STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-3324	1	5

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34923.1.1 (U-3324)* F.A. PROJ. *STPNHF-1(10)*

COUNTY *Moore*

PROJECT DESCRIPTION *Pinehurst – Southern Pines – Intersections of SR 1309 (Morganton Road) and US 1 (Sandhills Blvd.)*

SITE DESCRIPTION *Retaining Wall 4 on SR 1309 (Morganton Rd.) –Y6– Sta. 25+50.00 to 26+00.00*

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CAUTION NOTICE

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

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

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

PERSONNEL

D. Racey

D. Tignor

M. Renza

INVESTIGATED BY *F&R, Inc.*

CHECKED BY *P. Alton, P.E.*

SUBMITTED BY *F&R, Inc.*

DATE *1/12*

NORTH CAROLINA PROFESSIONAL SEAL 033758 ENGINEER PATRICK ALTON 3/23/12

Patrick Alton

DRAWN BY: *D. Racey*

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

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

PROJECT: 34923.1.1

ID: U-3324

PROJECT REFERENCE NO.	SHEET NO.
U-3324	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 TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, 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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT / CPT / DMT / VST / PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
C.P. - COASTAL PLAIN
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
R.E. - ROADWAY EMBANKMENT
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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-55
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: TBM: U3324-8: METAL DISK AT -Y6- STA. 24+64 21' RT.
N: 516,934.6470 E: 1,878,929.2040
ELEVATION: 534.28 FT.

NOTES:

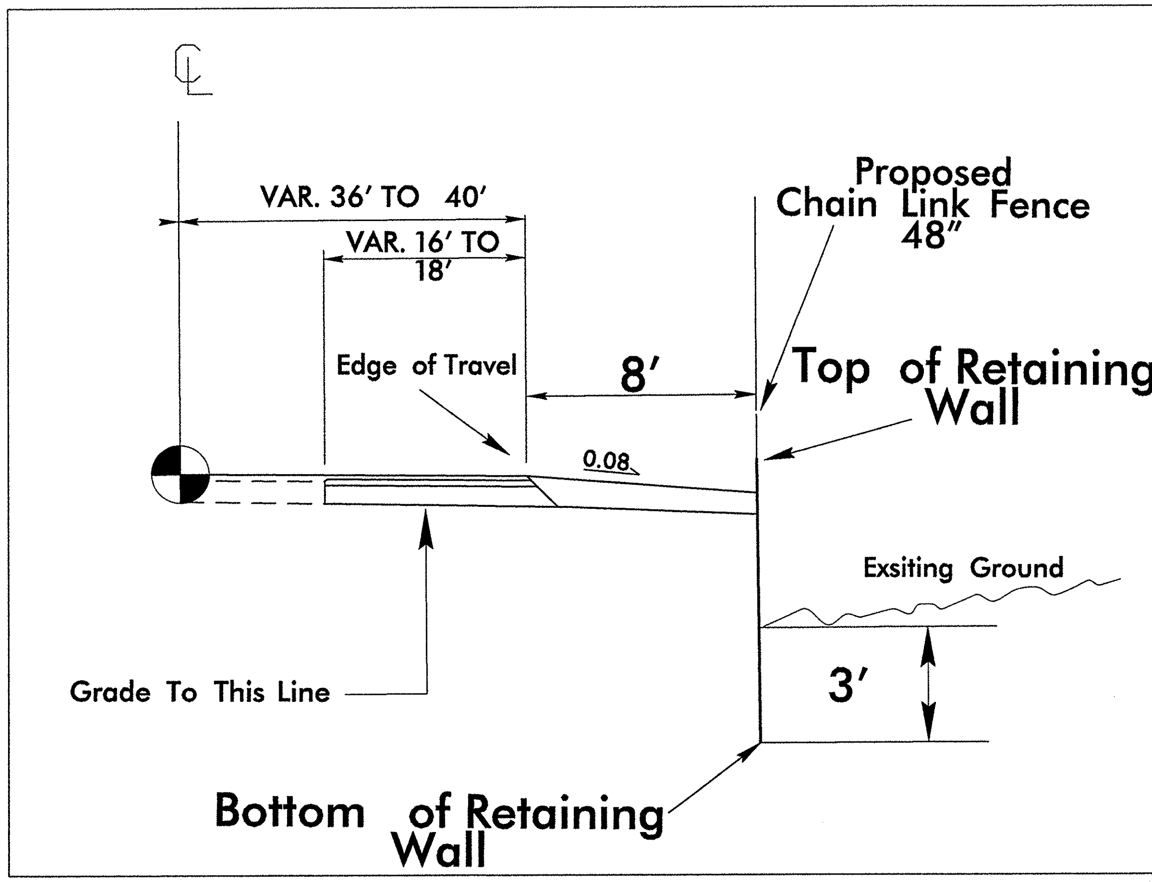
REVISED 09/23/09

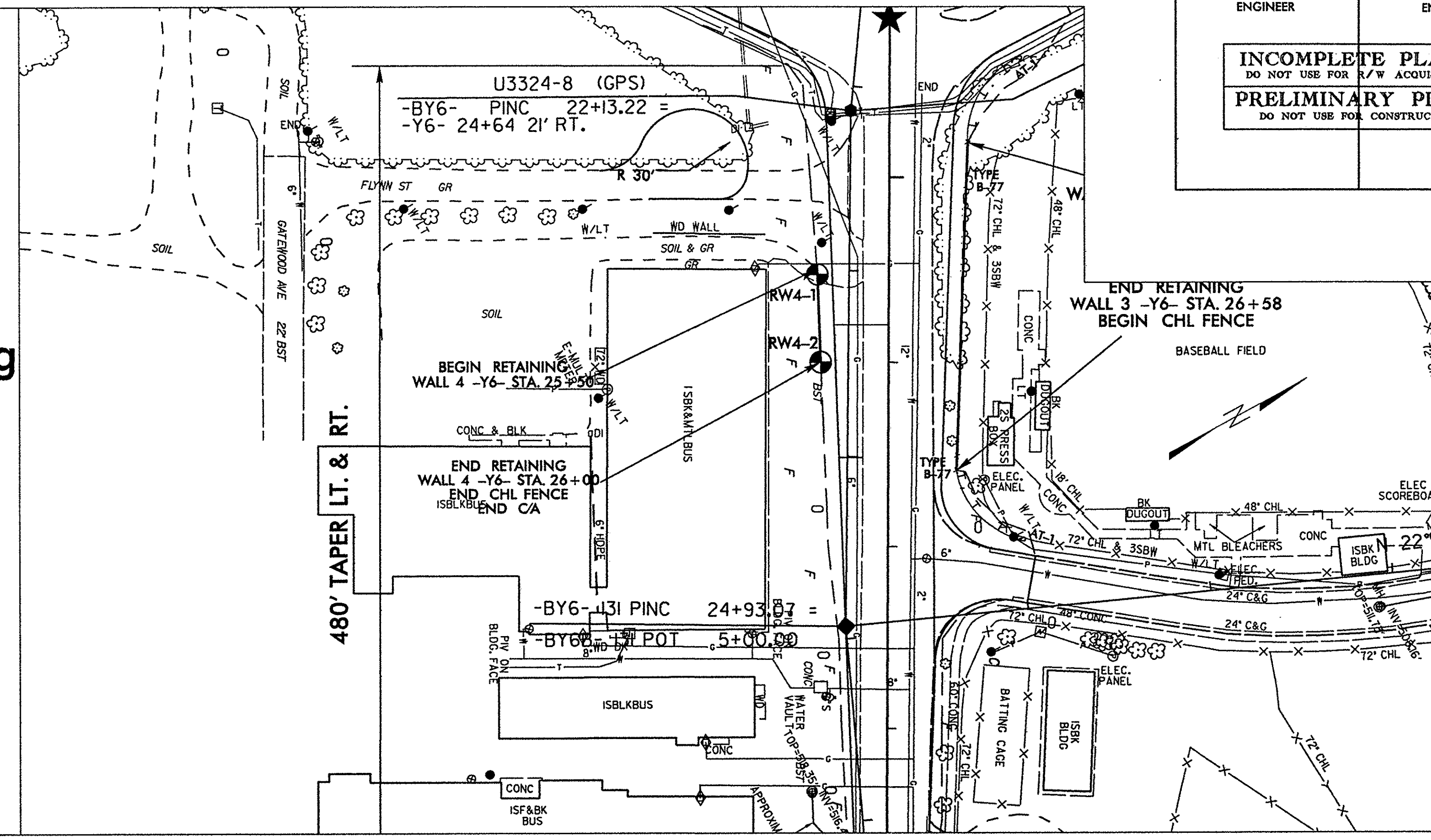
8/17/99

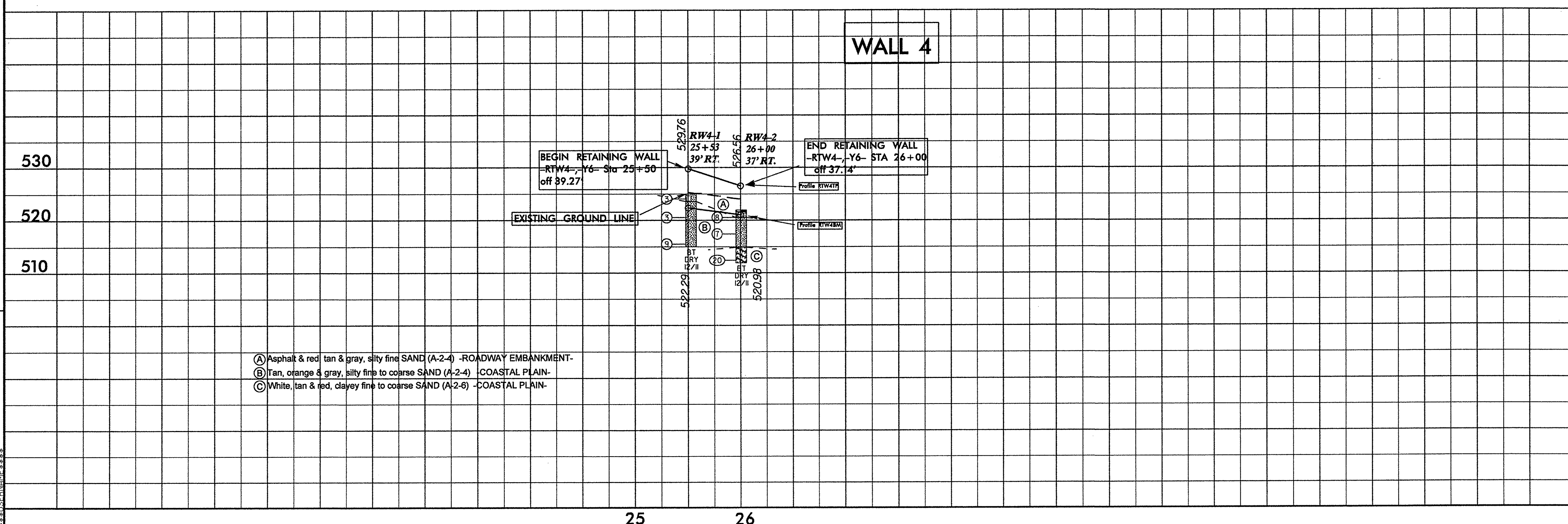
PROJECT REFERENCE NO.	SHEET NO.
U-3324	3
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION







(A) Asphalt & red tan & gray, silty fine SAND (A-2-4) -ROADWAY EMBANKMENT-
(B) Tan, orange & gray, silty fine to coarse SAND (A-2-4) -COASTAL PLAIN-
(C) White, tan & red, clayey fine to coarse SAND (A-2-6) -COASTAL PLAIN-

REVISIONS

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

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 4				**GROUND WTR (ft)**
BORING NO. RW4-1	**STATION** 25+53	**OFFSET** 39 ft RT	**ALIGNMENT** -Y6-	**0 HR.** Dry
COLLAR ELEV. 525.0 ft	**TOTAL DEPTH** 10.0 ft	**NORTHING** 516,877	**EASTING** 1,878,999	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 12/02/11	**COMP. DATE** 12/02/11	**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)
525	525.0	0.0	1	2	1	3		M		525.0 GROUND SURFACE 0.0
										523.5 **ROADWAY EMBANKMENT** 1.5
	521.5	3.5								Red, tan & gray, silty fine SAND (A-2-4), with trace gravel.
520			1	1	2	3		M		**COASTAL PLAIN**
										Tan, orange & gray, silty fine to coarse SAND (A-2-4), with trace clay.
	516.5	8.5								
515			3	4	5	9		W		515.0 10.0
										Boring Terminated at Elevation 515.0 ft in SAND (COASTAL PLAIN)

NOTES:

1) Boring located on gravel parking lot shoulder.

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 4				**GROUND WTR (ft)**
BORING NO. RW4-2	**STATION** 26+00	**OFFSET** 37 ft RT	**ALIGNMENT** -Y6-	**0 HR.** Dry
COLLAR ELEV. 521.9 ft	**TOTAL DEPTH** 10.0 ft	**NORTHING** 516,856	**EASTING** 1,879,042	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 12/02/11	**COMP. DATE** 12/02/11	**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
525										521.9 GROUND SURFACE 0.0
	521.5	0.4								521.5 0.4
			4	5	3	8		M		520.5 **ASPHALT** 1.4
520										**ROADWAY EMBANKMENT**
	518.4	3.5								Dark gray-tan, silty fine SAND (A-2-4).
			3	3	4	7		M		**COASTAL PLAIN**
										Gray-tan, silty fine to coarse SAND (A-2-4), with little clay.
515										514.9 7.0
	513.4	8.5								White, tan & red, clayey fine to coarse SAND (A-2-6), with little silt.
			4	9	11	20		M		511.9 10.0
										Boring Terminated at Elevation 511.9 ft in SAND (COASTAL PLAIN)

NOTES:

1) Geologist indicates strata break in split spoon at a depth of 1.4'.
2) 24 hr. water level not measured due to boring location in parking lot.

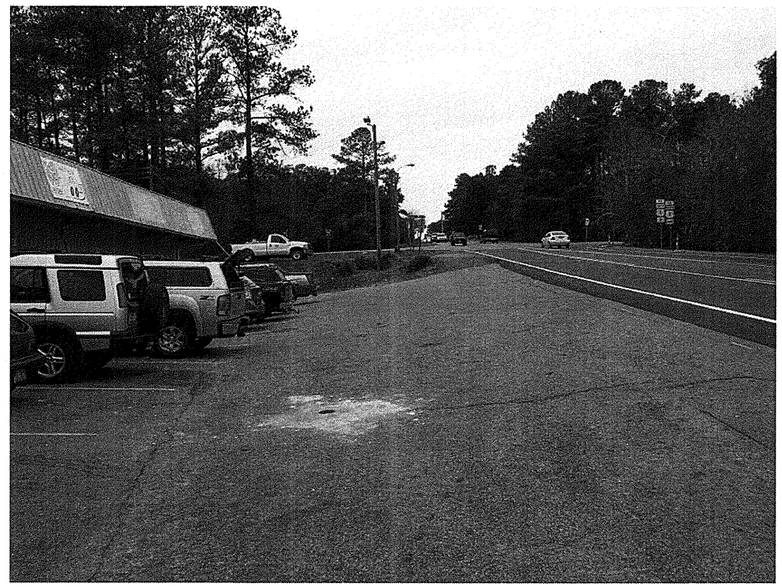


Photo No. 1: Wall 4 – along wall looking northwest

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-3324	1	6

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34923.1.1 (U-3324)* F.A. PROJ. *STPNHF-1(10)*

COUNTY *Moore*

PROJECT DESCRIPTION *Pinehurst – Southern Pines – Intersections of SR 1309 (Morganton Road) and US 1 (Sandhills Blvd.)*

SITE DESCRIPTION *Retaining Wall 3 on SR 1309 (Morganton Rd.) –Y6– Sta. 24+81.00 to 26+58.00*

CONTENTS

CAUTION NOTICE

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

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

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

PERSONNEL

D. Racey

D. Tignor

M. Renza

INVESTIGATED BY *F&R, Inc.*

CHECKED BY *P. Alton, P.E.*

SUBMITTED BY *F&R, Inc.*

DATE *M2*

NORTH CAROLINA PROFESSIONAL SEAL 033758 ENGINEER PATRICK ALTON

Patrick Alton 3/23/12

PROJECT: 34923.1.1

ID: U-3324

DRAWN BY: *D. Racey*

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

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

PROJECT REFERENCE NO.	SHEET NO.
U-3324	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 TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT PLASTIC INDEX	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 A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE 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 0.50 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
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, 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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT / DPT / DMT / VST / PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
C.P. - COASTAL PLAIN
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
R.E. - ROADWAY EMBANKMENT
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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-55
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: TBM: U3324-8: METAL DISK AT -Y6- STA. 24+64 21' RT.
N: 516,934.6470 E: 1,878,929.2040
ELEVATION: 534.28 FT.

NOTES:

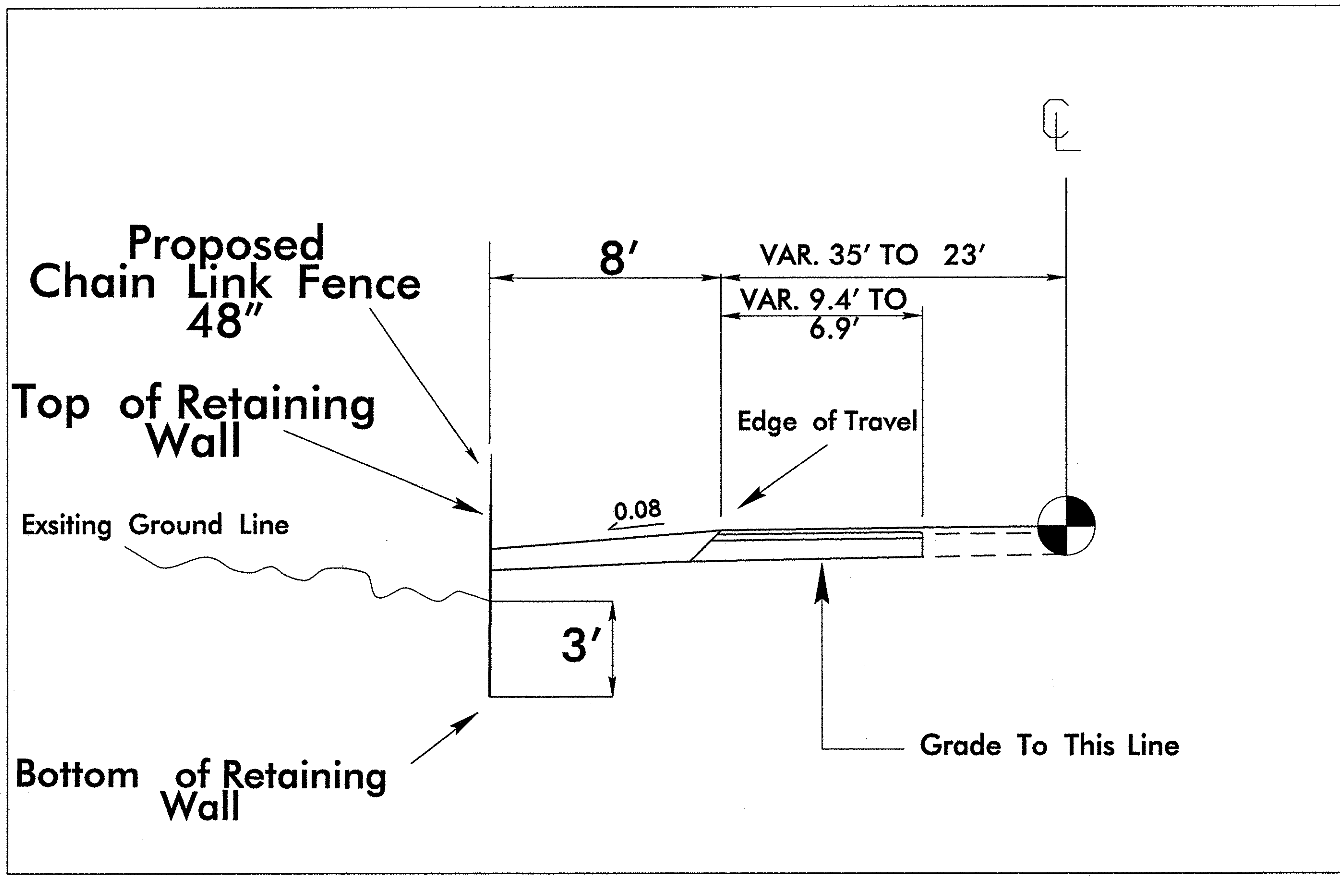
REVISED 09/23/09

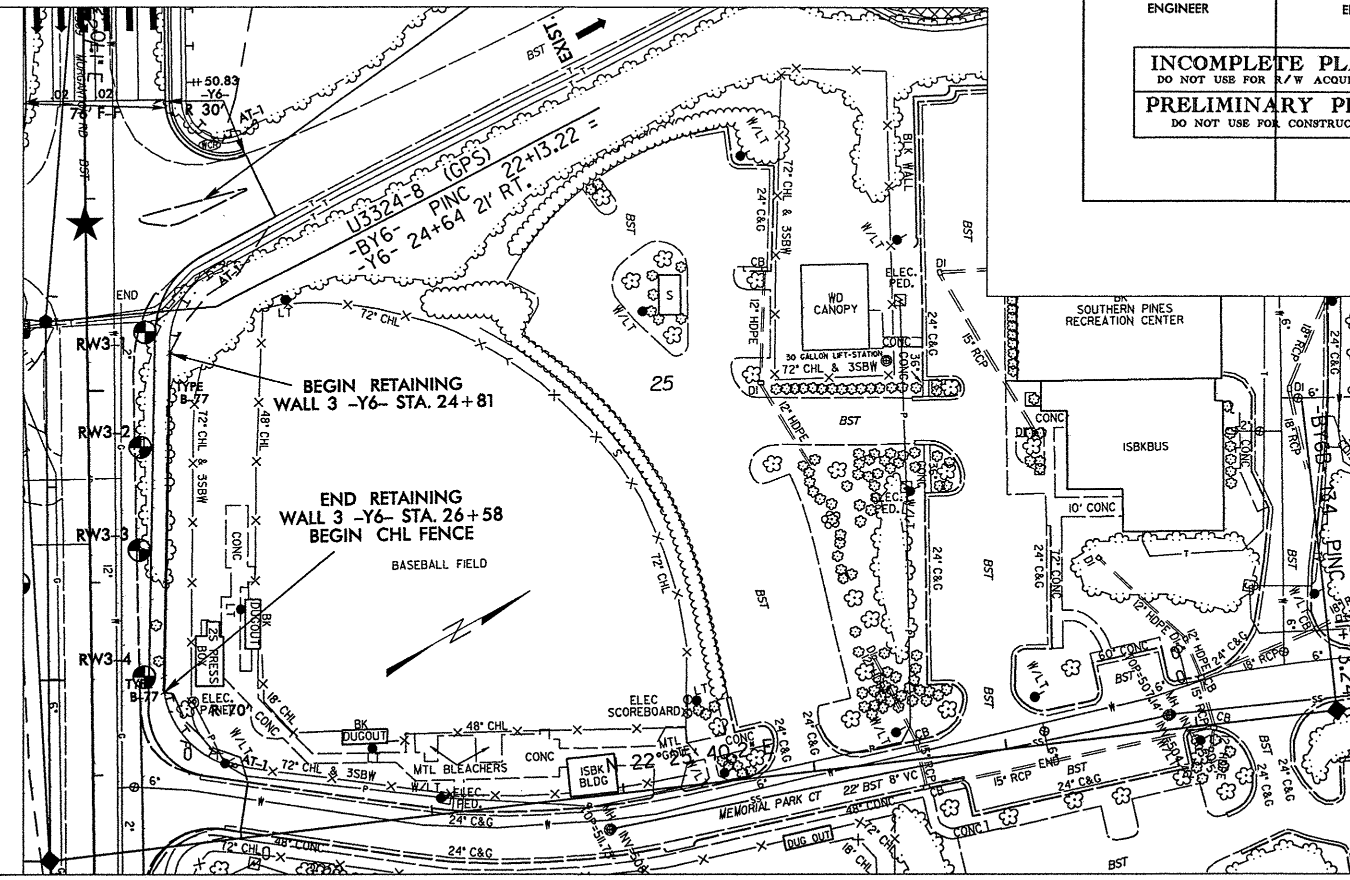
8/17/99

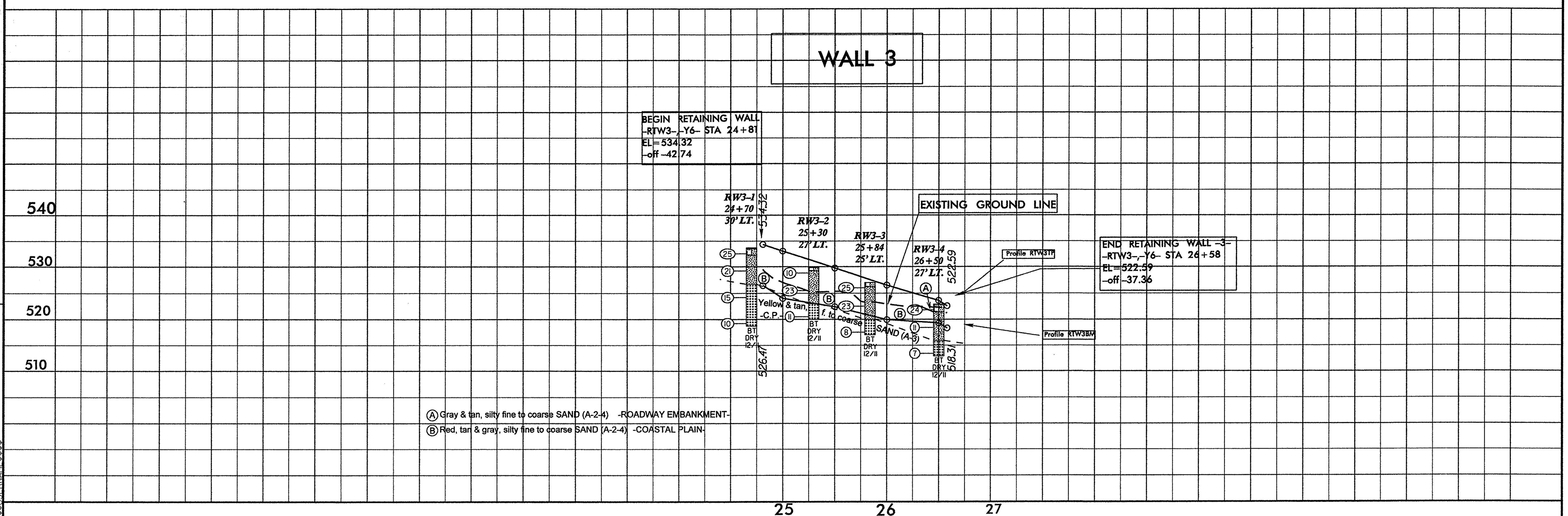
PROJECT REFERENCE NO.	SHEET NO.
U-3324	3
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION







REVISIONS

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

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 3				**GROUND WTR (ft)**
BORING NO. RW3-1	**STATION** 24+70	**OFFSET** 30 ft LT	**ALIGNMENT** -Y6-	**0 HR.** Dry
COLLAR ELEV. 533.7 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 516,977	**EASTING** 1,878,959	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 12/02/11	**COMP. DATE** 12/02/11	**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
535										ELEV. (ft) DEPTH (ft)
	533.5	0.2	7	10	15	25		M		533.7 0.0 GROUND SURFACE
										533.5 0.2 ASPHALT
530	530.2	3.5	9	10	11	21		M		532.2 1.5 ROADWAY EMBANKMENT Brown, silty fine to coarse SAND (A-2-4), with trace asphalt fragments & gravel. COASTAL PLAIN Red-tan, silty fine to coarse SAND (A-2-4).
525	525.2	8.5	7	7	8	15		M		526.7 7.0 Yellow-tan, fine to coarse SAND (A-3), with trace silt.
520	520.2	13.5	3	4	6	10		D		518.7 15.0 Boring Terminated at Elevation 518.7 ft in SAND (COASTAL PLAIN)

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 3				**GROUND WTR (ft)**
BORING NO. RW3-2	**STATION** 25+30	**OFFSET** 27 ft LT	**ALIGNMENT** -Y6-	**0 HR.** Dry
COLLAR ELEV. 530.0 ft	**TOTAL DEPTH** 10.0 ft	**NORTHING** 516,946	**EASTING** 1,879,010	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 12/02/11	**COMP. DATE** 12/02/11	**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
530										
	529.8	0.2	3	5	5	10		M		530.0 0.0 GROUND SURFACE
										529.8 0.2 ASPHALT
	526.5	3.5	9	12	11	23		M		529.2 0.8 ROADWAY EMBANKMENT Brown, silty fine to coarse SAND (A-2-4). COASTAL PLAIN Tan, gray & red, silty fine to coarse SAND (A-2-4), with trace clay.
525										523.0 7.0 Tan & brown, fine SAND (A-3).
	521.5	8.5	5	6	5	11		D		520.0 10.0 Boring Terminated at Elevation 520.0 ft in SAND (COASTAL PLAIN)
520										

NOTES:

1) Geologist indicates strata break in split spoon at a depth of 0.8'.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 3				**GROUND WTR (ft)**
BORING NO. RW3-3	**STATION** 25+84	**OFFSET** 25 ft LT	**ALIGNMENT** -Y6-	**0 HR.** Dry
COLLAR ELEV. 527.0 ft	**TOTAL DEPTH** 10.0 ft	**NORTHING** 516,919	**EASTING** 1,879,057	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 12/02/11	**COMP. DATE** 12/02/11	**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)
530											
	527.0	0.0								527.0 GROUND SURFACE	0.0
			14	11	14	25		M		526.2 **ROADWAY EMBANKMENT**	0.8
525										Red-tan, silty fine to coarse SAND (A-2-4), with trace clay & gravel.	
	523.5	3.5	6	12	11	23		M		**COASTAL PLAIN**	
										Gray-tan & red, silty fine SAND (A-2-4), with trace gravel, trace to little clay.	
520										520.0	7.0
	518.5	8.5	3	4	4	8		D		Tan, fine SAND (A-3).	
										517.0	10.0
										Boring Terminated at Elevation 517.0 ft in SAND (COASTAL PLAIN)	

NOTES:

1) Geologist indicates strata break in split spoon at a depth of 0.8'.

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 3				**GROUND WTR (ft)**
BORING NO. RW3-4	**STATION** 26+50	**OFFSET** 27 ft LT	**ALIGNMENT** -Y6-	**0 HR.** Dry
COLLAR ELEV. 522.9 ft	**TOTAL DEPTH** 10.0 ft	**NORTHING** 516,889	**EASTING** 1,879,116	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 12/02/11	**COMP. DATE** 12/02/11	**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
525										
	522.8	0.1								522.8 GROUND SURFACE 0.0
			9	11	13	24		M		522.4 **ASPHALT** 0.5
520										521.4 **ROADWAY EMBANKMENT** 1.5
	519.4	3.5	4	4	7	11		M		Gray & tan, silty fine to coarse SAND (A-2-4), with trace gravel.
										COASTAL PLAIN
515										515.9 Red, gray & tan, silty fine to coarse SAND (A-2-4), with trace to some clay. 7.0
	514.4	8.5	3	3	4	7		D		Tan, fine SAND (A-3).
										512.9 10.0
										Boring Terminated at Elevation 512.9 ft in SAND (COASTAL PLAIN)

Intersections of SR 1309 (Morganton Rd) and US 1 (Sandhills Blvd) in Pinehurst/Southern Pines
SITE PHOTOGRAPHS

Photo No. 1: Wall 3 – along toe of slope looking northwest

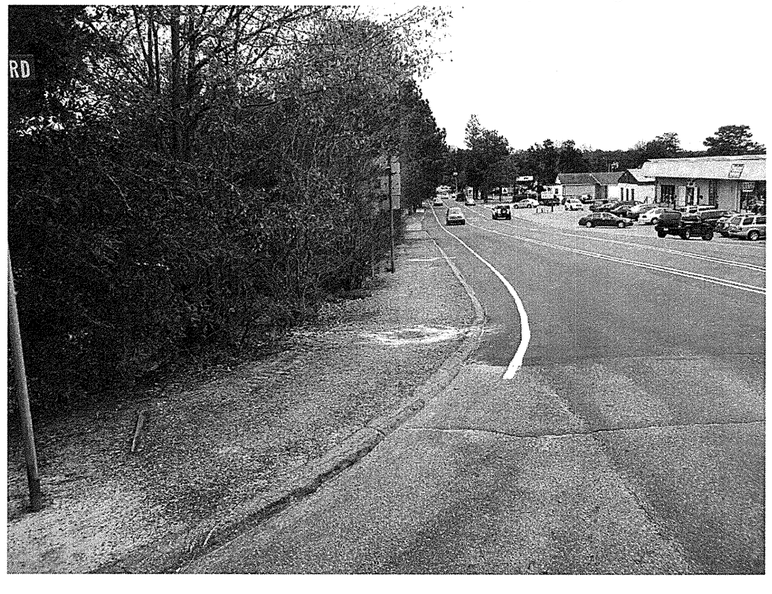


Photo No. 2: Wall 3 – along top of slope looking southeast

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-3324	1	12

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34923.1.1 (U-3324)* F.A. PROJ. *STPNHF-1(10)*

COUNTY *Moore*

PROJECT DESCRIPTION *Pinehurst – Southern Pines – Intersections of SR 1309 (Morganton Road) and US 1 (Sandhills Blvd.)*

SITE DESCRIPTION *Retaining Wall 2 on US 1 (Sandhills Blvd.) –L– Sta. 35+00.00 to 40+50.00*

CONTENTS

CAUTION NOTICE

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

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

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

PERSONNEL

D. Racey

D. Tignor

M. Renza

INVESTIGATED BY *F&R, Inc.*

CHECKED BY *P. Alton, P.E.*

SUBMITTED BY *F&R, Inc.*

DATE *1/12*

NORTH CAROLINA PROFESSIONAL SEAL 033758 3/23/12 ENGINEER PATRICK ALTON

Patrick Alton

PROJECT: 34923.1.1

ID: U-3324

DRAWN BY: *D. Racey*

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

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

PROJECT REFERENCE NO.	SHEET NO.
U-3324	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 TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT / CPT / DMT / VST / PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
C.P. - COASTAL PLAIN
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
R.E. - ROADWAY EMBANKMENT
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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-55
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

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

ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: SEE NOTES BELOW

NOTES:

RW-2) TBM: BY5-124: METAL DISK AT -Y5- STA. 26+69 16' RT.
N: 516,550.3670 E: 1,878,348.4180 ELEV. = 565.50 FT.

RW-2) TBM: BL-106: METAL DISK AT -L- STA. 39+08 46' LT.
N: 516,542.1310 E: 1,878,400.7930 ELEV. = 546.90 FT.

REVISED 09/23/09

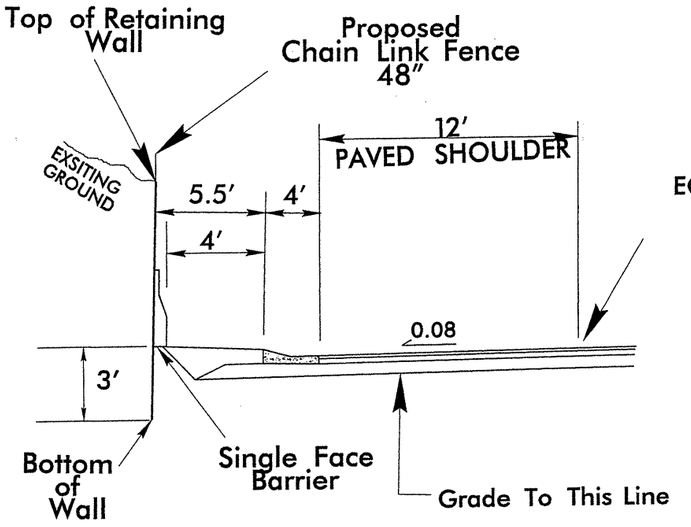
PROJECT REFERENCE NO.	SHEET NO.
U-3324	3
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

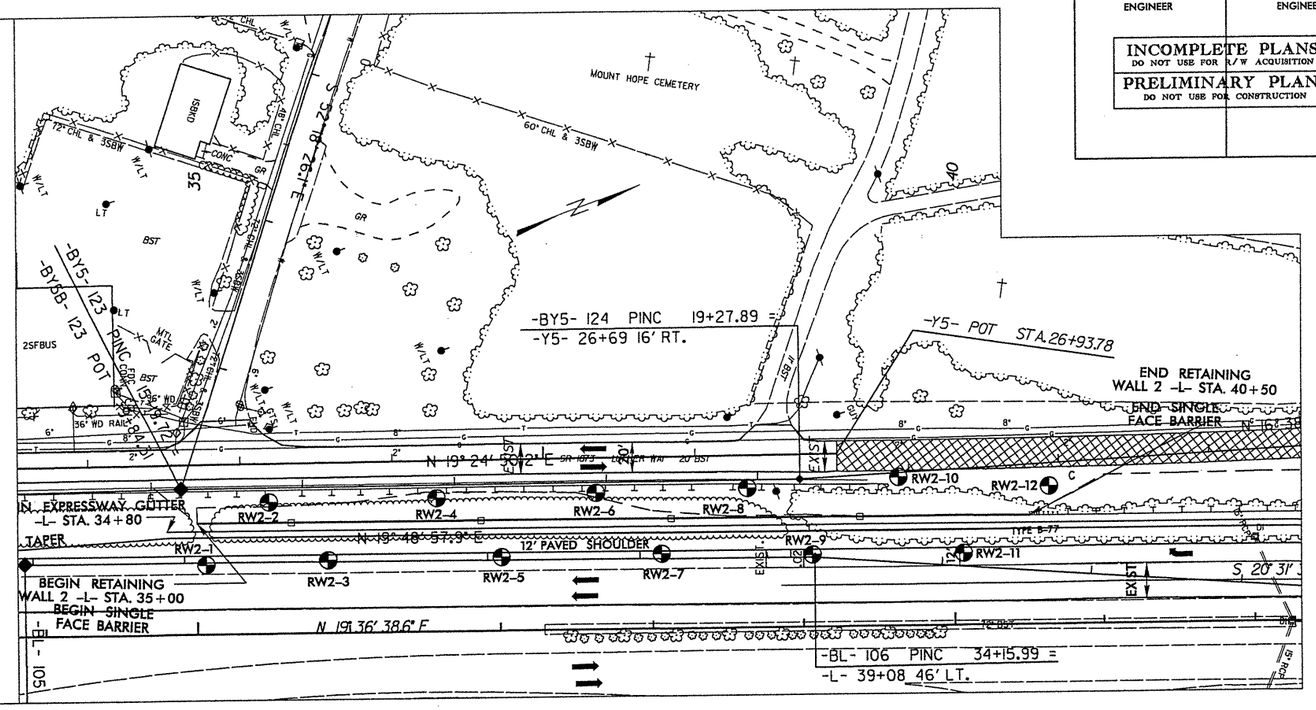
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

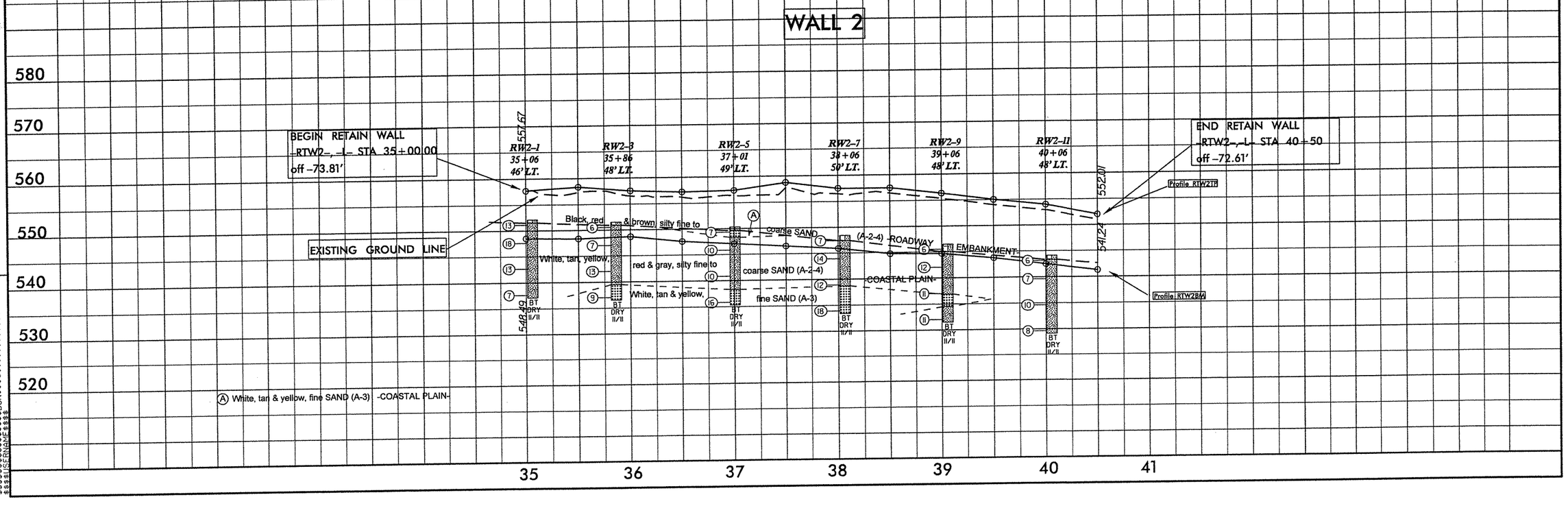
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

8/17/99

REVISIONS







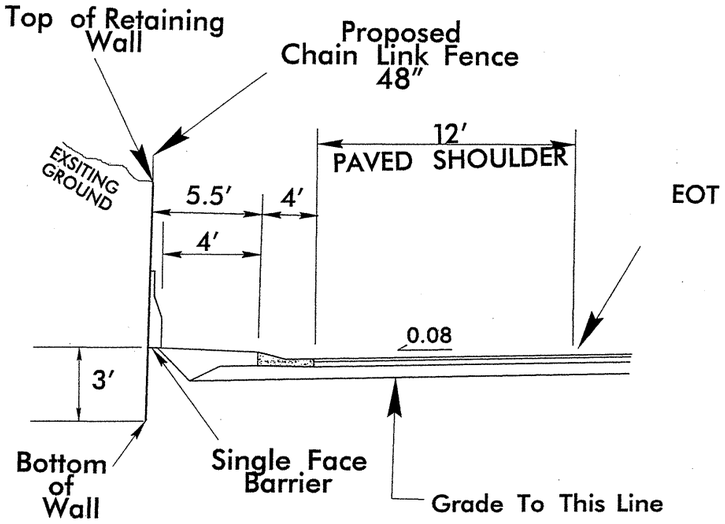
PROJECT REFERENCE NO.	SHEET NO.
U-3324	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

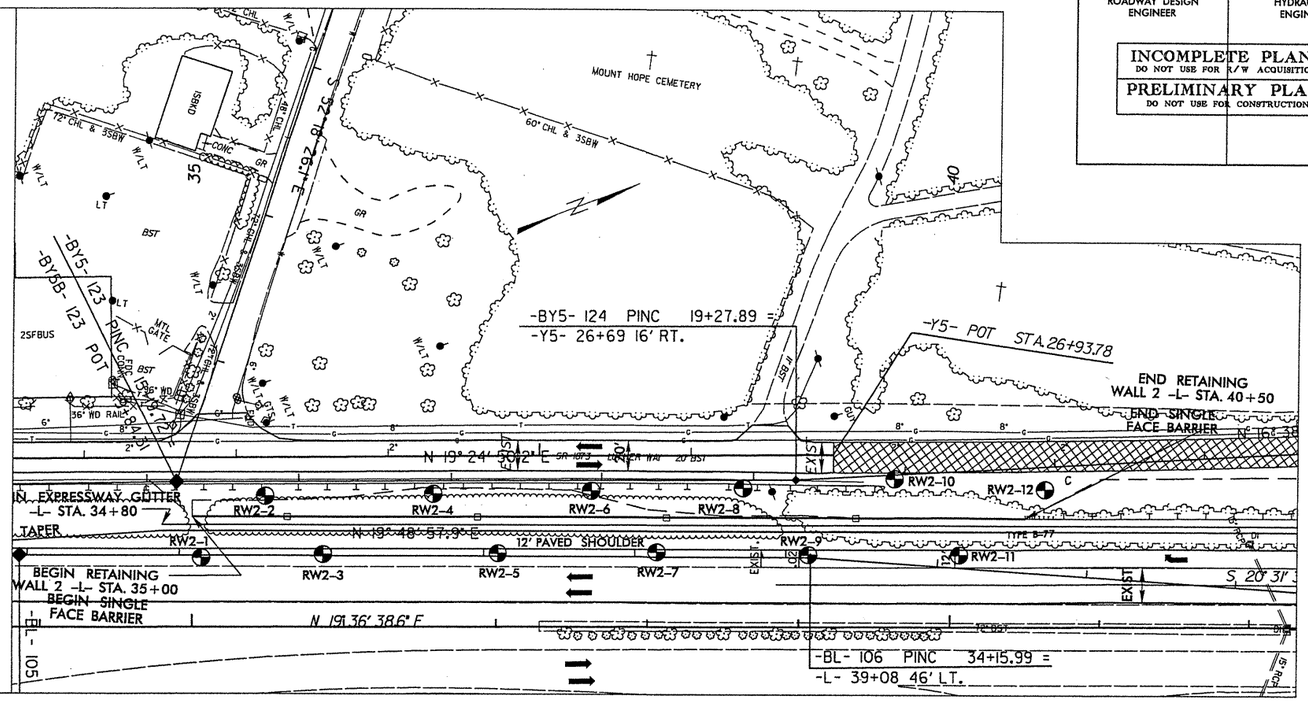
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

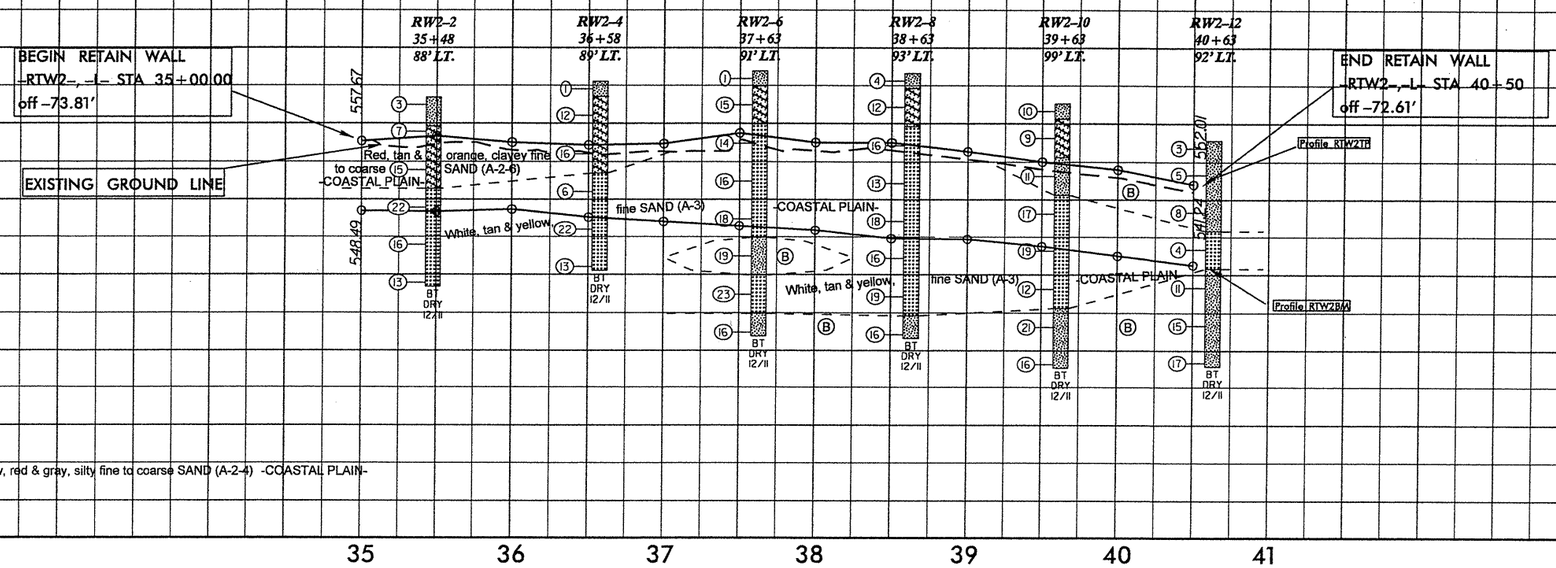
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

8/17/9

REVISIONS







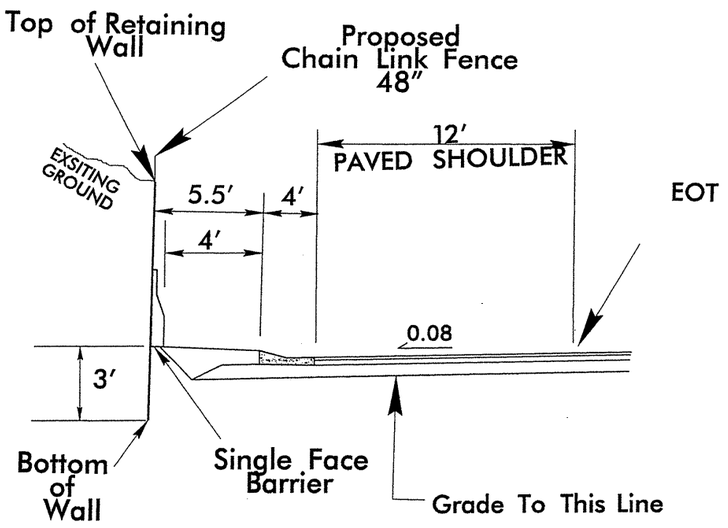
PROJECT REFERENCE NO.	SHEET NO.
U-3324	5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

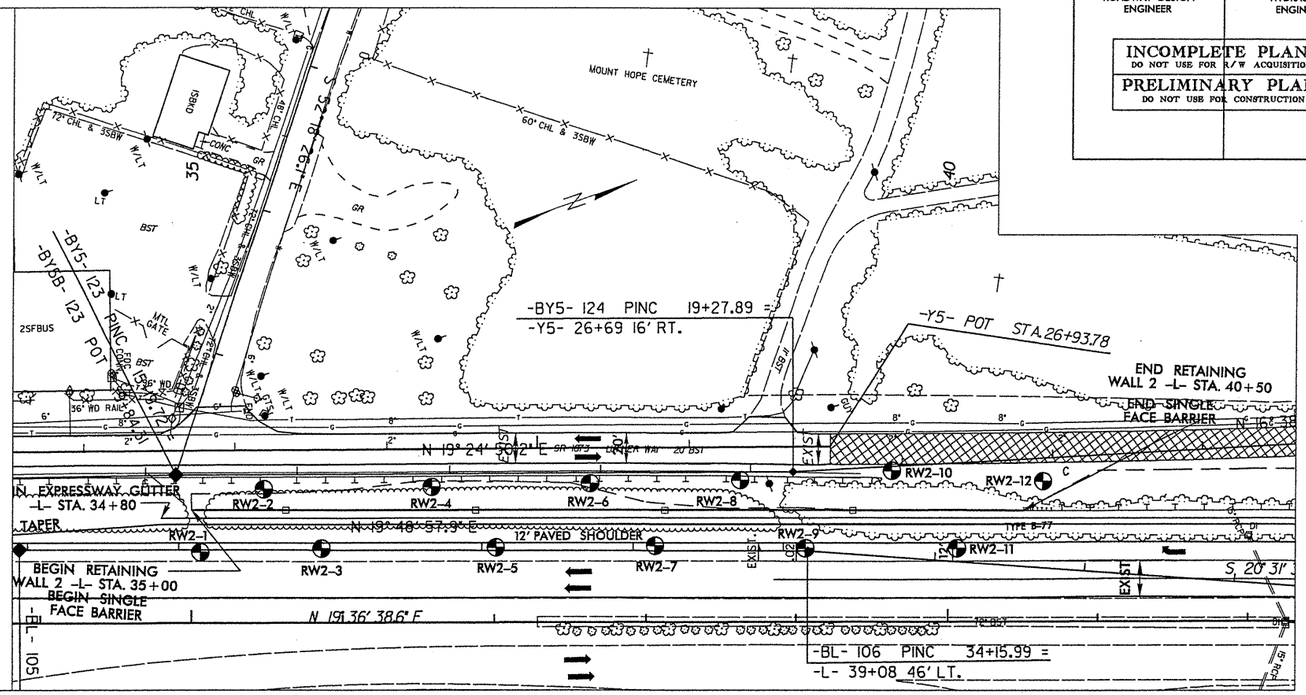
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

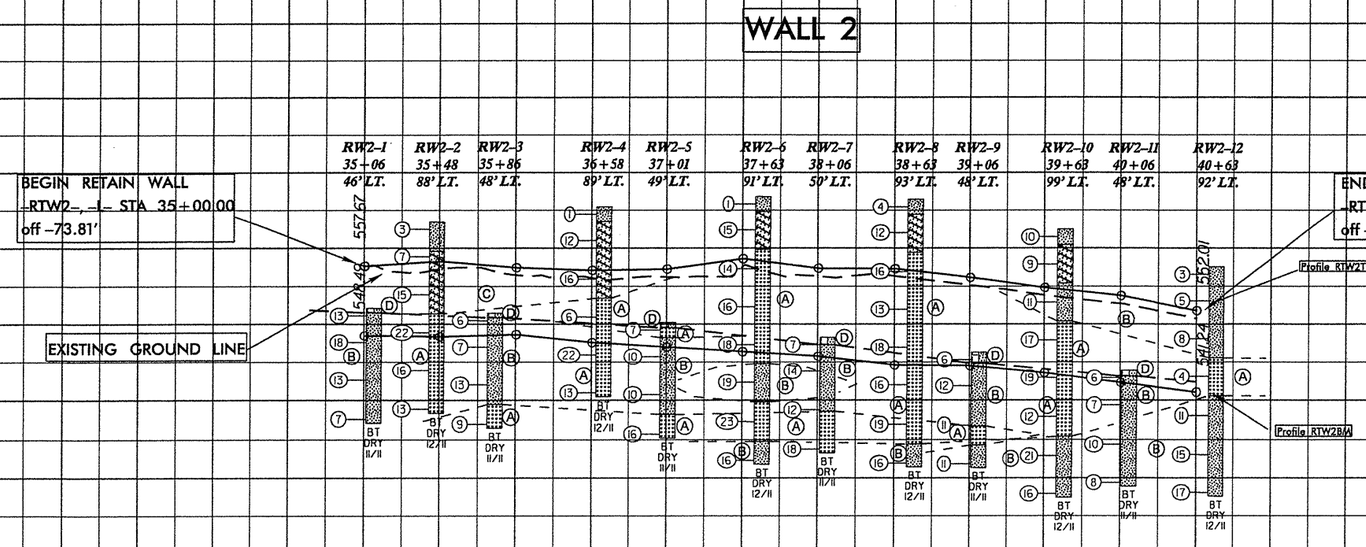
8/17/99

REVISIONS





WALL 2



Ⓐ White, tan & yellow, fine SAND (A-3) -COASTAL PLAIN-
Ⓑ White, tan, yellow, red & gray, silty fine to coarse SAND (A-2-4) -COASTAL PLAIN-
Ⓒ Red, tan & orange, clayey fine to coarse SAND (A-2-6) -COASTAL PLAIN-
Ⓓ Black, red & brown, silty fine to coarse SAND (A-2-4) -ROADWAY EMBANKMENT-

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 2				**GROUND WTR (ft)**
BORING NO. RW2-1	**STATION** 35+06	**OFFSET** 46 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 552.1 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 516,164	**EASTING** 1,878,266	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 11/30/11	**COMP. DATE** 11/30/11	**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)
555										
	552.1	0.0								552.1 0.0 GROUND SURFACE
			2	5	8	13		M		551.5 0.6 **ROADWAY EMBANKMENT** Black, silty fine SAND (A-2-4).
550										**COASTAL PLAIN** Yellow & orange to white & tan, silty fine to coarse SAND (A-2-4), with trace to some clay, some mica.
	548.6	3.5	10	9	9	18		M		
545										
	543.6	8.5	5	7	6	13		M		
540										
	538.6	13.5	2	4	3	7		M		537.1 15.0 Boring Terminated at Elevation 537.1 ft in SAND (COASTAL PLAIN)

NOTES:

1) 0.0-0.3' = Surficial Organic Soils
2) Geologist indicates strata break in split spoon at a depth of 0.6'.

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 2				**GROUND WTR (ft)**
BORING NO. RW2-2	**STATION** 35+48	**OFFSET** 88 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 563.4 ft	**TOTAL DEPTH** 25.0 ft	**NORTHING** 516,217	**EASTING** 1,878,241	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 12/01/11	**COMP. DATE** 12/01/11	**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)
565										
	563.4	0.0	WOH	1	2	3		M		563.4 0.0 GROUND SURFACE
560	559.9	3.5	2	3	4	7		M		**COASTAL PLAIN** Brown, silty fine SAND (A-2-4), with trace organics. 559.6 3.8 Brown-orange, silty clayey fine to coarse SAND (A-2-6), with trace mica.
555	554.9	8.5	6	6	9	15		M		
550	549.9	13.5	4	8	14	22		M		551.4 12.0 White & tan, fine to coarse SAND (A-3), with trace silt.
545	544.9	18.5	5	7	9	16		M		
540	539.9	23.5	5	6	7	13		M		538.4 25.0 Boring Terminated at Elevation 538.4 ft in SAND (COASTAL PLAIN)

NOTES:

1) Boring located in planted/landscaped area.
2) 0.0-0.4' = Surficial Organic Soils
3) Geologist indicates strata break in split spoon at a depth of 3.8'.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 2				**GROUND WTR (ft)**
BORING NO. RW2-3	**STATION** 35+86	**OFFSET** 48 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 551.5 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 516,240	**EASTING** 1,878,291	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 11/30/11	**COMP. DATE** 11/30/11	**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)
555										
	551.5	0.0								551.5 GROUND SURFACE 0.0
550			2	2	4	6		M		550.9 **ROADWAY EMBANKMENT** 0.6 Red-brown, silty fine SAND (A-2-4), with some clay.
	548.0	3.5	2	3	4	7		W		**COASTAL PLAIN**
545								W		Tan-brown, silty fine to coarse SAND (A-2-4), with trace to little clay, trace gravel.
	543.0	8.5	2	6	7	13		M		
540										539.5 12.0
	538.0	13.5								White, fine SAND (A-3), with trace mica.
			3	5	4	9		M		536.5 15.0
										Boring Terminated at Elevation 536.5 ft in SAND (COASTAL PLAIN)

NOTES:

1) 0.0-0.3' = Surficial Organic Soils
2) Geologist indicates strata break in split spoon at a depth of 0.6'.

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 2				**GROUND WTR (ft)**
BORING NO. RW2-4	**STATION** 36+58	**OFFSET** 89 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 565.5 ft	**TOTAL DEPTH** 25.0 ft	**NORTHING** 516,321	**EASTING** 1,878,277	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 12/01/11	**COMP. DATE** 12/01/11	**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
570										
	565.5	0.0								565.5 GROUND SURFACE 0.0
565			1	0	1	1		M		563.5 **COASTAL PLAIN** 2.0
	562.0	3.5	4	5	7	12		M		Brown, silty fine SAND (A-2-4), with trace organics. Red & tan, silty clayey fine to coarse SAND (A-2-6).
560										
	557.0	8.5	7	7	9	16		M		
555										553.5 12.0
	552.0	13.5	2	3	3	6		M		Tan-yellow to white & tan, fine SAND (A-3), with trace silt.
550										
	547.0	18.5	8	10	12	22		M		
545										
	542.0	23.5	4	6	7	13		M		540.5 25.0
										Boring Terminated at Elevation 540.5 ft in SAND (COASTAL PLAIN)

NOTES:

1) 0.0-0.2' = Surficial Organic Soils

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 2				**GROUND WTR (ft)**
BORING NO. RW2-5	**STATION** 37+01	**OFFSET** 49 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 550.3 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 516,348	**EASTING** 1,878,329	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 11/30/11	**COMP. DATE** 11/30/11	**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)
555											
550	550.3	0.0	1	3	4	7 10		M		550.3 GROUND SURFACE	0.0
										549.6 ROADWAY EMBANKMENT	0.7
	546.8	3.5								548.3 Red-tan, silty fine to coarse SAND (A-2-4).	2.0
545			3	4	6			M		COASTAL PLAIN Tan-yellow, fine SAND (A-3). White & tan, silty fine to coarse SAND (A-2-4).	
	541.8	8.5									
540			3	4	6	10		M			
	536.8	13.5								538.3	12.0
			5	8	8	16		M		White & tan, fine to coarse SAND (A-3).	
										535.3	15.0
										Boring Terminated at Elevation 535.3 ft in SAND (COASTAL PLAIN)	

NOTES:

1) 0.0-0.3' = Surficial Organic Soils
2) Geologist indicates strata break in split spoon at a depth of 0.7'.

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 2				**GROUND WTR (ft)**
BORING NO. RW2-6	**STATION** 37+63	**OFFSET** 91 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 566.9 ft	**TOTAL DEPTH** 35.0 ft	**NORTHING** 516,421	**EASTING** 1,878,310	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 12/01/11	**COMP. DATE** 12/01/11	**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)
570											
	566.9	0.0	WOH	1	0	1		M		566.9 GROUND SURFACE	0.0
565										COASTAL PLAIN	
	563.4	3.5								564.9 Brown, silty fine SAND (A-2-4), with trace clay.	2.0
			5	7	8	15		M		Red & tan, silty clayey fine to coarse SAND (A-2-6).	
560	558.4	8.5								559.9	7.0
			5	7	7	14		M		White, tan & orange, fine to coarse SAND (A-3), with trace silt.	
555	553.4	13.5									
			8	7	9	16		M			
550	548.4	18.5									
			8	8	10	18		M			
545	543.4	23.5								544.9	22.0
			7	8	11	19		M		White & orange, silty fine SAND (A-2-4), with trace clay, some mica.	
540	538.4	28.5								539.9	27.0
			7	10	13	23		M		White, fine to coarse SAND (A-3), with trace silt.	
535	533.4	33.5								534.9	32.0
			7	8	8	16		M		White, silty fine to coarse SAND (A-2-4), with trace mica.	
										531.9	35.0
										Boring Terminated at Elevation 531.9 ft in SAND (COASTAL PLAIN)	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 2				**GROUND WTR (ft)**
BORING NO. RW2-7	**STATION** 38+06	**OFFSET** 50 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 548.4 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 516,448	**EASTING** 1,878,363	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 11/30/11	**COMP. DATE** 11/30/11	**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)
550											
	548.4	0.0								548.4 GROUND SURFACE	0.0
			1	2	5	7		M		547.4 **ROADWAY EMBANKMENT** Brown, silty fine SAND (A-2-4), with trace clay & roots.	1.0
545	544.9	3.5						W		**COASTAL PLAIN** Red, tan & white, silty fine SAND (A-2-4), with trace to little clay.	
			4	7	7	14		M			
540	539.9	8.5								538.7 Tan & white, fine to coarse SAND (A-3), with trace silt.	9.7
			5	5	7	12		M			
535	534.9	13.5								533.4 Boring Terminated at Elevation 533.4 ft in SAND (COASTAL PLAIN)	15.0
			8	9	9	18		M			

NOTES:

1) 0.0-0.3' = Surficial Organic Soils
2) Geologist indicates strata breaks in split spoon at depths of 1.0' & 9.7'.

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 2				**GROUND WTR (ft)**
BORING NO. RW2-8	**STATION** 38+63	**OFFSET** 93 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 566.6 ft	**TOTAL DEPTH** 35.0 ft	**NORTHING** 516,516	**EASTING** 1,878,342	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 12/01/11	**COMP. DATE** 12/01/11	**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
570										
	566.6	0.0								566.6 GROUND SURFACE 0.0
			1	2	2	4		M		**COASTAL PLAIN**
565	563.1	3.5								564.6 Red, clayey silty fine SAND (A-2-4). 2.0
			4	4	8	12		M		Red-tan, silty clayey fine to coarse SAND (A-2-6).
560	558.1	8.5								559.6 7.0
			5	8	8	16		M		White, tan & orange, fine to coarse SAND (A-3), with trace silt.
555	553.1	13.5								
			7	7	6	13		M		
550	548.1	18.5								
			5	8	10	18		M		
545	543.1	23.5								
			3	7	9	16		M		
540	538.1	28.5								
			4	9	10	19		M		
535	533.1	33.5								534.6 White & tan-orange, silty fine SAND (A-2-4), with trace mica. 32.0
			8	8	8	16		M		531.6 Boring Terminated at Elevation 531.6 ft in SAND (COASTAL PLAIN) 35.0

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 2			**GROUND WTR (ft)**
BORING NO. RW2-9	**STATION** 39+06	**OFFSET** 48 ft LT	**ALIGNMENT** -L- — **0 HR.** Dry
COLLAR ELEV. 546.5 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 516,541	**EASTING** 1,878,399 — **24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER D. Tignor	**START DATE** 11/30/11	**COMP. DATE** 11/30/11	**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)
550											
	546.5	0.0	1	2	4	6		M		546.5 GROUND SURFACE	0.0
545										545.0 **ROADWAY EMBANKMENT** Brown, silty fine to coarse SAND (A-2-4).	1.5
	543.0	3.5	4	6	6	12		M		**COASTAL PLAIN** Tan & white, silty fine to coarse SAND (A-2-4), with trace clayey silt (thin layers).	
540											
	538.0	8.5	4	6	5	11		M		536.9 White, fine SAND (A-3), with trace silt.	9.6
535										534.5 Tan-orange, silty fine SAND (A-2-4).	12.0
	533.0	13.5	3	5	6	11		M		531.5 Boring Terminated at Elevation 531.5 ft in SAND (COASTAL PLAIN)	15.0

NOTES:

1) 0.0-0.3' = Surficial Organic Soils
2) Geologist indicates strata break in split spoon at a depth of 9.6'.

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 2			**GROUND WTR (ft)**
BORING NO. RW2-10	**STATION** 39+63	**OFFSET** 99 ft LT	**ALIGNMENT** -L- — **0 HR.** Dry
COLLAR ELEV. 562.6 ft	**TOTAL DEPTH** 35.0 ft	**NORTHING** 516,612	**EASTING** 1,878,370 — **24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER D. Tignor	**START DATE** 12/01/11	**COMP. DATE** 12/01/11	**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)
565											
	562.6	0.0	1	4	6	10		M		562.6 GROUND SURFACE	0.0
560										**COASTAL PLAIN**	
	559.1	3.5	4	4	5	9		M		560.6 Brown, silty fine SAND (A-2-4).	2.0
555										Red, silty clayey fine to coarse SAND (A-2-6).	
	554.1	8.5	4	5	6	11		M		555.6 Orange-tan, silty fine SAND (A-2-4).	7.0
550											
	549.1	13.5	6	8	9	17		M		550.6 White, tan & brown, fine to coarse SAND (A-3), with trace silt.	12.0
545											
	544.1	18.5	7	8	11	19		M			
540											
	539.1	23.5	5	5	7	12		M			
535										535.6 White & tan, silty fine SAND (A-2-4), with trace silt (thin layers).	27.0
	534.1	28.5	6	10	11	21		M			
530											
	529.1	33.5	4	7	9	16		M		527.6 Boring Terminated at Elevation 527.6 ft in SAND (COASTAL PLAIN)	35.0

NOTES:

1) 0.0-0.2' = Surficial Organic Soils

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 2			**GROUND WTR (ft)**
BORING NO. RW2-11	**STATION** 40+06	**OFFSET** 48 ft LT	**ALIGNMENT** -L- — **0 HR.** Dry
COLLAR ELEV. 544.1 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 516,635	**EASTING** 1,878,432 — **24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER D. Tignor	**START DATE** 11/30/11	**COMP. DATE** 11/30/11	**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))
545										
	544.1	0.0	1	2	4	6		W		544.1 GROUND SURFACE 0.0
	543.3	0.8								**ROADWAY EMBANKMENT** 0.8
540	540.6	3.5	3	4	3	7		M		Brown, silty fine to coarse SAND (A-2-4). **COASTAL PLAIN** Gray, tan & brown, silty fine to coarse SAND (A-2-4), with trace gravel & mica.
535	535.6	8.5	3	5	5	10		M		
530	530.6	13.5	3	4	4	8		M		529.1 15.0 Boring Terminated at Elevation 529.1 ft in SAND (COASTAL PLAIN)

NOTES:

1) 0.0-0.3' = Surficial Organic Soils
2) Geologist indicates strata break in split spoon at a depth of 0.8'.

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 2			**GROUND WTR (ft)**
BORING NO. RW2-12	**STATION** 40+63	**OFFSET** 92 ft LT	**ALIGNMENT** -L- — **0 HR.** Dry
COLLAR ELEV. 557.8 ft	**TOTAL DEPTH** 30.0 ft	**NORTHING** 516,704	**EASTING** 1,878,410 — **24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER D. Tignor	**START DATE** 12/02/11	**COMP. DATE** 12/02/11	**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))
560										
	557.8	0.0	1	2	1	3		M		557.8 GROUND SURFACE 0.0
555	554.3	3.5	3	2	3	5		M		**COASTAL PLAIN** Red, tan & orange, silty fine to coarse SAND (A-2-4), with trace to little clay, tree roots from 0.0'-0.3'.
550	549.3	8.5	4	4	4	8		M		
545	544.3	13.5	3	2	2	4		M		545.8 12.0 Yellow-tan, fine to coarse SAND (A-3), with trace silt.
540	539.3	18.5	3	6	5	11		M		540.8 17.0 Red, white & tan, silty fine to coarse SAND (A-2-4), with trace to little clay, trace silt (thin gray layers).
535	534.3	23.5	4	7	8	15		M		
530	529.3	28.5	4	7	10	17		M		527.8 30.0 Boring Terminated at Elevation 527.8 ft in SAND (COASTAL PLAIN)

NOTES:

1) Geologist indicates strata break in split spoon at a depth of 24.5'.

Photo No. 1: Wall 2 – along toe of slope looking northeast

Photo No. 2: Wall 2 – along top of slope looking northeast

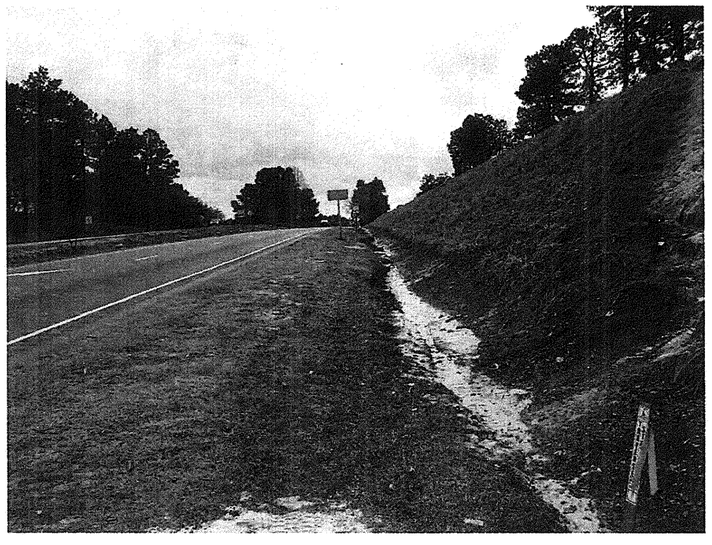


Photo No. 3: Wall 2 – along toe of slope looking southwest

Photo No. 4: Wall 2 – along top of slope looking southwest

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-3324	1	5

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34923.1.1 (U-3324)* F.A. PROJ. *STPNHF-1(10)*

COUNTY *Moore*

PROJECT DESCRIPTION *Pinehurst – Southern Pines – Intersections of SR 1309 (Morganton Road) and US 1 (Sandhills Blvd.)*

SITE DESCRIPTION *Retaining Wall 1 on SR 2054 (Murray Hill Rd.) -Y1- Sta. 11+50.00 to 12+40.28*

CONTENTS

CAUTION NOTICE

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

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PERSONNEL

D. Racey

D. Tignor

M. Renza

INVESTIGATED BY *F&R, Inc.*

CHECKED BY *P. Alton, P.E.*

SUBMITTED BY *F&R, Inc.*

DATE *1/12*

NORTH CAROLINA PROFESSIONAL SEAL 033758 3/23/12 ENGINEER PATRICK ALTON

Patrick Alton

PROJECT: 34923.1.1

ID: U-3324

DRAWN BY: *D. Racey*

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

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

PROJECT REFERENCE NO.	SHEET NO.
U-3324	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 TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/026 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT &NT, VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
C.P. - COASTAL PLAIN
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
R.E. - ROADWAY EMBANKMENT
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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-55
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

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

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

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SL.)	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 (SL.)	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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: TBM: BYI-111: METAL DISK AT -Y1- STA. 11+90 16' RT.
N: 514,425.7570 E: 1,877,237.4630
ELEVATION: 518.50 FT.

NOTES:

REVISED 09/23/09

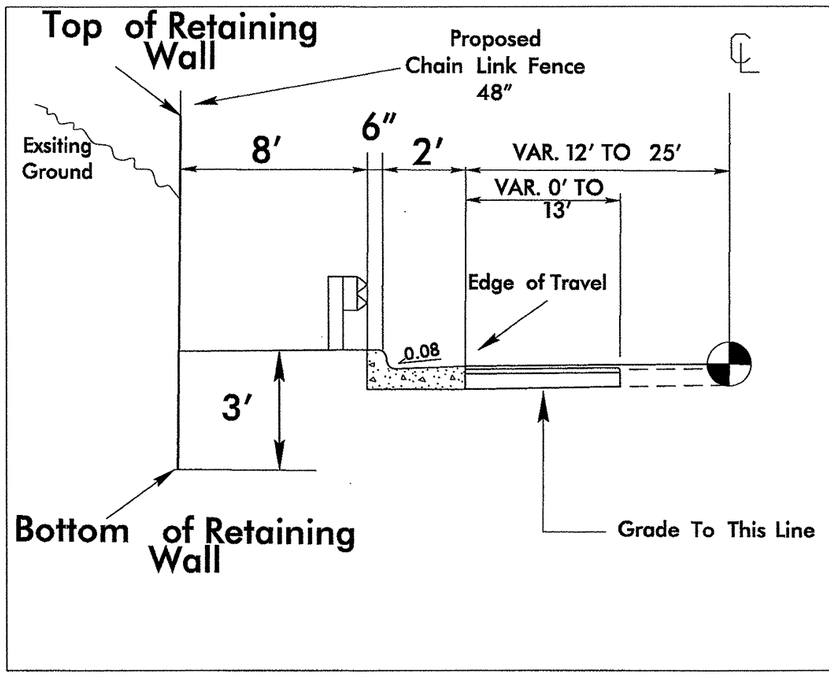
8/17/99

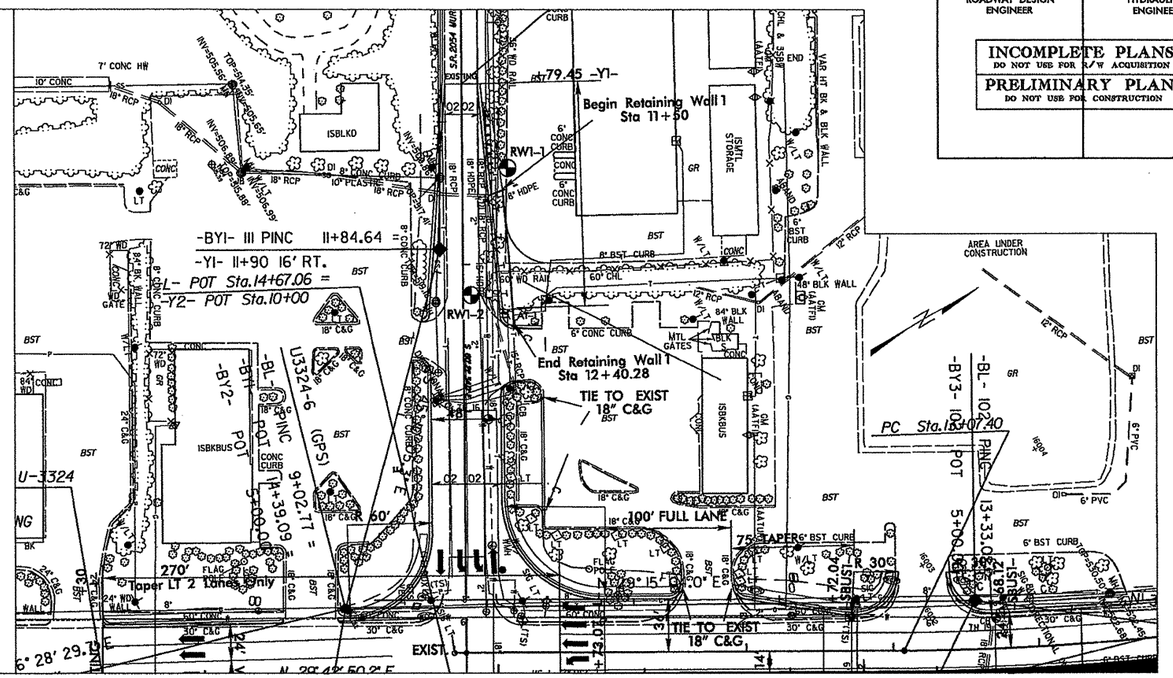
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
U-3324	3
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

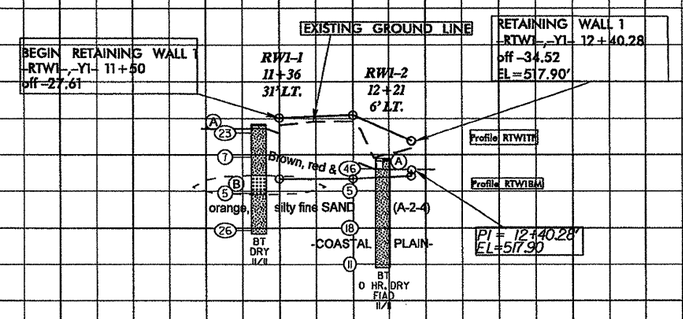
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION





WALL 1



Ⓐ Asphalt & gray, brown & red silty fine SAND (A-2-4) -ROADWAY EMBANKMENT-
Ⓑ Tan, fine SAND (A-3) -COASTAL PLAIN-

11 12 13

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 1				**GROUND WTR (ft)**
BORING NO. RW1-1	**STATION** 11+36	**OFFSET** 31 ft LT	**ALIGNMENT** -Y1-	**0 HR.** Dry
COLLAR ELEV. 524.2 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 514,493	**EASTING** 1,877,214	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 11/30/11	**COMP. DATE** 11/30/11	**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)
525										
	524.0	0.2	8	9	14			M		524.2 GROUND SURFACE 0.0 523.6 ASPHALT 0.6
520	520.7	3.5	3	4	3			M		**ROADWAY EMBANKMENT** Red, clayey silty fine SAND (A-2-4).
	515.7	8.5	2	1	4			D M		**COASTAL PLAIN** Dark brown, silty fine to coarse SAND (A-2-4), with trace clay. 7.0 Tan, fine SAND (A-3), with trace silt. 514.5 9.7 Brown to red-tan, silty fine SAND (A-2-4), with little clay, trace gravel.
510	510.7	13.5	11	13	13			M		509.2 15.0 Boring Terminated at Elevation 509.2 ft in SAND (COASTAL PLAIN)

NOTES:

1) Geologist indicates strata breaks in split spoon at depths of 0.6' & 9.7'.

WBS 34923.1.1	**TIP** U-3324	**COUNTY** MOORE	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Intersections of SR 1309 (Morganton Rd.) and US 1 (Sandhills Blvd.) - Retaining Wall 1				**GROUND WTR (ft)**
BORING NO. RW1-2	**STATION** 12+21	**OFFSET** 6 ft LT	**ALIGNMENT** -Y1-	**0 HR.** Dry
COLLAR ELEV. 519.5 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 514,429	**EASTING** 1,877,275	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 75% 2/15/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER D. Tignor	**START DATE** 11/30/11	**COMP. DATE** 11/30/11	**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
520										
	519.1	0.4	13	22	24			M		519.5 GROUND SURFACE 0.0 519.1 ASPHALT 0.4
515	516.0	3.5	3	3	2			M		518.0 **ROADWAY EMBANKMENT** 1.5 Gray-brown, silty fine SAND (A-2-4).
	511.0	8.5	6	10	8			M		**COASTAL PLAIN** Tan to orange-tan, silty fine to coarse SAND (A-2-4), with trace to little clay.
505	506.0	13.5	5	6	5			M		504.5 15.0 Boring Terminated at Elevation 504.5 ft in SAND (COASTAL PLAIN)

NOTES:

1) 24 hr. water level not measured due to boring location in roadway.

Photo No. 1: Wall 1 – along wall looking southeast

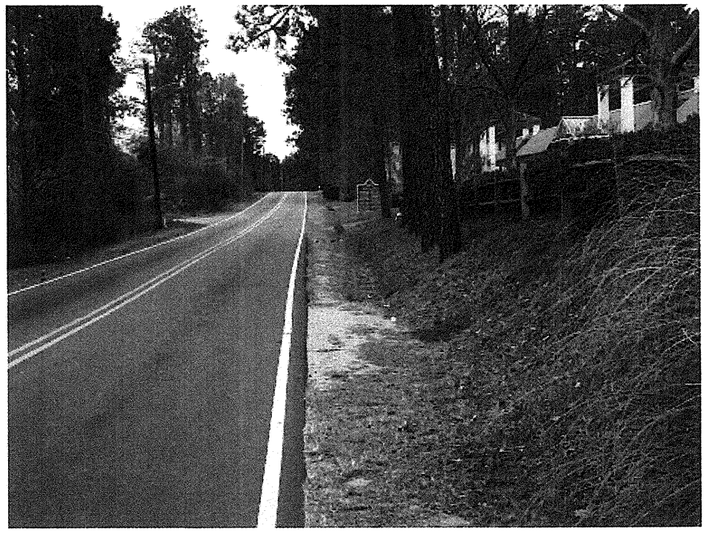


Photo No. 2: Wall 1 – along toe of slope looking northwest

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34923.1.1 (U-3324)	1	15

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34923.1.1 (U-3324)* F.A. PROJ. _____

COUNTY *MOORE*

PROJECT DESCRIPTION *PINEHURST-SOUTHERN PINES - INTERSECTION OF SR 1309 (MORGANTON RD.) AND US 1 (SANDHILLS BOULEVARD)*

SITE DESCRIPTION *BRIDGE NO 41 ON -Y6- SR 1309 (MORGANTON RD.) OVER -L- US 1 (SANDHILLS BLVD.)*

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SUBMITTED BY *C.B. LITTLE*

DATE *MAY 2010*

NORTH CAROLINA LICENSED SEAL 1104 GEOLOGIST CLINTON B. LITTLE

5-19-10

DRAWN BY: *J.K. McCLURE*

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PROJECT: 34923.1.1

ID: U-3324

PROJECT REFERENCE NO.	SHEET NO.
34923.1.1 (U-3324)	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 TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

	BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)
GRAIN SIZE	MM 305	75	2.0	0.25	0.05	0.005	
	IN. 12	3					

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT / SPT CMT / VST FMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- SPT N-VALUE
- REF — SPT REFUSAL
- TEST W/ CORE BORING

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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [X] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [X] TRICONE 2 15/16" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: U3324-BY6-I29
-BY6-I29 PINC I5+53.85
-L- STA. 45+28.49 ELEVATION: 560.06 FT.

NOTES:
STRATIGRAPHY ON PROFILES IS FROM BORING TO BORING.
STRATIGRAPHY ON CROSS-SECTIONS IS FROM BORING TO BORING.

REVISED 02/23/06

PROJECT REFERENCE NO.	SHEET
34923.1.1 (U-3324)	3

SITE PLAN

0 50 100
FEET

SKEW = 82°11'24"

COASTAL PLAIN
ROADWAY EMBANKMENT (FILL)
PC Sta. 11+91.51
CS Sta. 15+42.20
SC Sta. 17+42.20
-BL- 107 PINC 41+98.01
-L- STA 46+87.85
-BL- 200 PINC 40+43.84 =
-BY6- 200 PINC 18+82.80
(POINT NOT SET)
-L- STA 45+33.78
-L- POT STA .45+24.74 =
-Y6- POT STA .21+37.80
-Y6LPA-
-L-
N 28° 15' 43.0" E
S 80° 12' 32.2" E
S 56° 32' 01.1" E
S 61° 44' 17.2" E
N 23° 44' 25.5" E
97° 48' 36.16"
Y6-1980L
Y6-2235L
EB1-A
EB2-A
B1-A
EB1-B
EB2-B
B1-B
NOTE: TOWN OF SOUTHERN PINES 12" WATER LINE ATTACHED TO UNDERSIDE OF BRIDGE
SR 1309 MORGANTON RD
BEGIN PROPOSED RETAINING WALL -Y6- STA.24+81.00
U3324-8 (GPS)
-BY6- PINC 22+13.22
-L- STA 44+55.50
-BY6- PINC 15+53.85
-L- STA 45+28.49
-BY5- 130 POT 25+93.40 =
-BY6- 130 PINC 17+46.82
-L- STA 45+63.49
-Y6- POT STA.33+22.07
-Y6- POT STA.19+82.15
-Y6LPA- POT STA.10+00.00 =
-Y6- POT STA.17+61.82
PT Sta. 19+11.51
-L- PC STA.44+40.63
FLYNN ST
END

PROJECT REFERENCE NO.	SHEET
34923.1.1 (U-3324)	4
Profile -Y6- Showing Left Side Borings	

0 100 200 FEET

PI = 18+30.00
EL = 558.54'

PI = 20+00.00
EL = 559.30'

PI = 21+77.00
EL = 555.76'

PI = 23+00.00
EL = 546.67'

VC = 162'

559.63

526.73

(-)0.8415%

(+)0.4476%

(-)2.0000%

(-)2.0000%

(-)7.3862%

(-)3.5495%

ROADWAY EMBANKMENT (FILL)

COASTAL PLAIN

Y6-1980L
19+80 -Y6-
50.00 LT.

EB1-A
20+43 -Y6-
60.00 LT.

EB2-A
22+10 -Y6-
52.00 LT.

Y6-2236L
22+35 -Y6-
60.00 LT.

B1-A
21+33 -Y6-
29.00 LT.

TAN STIFF TO V. STIFF MOIST HIGH PLASTIC SANDY CLAY (A-7-5) (PI=26)

TAN MED. DENSE MOIST CLAYEY SAND (A-2-4)

TAN MED. DENSE MOIST SAND (A-1-B)

WHITE & TAN LOOSE TO MED. DENSE MOIST SLI. MICA. SAND & CLAYEY SAND (A-2-4) W/IRON RED-PURPLE CLAY SEAM @ 23.8

WHITE & TAN LOOSE WET LOW PLASTIC CLAYEY SAND (A-2-6) W/PURPLE-GRAY CLAY SEAM

LT. GRAY TO TAN & LT. BRN HARD TO V. STIFF MOIST MED. PLASTIC SILTY CLAY & SANDY SILTY CLAY (A-7-6) (SLI. MICA. @ 43.8)

BT NM (8/12/09)

WHITE-TAN & PURPLE DENSE TO MED. DENSE WET SAND (A-1-B)

PURPLE MED. DENSE MOIST MED. PLASTIC CLAYEY SAND (A-2-7)

GRAY & PURPLE HARD MOIST SLI. MICA. HIGH PLASTIC SANDY SILTY CLAY & SANDY CLAY (A-7-6)

GRAY & PURPLE HARD MOIST SLI. MICA. MED. PLASTIC SILTY SANDY CLAY (A-6)

BT NM (3/2/10)

LT. GRAY & PURPLE MED. DENSE TO DENSE MOIST MED. TO HIGH PLASTIC CLAYEY SAND (A-2-6, A-2-7)

BT NM (2/17/10)

GRAY-BRN & TAN LOOSE MOIST SAND (A-1-B)

ORANGE-TAN MED. DENSE MOIST MED. PLASTIC CLAYEY SAND (A-2-6)

ORANGE-TAN LOOSE & MED. DENSE MOIST CLAYEY SAND (A-2-4) W/THIN CLAY SEAMS

ORANGE-TAN MED. DENSE SAT. SAND (A-1-B)

BT 08/'09

LT. PURPLE HARD MOIST HIGH PLASTIC SANDY SILTY CLAY (A-7-6)

LT. PURPLE TO LT. GRAY DENSE TO MED. DENSE MOIST SLI. MICA. MED. PLASTIC CLAYEY SAND (A-2-7, A-2-6)

LT. PURPLE TO LT. GRAY HARD MOIST LOW TO MED. PLASTIC SANDY CLAY (A-6)

BT NM (2/26/10)

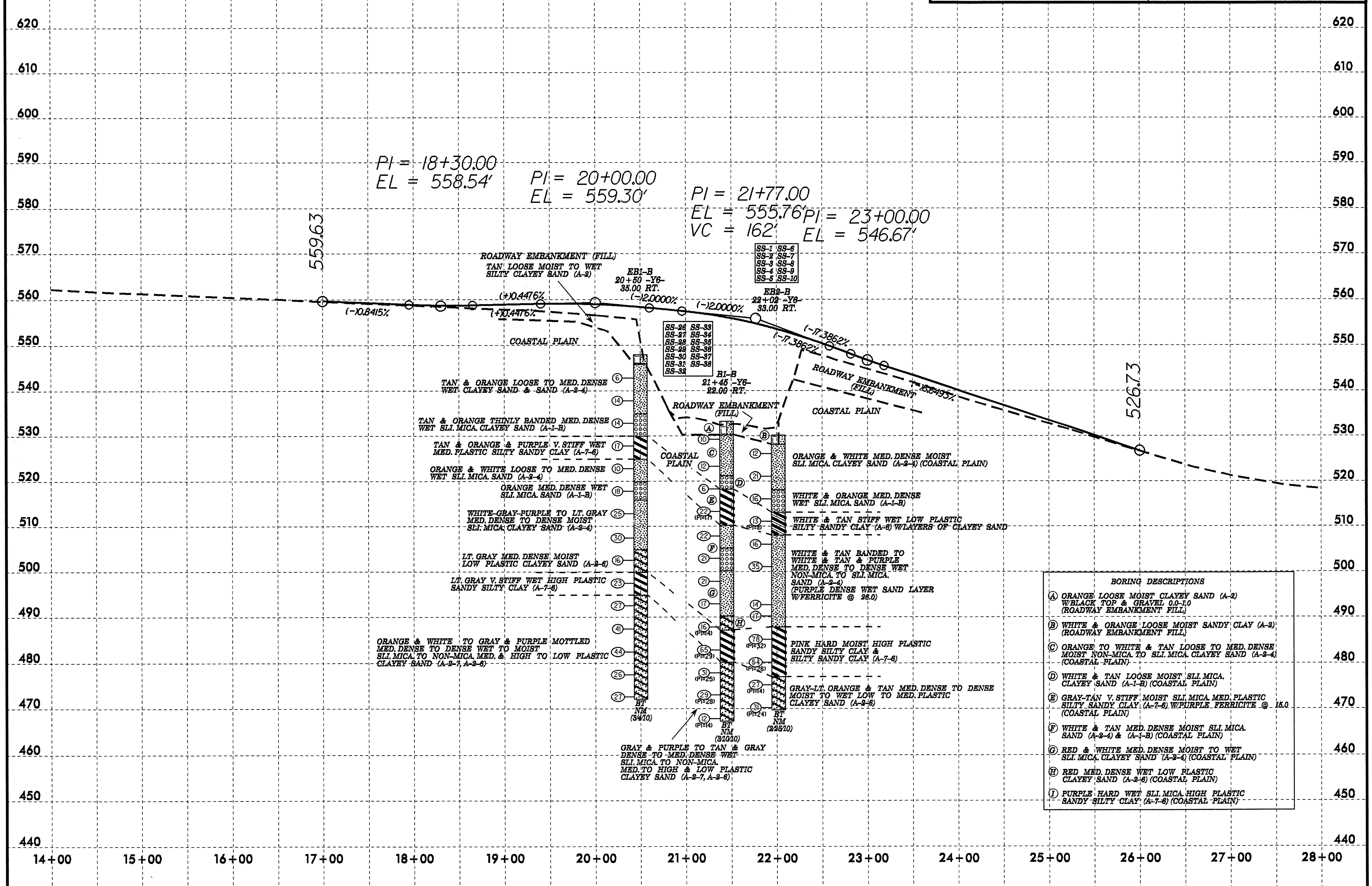
BORING DESCRIPTIONS

- (A) TAN & WHITE LOOSE TO MED. DENSE MOIST TO WET SAND & CLAYEY SAND (A-2) (COASTAL PLAIN)
- (B) GRAY-TAN V. STIFF MOIST MICA MED. PLASTIC SILTY SANDY CLAY (A-6) (COASTAL PLAIN)
- (C) GRAY-TAN V. STIFF MOIST MICA MED. PLASTIC SANDY SILTY CLAY (A-7-6) (COASTAL PLAIN)
- (E) ORANGE LOOSE MOIST SILTY CLAYEY SAND (A-2) W/ASPHALT & GRAVEL 0.0-1.0 (ROADWAY EMBANKMENT FILL)
- (F) ORANGE & WHITE MED. DENSE MOIST MED. PLASTIC CLAYEY SAND (A-2-6) (COASTAL PLAIN)
- (G) ORANGE & WHITE BANDED MED. DENSE MOIST CLAYEY SAND (A-2-4) (COASTAL PLAIN)
- (H) WHITE MED. DENSE MOIST SAND (A-1-B) (COASTAL PLAIN)
- (I) PINK TO LT. PURPLE HARD MOIST MED. PLASTIC SANDY SILTY CLAY (A-7-6) & SILTY SANDY CLAY (A-6) (COASTAL PLAIN)
- (J) WHITE-TAN MED. DENSE WET SLI. MICA. SAND (A-1-B) (COASTAL PLAIN)
- (K) WHITE-TAN MED. DENSE MOIST SLI. MICA. CLAYEY SAND (A-2-4) (COASTAL PLAIN)

630 620 610 600 590 580 570 560 550 540 530 520 510 500 490 480 470 460 450 440

14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00

PROJECT REFERENCE NO.	SHEET
34923.1.1 (U-3324)	5
Profile -Y6- Showing Right Side Borings	



PROJECT REFERENCE NO.	SHEET
34923.1.1 (U-3324)	6

Section Thru EndBent One
STA. 20+47.80 -Y6-
Skew = 82°11'24"

0 10 20
FEET

SS-12 SS-17
SS-13 SS-18
SS-14 SS-19
SS-15 SS-20
SS-16

Y6-1980L
19+80 -Y6-
50.00 LT.

SS-19 SS-23
SS-20 SS-24
SS-21 SS-25
SS-22

EB1-A
20+43 -Y6-
60.00 LT.

BRIDGE DECK

GROUND SURFACE

EB1-B
20+50 -Y6-
35.00 RT.

COASTAL PLAIN
TAN STIFF TO V. STIFF MOIST HIGH PLASTIC SANDY CLAY (A-7-5)
(23) (PI=26)

ROADWAY EMBANKMENT (FILL)

TAN LOOSE MOIST TO WET SILTY CLAYEY SAND (A-2)

(16) TAN MED. DENSE MOIST CLAYEY SAND (A-2-4)

COASTAL PLAIN

(13) TAN MED. DENSE MOIST SAND (A-1-B)

Ⓐ (9) WHITE & TAN LOOSE TO MED. DENSE MOIST SLI. MICA. SAND & CLAYEY SAND (A-2-4) W/IRON RED-PURPLE CLAY SEAM @ 23.8

(10)

(9) (PI=11) WHITE & TAN LOOSE WET LOW PLASTIC CLAYEY SAND (A-2-6) W/PURPLE-GRAY CLAY SEAM

(31) (PI=23)

(26) (PI=24) LT. GRAY TO TAN & LT. BRN HARD TO V. STIFF MOIST MED. PLASTIC SILTY CLAY & SANDY SILTY CLAY (A-7-6) (SLI. MICA. @ 43.8)

Ⓑ (26) (PI=16)

(15) (PI=9) BT NM (8/12/09)

Ⓒ (24) (PI=20)

(35) WHITE-TAN & PURPLE DENSE TO MED. DENSE WET SAND (A-1-B)

(29)

(18) (PI=20) PURPLE MED. DENSE MOIST MED. PLASTIC CLAYEY SAND (A-2-7)

(55) (PI=28) GRAY & PURPLE HARD MOIST SLI. MICA. HIGH PLASTIC SANDY SILTY CLAY & SANDY CLAY (A-7-6)

(37) (PI=26)

(35) (PI=20) GRAY & PURPLE HARD MOIST SLI. MICA. MED. PLASTIC SILTY SANDY CLAY (A-6)

BT NM (3/2/10)

(6) TAN & ORANGE LOOSE TO MED. DENSE WET CLAYEY SAND & SAND (A-2-4)

(14)

(14) TAN & ORANGE THINLY BANDED MED. DENSE WET SLI. MICA. CLAYEY SAND (A-1-B)

(17) TAN & ORANGE & PURPLE V. STIFF WET MED. PLASTIC SILTY SANDY CLAY (A-7-6)

(10) ORANGE & WHITE LOOSE TO MED. DENSE WET SLI. MICA. SAND (A-2-4)

(18) ORANGE MED. DENSE WET SLI. MICA. SAND (A-1-B)

(25) WHITE-GRAY-PURPLE TO LT. GRAY MED. DENSE TO DENSE MOIST SLI. MICA. CLAYEY SAND (A-2-4)

(30)

(16) LT. GRAY MED. DENSE MOIST LOW PLASTIC CLAYEY SAND (A-2-6)

(23) LT. GRAY V. STIFF WET HIGH PLASTIC SANDY SILTY CLAY (A-7-6)

(27)

(41) ORANGE & WHITE TO GRAY & PURPLE MOTTLED MED. DENSE TO DENSE WET TO MOIST SLI. MICA. TO NON-MICA. MED. & HIGH TO LOW PLASTIC CLAYEY SAND (A-2-7, A-2-6)

(44)

(26)

(27) BT NM (3/4/10)

BORING DESCRIPTIONS (COASTAL PLAIN)

Ⓐ TAN & WHITE LOOSE TO MED. DENSE MOIST TO WET SAND & CLAYEY SAND (A-2)

Ⓑ GRAY-TAN V. STIFF MOIST MICA. MED. PLASTIC SILTY SANDY CLAY (A-6)

Ⓒ GRAY-TAN V. STIFF MOIST MICA. MED. PLASTIC SANDY SILTY CLAY (A-7-6)

560 550 540 530 520 510 500 490 480 470

60 50 40 30 20 10 0 10 20 30 40 50 60

PROJECT REFERENCE NO.	SHEET
34923.1.1 (U-3324)	7
Section Thru Bent One STA. 21+37.80 -Y6- Skew = 82°11'24"	

0 10 20
FEET

BRIDGE DECK

SS-39
SS-40
SS-41
SS-42
SS-43
SS-44
SS-45
SS-46

B1-A
21+33 -Y6-
29.00 LT.

SS-26 SS-33
SS-27 SS-34
SS-28 SS-35
SS-29 SS-36
SS-30 SS-37
SS-31 SS-38
SS-32

B1-B
21+45 -Y6-
22.00 RT.

ROADWAY EMBANKMENT (FILL)
ORANGE LOOSE MOIST SILTY CLAYEY SAND (A-2)
W/ASPHALT & GRAVEL 0.0-1.0

GROUND SURFACE

ROADWAY EMBANKMENT (FILL)

ORANGE LOOSE MOIST CLAYEY SAND (A-2)
W/ASPHALT & GRAVEL 0.0-1.0

COASTAL PLAIN

10 (PI=17) ORANGE & WHITE MED. DENSE MOIST MED. PLASTIC CLAYEY SAND (A-2-6)

18

15

17 ORANGE & WHITE BANDED MED. DENSE MOIST CLAYEY SAND (A-2-4)

12

14

15

18 WHITE MED. DENSE MOIST SAND (A-1-B)

70 (PI=24) PINK TO LT. PURPLE HARD MOIST MED. PLASTIC SANDY SILTY CLAY (A-7-6)

67 (PI=16) LT. PURPLE HARD MOIST MED. PLASTIC SILTY SANDY CLAY (A-6)

20 (PI=16)

38 (PI=36) LT. GRAY & PURPLE MED. DENSE TO DENSE MOIST MED. TO HIGH PLASTIC CLAYEY SAND (A-2-6, A-2-7)

BT
NM
(2/11/10)

10 ORANGE TO WHITE & TAN LOOSE TO MED. DENSE MOIST NON-MICA. TO SLI. MICA. CLAYEY SAND (A-2-4)

12

WHITE & TAN LOOSE MOIST SLI. MICA. CLAYEY SAND (A-1-B)

6

22 (PI=17) GRAY-TAN V. STIFF MOIST SLI. MICA. MED. PLASTIC SILTY SANDY CLAY (A-7-6) W/PURPLE FERRICITE @ 15.0

22 WHITE & TAN MED. DENSE MOIST SLI. MICA. SAND (A-2-4)

21 WHITE & TAN MED. DENSE MOIST SLI. MICA. SAND (A-1-B)

21 RED & WHITE MED. DENSE MOIST TO WET SLI. MICA. CLAYEY SAND (A-2-4)

17

16 (PI=14) RED MED. DENSE WET LOW PLASTIC CLAYEY SAND (A-2-6)

65 (PI=29) PURPLE HARD WET SLI. MICA. HIGH PLASTIC SANDY SILTY CLAY (A-7-6)

31 (PI=25)

29 (PI=28) GRAY & PURPLE TO TAN & GRAY DENSE TO MED. DENSE WET SLI. MICA. TO NON-MICA. MED. TO HIGH & LOW PLASTIC CLAYEY SAND (A-2-7, A-2-6)

12 (PI=14)

BT
NM
(3/10/10)

550 540 530 520 510 500 490 480 470 460

60 50 40 30 20 10 0 10 20 30 40 50 60

PROJECT REFERENCE NO.	SHEET
34923.1.1 (U-3324)	8

Section Thru End Bent Two
STA. 22+15.30 -Y6-
Skew = 82°11'24"

0 10 20
FEET

SS-107 SS-112
SS-108 SS-113
SS-109 SS-114
SS-110 SS-115
SS-111

Y6-2235L
22+35 -Y6-
60.00 LT.

SS-11 SS-15
SS-12 SS-16
SS-13 SS-17
SS-14 SS-18

EB2-A
22+10 -Y6-
52.00 LT.

BRIDGE DECK

GROUND SURFACE

ROADWAY EMBANKMENT (FILL)

COASTAL PLAIN

EB2-B
22+02 -Y6-
33.00 RT.

SS-1 SS-6
SS-2 SS-7
SS-3 SS-8
SS-4 SS-9
SS-5 SS-10

540
530
520
510
500
490
480
470
460

GRAY-BRN & TAN LOOSE MOIST SAND (A-1-B) (7)

ORANGE-TAN MED. DENSE MOIST MED. PLASTIC CLAYEY SAND (A-2-6) (22) (PI=17)

(18) (PI=19)

(13)

ORANGE-TAN LOOSE & MED. DENSE MOIST CLAYEY SAND (A-2-4) W/THIN CLAY SEAMS (9)

(11)

(7) ORANGE-TAN MED. DENSE SAT. SAND (A-1-B)

(12) 08/09 (11)

BT

GRAY-BRN & TAN LOOSE MOIST SAND (A-1-B)

ORANGE-TAN MED. DENSE MOIST MED. PLASTIC CLAYEY SAND (A-2-6)

ORANGE-TAN LOOSE & MED. DENSE MOIST CLAYEY SAND (A-2-4) W/THIN CLAY SEAMS

(19) WHITE-TAN MED. DENSE WET SLI. MICA. SAND (A-1-B)

(24)

(12) WHITE-TAN MED. DENSE MOIST SLI. MICA. CLAYEY SAND (A-2-4)

(56) (PI=31) LT. PURPLE HARD MOIST HIGH PLASTIC SANDY SILTY CLAY (A-7-6)

(39) (PI=25) LT. PURPLE TO LT. GRAY DENSE TO MED. DENSE MOIST SLI. MICA. MED. PLASTIC CLAYEY SAND (A-2-7, A-2-6)

(20) (PI=21)

(51) (PI=15) LT. PURPLE TO LT. GRAY HARD MOIST LOW TO MED. PLASTIC SANDY CLAY (A-6)

(49) (PI=17)

BT
NM
(2/26/10)

ROADWAY EMBANKMENT (FILL)
WHITE & ORANGE LOOSE MOIST SANDY CLAY (A-2)

COASTAL PLAIN

(12)

(21) ORANGE & WHITE MED. DENSE MOIST SLI. MICA. CLAYEY SAND (A-2-4)

(16) WHITE & ORANGE MED. DENSE WET SLI. MICA. SAND (A-1-B)

(13) (PI=11) WHITE & TAN STIFF WET LOW PLASTIC SILTY SANDY CLAY (A-6) W/LAYERS OF CLAYEY SAND

(16)

(35) WHITE & TAN BANDED TO WHITE & TAN & PURPLE MED. DENSE TO DENSE WET NON-MICA. TO SLI. MICA. SAND (A-2-4) (PURPLE DENSE WET SAND LAYER W/FERRICITE @ 26.0)

(14)

(17)

(78) (PI=32) PINK HARD MOIST HIGH PLASTIC SANDY SILTY CLAY & SILTY SANDY CLAY (A-7-6)

(54) (PI=28)

(27) (PI=14) GRAY -LT. ORANGE & TAN MED. DENSE TO DENSE MOIST TO WET LOW TO MED. PLASTIC CLAYEY SAND (A-2-6)

(31) (PI=24)

BT
NM
(2/25/10)

60 50 40 30 20 10 0 10 20 30 40 50 60

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34923.1.1	**ID.** U-3324	**COUNTY** MOORE	**GEOLOGIST** Murray, C. C.	
SITE DESCRIPTION PINEHURST-SOUTHERN PINES-INTERSECTION OF SR 1309 (MORGANTON RD.) & US 1 (SANDHILLS BLVD)				**GROUND WTR (ft)**
BORING NO. Y6-1980L	**STATION** 19+80	**OFFSET** 50 ft LT	**ALIGNMENT** -Y6-	**0 HR.** Dry
COLLAR ELEV. 552.1 ft	**TOTAL DEPTH** 45.3 ft	**NORTHING** 517,227	**EASTING** 1,878,537	**24 HR.** Dry
DRILL MACHINE CME-550X	**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 08/12/09	**COMP. DATE** 08/12/09	**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)
555										552.1 GROUND SURFACE 0.0
550	548.3	3.8								**COASTAL PLAIN** TAN STIFF TO V. STIFF MOIST HIGH (PI=26) PLASTIC SANDY CLAY (A-7-5)
545	543.3	8.8	5	8	15	23	SS-12	M		544.1 8.0
540	538.3	13.8	7	9	7	16	SS-13	M		**COASTAL PLAIN** TAN MED. DENSE MOIST CLAYEY SAND (A-2-4)
535	533.3	18.8	5	6	7	13	SS-14	M		539.1 13.0 **COASTAL PLAIN** TAN MED. DENSE MOIST SAND (A-1-B)
530	528.3	23.8	2	4	5	9	SS-15	M		534.1 18.0 **COASTAL PLAIN** WHITE & TAN LOOSE TO MED. DENSE MOIST SLI. MICA. SAND & CLAYEY SAND (A-2-4) W/ IRON RED-PURPLE CLAY SEAM @ 23.8
525	523.3	28.8	2	5	5	10	SS-16	M		524.1 28.0
520	518.3	33.8	5	4	5	9	SS-17	W		**COASTAL PLAIN** WHITE & TAN LOOSE WET LOW (PI=11) PLASTIC CLAYEY SAND (A-2-6) W/ PURPLE-GRAY CLAY SEAM
515	513.3	38.8	8	13	18	31	SS-18	M		519.1 33.0 **COASTAL PLAIN** LT. GRAY TO TAN & LT. BRN HARD TO V. STIFF MOIST MED. (PI=23, 24, 19) PLASTIC SILTY CLAY & SANDY SILTY CLAY (A-7-6) (SLI. MICA. @ 43.8)
510	508.3	43.8	8	11	15	26	SS-19	M		
505			4	6	9	15	SS-20	M		506.8 45.3 Boring Terminated at Elevation 506.8 ft IN TAN TO LT. BRN STIFF TO V. STIFF MOIST MED. PLASTIC SANDY SILTY CLAY (A-7-6)
500										PERCHED WATER TABLE @ 29.0'
495										
490										
485										
480										
475										

NCDOT BORE SINGLE U3324_GEO_BH_BRDG0041_MOORE.GPJ NC_DOT.GDT 04/27/10

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34923.1.1	**ID.** U-3324	**COUNTY** MOORE	**GEOLOGIST** Murray, C. C.	
SITE DESCRIPTION PINEHURST-SOUTHERN PINES-INTERSECTION OF SR 1309 (MORGANTON RD.) & US 1 (SANDHILLS BLVD)				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 20+43	**OFFSET** 60 ft LT	**ALIGNMENT** -Y6-	**0 HR.** NM
COLLAR ELEV. 544.4 ft	**TOTAL DEPTH** 71.5 ft	**NORTHING** 517,206	**EASTING** 1,878,597	**24 HR.** NM
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 02/26/10	**COMP. DATE** 03/01/10	**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)
545										544.4 GROUND SURFACE 0.0
540										**COASTAL PLAIN** TAN & WHITE LOOSE TO MED. DENSE MOIST TO WET SAND & CLAYEY SAND (A-2)
535										
530										
525										
520										
515										
510	509.4	35.0	7	12	14	26	SS-19	M		511.4 33.0 **COASTAL PLAIN** GRAY-TAN V. STIFF MOIST MICA. MED. (PI=16) PLASTIC SILTY SANDY CLAY (A-6)
505	504.4	40.0	7	11	13	24	SS-20	M		505.4 39.0 **COASTAL PLAIN** GRAY-TAN V. STIFF MOIST MICA. MED. (PI=20) PLASTIC SANDY SILTY CLAY (A-7-6)
500	499.4	45.0	13	18	17	35	SS-21	W		500.9 43.5 **COASTAL PLAIN** WHITE-TAN & PURPLE DENSE TO MED. DENSE WET SAND (A-1-B)
495	494.4	50.0	6	12	17	29		W		
490	489.4	55.0	12	9	9	18	SS-22	M		490.4 54.0 **COASTAL PLAIN** PURPLE MED. DENSE MOIST MED. (PI=20) PLASTIC CLAYEY SAND (A-2-7)
485	484.4	60.0	11	23	32	55	SS-23	M		487.4 57.0 **COASTAL PLAIN** GRAY & PURPLE HARD MOIST SLI. MICA. HIGH (PI=28,26) PLASTIC SANDY SILTY CLAY & SANDY CLAY (A-7-6)
480	479.4	65.0	9	16	21	37	SS-24	M		
475	474.4	70.0	10	15	20	35	SS-25	M		475.4 69.0 **COASTAL PLAIN** GRAY & PURPLE HARD MOIST SLI. MICA. MED. (PI=20) PLASTIC SILTY SANDY CLAY (A-6)
470										472.9 71.5 Boring Terminated at Elevation 472.9 ft IN HARD MOIST SLI. MICA. MED. PLASTIC SILTY SANDY CLAY (A-6)
465										

NCDOT BORE SINGLE U3324_GEO_BH_BRDG0041_MOORE.GPJ NC_DOT.GDT 04/29/10

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34923.1.1	**ID.** U-3324	**COUNTY** MOORE	**GEOLOGIST** Murray, C. C.	
SITE DESCRIPTION PINEHURST-SOUTHERN PINES-INTERSECTION OF SR 1309 (MORGANTON RD.) & US 1 (SANDHILLS BLVD)				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 20+50	**OFFSET** 35 ft RT	**ALIGNMENT** -Y6-	**0 HR.** NM
COLLAR ELEV. 547.9 ft	**TOTAL DEPTH** 75.9 ft	**NORTHING** 517,119	**EASTING** 1,878,558	**24 HR.** NM
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 03/03/10	**COMP. DATE** 03/03/10	**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))
550										547.9 GROUND SURFACE 0.0
545	543.8	4.1								545.9 **ROADWAY EMBANKMENT** TAN LOOSE MOIST TO WET SILTY CLAYEY SAND (A-2) 2.0
540	538.8	9.1	0	2	4	6		W		**COASTAL PLAIN** TAN & ORANGE LOOSE TO MED. DENSE WET CLAYEY SAND & SAND (A-2-4)
535	533.8	14.1	4	6	8	14		W		534.9 13.0
530	528.8	19.1	5	6	8	14		W		**COASTAL PLAIN** TAN & ORANGE THINLY BANDED MED. DENSE WET SLI. MICA. CLAYEY SAND (A-1-B)
525	523.8	24.1	4	8	9	17		W		529.9 18.0 **COASTAL PLAIN** TAN & ORANGE & PURPLE V. STIFF WET MED. PLASTIC SILTY SANDY CLAY (A-7-6)
520	518.8	29.1	5	5	5	10		W		524.9 23.0 **COASTAL PLAIN** ORANGE & WHITE LOOSE TO MED. DENSE WET SLI. MICA. SAND (A-2-4)
515	513.8	34.1	7	8	10	18		W		519.9 28.0 **COASTAL PLAIN** ORANGE MED. DENSE WET SLI. MICA. SAND (A-1-B)
510	508.5	39.4	6	10	15	25		M		515.9 32.0 **COASTAL PLAIN** WHITE-GRAY-PURPLE TO LT. GRAY MED. DENSE TO DENSE MOIST SLI. MICA. CLAYEY SAND (A-2-4)
505	503.5	44.4	7	13	17	30		M		504.9 43.0
500	498.5	49.4	4	7	9	16		M		**COASTAL PLAIN** LT. GRAY MED. DENSE MOIST LOW PLASTIC CLAYEY SAND (A-2-6) 499.9 48.0
495	493.5	54.4	12	11	12	23		W		**COASTAL PLAIN** LT. GRAY V. STIFF WET HIGH PLASTIC SANDY SILTY CLAY (A-7-6) 494.9 53.0
490	488.5	59.4	8	12	15	27		W		**COASTAL PLAIN** ORANGE & WHITE TO GRAY & PURPLE MOTTLED MED. DENSE TO DENSE WET TO MOIST SLI. MICA. TO NON-MICA. MED. & HIGH TO LOW PLASTIC CLAYEY SAND (A-2-7, A-2-6)
485	483.5	64.4	7	18	23	41		W		
480	478.5	69.4	12	20	24	44		M		
475	473.5	74.4	8	11	15	26		M		
470			10	13	14	27		M		472.0 75.9 Boring Terminated at Elevation 472.0 ft IN MED. DENSE MOIST CLY SAND (A-2-6)

NCDOT BORE SINGLE U3324_GEO_BH_BRDG0041_MOORE.GPJ NC_DOT.GDT 05/06/10

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34923.1.1	**ID.** U-3324	**COUNTY** MOORE	**GEOLOGIST** Murray, C. C.	
SITE DESCRIPTION PINEHURST-SOUTHERN PINES-INTERSECTION OF SR 1309 (MORGANTON RD.) & US 1 (SANDHILLS BL				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 21+33	**OFFSET** 29 ft LT	**ALIGNMENT** -Y6-	**0 HR.** NM
COLLAR ELEV. 531.5 ft	**TOTAL DEPTH** 59.9 ft	**NORTHING** 517,136	**EASTING** 1,878,662	**24 HR.** NM
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 02/10/10	**COMP. DATE** 02/10/10	**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)
535										
										531.5 GROUND SURFACE 0.0
530										**ROADWAY EMBANKMENT**
										529.5 ORANGE LOOSE MOIST SILTY CLAYEY SAND (A-2) W/ ASPHALT & GRAVEL 0.0-1.0 2.0
	528.5	3.0								**COASTAL PLAIN**
			3	5	5	10	SS-39	M		ORANGE & WHITE MED. DENSE MOIST MED. (PI=17) PLASTIC CLAYEY SAND (A-2-6)
525										
	522.8	8.7								
			6	8	10	18		M		
520										
	517.8	13.7								517.5 14.0
			5	7	8	15	SS-40			**COASTAL PLAIN**
515										ORANGE & WHITE BANDED MED. DENSE MOIST CLAYEY SAND (A-2-4)
	512.8	18.7								
			5	7	10	17				
510										
	507.8	23.7								
			4	5	7	12	SS-41			
505										
	502.8	28.7								
			4	6	8	14				
500										
	497.8	33.7								
			4	7	8	15				
495										495.5 36.0
	492.8	38.7								**COASTAL PLAIN**
			4	9	9	18	SS-42			WHITE MED. DENSE MOIST SAND (A-1-B)
490										489.5 42.0
	487.1	44.4								**COASTAL PLAIN**
			8	28	42	70	SS-43			PINK TO LT. PURPLE HARD MOIST MED. (PI=24) PLASTIC SANDY SILTY CLAY (A-7-6)
485										483.5 48.0
	482.1	49.4								**COASTAL PLAIN**
			13	27	40	67	SS-44			LT. PURPLE HARD MOIST MED. (PI=16) PLASTIC SILTY SANDY CLAY (A-6)
480										478.5 53.0
	477.1	54.4								**COASTAL PLAIN**
			6	9	11	20	SS-45			LT. GRAY & PURPLE MED. DENSE TO DENSE MOIST MED. (PI=16) TO HIGH (PI=36) PLASTIC CLAYEY SAND (A-2-6, A-2-7)
475										
	473.1	58.4								
			10	17	21	38	SS-46			471.6 59.9
470										Boring Terminated at Elevation 471.6 ft IN DENSE MOIST CLAYEY SAND (A-2-7)
465										
460										
455										

NCDOT BORE SINGLE U3324_GEO_BH_BRDG0041_MOORE.GPJ NC_DOT.GDT 05/07/10

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34923.1.1	**ID.** U-3324	**COUNTY** MOORE	**GEOLOGIST** Murray, C. C.	
SITE DESCRIPTION PINEHURST-SOUTHERN PINES-INTERSECTION OF SR 1309 (MORGANTON RD.) & US 1 (SANDHILLS BL				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 21+45	**OFFSET** 22 ft RT	**ALIGNMENT** -Y6-	**0 HR.** NM
COLLAR ELEV. 533.2 ft	**TOTAL DEPTH** 65.8 ft	**NORTHING** 517,085	**EASTING** 1,878,648	**24 HR.** NM
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 03/09/10	**COMP. DATE** 03/09/10	**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)
535										
										533.2 GROUND SURFACE 0.0
530										**ROADWAY EMBANKMENT**
										ORANGE LOOSE MOIST CLAYEY SAND (A-2) W/ BLACK TOP & GRAVEL 0.0-1.0 3.0
	530.2	3.0								**COASTAL PLAIN**
			4	5	5	10	SS-26	M		ORANGE TO WHITE & TAN LOOSE TO MED. DENSE MOIST NON-MICA. TO SLI. MICA. CLAYEY SAND (A-2-4)
525										
	524.3	8.9								
			3	5	7	12	SS-27	M		
520										
	519.3	13.9								521.2 12.0
			2	3	3	6	SS-28	M		**COASTAL PLAIN**
515										WHITE & TAN LOOSE MOIST SLI. MICA. CLAYEY SAND (A-1-B) 518.2 15.0
	514.3	18.9								**COASTAL PLAIN**
			5	9	13	22	SS-29	M		GRAY-TAN V. STIFF MOIST SLI. MICA. MED. (PI=17) PLASTIC SILTY SANDY CLAY (A-7-6) W/ PURPLE FERRICITE @ 15.0
510										510.2 23.0
	508.9	24.3								**COASTAL PLAIN**
			5	9	13	22	SS-30	M		WHITE & TAN MED. DENSE MOIST SLI. MICA. SAND (A-2-4)
505										505.2 28.0
	503.9	29.3								**COASTAL PLAIN**
			6	10	11	21	SS-31	M		WHITE & TAN MED. DENSE MOIST SLI. MICA. SAND (A-1-B)
500										500.2 33.0
	498.9	34.3								**COASTAL PLAIN**
			6	10	11	21	SS-32	M		RED & WHITE MED. DENSE MOIST TO WET SLI. MICA. CLAYEY SAND (A-2-4)
495										
	493.9	39.3								490.2 43.0
			5	8	9	17	SS-33	W		**COASTAL PLAIN**
490										RED MED. DENSE WET LOW (PI=14) PLASTIC CLAYEY SAND (A-2-6) 487.2 46.0
	488.9	44.3								**COASTAL PLAIN**
			4	6	10	16	SS-34	W		PURPLE HARD WET SLI. MICA. HIGH (PI=29) PLASTIC SANDY SILTY CLAY (A-7-6)
485										480.2 53.0
	483.9	49.3								**COASTAL PLAIN**
			12	25	40	65	SS-35	W		GRAY & PURPLE TO TAN & GRAY DENSE TO MED. DENSE WET SLI. MICA. TO NON-MICA. MED. (PI=25) TO HIGH (PI=28) & LOW (PI=14) PLASTIC CLAYEY SAND (A-2-7, A-2-6)
480										
	478.9	54.3								
			9	14	17	31	SS-36	W		
475										
	473.9	59.3								
			5	9	20	29	SS-37	W		
470										
	468.9	64.3								
			4	5	7	12	SS-38	W		467.4 65.8
465										Boring Terminated at Elevation 467.4 ft IN MED. DENSE WET LOW PLASTIC CLAYEY SAND (A-2-6)
460										
455										

NCDOT BORE SINGLE U3324_GEO_BH_BRDG0041_MOORE.GPJ NC_DOT.GDT 04/27/10

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34923.1.1	**ID.** U-3324	**COUNTY** MOORE	**GEOLOGIST** Murray, C. C.	
SITE DESCRIPTION PINEHURST-SOUTHERN PINES-INTERSECTION OF SR 1309 (MORGANTON RD.) & US 1 (SANDHILLS BLVD)				**GROUND WTR (ft)**
BORING NO. Y6-2235L	**STATION** 22+35	**OFFSET** 60 ft LT	**ALIGNMENT** -Y6-	**0 HR.** 43.1
COLLAR ELEV. 533.4 ft	**TOTAL DEPTH** 45.8 ft	**NORTHING** 517,115	**EASTING** 1,878,766	**24 HR.** 43.0
DRILL MACHINE CME-550X	**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 08/20/09	**COMP. DATE** 08/20/09	**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)
535										533.4 GROUND SURFACE 0.0
										COASTAL PLAIN GRAY-BRN & TAN LOOSE MOIST SAND (A-1-B)
530	529.1	4.3								
			2	3	4	7	SS-107	M		
525	524.1	9.3								526.4 7.0
			6	11	11	22	SS-108	M		**COASTAL PLAIN** ORANGE-TAN MED. DENSE MOIST MED. (PI=17, 19) PLASTIC CLAYEY SAND (A-2-6)
520	519.1	14.3								
			7	9	9	18	SS-109	M		
515	514.1	19.3								514.4 19.0
			6	6	7	13	SS-110	M		**COASTAL PLAIN** ORANGE-TAN LOOSE & MED. DENSE MOIST CLAYEY SAND (A-2-4) W/ THIN CLAY SEAMS
510	509.1	24.3								
			4	4	5	9	SS-111	M		
505	504.1	29.3								
			3	6	5	11	SS-112	M		
500	499.1	34.3								499.4 34.0
			3	3	4	7	SS-113	M		**COASTAL PLAIN** ORANGE-TAN MED. DENSE SAT. SAND (A-1-B)
495	494.1	39.3								
			3	5	7	12	SS-114	M		
490	489.1	44.3								
			2	4	7	11	SS-115	Sat.		487.6 45.8
485										Boring Terminated at Elevation 487.6 ft IN ORANGE-TAN MED. DENSE SAT. SAND (A-1-B)
480										
475										
470										
465										
460										
455										

NCDOT BORE SINGLE U3324_GEO_BH_BRDG0041_MOORE.GPJ NC_DOT.GDT 04/27/10

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34923.1.1	**ID.** U-3324	**COUNTY** MOORE	**GEOLOGIST** Murray, C. C.	
SITE DESCRIPTION PINEHURST-SOUTHERN PINES-INTERSECTION OF SR 1309 (MORGANTON RD.) & US 1 (SANDHILLS BLVD)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 22+10	**OFFSET** 52 ft LT	**ALIGNMENT** -Y6-	**0 HR.** NM
COLLAR ELEV. 533.9 ft	**TOTAL DEPTH** 71.3 ft	**NORTHING** 517,119	**EASTING** 1,878,740	**24 HR.** NM
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 02/24/10	**COMP. DATE** 02/25/10	**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)
535										533.9 GROUND SURFACE 0.0
										COASTAL PLAIN GRAY-BRN & TAN LOOSE MOIST SAND (A-1-B)
530										
										526.9 7.0
525										**COASTAL PLAIN** ORANGE-TAN MED. DENSE MOIST MED. (PI=17, 19) PLASTIC CLAYEY SAND (A-2-6)
520										
										514.9 19.0
515										**COASTAL PLAIN** ORANGE-TAN LOOSE & MED. DENSE MOIST CLAYEY SAND (A-2-4) W/ THIN CLAY SEAMS
510										
505										
	499.1	34.8								499.9 34.0
500			5	8	11	19	SS-11	W		**COASTAL PLAIN** WHITE-TAN MED. DENSE WET SLI. MICA. SAND (A-1-B)
495	494.1	39.8								
			14	12	12	24	SS-12	W		
490	489.1	44.8								490.9 43.0
			4	3	9	12	SS-13	M		**COASTAL PLAIN** WHITE-TAN MED. DENSE MOIST SLI. MICA. CLAYEY SAND (A-2-4)
485	485.1	48.8								487.1 46.8
			11	21	35	56	SS-14	M		**COASTAL PLAIN** LT. PURPLE HARD MOIST HIGH (PI=31) PLASTIC SANDY SILTY CLAY (A-7-6)
480	479.1	54.8								479.9 54.0
			8	15	24	39	SS-15	M		**COASTAL PLAIN** LT. PURPLE TO LT. GRAY DENSE TO MED. DENSE MOIST SLI. MICA. MED. (PI=25, 21) PLASTIC CLAYEY SAND (A-2-7, A-2-6)
475	474.1	59.8								
			5	10	10	20	SS-16	M		
470	469.1	64.8								470.9 63.0
			8	15	36	51	SS-17	M		**COASTAL PLAIN** LT. PURPLE TO LT. GRAY HARD MOIST LOW (PI=15) PLASTIC SANDY CLAY (A-6)
465	464.1	69.8								
			16	21	28	49	SS-18	M		462.6 71.3
460										Boring Terminated at Elevation 462.6 ft IN HARD MOIST LOW PLASTIC SANDY CLAY (A-6)
455										

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NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34923.1.1	**ID.** U-3324	**COUNTY** MOORE	**GEOLOGIST** Murray, C. C.	
SITE DESCRIPTION PINEHURST-SOUTHERN PINES-INTERSECTION OF SR 1309 (MORGANTON RD.) & US 1 (SANDHILLS BLVD)				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 22+02	**OFFSET** 33 ft RT	**ALIGNMENT** -Y6-	**0 HR.** NM
COLLAR ELEV. 530.1 ft	**TOTAL DEPTH** 60.4 ft	**NORTHING** 517,048	**EASTING** 1,878,693	**24 HR.** NM
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 02/23/10	**COMP. DATE** 02/24/10	**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))
535										530.1 GROUND SURFACE 0.0
530										**ROADWAY EMBANKMENT**
	527.1	3.0								528.1 WHITE & ORANGE LOOSE MOIST SANDY CLAY (A-2) 2.0
525			6	7	5	12	SS-1	M		**COASTAL PLAIN** ORANGE & WHITE MED. DENSE MOIST SLI. MICA. CLAYEY SAND (A-2-4)
	522.1	8.0								
520			9	11	10	21	SS-2	M		
	517.1	13.0								518.1 12.0
515			10	8	8	16	SS-3	W		**COASTAL PLAIN** WHITE & ORANGE MED. DENSE WET SLI. MICA. SAND (A-1-B)
	512.1	18.0								513.1 17.0
510			5	5	8	13	SS-4	W		**COASTAL PLAIN** WHITE & TAN STIFF WET LOW (PI=11) PLASTIC SILTY SANDY CLAY (A-6) W/ LAYERS OF CLAYEY SAND
	507.1	23.0								508.1 22.0
505			6	8	8	16	SS-5	W		**COASTAL PLAIN** WHITE & TAN BANDED TO WHITE & TAN & PURPLE MED. DENSE TO DENSE WET NON-MICA. TO SLI. MICA. SAND (A-2-4) (PURPLE DENSE WET SAND LAYER W/ FERRICITE @ 26.0)
	502.1	28.0								
500			19	19	16	35		W		
495										
	493.7	36.4								
			4	6	8	14	SS-6	W		
	491.2	38.9								
490			5	8	9	17		W		
	486.2	43.9								487.9 42.2
485			16	32	46	78	SS-7	M		**COASTAL PLAIN** PINK HARD MOIST HIGH (PI=32,28) PLASTIC SANDY SILTY CLAY & SILTY SANDY CLAY (A-7-6)
	481.2	48.9								
480			14	22	32	54	SS-8	M		
	476.2	53.9								477.0 53.1
475			8	13	14	27	SS-9			**COASTAL PLAIN** GRAY -LT. ORANGE & TAN MED. DENSE TO DENSE MOIST TO WET LOW (PI=14) TO MED. (PI=24) PLASTIC CLAYEY SAND (A-2-6)
	471.2	58.9								
470			8	14	17	31	SS-10	W		469.7 60.4
465										Boring Terminated at Elevation 469.7 ft IN DENSE MOIST TO WET MED. PLASTIC CLAYEY SAND (A-2-6)
460										
455										

NCDOT BORE SINGLE U3324_GEO_BH_BRDG0041_MOORE.GPJ NC_DOT.GDT 04/27/10

TEST RESULTS

PROJECT: 34923.1.1 (U-3324)
COUNTY: MOORE
SITE DESCRIPTION: BRIDGE NO. 041 ON -Y6- SR 1309 (MORGANTON RD.) OVER -L- US 1 (SANDHILLS BLVD.)

SOIL SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING SIEVES 10	40	200	% MOISTURE	% ORGANIC	UNIT WT. (d)	VOID RATIO
		EB1-A																
SS-19	60 LT	20+43	35.0-36.5	A-6(8)	36	16	4.6	39.3	17.8	38.3	100	99	63	-	-			
SS-20	60 LT	20+43	40.0-41.5	A-7-6(20)	45	20	0.8	14.7	24.1	60.4	100	100	89	-	-			
SS-21	60 LT	20+43	45.0-46.5	A-1-b(0)	26	6	76.1	10.7	5.1	8.1	100	38	14	-	-			
SS-22	60 LT	20+43	55.0-56.5	A-2-7(1)	42	20	63.2	8.7	5.9	22.2	92	39	27	-	-			
SS-23	60 LT	20+43	60.0-61.5	A-7-6(23)	48	28	3.0	20.3	22.3	54.4	100	99	82	-	-			
SS-24	60 LT	20+43	65.0-66.5	A-7-6(5)	47	26	43.7	17.7	4.3	34.2	98	74	39	-	-			
SS-25	60 LT	20+43	70.0-71.5	A-6(4)	40	20	46.9	15.9	11.0	26.2	99	56	40	-	-			
		B1-A																
SS-39	29 LT	21+33	3.0-4.5	A-2-6(1)	38	17	54.5	15.5	5.8	24.1	98	56	31	-	-			
SS-40	29 LT	21+33	13.7-15.2	A-2-4(0)	21	NP	60.2	21.5	4.2	14.1	100	89	20	-	-			
SS-41	29 LT	21+33	23.7-25.2	A-2-4(0)	22	NP	50.1	32.5	5.3	12.1	99	77	18	-	-			
SS-42	29 LT	21+33	38.7-40.2	A-1-b(0)	25	5	81.2	9.1	2.7	7.0	99	27	11	-	-			
SS-43	29 LT	21+33	44.4-45.9	A-7-6(21)	46	24	4.0	15.7	19.9	60.4	100	98	84	-	-			
SS-44	29 LT	21+33	48.4-49.9	A-6(9)	33	17	7.8	31.0	20.9	40.2	100	96	68	-	-			
SS-45	29 LT	21+33	54.4-55.9	A-2-6(1)	33	16	59.7	13.6	3.6	23.1	98	65	27	-	-			
SS-46	29 LT	21+33	58.4-59.9	A-2-7(5)	58	36	55.6	11.2	3.0	30.2	99	59	34	-	-			
		B1-B																
SS-26	22 RT	21+45	3.0-4.5	A-2-4(0)	29	10	47.1	26.6	6.1	20.1	100	71	30	-	-			
SS-27	22 RT	21+45	8.9-10.4	A-2-4(0)	19	NP	63.2	23.4	5.3	8.1	100	67	15	-	-			
SS-28	22 RT	21+45	13.7-15.4	A-1-b(0)	22	3	62.8	22.6	4.5	10.1	98	47	16	-	-			
SS-29	22 RT	21+45	18.9-20.4	A-7-6(14)	42	17	2.2	25.8	23.7	48.3	100	99	79	-	-			
SS-30	22 RT	21+45	24.3-25.8	A-2-4(0)	20	NP	58.0	29.4	4.5	8.1	100	74	14	-	-			
SS-31	22 RT	21+45	29.3-30.8	A-1-b(0)	24	5	72.9	15.3	3.7	8.1	97	36	13	-	-			
SS-32	22 RT	21+45	34.3-35.8	A-2-4(0)	25	3	55.4	27.0	3.5	14.1	91	54	18	-	-			
SS-33	22 RT	21+45	39.3-40.8	A-2-4(0)	27	8	75.1	9.9	2.9	12.1	98	39	16	-	-			
SS-34	22 RT	21+45	44.3-45.8	A-2-6(0)	31	14	76.9	8.5	4.5	10.1	92	26	14	-	-			
SS-35	22 RT	21+45	49.3-50.8	A-7-6(26)	51	29	3.4	15.9	22.3	58.4	100	98	84	-	-			
SS-36	22 RT	21+45	54.3-55.8	A-2-7(3)	43	25	55.8	12.9	3.1	28.2	100	72	32	-	-			
SS-37	22 RT	21+45	59.3-60.8	A-2-6(2)	31	28	50.2	21.1	4.5	24.2	91	69	28	-	-			
SS-38	22 RT	21+45	64.3-65.8	A-2-6(1)	31	14	29.8	41.5	2.5	26.2	100	99	29	-	-			
		EB2-A																
SS-11	52 LT	22+10	(NO AVAILABLE DATA, LAB SAMPLE LOST)															
SS-12	52 LT	22+10	39.8-41.3	A-1-b(0)	19	NP	73.9	17.0	4.1	5.1	93	43	10	-	-			
SS-13	52 LT	22+10	44.8-46.3	A-2-4(0)	21	NP	68.2	16.6	4.1	11.2	100	85	16	-	-			
SS-14	52 LT	22+10	48.8-50.3	A-7-6(25)	52	31	3.9	22.2	25.2	48.8	100	98	80	-	-			
SS-15	52 LT	22+10	54.8-56.3	A-2-7(3)	44	25	57.6	10.5	0.4	31.5	100	66	33	-	-			
SS-16	52 LT	22+10	59.8-61.3	A-2-6(1)	40	21	65.4	8.3	0.8	25.4	100	72	27	-	-			
SS-17	52 LT	22+10	64.8-66.3	A-6(1)	29	15	44.3	23.8	9.6	22.4	100	73	36	-	-			
SS-18	52 LT	22+10	69.8-71.3	A-6(2)	36	17	41.5	22.4	9.8	26.4	98	74	38	-	-			
		EB2-B																
SS-1	33 RT	22+02	3.0-4.5	A-2-4(0)	30	9	36.7	38.9	6.4	18.0	100	86	26	-	-			
SS-2	33 RT	22+02	8.0-9.5	A-2-4(0)	26	6	48.1	28.7	9.2	14.0	100	69	28	-	-			
SS-3	33 RT	22+02	13.0-14.5	A-1-b(0)	18	NP	79.0	11.6	3.4	6.0	100	48	11	-	-			
SS-4	33 RT	22+02	18.0-19.5	A-6(2)	31	11	22.6	38.5	14.8	24.0	100	87	44	-	-			
SS-5	33 RT	22+02	23.0-24.5	A-2-4(0)	22	NP	64.9	21.2	6.8	7.0	100	63	15	-	-			
SS-6	33 RT	22+02	36.4-37.9	A-2-4(0)	17	NP	69.4	16.4	5.1	9.0	100	75	15	-	-			
SS-7	33 RT	22+02	43.9-45.4	A-7-6(27)	52	32	5.4	17.0	23.4	54.1	100	96	83	-	-			
SS-8	33 RT	22+02	48.9-50.4	A-7-6(7)	49	28	24.2	33.7	10.0	32.1	100	80	44	-	-			

ROCK SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	RQD	UNIT WT (pcf)	Q(ksf)	E(MPsi)

TEST RESULTS

PROJECT: 34923.1.1 (U-3324)
COUNTY: MOORE
SITE DESCRIPTION: BRIDGE NO. 041 ON -Y6- SR 1309 (MORGANTON RD.) OVER -L- US 1 (SANDHILLS BLVD.)

SOIL SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING SIEVES 10	40	200	% MOISTURE	% ORGANIC	UNIT WT. (d)	VOID RATIO
		EB2-B (CONT.)																
SS-9	33 RT	22+02	53.9-55.4	A-2-6(1)	31	14	23.2	45.5	7.2	24.0	100	86	34	-	-			
SS-10	33 RT	22+02	58.9-60.4	A-2-6(2)	40	24	61.1	12.6	4.2	22.0	97	54	26	-	-			
		Y6-1980L	(SAMPLES FROM ROADWAY BORINGS)															
SS-12	50 LT	19+80	3.8-5.3	A-7-5(14)	58	26	32.1	11.0	8.7	48.1	100	82	58	-	-			
SS-13	50 LT	19+80	8.8-10.3	A-2-4(0)	30	8	65.6	14.0	5.3	15.0	99	57	21	-	-			
SS-14	50 LT	19+80	13.8-15.3	A-1-b(0)	22	NP	84.3	8.8	2.9	4.0	100	24	8	-	-			
SS-15	50 LT	19+80	18.8-20.3	A-2-4(0)	23	NP	39.5	47.0	5.4	8.0	100	95	15	-	-			
SS-16	50 LT	19+80	23.8-25.3	A-2-4(0)	23	6	43.5	30.5	9.9	16.0	99	85	28	-	-			
SS-17	50 LT	19+80	28.8-30.3	A-2-6(0)	31	11	64.4	10.4	9.1	16.0	96	57	26	-	-			
SS-18	50 LT	19+80	33.8-35.3	A-7-6(26)	52	23	0.6	9.0	32.2	58.2	100	100	95	-	-			
SS-19	50 LT	19+80	38.8-40.3	A-7-6(26)	53	24	1.2	10.2	28.4	60.2	100	100	92	-	-			
SS-20	50 LT	19+80	43.8-45.3	A-7-6(20)	45	19	0.2	11.6	30.0	58.2	100	100	93	-	-			
		Y6-2235L	(SAMPLES FROM ROADWAY BORINGS)															
SS-107	60 LT	22+35	4.3-5.8	A-1-b(0)	17	NP	74.3	14.2	3.4	8.0	95	39	12	-	-			
SS-108	60 LT	22+35	9.3-10.8	A-2-6(1)	39	17	66.0	9.7	2.3	22.0	100	54	25	-	-			
SS-109	60 LT	22+35	14.3-15.8	A-2-6(1)	39	19	65.2	12.7	3.1	19.0	96	43	22	-	-			
SS-110	60 LT	22+35	19.3-20.8	A-2-4(0)	28	8	63.0	20.5	3.5	13.0	91	41	17	-	-			
SS-111	60 LT	22+35	24.3-25.8	A-2-4(0)	24	NP	55.2	29.8	5.0	10.0	100	73	16	-	-			
SS-112	60 LT	22+35	29.3-30.8	A-2-4(0)	24	3	63.6	17.6	5.8	13.0	97	58	20	-	-			
SS-113	60 LT	22+35	34.3-35.8	A-1-b(0)	21	NP	80.8	8.2	4.0	7.0	99	45	12	-	-			
SS-114	60 LT	22+35	39.3-40.8	A-1-b(0)	27	3	84.5	5.9	2.6	7.0	100	22	10	-	-			
SS-115	60 LT	22+35	44.3-45.8	A-1-b(0)	23	NP	82.4	6.3	2.3	9.0	100	43	12	-	-			

ROCK SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	RQD	UNIT WT (pcf)	Q(ksf)	E(MPsi)