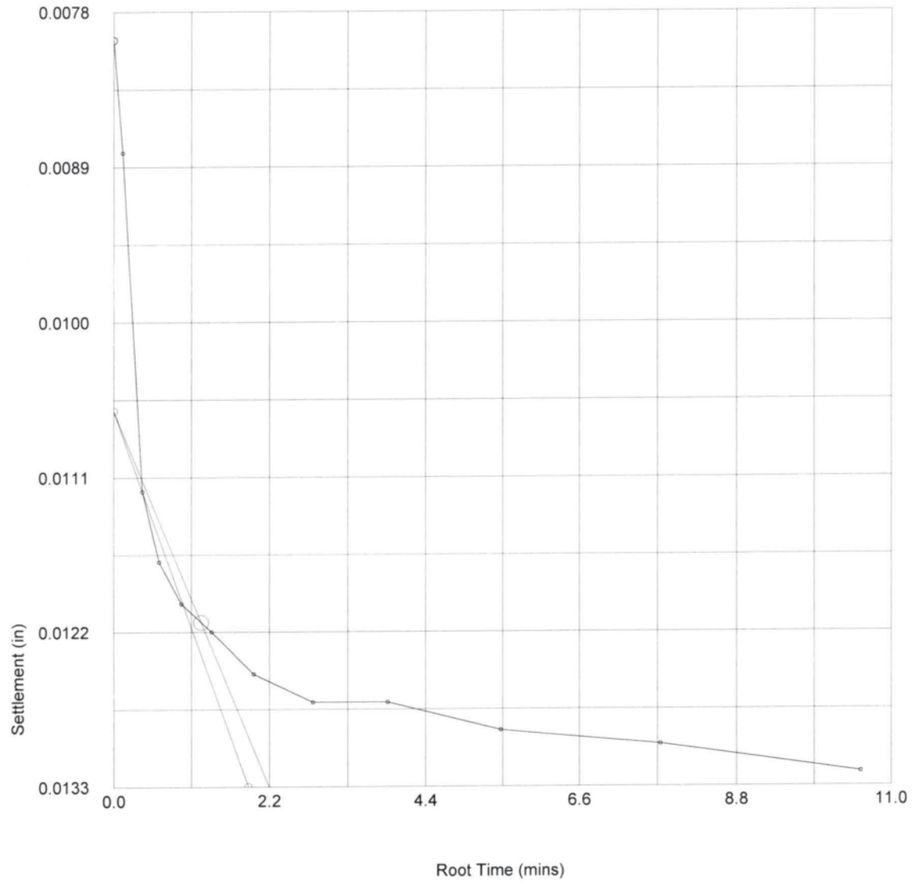
Sample: ST-6
Borehole: B8-A LT LN

Operator: MK Checked: MK Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	1.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0052
Voids Ratio e	0.5181
Final Temp oC	0.0
t_{90} (mins)	1.53
c_v (ft2/day)	1.35
m_v (ft2/ton)	0.011
Sec Compression C_{sec}	0.00



S&ME

ASTM D2435-96

Test name Consolidation
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-6
Borehole: B8-A LT LN

Operator: MK Checked: MK Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	132	0.0132	0.0132
2	0.017	136	0.0136	0.0136
3	0.167	184	0.0184	0.0184
4	0.417	192	0.0192	0.0192
5	0.917	199	0.0199	0.0199
6	1.917	204	0.0204	0.0204
7	3.917	207	0.0207	0.0207
8	7.917	208	0.0208	0.0208
9	14.917	212	0.0212	0.0212
10	29.917	214	0.0214	0.0214
11	59.917	215	0.0215	0.0215
12	119.917	216	0.0216	0.0216
13	149.917	216	0.0216	0.0216
14	179.917	217	0.0217	0.0217
15	209.917	218	0.0218	0.0218
16	239.917	219	0.0219	0.0219
17	269.917	220	0.0220	0.0220
18	299.917	221	0.0221	0.0221

S&ME

ASTM D2435-96

Test name Consolidation Load: 2.000 (TSF)
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

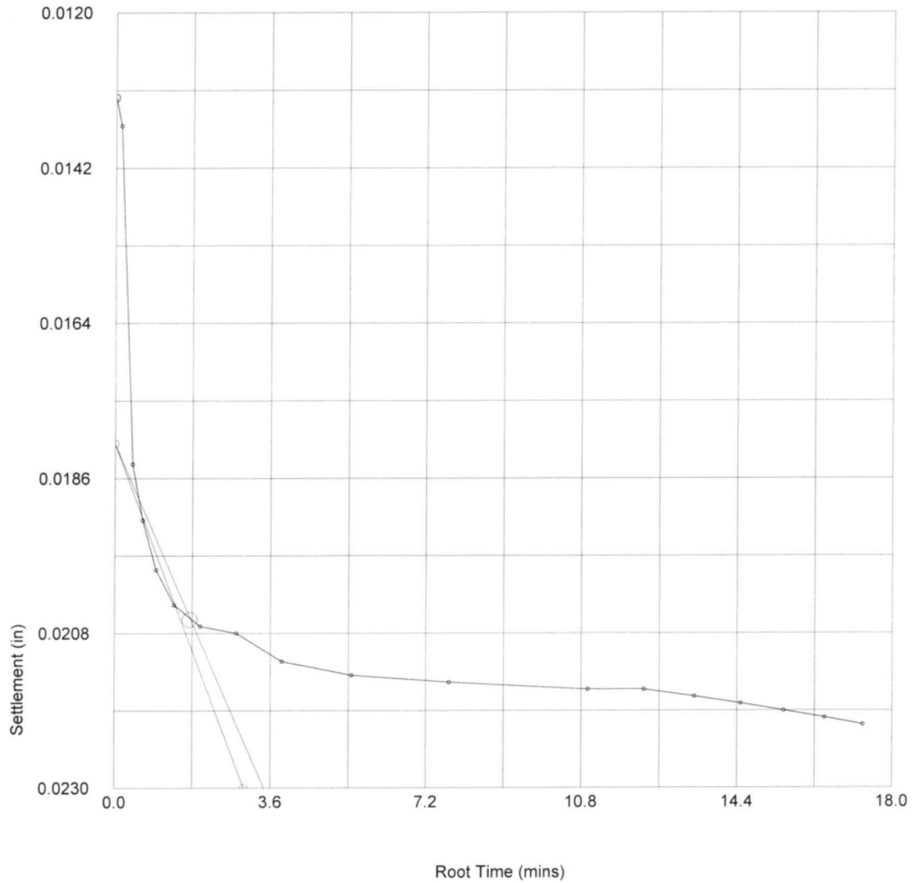
Sample: ST-6
Borehole: B8-A LT LN

Operator: MLK Checked: MLK Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0089
Voids Ratio e	0.5044
Final Temp oC	0.0
t_{90} (mins)	3.02
c_v (ft2/day)	0.673
m_v (ft2/ton)	0.009
Sec Compression C_{sec}	0.00



S&ME

ASTM D2435-96

Test name Consolidation
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-6
Borehole: B8-A LT LN

Operator: MLK Checked: MLK Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	221	0.0221	0.0221
2	0.017	224	0.0224	0.0224
3	0.167	288	0.0288	0.0288
4	0.417	296	0.0296	0.0296
5	0.917	304	0.0304	0.0304
6	1.917	312	0.0312	0.0312
7	3.917	316	0.0316	0.0316
8	7.917	319	0.0319	0.0319
9	14.917	320	0.0320	0.0320
10	29.917	324	0.0324	0.0324
11	59.917	326	0.0326	0.0326
12	119.917	328	0.0328	0.0328
13	130.600	328	0.0328	0.0328

S&ME

ASTM D2435-96

Test name Consolidation Load: 4.000 (TSF)
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

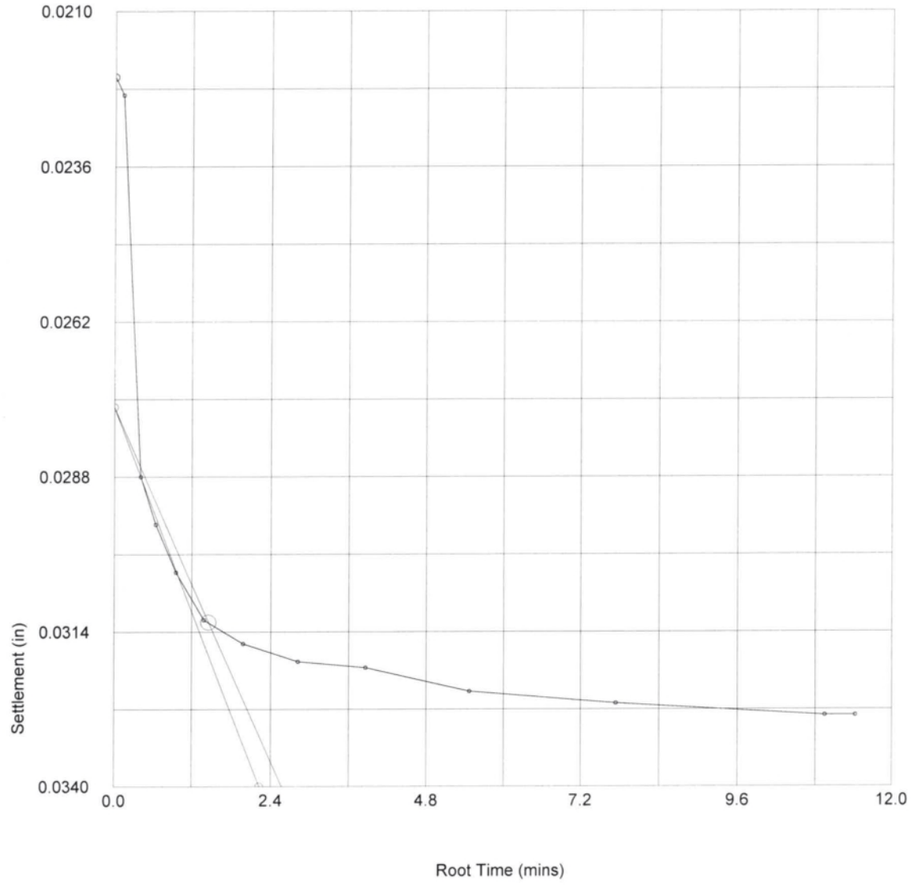
Sample: ST-6
Borehole: B8-A LT LN

Operator: MK Checked: MK Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	4.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0107
Voids Ratio e	0.4879
Final Temp oC	0.0
t_{90} (mins)	2.11
c_v (ft2/day)	0.944
m_v (ft2/ton)	0.006
Sec Compression C_{sec}	0.00



S&ME

ASTM D2435-96

Test name Consolidation
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-6
Borehole: B8-A LT LN

Operator: MK Checked: MK Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	328	0.0328	0.0328
2	0.017	319	0.0319	0.0319
3	0.167	316	0.0316	0.0316
4	0.417	312	0.0312	0.0312
5	0.917	312	0.0312	0.0312
6	1.917	312	0.0312	0.0312
7	3.917	312	0.0312	0.0312
8	7.917	312	0.0312	0.0312
9	14.917	312	0.0312	0.0312
10	29.917	312	0.0312	0.0312
11	59.917	312	0.0312	0.0312
12	119.917	312	0.0312	0.0312
13	149.917	312	0.0312	0.0312
14	155.283	312	0.0312	0.0312

S&ME

ASTM D2435-96

Test name Consolidation Load: 2.000 (TSF)
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

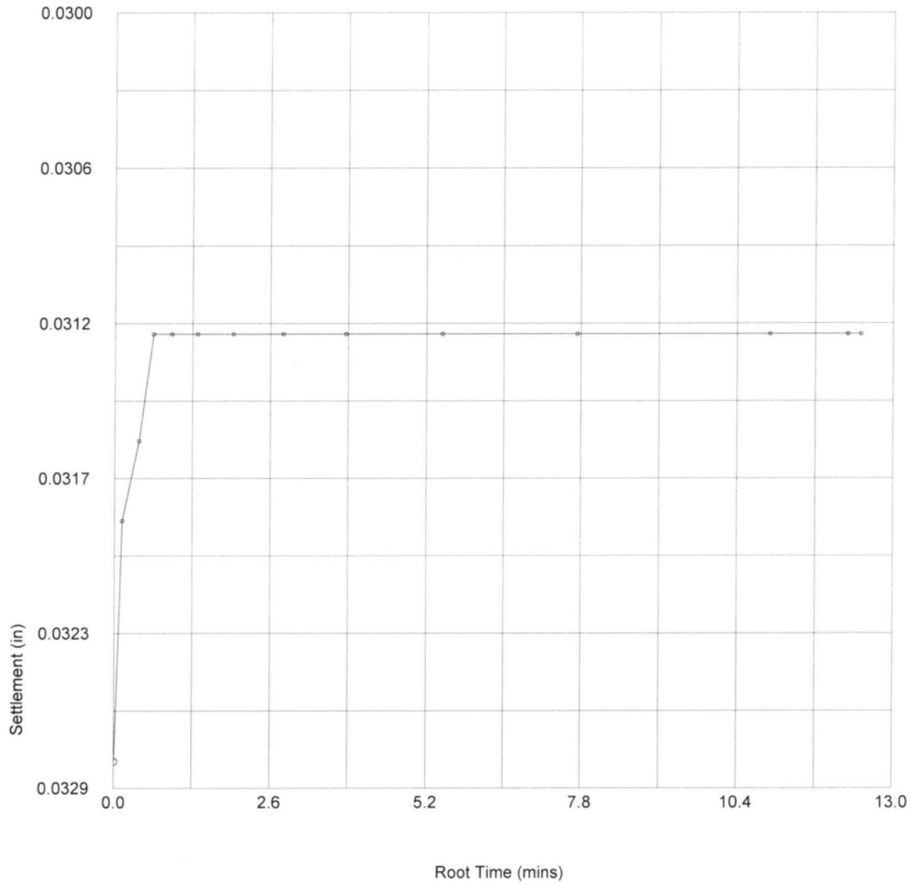
Sample: ST-6
Borehole: B8-A LT LN

Operator: MK Checked: MK Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0016
Voids Ratio e	0.4904
Final Temp oC	
t_{90} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



S&ME

ASTM D2435-96

Test name Consolidation
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-6
Borehole: B8-A LT LN

Operator: MK Checked: MK Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	312	0.0312	0.0312
2	0.017	304	0.0304	0.0304
3	0.167	286	0.0286	0.0286
4	0.417	280	0.0280	0.0280
5	0.917	277	0.0277	0.0277
6	1.917	272	0.0272	0.0272
7	3.917	269	0.0269	0.0269
8	7.917	265	0.0265	0.0265
9	14.917	264	0.0264	0.0264
10	29.917	264	0.0264	0.0264
11	59.917	264	0.0264	0.0264
12	111.867	264	0.0264	0.0264

S&ME

ASTM D2435-96

Test name Consolidation Load: 0.500 (TSF)
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

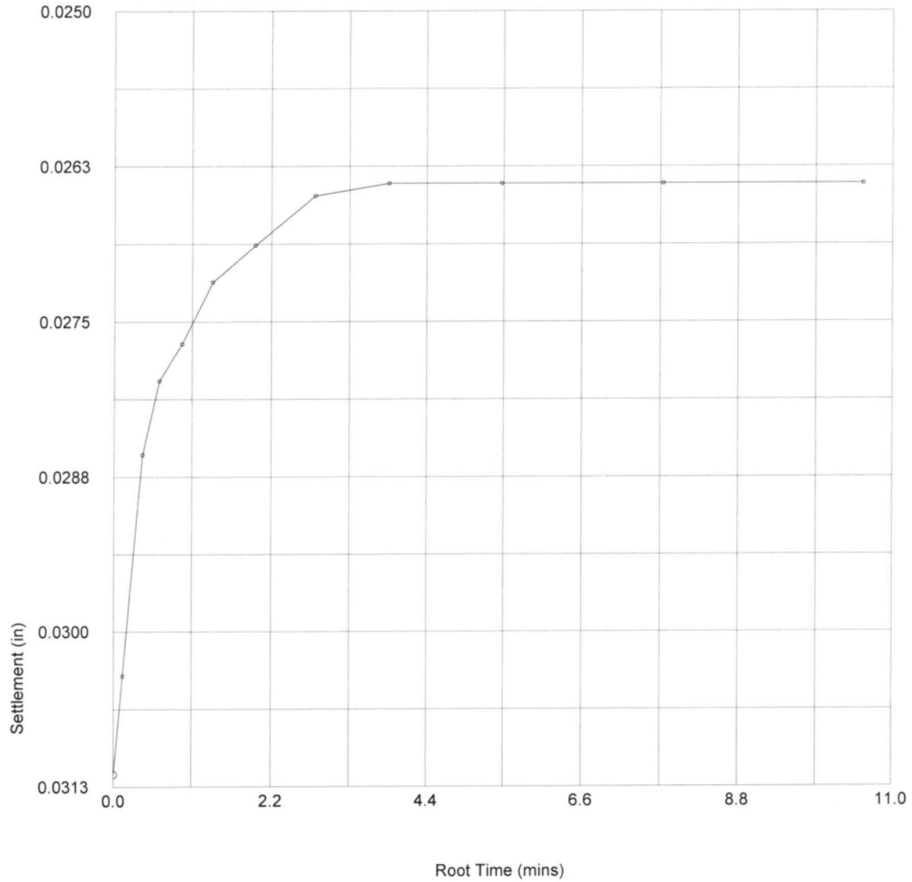
Sample: ST-6
Borehole: B8-A LT LN

Operator: MLL Checked: MLL Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0048
Voids Ratio e	0.4978
Final Temp oC	
t_{90} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



S&ME

ASTM D2435-96

Test name Consolidation
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-6
Borehole: B8-A LT LN

Operator: MLL Checked: MLL Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	264	0.0264	0.0264
2	0.017	256	0.0256	0.0256
3	0.167	245	0.0245	0.0245
4	0.417	239	0.0239	0.0239
5	0.917	235	0.0235	0.0235
6	1.917	229	0.0229	0.0229
7	3.917	222	0.0222	0.0222
8	7.917	217	0.0217	0.0217
9	14.917	212	0.0212	0.0212
10	29.917	208	0.0208	0.0208
11	36.117	207	0.0207	0.0207

S&ME

ASTM D2435-96

Test name Consolidation Load: 0.050 (TSF)
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

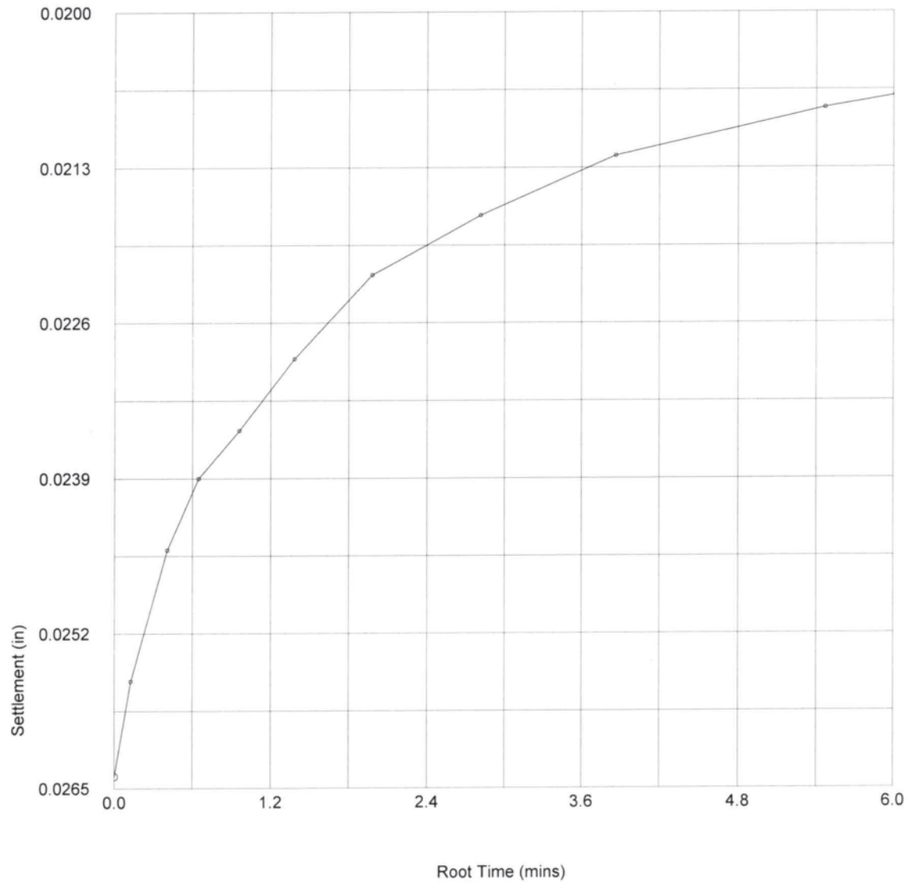
Sample: ST-6
Borehole: B8-A LT LN

Operator: MLC Checked: MLC Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0057
Voids Ratio e	0.5066
Final Temp oC	
t_{90} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



S&ME

ASTM D2435-96

Test name Consolidation
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-6
Borehole: B8-A LT LN

Operator: MLC Checked: MLC Approved:

Effective Stress Triaxial Compression

Consolidated Undrained

Sample details

Sketch showing specimen location in original Sample

Depth 9.7 - 11.7 ft.
Description: Dark Gray Silty Clayey Fine to Coarse SAND (A-2-6) (0)

	Specimen 1	Specimen 2	Specimen 3
Type	Undisturbed	Undisturbed	Undisturbed
Height H_0 (in)	5.992	5.879	6.037
Diameter D_0 (in)	2.865	2.868	2.863
Weight W_0 (gr)	1309	1307.7	1332.7
Bulk Density ρ (PCF)	129.09	131.17	130.63
Particle Density ρ_s	2.667 (measured)	2.667 (measured)	2.667 (measured)

Initial Conditions

	Specimen 1	Specimen 2	Specimen 3
Cell Pressure σ_3 (lbf/in2)	4.0	10.0	16.0
Pore Pressure u (lbf/in2)	0.0	0.0	0.0
Machine Speed d_r(in/min)	0.0067	0.0195	0.0068
No. of Membranes	1	1	1
Total Thickness (in)	0.012	0.012	0.012
Strain Channel	1798	1798	1798
Load Channel	1776	1776	1776
Pore P. Channel	1779	1779	1779
Volume Channel	Volume Chang	Volume Chang	Volume Chang
Moisture Content w_0%	19.8	18.6	18.4
Dry Density ρ_{d0} (PCF)	107.80	110.62	110.32
Voids Ratio e_0	0.54	0.50	0.51
Deg of Saturation S_0%	96.88	98.21	96.57
Final B Value	0.95	0.97	0.96

Final Conditions

	Specimen 1	Specimen 2	Specimen 3
Moisture Content w_f%	20.5	19.2	19.3
Dry Density ρ_d (PCF)	108.97	113.19	113.59
Voids Ratio e_f	0.53	0.47	0.47
Deg of Saturation S_f%	100.00	100.00	100.00
Failure Criteria	Mx Stress Ratio	Mx Stress Ratio	Mx Stress Ratio
Axial Strain ε_f%	3.0	4.0	6.0
Corr Dev Stress $(\sigma_1 - \sigma_3)f$ (lbf/in2)	25.9	34.2	47.2
Minor Stress σ_{3f} (lbf/in2)	1.2	3.9	7.7
Major Stress σ_{1f} (lbf/in2)	27.1	38.1	54.9
Stress Ratio $(\sigma_1/\sigma_3)_f$	22.6	9.8	7.1

Notes:

Failure Sketch

Sp 1 Sp 2

Sp 3

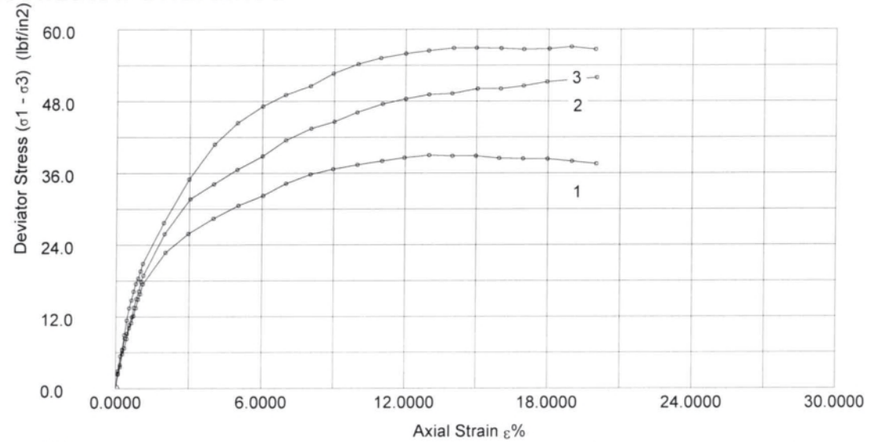
Surface Inclination

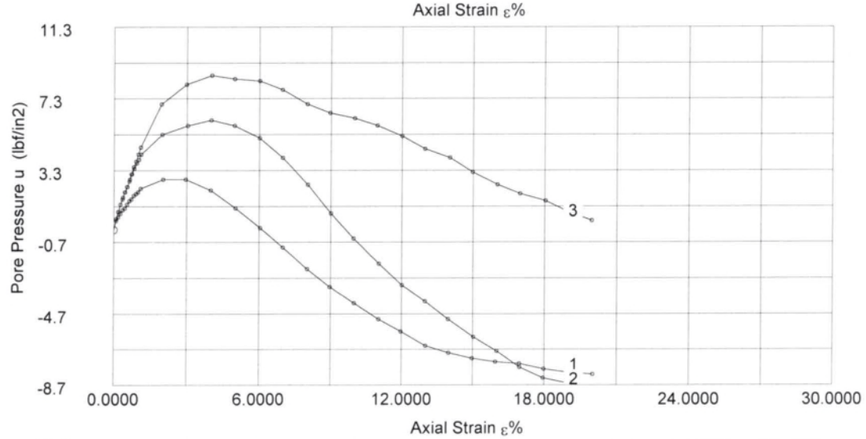
S&ME

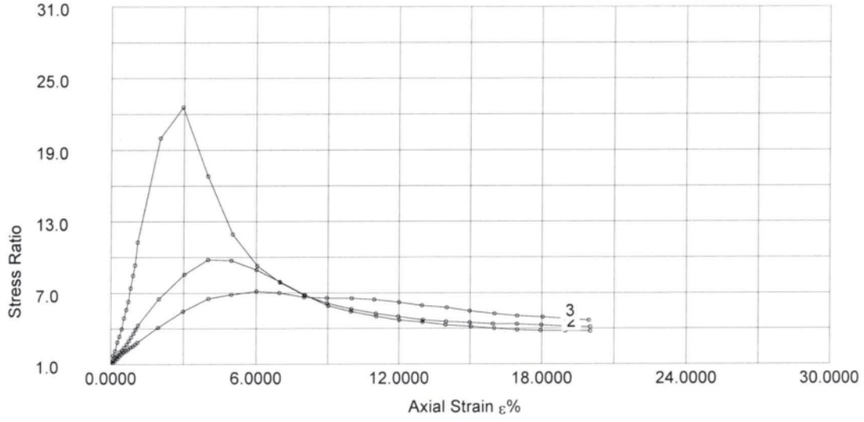
Test Method: ASTM D4767-95 | Test name CU Triaxial (SS, MS) | Date of Test: 12-6-16
Site Reference: C.F. Harvey | Sample: ST-6
Jobfile: E:\16010.JOB | Borehole: B8-A LT LN
Operator: MLC | Checked: MLC | Approved:

Effective Stress Triaxial Compression

Consolidated Undrained





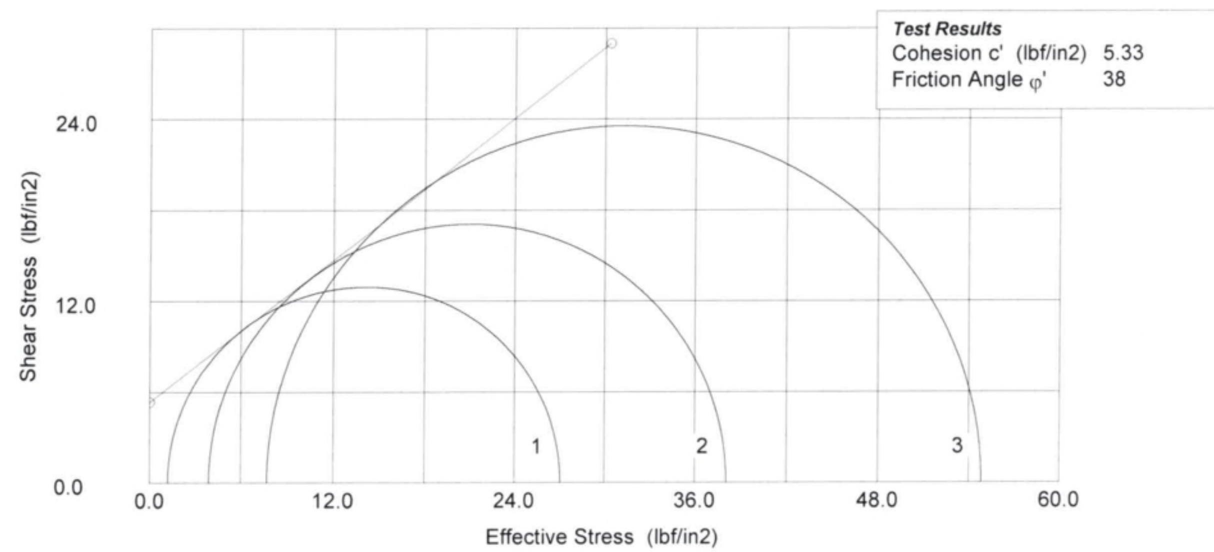


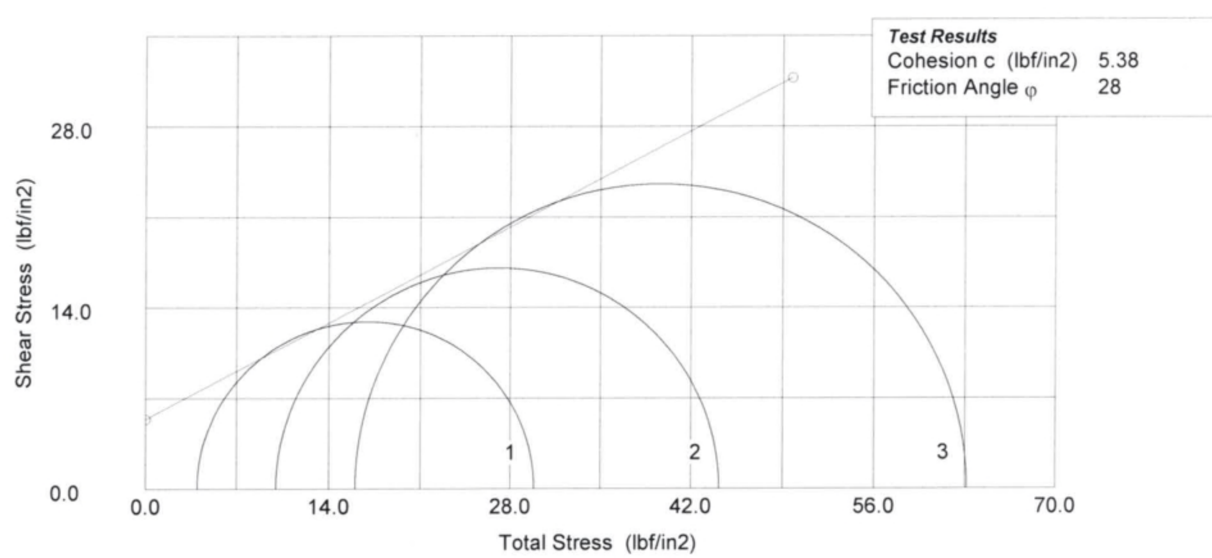
S&ME

Test Method: ASTM D4767-95 | Test name CU Triaxial (SS, MS) | Date of Test: 12-6-16
Site Reference: C.F. Harvey | Sample: ST-6
Jobfile: E:\16010.JOB | Borehole: B8-A LT LN
Operator: MLC | Checked: MLC | Approved:

Effective Stress Triaxial Compression

Consolidated Undrained

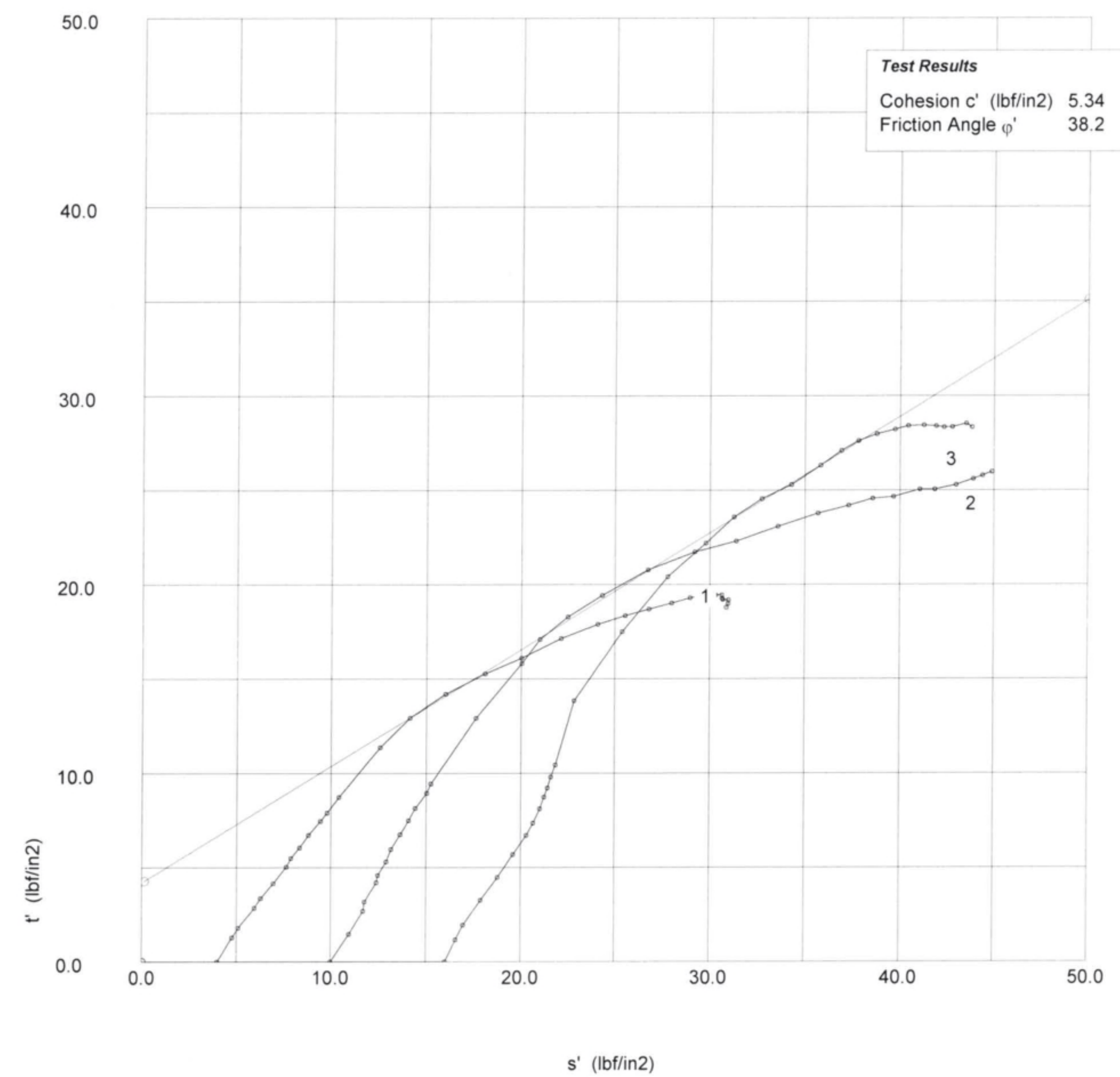




S&ME	Test Method: ASTM D4767-95	Test name Date of Test:	CU Triaxial (SS, MS) 12-6-16
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB	Sample: Borehole:	ST-6 B8-A LT LN
	Operator: [illegible] Checked: [illegible]	Approved:	

Effective Stress Triaxial Compression

Consolidated Undrained



S&ME	Test Method: ASTM D4767-95	Test name Date of Test:	CU Triaxial (SS, MS) 12-6-16
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB	Sample: Borehole:	ST-6 B8-A LT LN
	Operator: [illegible] Checked: [illegible]	Approved:	

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 1)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	321	0.00	569	0.0	0	0.0	0.0	0.0	4.00	4.00	1.00
2	376	0.09	733	16.4	5	0.5	2.6	2.6	3.50	6.06	1.73
3	427	0.18	800	23.1	7	0.7	3.6	3.6	3.30	6.90	2.09
4	485	0.27	936	36.7	9	0.9	5.7	5.7	3.10	8.82	2.84
5	538	0.36	1002	43.3	11	1.1	6.7	6.7	2.90	9.64	3.32
6	593	0.46	1103	53.4	12	1.2	8.3	8.3	2.80	11.10	3.97
7	650	0.55	1228	65.9	14	1.4	10.2	10.1	2.60	12.68	4.88
8	705	0.64	1286	71.7	16	1.6	11.1	11.0	2.40	13.37	5.57
9	759	0.73	1359	79.0	17	1.7	12.3	12.1	2.30	14.39	6.26
10	816	0.83	1447	87.8	19	1.9	13.6	13.4	2.10	15.54	7.40
11	870	0.92	1542	97.3	20	2.0	15.1	14.9	2.00	16.90	8.45
12	922	1.01	1601	103.2	21	2.1	16.0	15.8	1.90	17.70	9.32
13	982	1.11	1708	113.9	23	2.3	17.6	17.4	1.70	19.14	11.26
14	1535	2.03	2074	150.5	28	2.8	23.0	22.8	1.20	23.96	19.96
15	2088	2.96	2299	173.0	28	2.8	26.2	25.9	1.20	27.07	22.56
16	2702	3.99	2495	192.6	22	2.2	28.9	28.4	1.80	30.21	16.79
17	3316	5.02	2666	209.7	12	1.2	31.1	30.6	2.80	33.36	11.92
18	3929	6.04	2807	223.8	1	0.1	32.9	32.2	3.90	36.12	9.26
19	4493	6.99	2976	240.7	-10	-1.0	35.0	34.3	5.00	39.26	7.85
20	5106	8.01	3115	254.6	-22	-2.2	36.6	35.8	6.20	41.99	6.77
21	5672	8.96	3210	264.1	-32	-3.2	37.6	36.7	7.20	43.89	6.10
22	6288	9.99	3296	272.7	-41	-4.1	38.3	37.4	8.10	45.49	5.62
23	6908	11.03	3379	281.0	-50	-5.0	39.1	38.0	9.00	47.02	5.22
24	7470	11.97	3454	288.5	-57	-5.7	39.7	38.6	9.70	48.26	4.98
25	8089	13.01	3524	295.5	-65	-6.5	40.2	39.0	10.50	49.48	4.71
26	8670	13.98	3554	298.5	-69	-6.9	40.1	38.9	10.90	49.76	4.56
27	9258	14.97	3594	302.5	-72	-7.2	40.2	38.9	11.20	50.07	4.47
28	9851	15.96	3606	303.7	-74	-7.4	39.9	38.5	11.40	49.90	4.38
29	10450	16.96	3640	307.1	-75	-7.5	39.8	38.4	11.50	49.89	4.34
30	11053	17.97	3681	311.2	-78	-7.8	39.9	38.4	11.80	50.17	4.25
31	11659	18.99	3691	312.2	-80	-8.0	39.5	38.0	12.00	49.96	4.16
32	12265	20.00	3702	313.3	-81	-8.1	39.2	37.6	12.10	49.66	4.10

S&ME

Test Method: ASTM D4767-95

Test name: CU Triaxial (SS, MS) Shear (Specimen 1)
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-6
Borehole: B8-A LT LN

Operator: MLL | Checked: MLK | Approved:

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 2)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	127	0.00	603	0.0	0	0.0	0.0	0.0	10.00	10.00	1.00
2	183	0.10	789	18.6	5	0.5	2.9	2.9	9.50	12.42	1.31
3	236	0.19	947	34.4	10	1.0	5.4	5.4	9.00	14.40	1.60
4	289	0.28	1009	40.6	14	1.4	6.4	6.4	8.60	14.96	1.74
5	347	0.38	1139	53.6	18	1.8	8.4	8.4	8.20	16.59	2.02
6	401	0.47	1188	58.5	21	2.1	9.2	9.2	7.90	17.05	2.16
7	455	0.56	1293	69.0	24	2.4	10.8	10.6	7.60	18.23	2.40
8	513	0.66	1377	77.4	28	2.8	12.1	11.9	7.20	19.13	2.66
9	567	0.75	1478	87.5	31	3.1	13.7	13.5	6.90	20.39	2.96
10	621	0.85	1574	97.1	34	3.4	15.1	15.0	6.60	21.58	3.27
11	680	0.95	1658	105.5	37	3.7	16.4	16.3	6.30	22.57	3.58
12	733	1.04	1762	115.9	39	3.9	18.0	17.9	6.10	23.97	3.93
13	786	1.13	1828	122.5	42	4.2	19.0	18.9	5.80	24.68	4.26
14	1285	1.98	2297	169.4	53	5.3	26.1	25.8	4.70	30.52	6.49
15	1897	3.03	2703	210.0	58	5.8	32.0	31.7	4.20	35.85	8.54
16	2456	3.99	2899	229.6	61	6.1	34.7	34.2	3.90	38.08	9.76
17	3018	4.96	3088	248.5	58	5.8	37.1	36.6	4.20	40.77	9.71
18	3633	6.01	3274	267.1	51	5.1	39.5	38.8	4.90	43.73	8.92
19	4198	6.98	3491	288.8	40	4.0	42.2	41.5	6.00	47.52	7.92
20	4816	8.04	3663	306.0	25	2.5	44.2	43.4	7.50	50.94	6.79
21	5382	9.01	3781	317.8	9	0.9	45.5	44.6	9.10	53.68	5.90
22	5945	9.97	3933	333.0	-5	-0.5	47.1	46.2	10.50	56.67	5.40
23	6568	11.04	4077	347.4	-19	-1.9	48.6	47.5	11.90	59.45	5.00
24	7135	12.01	4183	358.0	-31	-3.1	49.5	48.4	13.10	61.50	4.70
25	7701	12.98	4281	367.8	-40	-4.0	50.3	49.1	14.00	63.14	4.51
26	8273	13.96	4341	373.8	-50	-5.0	50.6	49.3	15.00	64.30	4.29
27	8894	15.03	4451	384.8	-60	-6.0	51.4	50.1	16.00	66.09	4.13
28	9465	16.01	4501	389.8	-68	-6.8	51.5	50.1	16.80	66.89	3.98
29	10030	16.97	4588	398.5	-77	-7.7	52.0	50.6	17.70	68.26	3.86
30	10598	17.95	4691	408.8	-83	-8.3	52.7	51.2	18.30	69.52	3.80
31	11194	18.97	4774	417.1	-86	-8.6	53.1	51.6	18.60	70.18	3.77
32	11800	20.01	4862	425.9	-89	-8.9	53.6	52.0	18.90	70.87	3.75

S&ME

Test Method: ASTM D4767-95

Test name: CU Triaxial (SS, MS) Shear (Specimen 2)
Date of Test: 12-6-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-6
Borehole: B8-A LT LN

Operator: MLL | Checked: MLK | Approved:

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 3)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	289	0.00	703	0.0	0	0.0	0.0	0.0	16.00	16.00	1.00
2	343	0.09	850	14.7	6	0.6	2.3	2.3	15.40	17.73	1.15
3	394	0.18	950	24.7	10	1.0	3.9	3.9	15.00	18.91	1.26
4	453	0.27	1117	41.4	14	1.4	6.5	6.5	14.60	21.14	1.45
5	505	0.36	1270	56.7	17	1.7	8.9	8.9	14.30	23.25	1.63
6	560	0.45	1425	72.2	21	2.1	11.4	11.4	13.90	25.29	1.82
7	618	0.55	1564	86.1	24	2.4	13.6	13.4	13.60	27.01	1.99
8	673	0.64	1648	94.5	27	2.7	14.9	14.7	13.30	28.02	2.11
9	728	0.73	1745	104.2	31	3.1	16.4	16.2	12.90	29.13	2.26
10	785	0.83	1825	112.2	35	3.5	17.6	17.5	12.50	29.97	2.40
11	841	0.92	1887	118.4	38	3.8	18.6	18.4	12.20	30.62	2.51
12	895	1.01	1963	126.0	42	4.2	19.8	19.6	11.80	31.40	2.66
13	953	1.11	2045	134.2	46	4.6	21.0	20.9	11.40	32.26	2.83
14	1456	1.95	2503	180.0	70	7.0	28.0	27.7	9.00	36.68	4.08
15	2071	2.98	3003	230.0	81	8.1	35.4	35.0	7.90	42.89	5.43
16	2691	4.02	3418	271.5	86	8.6	41.3	40.8	7.40	48.20	6.51
17	3256	4.96	3688	298.5	84	8.4	44.9	44.4	7.60	51.98	6.84
18	3880	6.01	3913	321.0	83	8.3	47.8	47.2	7.70	54.86	7.12
19	4447	6.96	4082	337.9	78	7.8	49.8	49.1	8.20	57.29	6.99
20	5073	8.00	4227	352.4	70	7.0	51.4	50.6	9.00	59.56	6.62
21	5641	8.95	4413	371.0	65	6.5	53.5	52.6	9.50	62.14	6.54
22	6270	10.00	4572	386.9	62	6.2	55.2	54.2	9.80	64.00	6.53
23	6839	10.96	4691	398.8	58	5.8	56.3	55.2	10.20	65.42	6.41
24	7467	12.01	4797	409.4	52	5.2	57.1	56.0	10.80	66.75	6.18
25	8040	12.97	4883	418.0	45	4.5	57.6	56.5	11.50	67.95	5.91
26	8668	14.02	4969	426.6	40	4.0	58.1	56.9	12.00	68.85	5.74
27	9239	14.97	5025	432.2	32	3.2	58.2	56.9	12.80	69.70	5.45
28	9868	16.02	5077	437.4	25	2.5	58.2	56.8	13.50	70.31	5.21
29	10438	16.98	5122	441.9	20	2.0	58.1	56.7	14.00	70.67	5.05
30	11068	18.03	5188	448.5	16	1.6	58.2	56.7	14.40	71.13	4.94
31	11615	18.95	5268	456.5	10	1.0	58.6	57.1	15.00	72.06	4.80
32	12221	19.96	5298	459.5	5	0.5	58.3	56.7	15.50	72.17	4.66

S&ME

Test Method: ASTM D4767-95 | Test name: CU Triaxial (SS, MS) Shear (Specimen 3)

Site Reference: C.F. Harvey | Date of Test: 12-6-16

Jobfile: E:\16010.JOB | Sample: ST-6

Operator: MK | Checked: MK | Approved: | Borehole: B8-A LT LN

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

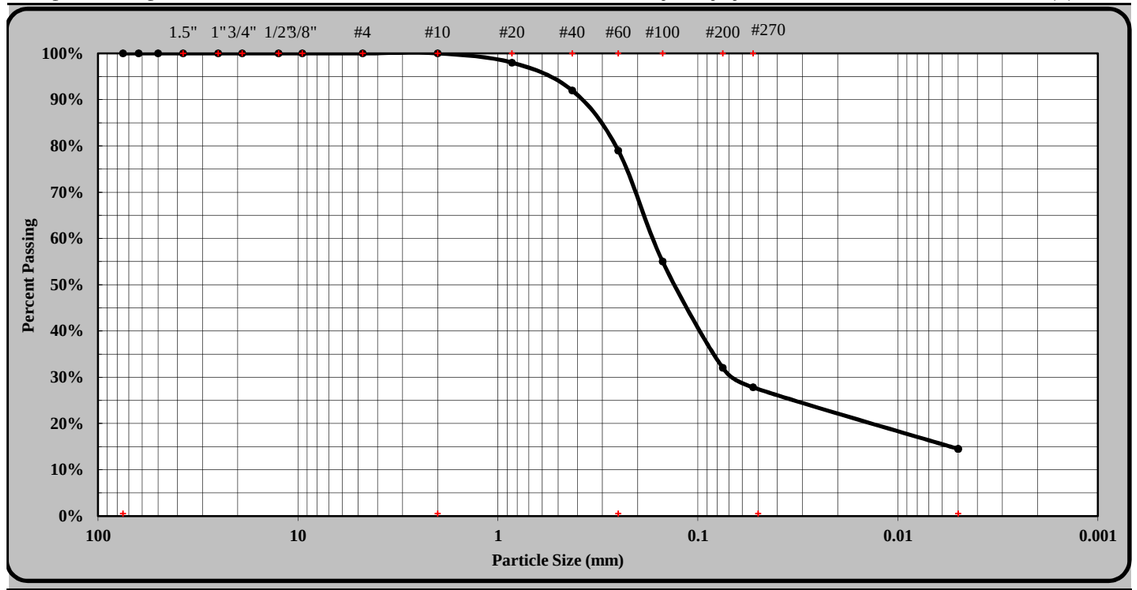
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	11/14/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	10/7 - 11/14/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B4-B RT LN Sample #: SS-46	Sample Date:	8/4/16
Location:	218+00 Offset: 35' RT	Depth (ft):	1.0 - 2.5
Sample Description:	Tan Silty Clayey Coarse to Fine SAND	A-2-4	(0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	21%	Silt	13%
Gravel	0%	Fine Sand	51%	Clay	15%
Apparent Relative Density	ND	Moisture Content	16.5%	% Passing #200	32.0%
Liquid Limit	20	Plastic Limit	17	Plastic Index	3

Soil Mortar (-#10 Sieve)

Coarse Sand	21%	Fine Sand	51%	Silt	13%	Clay	15%

Description of Sand & Gravel Particles:		Rounded	☐	Angular	☐
Hard & Durable	☐	Soft	☐	Weathered & Friable	☐

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	11/14/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	11/14/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No: TR-T267
Revision No. 0
Revision Date: 07/10/08

Moisture, Ash, and Organic Matter

AASHTO T-267 — *Quality Assurance*

S&ME, Inc. Raleigh, 3201 Spring Forest Raod, Raleigh, North Carolina 27616

Project #:	**6235-16-010**	Report Date:	10/21/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	10/18 - 10/21/16
Client Name:	Michael Baker Engineering		
Client Address:	Raleigh, NC		

Boring #:	B4-B RT LN	Sample #:	SS-46	Sample Date:	8/4/16
Location:	218+00	Offset:	35' RT	Depth (ft):	1.0 - 2.5
Sample Description:	Tan Silty Clayey Coarse to Fine SAND (A-2-4) (0)				

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*

*Balance: S&ME ID #: **1024** Cal. Date: **11/06/16** Due: **11/06/17***

Method A: Moisture Content Determination *Required Oven Temperature:105 ± 5 ° C*

	Oven Temperature: **105** **°C**	*Tare #*	am
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	48.40
a	Mass of ***As-Received*** Specimen + Tare Wt.	*grams*	93.53
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	87.24
w	Water Weight	*(a-b)*	6.29
A	Mass of As-Received Specimen	*(a-t)*	45.13
B	Mass of Oven Dry Specimen	*(b-t)*	38.84
	% Moisture Content as a % of As Received or Total Mass	*(w/A)*100*	**13.9%**
	% Moisture Content as a % of Oven-dried Mass	*(w/B)*100*	**16.2%**

*Oven S&ME ID #: **1454** Cal. Date: **10/7/16** Due: **10/7/17***

Method C (440 ° C) or D (750 ° C): Ash Content and Organic Matter Determination

	Muffle Furnace: **455** **°C**	*Tare #*	85
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	49.03
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	87.97
c	Ash Weight + Tare Wt.	*grams*	87.39
C	Ash Weight	*c-t*	38.36
B	Mass of Oven Dry Specimen	*(b-t)*	38.94
D	***% Ash Content***	*(C/B)*100*	**98.5%**
	% Organic Matter	*100-D*	**1.5%**

*Muffle Furnace: S&ME ID #: **00261***

Notes / Deviations / References:

Mal Krajan, ET — *Technical Responsibility*
Signature
Laboratory Manager — *Position*
11/14/2016 — *Date*

Form No: TR-T289-1
Revision No. 0
Revision Date: 07/10/08

pH of Soil

AASHTO T289 — *Quality Assurance*

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

Project #:	**6235-16-010**	Report Date:	11/7/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	11/5 - 11/7/16
Client Name:	Michael Baker Engineering		
Client Address:	Raleigh, NC		

Boring #:	B4-B RT LN	Sample #:	SS-46	Sample Date:	8/4/16
Location:	218+00	Offset:	35' RT	Depth (ft):	1.0 - 2.5
Sample Description:	Tan Silty Clayey Coarse to Fine SAND (A-2-4) (0)				

Equipment:

Balance		*S&ME ID#*	*1024*	*Cal. Date:*	*11/6/16*	*Due:*	*11/6/17*
Sieve:	*#10*	*S&ME ID#*	*13223*	*Cal. Date:*	*6/11/16*	*Due:*	*6/11/17*
pH Meter:		*S&ME ID#*	*1365*	*Cal. Date:*	*11/7/16*	*Due:*	*NA*

pH Meter Calibration

Buffer Solution	***Results***
pH buffer 7.0	***7.02***
pH buffer 4.01	***4.01***
pH buffer 10.0	***10.03***
Buffer Temperature ^{0}C	***22.4***

Measuring pH of Soil

Measurements	
Weigtht of Air Dry Soil (g)	***30.02***
Distilled Water (g)	***30.02***
Temperature ^{0}C	***22.1***
pH Readings	***5.88***

Notes / Deviations / References: AASHTO T-289: Determining pH of Soil for Use in Corrosion Testing

Mal Krajan, ET — *Technical Responsibility*
Signature
Laboratory Manager — *Position*
11/14/2016 — *Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

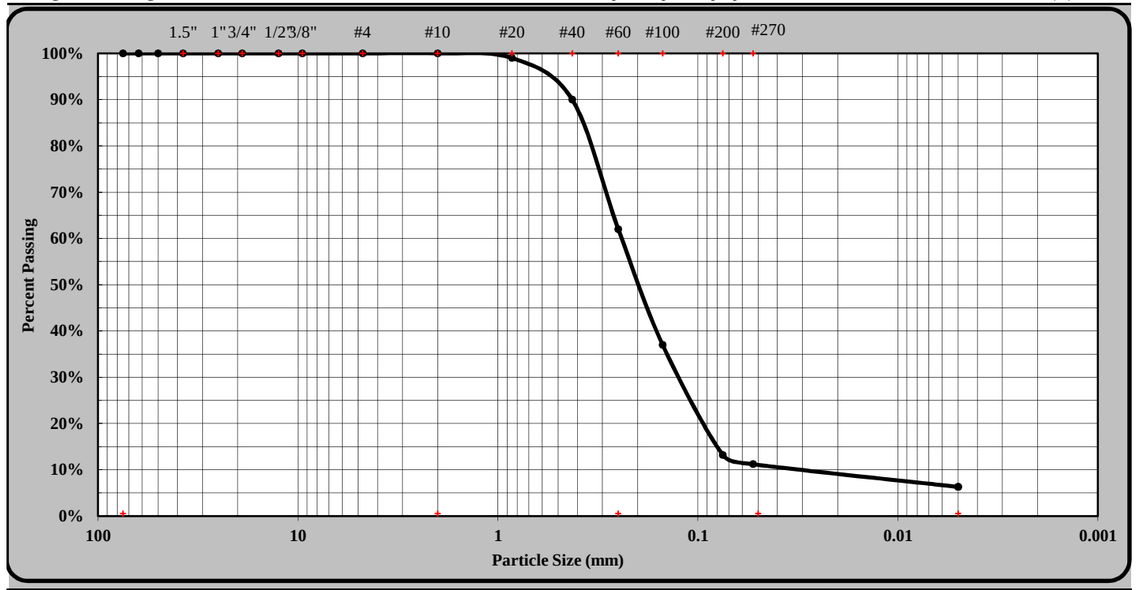
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	11/14/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	10/7 - 11/14/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B4-B RT LN Sample #: SS-47	Sample Date:	8/4/16
Location:	218+00 Offset: 35' RT	Depth (ft):	58.1 - 59.6
Sample Description:	Dark Gray Silty Clayey Coarse to Fine SAND A-2-4 (0)		



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	38%	Silt	5%
Gravel	0%	Fine Sand	51%	Clay	6%
Apparent Relative Density	ND	Moisture Content	27.1%	% Passing #200	13.2%
Liquid Limit	20	Plastic Limit	0	Plastic Index	N.P.

Soil Mortar (-#10 Sieve)

Coarse Sand	38%	Fine Sand	51%	Silt	5%	Clay	6%

Description of Sand & Gravel Particles:	Rounded	☐		Angular	☐
Hard & Durable	☐	Soft	☐	Weathered & Friable	☐

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	11/14/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET	*Signature*	Laboratory Manager	11/14/2016
Technical Responsibility		*Position*	*Date*

Form No: TR-T267
Revision No. 0
Revision Date: 07/10/08

Moisture, Ash, and Organic Matter

AASHTO T-267

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Raod, Raleigh, North Carolina 27616

Project #:	**6235-16-010**	Report Date:	10/21/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	10/18 - 10/21/16
Client Name:	Michael Baker Engineering		
Client Address:	Raleigh, NC		
Boring #:	B4-B RT LN Sample #: SS-47	Sample Date:	8/4/16
Location:	218+00 Offset: 35' RT	Depth (ft):	58.1 - 59.6
Sample Description:	Dark Gray Silty Clayey Coarse to Fine SAND (A-2-4) (0)		

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*
Balance: *S&ME ID #:* ***1024*** *Cal. Date:* ***11/06/16*** *Due:* ***11/06/17***

Method A: Moisture Content Determination *Required Oven Temperature:105 ± 5 °C*

	Oven Temperature: **105 °C**	*Tare #*	m
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	48.80
a	Mass of ***As-Received*** Specimen + Tare Wt.	*grams*	92.58
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	83.24
w	Water Weight	*(a-b)*	9.34
A	Mass of As-Received Specimen	*(a-t)*	43.78
B	Mass of Oven Dry Specimen	*(b-t)*	34.44
	% Moisture Content as a % of As Received or Total Mass	*(w/A)*100*	**21.3%**
	% Moisture Content as a % of Oven-dried Mass	*(w/B)*100*	**27.1%**

Oven *S&ME ID #:* ***1454*** *Cal. Date:* ***10/7/16*** *Due:* ***10/7/17***

Method C (440 °C) or D (750 °C): Ash Content and Organic Matter Determination

	Muffle Furnace: **455 °C**	*Tare #*	49
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	49.46
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	83.89
c	Ash Weight + Tare Wt.	*grams*	83.65
C	Ash Weight	*c-t*	34.19
B	Mass of Oven Dry Specimen	*(b-t)*	34.43
D	***% Ash Content***	*(C/B)*100*	**99.3%**
	% Organic Matter	*100-D*	**0.7%**

Muffle Furnace: *S&ME ID #:* ***00261***

Notes / Deviations / References:

Mal Krajan, ET	*Signature*	Laboratory Manager	11/14/2016
Technical Responsibility		*Position*	*Date*

Form No: TR-T289-1
Revision No. 0
Revision Date: 07/10/08

pH of Soil

AASHTO T289

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

Project #:	**6235-16-010**	Report Date:	11/7/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	11/5 - 11/7/16
Client Name:	Michael Baker Engineering		
Client Address:	Raleigh, NC		

Boring #:	B4-B RT LN	Sample #:	SS-47	Sample Date:	8/4/16
Location:	218+00	Offset:	35' RT	Depth (ft):	58.1 - 59.6
Sample Description:	Dark Gray Silty Clayey Coarse to Fine SAND (A-2-4) (0)				

Equipment:

Balance		*S&ME ID#*	*1024*	*Cal. Date:*	*11/6/16*	*Due:*	*11/6/17*
Sieve:	*#10*	*S&ME ID#*	*13223*	*Cal. Date:*	*6/11/16*	*Due:*	*6/11/17*
pH Meter:		*S&ME ID#*	*1365*	*Cal. Date:*	*11/7/16*	*Due:*	*NA*

pH Meter Calibration

Buffer Solution	*Results*
pH buffer 7.0	***7.02***
pH buffer 4.01	***4.01***
pH buffer 10.0	***10.03***
Buffer Temperature ^{0}C	***22.4***

Measuring pH of Soil

Measurements	
Weigtht of Air Dry Soil (g)	***20.00***
Distilled Water (g)	***20.01***
Temperature ^{0}C	***21.8***
pH Readings	***6.01***

Notes / Deviations / References: AASHTO T-289: Determining pH of Soil for Use in Corrosion Testing

Mal Krajan, ET		Laboratory Manager	11/14/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

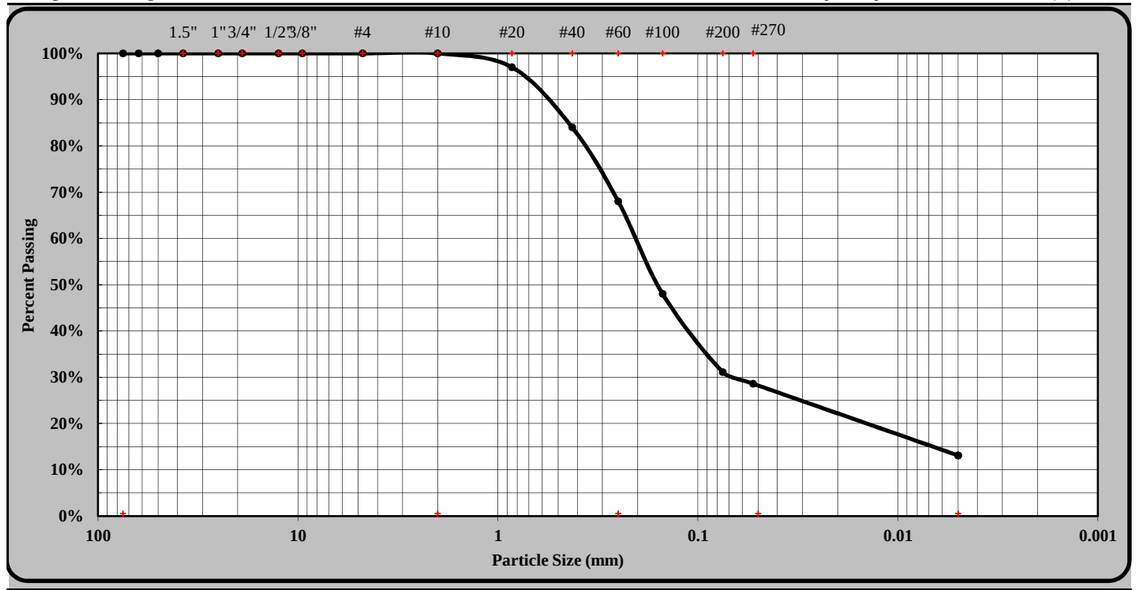
Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010			Report Date:	11/8/16
Project Name:	C.F. Harvey Parkway Extension R-5703			Test Date(s):	11/1-8/16
State Project #:	46375.1.1	F.A. Project No:	N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering				
Address:	Raleigh, NC				
Boring #:	B6-B RT LN	Sample #:	SS-48	Sample Date:	8/11/16
Location:	220+00	Offset:	35' RT	Depth (ft):	4.2-5.7'
Sample Description:				Gray Silty SAND	A-2-4 (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#20	Coarse Sand	32%	Silt	16%
Gravel	0%	Fine Sand	39%	Clay	13%
Apparent Relative Density	2.650	Moisture Content	24.5%	% Passing #200	31.1%
Liquid Limit	22	Plastic Limit	13	Plastic Index	9

Soil Mortar (-#10 Sieve)

Coarse Sand	32%	Fine Sand	39%	Silt	16%	Clay	13%

Description of Sand & Gravel Particles:		Rounded	☐	Angular	☒
Hard & Durable	☒	Soft	☐	Weathered & Friable	☐

References / Comments / Deviations: ND=Not Determined.

Karen Warner	118-06-0305	Laboratory Technician	11/8/2016
Technician Name	*Certification No.*	*Position*	*Date*
Stewart Laney, P.E		Senior Engineer	
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

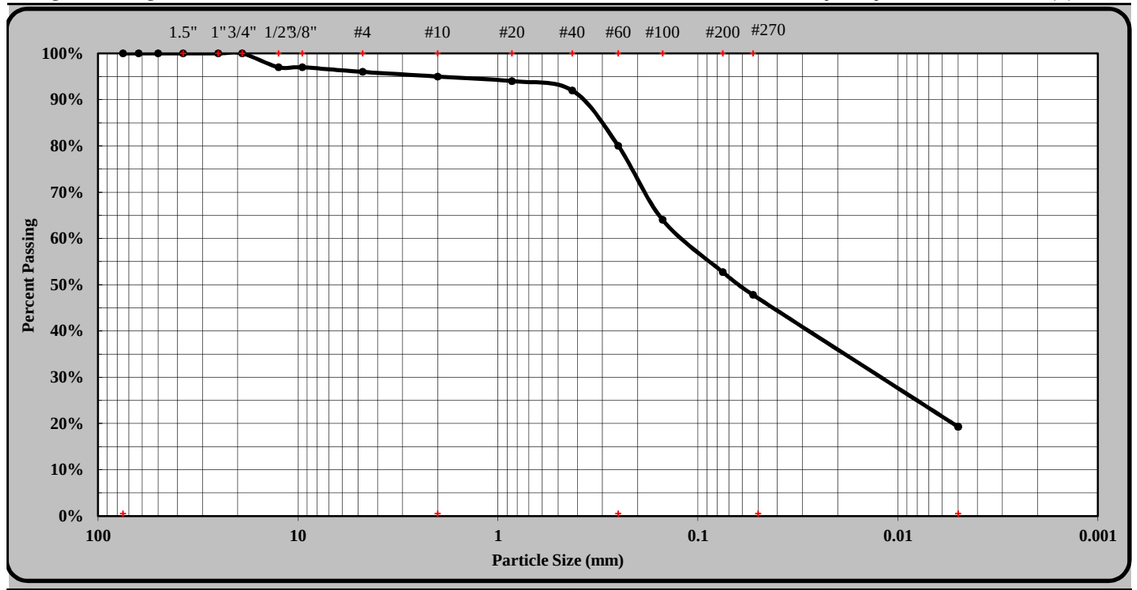
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	11/8/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	11/1-8/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B6-B RT LN Sample #: SS-49	Sample Date:	8/11/16
Location:	220+00 Offset: 35' RT	Depth (ft):	48.5-50.0
Sample Description:	Gray Silty CLAY	A-6	(3)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	1/2"	Coarse Sand	15%	Silt	29%
Gravel	5%	Fine Sand	32%	Clay	19%
Apparent Relative Density	2.650	Moisture Content	24.0%	% Passing #200	52.7%
Liquid Limit	28	Plastic Limit	16	Plastic Index	12

Soil Mortar (-#10 Sieve)

Coarse Sand	16%	Fine Sand	34%	Silt	30%	Clay	20%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☐		Weathered & Friable		☐

References / Comments / Deviations: ND=Not Determined.

Karen Warner	118-06-0305	Laboratory Technician	11/8/2016
Technician Name	*Certification No.*	*Position*	*Date*
Stewart Laney, P.E	_____	Senior Engineer	
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

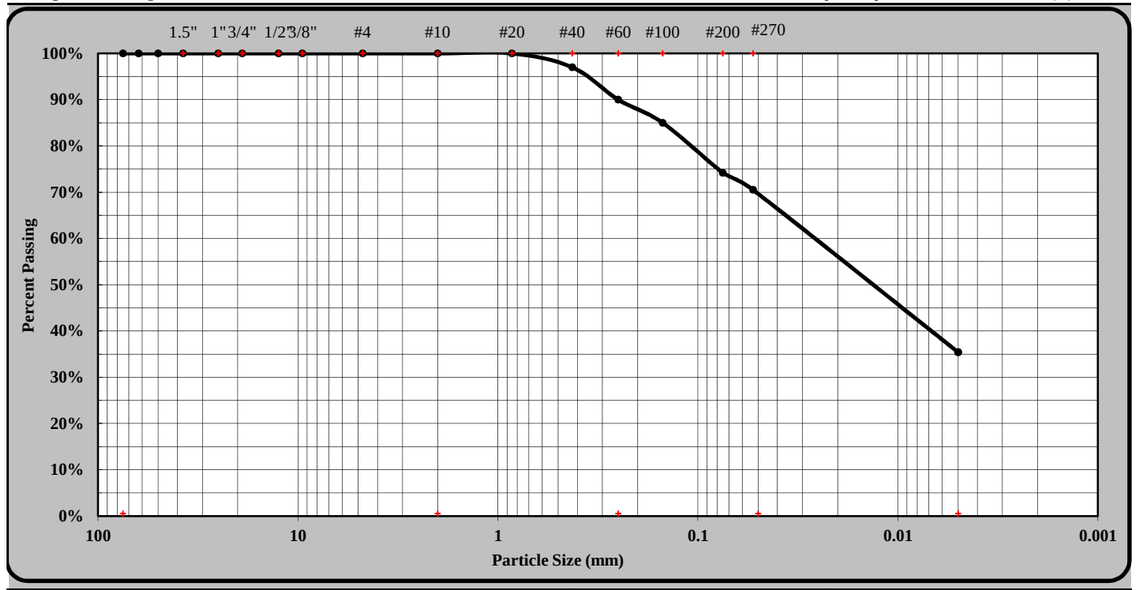
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-16-010	Report Date:	9/20/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	9/12 - 9/20/16
State Project #:	46375.1.1 F.A. Project No: N/A	TIP NO:	R-5703
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B7-B RT LN Sample #: SS-50	Sample Date:	8/15/16
Location:	221+00 Offset: 35' RT	Depth (ft):	0.3 - 1.8
Sample Description:	Dark Brown Coarse to Fine Sandy Silty CLAY	A-6	(8)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	10%	Silt	35%
Gravel	0%	Fine Sand	20%	Clay	35%
Apparent Relative Density	ND	Moisture Content	70.2%	% Passing #200	74.2%
Liquid Limit	40	Plastic Limit	29	Plastic Index	11

Soil Mortar (-#10 Sieve)

Coarse Sand	10%	Fine Sand	20%	Silt	35%	Clay	35%
Description of Sand & Gravel Particles:		Rounded	☐		Angular		☒
Hard & Durable	☒	Soft	☒		Weathered & Friable		☒

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	9/12/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET	_____	Laboratory Manager	9/26/2016
Technical Responsibility	*Signature*	*Position*	*Date*