STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

JAMES H. TROGDON, III
SECRETARY

DATE: September 14, 2017

TO: Karen E. Collette, P.E.
Division Engineer

FROM: Christopher Kreider, P.E.
Eastern Regional Geotechnical Manager

DocuSigned by:
Chris Kreider
0263EDEBEADC45D...
9/15/2017

STATE PROJECT: 40238.1.4 (U-4902D)
F.A. NUMBER.: NHS-0017(76)
COUNTY: New Hanover

DESCRIPTION: US 17 Business (Market Street) from Lendire Road to Marsh Oaks Drive

SUBJECT: Geotechnical Report Addendum – Rock Plating Recommendations

Per Division's request, the Geotechnical Engineering Unit has reviewed the roadway plans and cross-sections for the proposed rock plated slopes listed below and provides the following recommendations.

Line	Station(±)	Location
-L-	270+75 ± to 278+75 ±	RT

Use the Standard Rock Plating detail No. 1 of the Standard Drawing No. 1802.01 as shown on the Roadway plans. The estimated quantity for rock plating is 1600 square yards. Rock Plating is outlined in the Section 275 of the 2012 Standard Specifications. The following note should be added to the Roadway Plans:

"USE ROCK PLATING DETAIL NO. 1 AT -L- STA 270+75± TO -L- STA 278+75±, RIGHT. EXTEND ROCK PLATING LIMITS TO 2.75:1 (H:V) SLOPES. SEE STANDARD ROCK PLATING DETAIL."

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GARNER, NC 27529

Summary of Rock Plating Table

Line	Beginning Slope	Approx. Station	Ending Slope	Approx. Station	Location LT/RT	Rock Plating Detail No. 1/2/3/4	Riprap Class 1/2/B	SY
-L-	2.75:1	270+75 ±	2.75:1	278+75 ±	RT	1	*	1600

* Use Riprap Class B, 1 or 2.

If you have any questions concerning this memorandum, please contact Majid Khazaei, P.E. or Chris Kreider, P.E. at 919-662-4710.

Prepared by,

9/15/2017

DocuSigned by:
Majid Khazaei
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Majid Khazaei, P.E.
Geotechnical Design Engineer

CAK/MK

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-4902D	1	18

REFERENCE: U-4902D

PROJECT: 40238

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

LINE	STATION	PLAN	PROFILE
L	202+50 TO 288+00	4-10	11-17
Y28A	10+00 TO 11+25	4	18
Y29	13+00 TO 17+10	6	18
Y30	10+00 TO 11+75	6	18
Y31	11+25 TO 12+50	7	18
Y32	11+50 TO 13+02	7	18
Y33	11+65 TO 12+50	8	18

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *NEW HANOVER*

PROJECT DESCRIPTION *US 17 BUSINESS (MARKET ST.) FROM LENDIRE ROAD TO MARSH OAKS DRIVE*

INVENTORY

CAUTION NOTICE

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

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

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

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

PERSONNEL

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COREY FUTRAL

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MICHAEL D. MASON

INVESTIGATED BY *CATLIN*

DRAWN BY *DAVID MCPHERSON*

CHECKED BY *STEVEN V. HUDSON*

SUBMITTED BY *STEVEN V. HUDSON*

DATE *MAY 2016*

NORTH CAROLINA LICENSED SEAL 1583 GEOLOGIST STEVEN V. HUDSON

DocuSigned by: steve hudson 62EFD88181E445F...

5/31/2016

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] CME-45B
- [X] DIEDRICH D-50
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [ ] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK:

ELEVATION: FEET

NOTES:

U.C.P. = UNDIFFERENTIATED COASTAL PLAIN

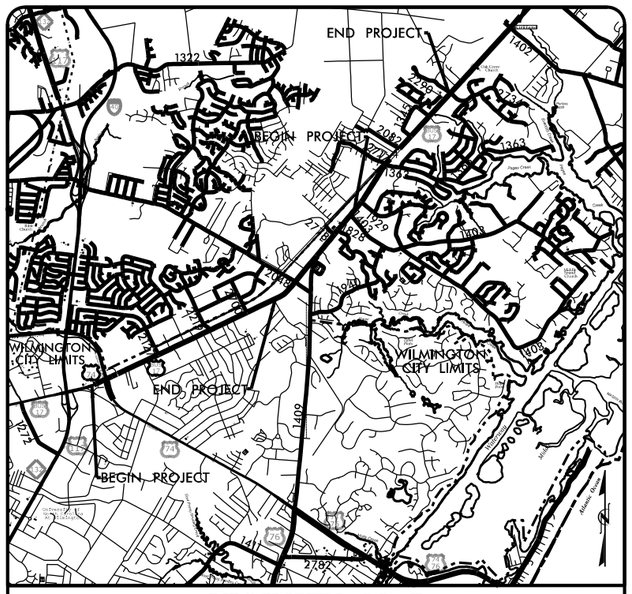
W/ = WITH

= APPROXIMATE HORIZONTAL LIMIT OF ORGANIC SOIL

DATE: 8-15-14

TIP PROJECT: U-4902D

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbols



VICINITY MAP

65% PLAN SUBMITTAL

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

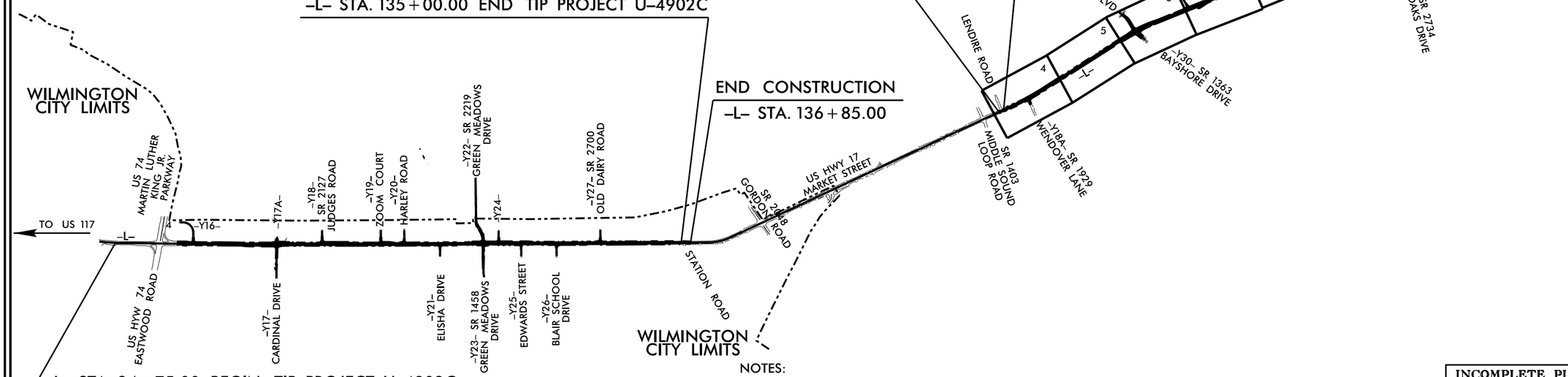
NEW HANOVER COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-4902D	3	18

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
40238.1.1		

LOCATION: *MARKET STREET FROM JUST WEST OF US 74 (MLK PARKWAY) TO WEST OF STATION ROAD AND WEST OF WENDOVER LN TO MARSH OAKS DR*

TYPE OF WORK: *GRADING, PAVING, AND DRAINAGE*



NOTES:

1. CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II .
2. A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE CITY OF WILMINGTON.

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

CONTRACT:

GRAPHIC SCALES

PLANS 50 25 0 50 100

PROFILE (HORIZONTAL) 50 25 0 50 100

PROFILE (VERTICAL) 10 5 0 10 20

DESIGN DATA

ADT 2008 = 52,900
ADT 2035 = 66,000
K = 11 %
D = 55 %
T = 6 % *
V = 50 MPH
* TTST =2% DUAL 4%
FUNC CLASS = PRINCIPAL ARTERIAL
REGIONAL TIER

PROJECT LENGTH

LENGTH OF ROADWAY T.I.P. PROJECT U–4902C/D = 3.688 MILES

TOTAL LENGTH OF T.I.P. PROJECT U–4902C/D = 3.688 MILES

ALL LENGTH BASED ON –L– CENTERLINE

Prepared In the Office of:
HNTB NORTH CAROLINA, P.C.
343 E. Six Forks Road, Raleigh NC, 27609

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
SEPTEMBER 10, 2015

LETTING DATE:
AUGUST 16, 2016

DAVID BASS, PE
PROJECT ENGINEER

TRACE HOWELL, EI
PROJECT DESIGN ENGINEER

DAVID LEONARD, PE
NCDOT CONTACT

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION • STATE OF

STATE PROJECT: 40238.1.4 (U-4902D)
F.A. PROJECT: NHS-0017(76)
COUNTY: NEW HANOVER

DESCRIPTION: US 17 Business (Market Street) from Lendire Road to Marsh Oaks Drive

SUBJECT: Geotechnical Inventory Report

PROJECT DESCRIPTION

The proposed project is located in New Hanover County just north of the city of Wilmington. The proposed roadway will consist of widening existing US 17 Business (Market Street).

A geotechnical field investigation was conducted by CATLIN Engineers and Scientists (CATLIN) personnel in March through May 2016. Standard penetration test borings were advanced using hollow-stem augers under the direct supervision of a North Carolina Licensed Well Contractor with a Central Mine Equipment (CME) CME 45B drilling rig and a Diedrich D-50 drilling rig equipped with an automatic hammer. Standard penetration testing was conducted in general accordance with American Society for Testing and Materials (ASTM) D-1586-84, "Penetration Test and Split Barrel Sampling of Soils" or American Association of State Highway and Transportation Officials (AASHTO) Standard Method T206-81. Hand auger borings were advanced across the entire project site to augment the SPT data. A total of 50 borings totaling roughly 355 vertical feet were advanced during this investigation.

Representative soil samples were collected for visual classification in the field and selected samples were submitted for laboratory analysis by CATLIN Geotechnical Laboratory in Wilmington, North Carolina. Samples were prepared and analyzed in accordance with one or more of the following AASHTO Standards as modified by NCDOT:

T 87-86	(Dry Preparation of Disturbed Soil)
T 88-93	(Particle Size Analysis)
T 89-94	(Liquid Limit)
T 90-94	(Plastic Limit)
T 265-93	(Soil Moisture Content)
T 267	(Organic Content)

CATLIN personnel used Global Positioning System (GPS) technology to locate all borings. All horizontal locations were recorded to the nearest foot and are presented in the North Carolina State Plane (NCSP), North American Datum 1983 (NAD 83). Vertical control was measured to the nearest 0.1 foot and referenced to the National Geodetic Vertical Datum 1988 (NGVD88). All measurements were recorded and reported in United States Survey Feet (US Ft).

The following alignments were investigated. Plan sheets, subsurface profiles, and selected cross sections of the alignment are included in this report.

Line	Station (±)
-L-	202+50 to 288+00
-Y28A-	10+00 to 11+25
-Y29-	13+00 to 17+10
-Y30-	10+00 to 11+75
-Y31-	11+25 to 12+50
-Y32-	11+50 to 13+02
-Y33-	11+65 to 12+50

The project reportedly will consist of 1.734 miles of roadway widening.

AREAS OF SPECIAL GEOTECHNICAL INTEREST

1) GROUNDWATER: Groundwater within six (6) feet of natural ground was noted at the following sections:

Line	Station (±)
-L-	202+50 to 224+00
-L-	226+00 to 254+00
-L-	272+00 to 288+00
-Y28A-	10+00 to 11+25
-Y29-	13+00 to 17+10
-Y30-	10+00 to 11+75
-Y31-	11+25 to 12+50
-Y32-	11+50 to 13+02

2) COHESIVE SOILS: Clay or cohesive soils which may have the potential to cause embankment/subgrade and or slope stability problems during construction was encountered at the following sections of the project:

Line	Station ±
-L-	220+14 to 221+40

3) ORGANIC SOILS: Organic material that may cause construction related issues was identified at the following sections on the project:

Line	Station ±
-L-	202+50 to 204+03
-L-	208+00 to 209+50
-L-	221+29 to 222+40
-L-	242+00 to 244+60
-L-	271+00 to 275+00
-L-	280+40 to 281+70
-Y28A-	10+00 to 11+25

4) WATER WELLS: No water wells were identified within the proposed construction limits. Water supply wells may be present along the project corridors that were not detected.

PHYSIOGRAPHY AND GEOLOGY

The project is located within the eastern most portion of the North Carolina Coastal Plain physiographic province. Geology in the vicinity of Wilmington is dominated by Undifferentiated Coastal Plain (U.C.P.) materials which are noted as Quaternary Surficial Deposits on the Geologic Map of North Carolina. Coastal Plain materials are described as sand, clay, gravel, and peat deposits which were deposited in marine, fluvial, eolian, and lacustrine environments. Sediments of the Castle Hayne and Peedee Formations are reported to underlay the U.C.P. deposits in the vicinity of Wilmington.

Land use in the area is primarily commercial and residential. The land surface in the project vicinity is dominated by flat terrain typical of coastal environments with land surface elevations ranging from approximately 25 to 47 feet. Numerous underground and overhead utilities exist in the vicinity of the proposed project. The project is primarily drained by surficial runoff to stormwater systems and drainage ditches.

GROUNDWATER

Groundwater data was collected from open boreholes, where possible, during the field investigation conducted between March and May 2016

Measured groundwater elevations (24 hour measurements) ranged from elevation 22.5 feet to 42.5 feet with an average elevation of 34.8 feet. Twenty-four hour depth to groundwater measurements ranged from 1.5 feet to 6.4 feet below existing land surface (BLS), with an average depth to water of 3.7 feet. Formational material in which groundwater was typically observed was found to be predominantly silty sand material with an assumed moderate permeability.

SOIL PROPERTIES

Soils encountered at the project site include roadway embankment and undifferentiated coastal plain sediments.

Roadway embankment soils were identified beneath and adjacent to existing roadways and consist of loose to medium dense, sand and silty sand (A-3 and A-2-4).

The dominant U.C.P. material encountered consisted of very loose to medium dense sand to silty sand (A-3 and A-2-4). The sand was encountered from land surface, or below the roadway embankment to a depth of at least 12 feet BLS (depth of deepest borings). A small amount of highly plastic clay, silt, and organic sands were encountered at the previously described locations.

Material within the identified organic soil area was described as very loose, dark brown to black, highly organic (15.2% to 18.9%) sand to silty fine sand with little (3.1% to 6.8%) organics.

Prepared by,
Steven V. Hudson, L.G.
Project Geologist
DS
SH
5/31/2016

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NAD 83/NSRS 2007

BEGIN TIP PROJECT U-4902D
-L- POT STA. 203+50.00

END TIP PROJECT U-4751
-YI- POT STA 83+14.00

205

210

215

-L- POC Sta. 208+75.01=
-Y28A- POT Sta. 10+00.00

-L- PC Sta. 205+64.96

-L- PT Sta. 211+98.60

-L- STA 216+00.00
SEE SHEET 5

MATCH LINE

MARKET STREET 58' BST

N 32° 14' 30.8" E

-L-

-Y28A-

12" CMP

72"CMP

24"C&G

ASPHALT

CONC

EIR

ISF BUS

WELLS

BMU47515

WENDOVER LANE

S 51° 41' 54.8" E

BEGIN CONSTRUCTION
-L- STA. 202+50.00

END CONSTRUCTION
-Y28A- POT Sta. 11+25.00
-Y28A- POT Sta. 11+30.00

-L-
PI Sta 208+82.33
Δ = 8° 15' 04.1" (LT)
D = 1° 18' 07.8"
L = 633.64'
T = 317.37'
R = 4,400.00'

REVISIONS

8/17/99

25-MAY-2016 08:33
S:\pmktg\PROJECT\2016\216032 NCDOT MARKET STREET (U4902D_Lendire Rd. to Marsh Oaks)\U4902D_GEO_RDWY\CADD_GEOTECH\Site&Sub\U4902D_GEO_psh_04.dgn
chudson
21 STEVENSON21

REVISIONS

25-MAY-2016 08:39
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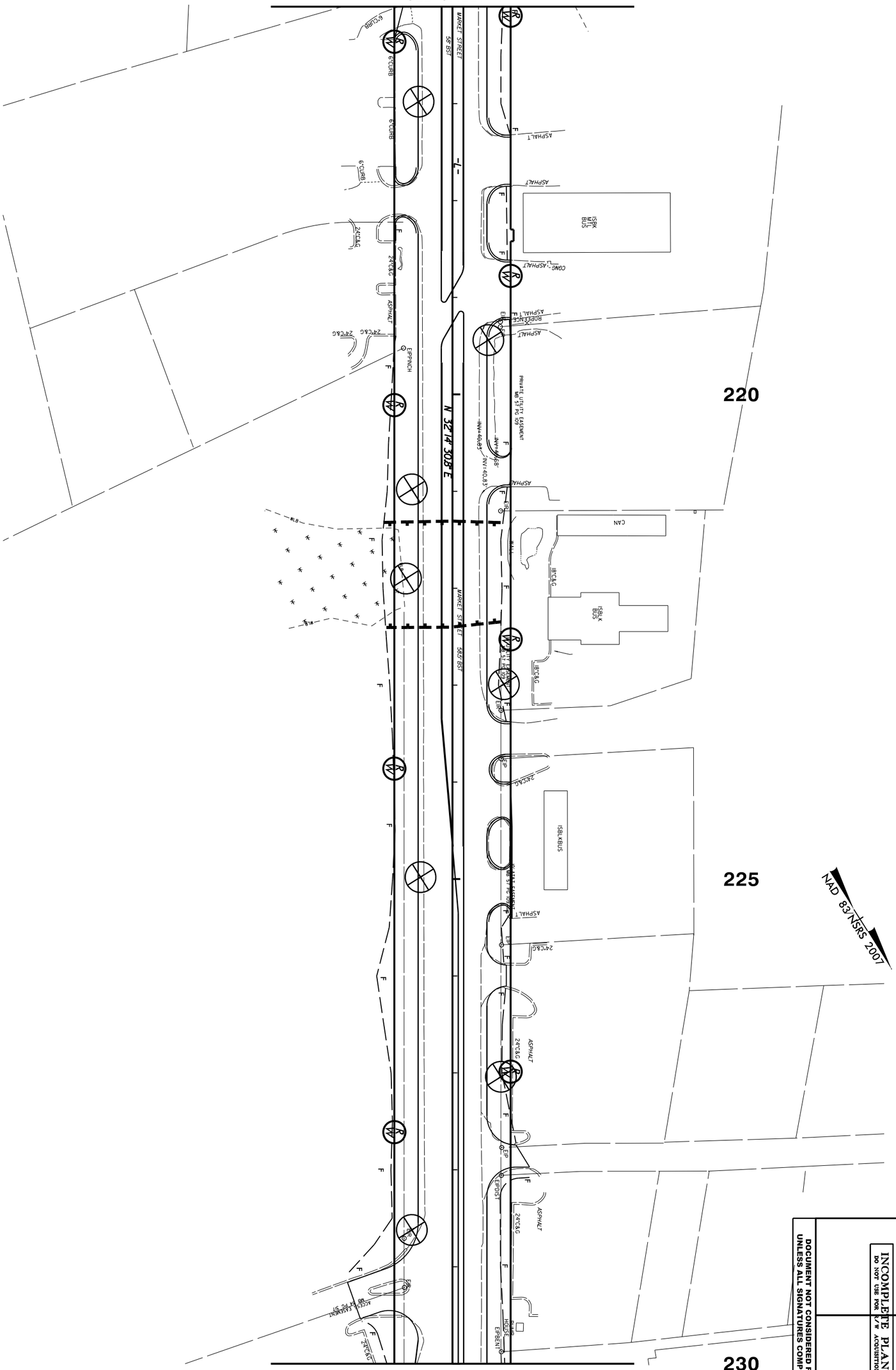
surface AT STEVEHUDSON-PC

8/17/99

MATCH LINE –L STA 216+00.00
SEE SHEET 4



MATCH LINE –L– STA 230+00.00
SEE SHEET 6

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

ROADWAY DESIGN ENGINEER

R/W SHEET NO.

HYDRAULICS ENGINEER

PROJECT REFERENCE NO.
U-4902D

SHEET NO.
5

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	6
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

BEGIN CONSTRUCTION
-Y29- POC STA 13+00.00

-Y29-
PRC Sta. 12+78.57

-Y29-
PI Sta 13+97.39
Δ = 25° 33' 01.3" (RT)
D = 10° 56' 03.5"
L = 233.67'
T = 118.81'
R = 524.00'

-L- POT STA 233+34.80 =
-Y29- POT STA 17+10.51

-Y29- PT Sta. 15+12.25

235

240

NAD 83/NSRS 2007

S 55° 45' 23.2" E
-Y29-

-L-

US HWY 17 MARKET STREET 63.5' BST

N 42° 35' 21.9" E

MATCH LINE -L- 230+00.00
SEE SHEET 5

MATCH LINE -L- STA 244+00.00
SEE SHEET 7

SR 2171 TORCHWOOD BLVD. 35' BST

20' AT&T EASEMENT MB 34 PG 3

20' ACCESS & UTILITY EASEMENT MB 34 PG 3

OAK RIDGE LANE 85' VARIES

ASPHALT

MAG NAIL

COTTONSPINDLE

EIPBENT

ECM

EIPINCH

EIP

EIR

24"C&G

BM12

-L- PC Sta. 230+13.66

-L- PT Sta. 237+45.09

-L- POT STA 233+36.89 =
-Y30- POT STA 10+00.00

END CONSTRUCTION
-Y30- POT STA 11+75.00

-Y30- POT Sta. 12+54.62

S 77° 07' 21.8" E

-L-
PI Sta 233+80.37
Δ = 10° 20' 51.1" (RT)
D = 1° 24' 53.0"
L = 731.42'
T = 366.71'
R = 4,050.00'

SR 1563 BAYSHORE DRIVE 33' BST

SR 1563 BAYSHORE DRIVE 19.5' BST

GRASS ISL

BACK BALL

WOOD SHED

ISBLK CHURCH

ISBKD

20' DRAINAGE EASEMENT MB 34 PG 37

ACCESS EASEMENT MB 34 PG 37

30' OP&L EASEMENT MB 34 PG 17

REVISIONS

8/17/99

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S:\wpmktg\PROJECT\2016_2016032 NCDOT MARKET STREET (U4902D_Lendire Rd. to Marsh Oaks)\U4902D_GEO_RDWY\CADD_GEOTECH\Site&Sub\U4902D_GEO_psh_06.dgn
ahudson AT STEFFENSON.COM

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	7
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NAD 83/NSRS 2007

REVISIONS 8/17/99

MATCH LINE -L- 244+00.00
SEE SHEET 6

MATCH LINE -L- 258+00.00
SEE SHEET 8

245 250 255

-Y31- POT Sta. 10+00.00

-Y32- POT Sta. 10+00.00

BEGIN CONSTRUCTION
-Y31- POT STA 11+25.00

BEGIN CONSTRUCTION
-Y32- POT STA 11+50.00

S 57° 49' 35" E -Y31-

S 57° 06' 33" E -Y32-

+25.00 -Y31- 30.00' RT
+22.46 -L- 75.00' LT
+21.40 -L- 65.00' LT

-L- POT STA 244+79.10 =
-Y31- POT STA 12+50.09

-L- POT STA 254+25.70 =
-Y32- POT STA 13+02.10

BM14

US HWY 17 MARKET STREET 60' BST

-L-

EIPPINCH EIRBENT EIR EIP EIPDIST EIRS MON

SOIL GRAVEL ASPHALT CONC GRASS

40' ACCESS EASEMENT DB 5799 PG 141

40' UTILITY EASEMENT PROPOSED MB 50 PG 336

26' SEWER EASEMENT MB 50 PG 336

30' SEWER EASEMENT DB 3300 PG 99

40' WATER EASEMENT DB 3264 PG 26

35' DRAINAGE EASEMENT DB 1637 PG 1536

15' DRAINAGE EASEMENT DB 1637 PG 1536

20' ACCESS EASEMENT DB 2889 PG 1055

ALEXANDER ROAD SR 1346 19' BST

6"CONC CURB 6"CURB 6"ASPHALT CURB 8"ASPHALT CURB

36"SRF 60"CHL

ISFD ISWD BUS ISMTL BUS ISBLK BUS PUMP HOUSE CAN

25-MAY-2016 08:39
S:\wpmktg\PROJECT\2016_2603\2 NCDOT MARKET STREET (U4902D_Lendire Rd. to Marsh Oaks)\U4902D_GEO_RDWY\CADD_GEOTECH\Site&Sub\U4902D_GEO_psh_07.dgn
Anderson, ST STEPHENSON

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NAD 83/NSRS 2007

MATCH LINE -L- STA 258+00.00
SEE SHEET 7

MATCH LINE -L- STA 272+00.00
SEE SHEET 9

260

265

270

-Y33- POT Sta. 10+00.00

S 52° 20' 04" E -Y33-

BEGIN CONSTRUCTION
-Y33- POT STA 11+65.00

SR 1345 ALEXANDER ROAD 20' BST

SOU

-L- N 42° 35' 21.9" E

US HWY 17 MARKET STREET BST VARIES

-L-

-L- POT STA 269+08.94 =
-Y33- POT STA 12+50.70

84" SW

10" UTILITY EASEMENT MB 47 PG 42

10" SEWER & UTILITY EASEMENT MB 54 PG 79

10" UTILITY EASEMENT MB 54 PG 79

50' WATER & SEWER EASEMENT DB 2745 PG 886

ALPHA BOX

WDSHED

GATE

GRAVEL

ROPEFENCE

CONC

ASPHALT

GRASS ISL

24"CSP

8"CONC CURB

6"CURB

BRK PIER

EIR

EIPOLD

EIPINCH

60' CHL

F

T

W

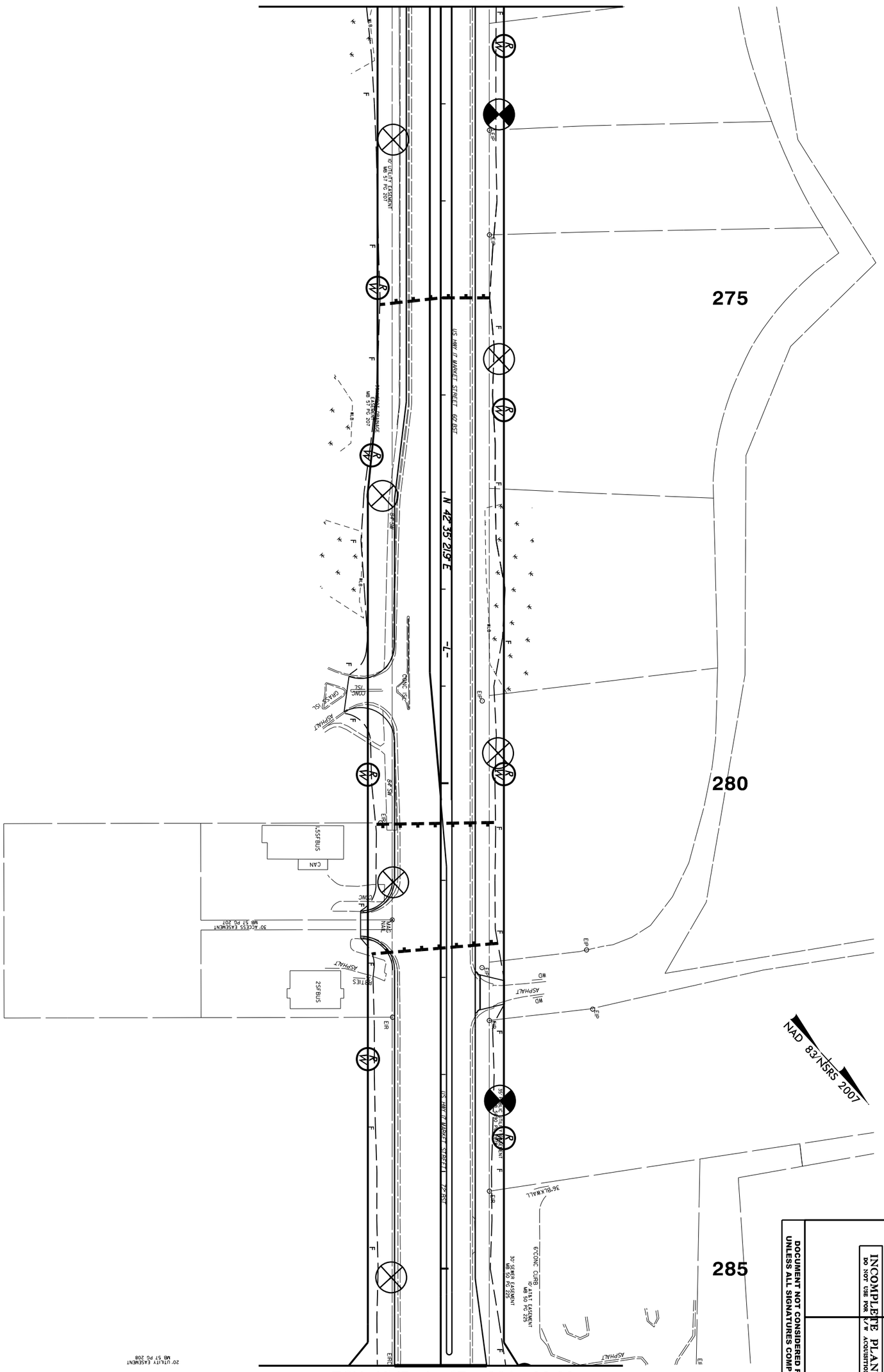
RW

REVISIONS

25-MAY-2016 08:39
S:\wpmktg\PROJECT\2016\216032 NCDOT MARKET STREET (U4902D_Lendire Rd. to Marsh Oaks)\U4902D_GEO_RDWY\CADD_GEOTECH\Site&Sub\U4902D_GEO_psh_09.dgn
sburgess AT STEVEHUDSON-PC

8/17/99

MATCH LINE –L– STA 272+00.00
SEE SHEET 8



MATCH LINE –L– STA 286+00.00
SEE SHEET 10

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

ROADWAY DESIGN ENGINEER

RW SHEET NO.

HYDRAULICS ENGINEER

PROJECT REFERENCE NO.
U-4902D

SHEET NO.
9

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	10
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NAD 83/NSRS 2007

290

295

-Y34- POT Sta. 10+00.00 10

S 56°18'13.4" E

MENDENHALL LANE 85' VARIES

EIR

20' LANDSCAPE BUFFER MB 44 PG 121

EIP/PINCH

EIR

DIST

ASPHALT

CONC

+12.61 -Y34- 25.00' RT

+10.57 86.67' LT

-L- POT STA 286+81.51 =
-Y34- POT STA 13+22.80

END TIP PROJECT U-4902D
-L- POT STA. 288+00.00
END CONSTRUCTION

24°C&G

30' SEWER EASEMENT MB 44 PG 121

42' ACCESS EASEMENT MB 44 PG 121

ASPHALT

24°C&G

EIP

N 42° 35' 21.9" E

-L-

US HWY 17 MARKET STREET 60' BST

-Y35-

MATCH LINE -L- STA 286+00.00
SEE SHEET 9

6"CONC CURB

EIP

6"CONC CURB

6"CONC CURB

ASPHALT

ASPHALT

ASPHALT

ASPHALT

SIDE

SR 2734 MARSH OAKS DRIVE 245' BST

SR 2734 MARSH OAKS DRIVE 245' BST

S 43°14'47.1" E

-L- POT STA 286+83.61 =
-Y35- POT STA 10+00.00

+18.98 -Y35- 50.52' RT

-Y35- POT Sta. 12+53.69

REVISIONS

8/17/99

25-MAY-2016 08:39
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Davison at STEVEHINSON2

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	11
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

SAMPLE NUMBER	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
S-34	48 ft LT	202+43	3.0 - 5.0	A-3(0)	18	NP	37.7	53.6	2.5	6.2	98.8	91	9	-	4.1
SS-66	51 ft RT	204+96	3.5 - 5.0	A-2-4(0)	10	NP	33.6	50.3	7.7	8.4	99.9	93	16	-	2.8
S-35	38 ft LT	206+96	3.0 - 3.5	A-2-4(0)	13	NP	40.0	45.9	3.9	10.2	99.8	93	14	-	1.9
S-36	38 ft LT	206+96	3.5 - 4.0	A-3(0)	16	NP	40.6	51.1	2.1	6.1	99.0	88	9	-	0.5
S-37	45 ft LT	210+99	1.5 - 4.0	A-3(0)	20	NP	33.7	59.1	0.9	6.3	95.9	92	8	-	1.8
S-38	45 ft LT	210+99	4.0 - 7.0	A-3(0)	19	NP	40.5	53.8	0.5	5.2	94.9	90	6	-	1.8
S-41	81 ft RT	208+42	2.0 - 3.0	A-2-4(0)	14	NP	29.8	55.4	4.3	10.5	99.7	95	15	-	2.1
S-42	81 ft RT	208+42	3.8 - 4.9	A-2-4(0)	27	NP	20.6	69.0	3.8	6.6	99.9	97	11	-	4.0

(A) LIGHT GRAY TO DARK BROWN, MED. DENSE TO DENSE, F. SAND, DRY TO MOIST. (ROADWAY EMBANKMENT)

(B) BLACK, MED. DENSE, F. SAND W/LITTLE ORG. WET TO SAT. (U.C.P.)

BEGIN GRADE
U-4902D
-L- STA. 203+50.00
EL = 47.08'

FEATHER TO EXISTING
-L- STA. 202+50.00
EL = 46.80'

S-34 48 LT

SS-66 51 RT

S-35 S-36 38 LT

S-41 S-42 81 RT

S-37 S-38 45 LT

43 RT

U-4751 -Y1- STA. 82+14.00

U-4751 -Y1- STA. 83+14.00

END GRADE U-4751 -Y1- STA. 84+95.00

GRADE TIE
U-4902C -L- STA. 205+31.00
U-4751 -Y1- STA. 84+94.00
EL = 47.28'

LIGHT GRAY TO DARK BROWN, MED. DENSE TO DENSE, F. SAND. NO TO TR. ORG. MOIST TO SAT. (U.C.P.)

-L- STA. 208+75.01
-Y28A- STA. 10+00.00

LIGHT GRAY TO DARK BROWN, MED. DENSE, F. SAND. NO TO TR. ORG. MOIST TO SAT. (U.C.P.)

130 120 110 100 90 80 70 60 50 40 30 20 10 0 –10 –20 –30 –40 –50 –60

200+00 201+00 202+00 203+00 204+00 205+00 206+00 207+00 208+00 209+00 210+00 211+00 212+00 213+00 214+00

5/14/99

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Driver: 21 STEVEHINSNET

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	12
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

SAMPLE NUMBER	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
S-39	41 ft LT	215+01	0.0 - 3.0	A-3(0)	16	NP	40.0	55.2	0.9	4.0	99.4	91	5	-	1.6
S-40	41 ft LT	215+01	3.0 - 5.5	A-3(0)	14	NP	37.5	58.9	0.6	3.0	98.6	92	4	-	1.2
S-43	37 ft LT	219+44	0.0 - 2.0	A-3(0)	19	NP	35.3	57.9	1.6	5.1	93.4	91	8	-	1.3
S-44	37 ft LT	219+44	2.0 - 6.0	A-3(0)	13	NP	48.9	46.5	0.5	4.2	99.5	88	5	-	-
S-45	29 ft RT	220+98	2.0 - 4.0	A-3(0)	15	NP	38.5	54.6	1.9	5.0	99.8	94	7	-	2.2
S-46	29 ft RT	220+98	4.0 - 5.5	A-4(0)	20	7	2.1	63.7	17.0	17.2	100	100	39	-	-
S-47	29 ft RT	220+98	5.5 - 6.5	A-7-6(17)	44	26	3.2	30.9	16.9	48.9	100	99	70	-	2.2
S-48	33 ft RT	224+98	0.0 - 6.0	A-3(0)	10	NP	26.0	69.1	0.7	4.2	99.8	97	5	-	-
S-74	48 ft RT	221+90	4.5 - 5.0	A-2-5(0)	72	NP	31.2	42.9	19.5	6.4	98.8	93	26	-	15.2

(A) LIGHT GRAY TO DARK BROWN,MED.DENSE TO DENSE,F.SAND. DRY TO MOIST.(ROADWAY EMBANKMENT)

(C) LIGHT GRAY,SOFT,SANDY SILT W/CLAY. SAT.

(D) BLACK TO DARK BROWN,V.LOOSE TO LOOSE,HIGHLY ORGANIC SILTY,F.SAND. SAT.(MUCK)

S-39 S-40 — 41 LT — BT 03/16

35 RT — BT 03/16

S-43 S-44 — 37 LT — BT 03/16

S-45 S-46 S-47 — 42 RT — BT 03/16

S-74 — 48 RT — BT 04/16

BT LIGHT GRAY,SOFT, HIGHLY PLASTIC CLAY. SAT.

53 LT — BT 04/16

S-48 — 33 RT — BT DRY

50 LT — BT 03/16

LIGHT GRAY TO DARK BROWN,MED.DENSE TO DENSE,F.SAND. NO TO TR.ORG. MOIST TO SAT.(U.C.P.)

LIGHT GRAY TO DARK BROWN,MED.DENSE TO DENSE,F.SAND. NO TO TR.ORG. MOIST TO SAT.(U.C.P.)

130 120 110 100 90 80 70 60 50 40 30 20 10 0 –10 –20 –30 –40 –50 –60

214+00 215+00 216+00 217+00 218+00 219+00 220+00 221+00 222+00 223+00 224+00 225+00 226+00 227+00 228+00

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Shawn
41 SIGNATURES

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	13
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

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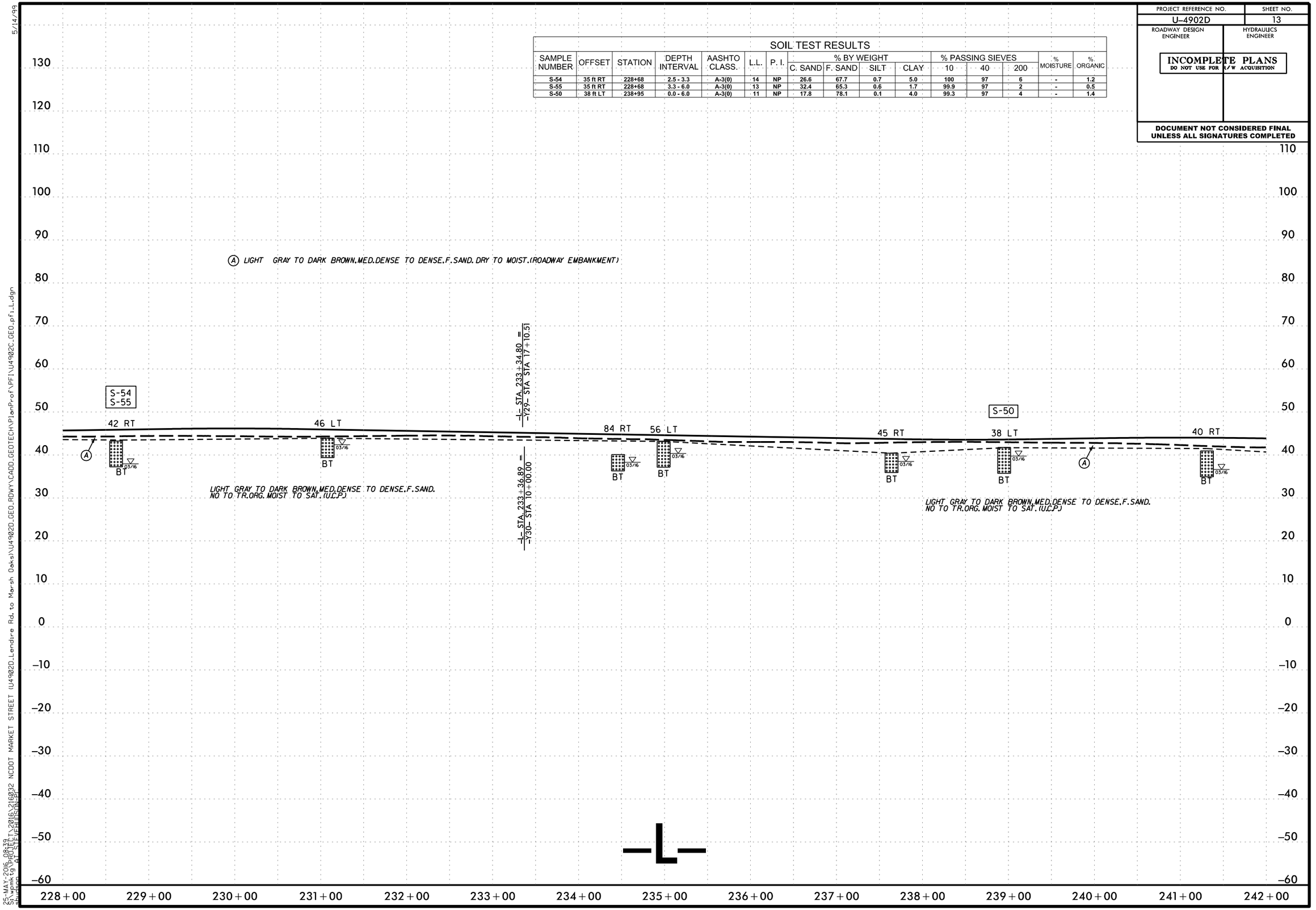
SOIL TEST RESULTS

SAMPLE NUMBER	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
S-54	35 ft RT	228+68	2.5 - 3.3	A-3(0)	14	NP	26.6	67.7	0.7	5.0	100	97	6	-	1.2
S-55	35 ft RT	228+68	3.3 - 6.0	A-3(0)	13	NP	32.4	65.3	0.6	1.7	99.9	97	2	-	0.5
S-50	38 ft LT	238+95	0.0 - 6.0	A-3(0)	11	NP	17.8	78.1	0.1	4.0	99.3	97	4	-	1.4



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jhudson
ET STEVENSON,PE

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	14
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

SAMPLE NUMBER	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-72	62 ft LT	243+08	10.5 - 12.0	A-2-5(0)	65	NP	42.1	38.7	16.5	2.7	100	79	20	-	18.9
SS-73	62 ft LT	243+08	13.5 - 15.0	A-3(0)	10	NP	80.7	18.6	0.4	0.3	100	69	1	-	0.4
S-52	56 ft LT	255+59	2.0 - 4.0	A-2-4(0)	18	NP	33.1	56.4	3.6	6.9	98.5	92	11	-	-

130 120 110 100 90 80 70 60 50 40 30 20 10 0 –10 –20 –30 –40 –50 –60

Ⓐ LIGHT GRAY TO DARK BROWN,MED.DENSE TO DENSE,F.SAND,DRY TO MOIST.(ROADWAY EMBANKMENT)

Ⓓ BLACK TO DARK BROWN,V.LOOSE TO LOOSE,HIGHLY ORGANIC SILTY,F.SAND,SAT.(MUCK)

SS-72
SS-73

62 LT

38 RT

60 LT

37 RT

59 LT

36 RT

S-52
56 LT

7 8 3 2 WOH 4 — 04/16 — BT

03/16 — BT

03/16 — BT

03/16 — BT

03/16 — BT

03/16 — BT

BT DRY

℄ STA. 244+79.10 ≠
℄Y31– STA 12+50.09

℄ STA. 254+25.70 =
℄Y32– STA 13+02.10

LIGHT GRAY TO DARK BROWN,LOOSE,F.SAND. NO TO TR.ORG.MOIST TO SAT.(U.C.P.)

LIGHT GRAY TO DARK BROWN,LOOSE,F.SAND. NO TO TR.ORG.MOIST TO SAT.(U.C.P.)

242+00 243+00 244+00 245+00 246+00 247+00 248+00 249+00 250+00 251+00 252+00 253+00 254+00 255+00 256+00

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Steven Hudson

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	15
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

SAMPLE NUMBER	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
S-53	39 ft RT	257+09	4.0 - 6.0	A-3(0)	12	NP	52.5	43.8	0.7	3.0	97.9	78	4	-	2.3
S-56	26 ft RT	265+07	0.0 - 1.0	A-2-4(0)	21	NP	4.5	83.0	4.9	7.7	98.9	99	24	-	-
S-57	26 ft RT	265+07	1.0 - 6.0	A-3(0)	11	NP	38.2	58.6	0.5	2.7	99.4	93	3	-	-

Ⓐ LIGHT GRAY TO DARK BROWN,MED.DENSE TO DENSE,F.SAND, DRY TO MOIST.(ROADWAY EMBANKMENT)

S-53
39 RT
BT
DRY

49 LT
BT
03/16

45 RT
BT
DRY

LIGHT GRAY TO DARK BROWN,V.LOOSE TO LOOSE,F.SAND, NO TO TR.ORG. MOIST TO SAT.(U.C.P.)

41 LT
BT
04/16

S-56
S-57
26 RT
BT
DRY

LIGHT GRAY TO DARK BROWN,V.LOOSE TO LOOSE,F.SAND.
NO TO TR.ORG. MOIST TO SAT.(U.C.P.)

60 LT
BT
03/16

42 RT
BT
DRY

-L- STA 269+08.94
-Y33- STA 12+50.70

120 110 100 90 80 70 60 50 40 30 20 10 0 –10 –20 –30 –40 –50 –60 –70

256+00 257+00 258+00 259+00 260+00 261+00 262+00 263+00 264+00 265+00 266+00 267+00 268+00 269+00 270+00

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	16
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

SAMPLE NUMBER	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-70	60 ft LT	273+11	6.0 - 12.0	A-3(0)	12	NP	27.6	65.7	2.2	4.4	99.5	96	7	-	1.9
SS-71	60 ft LT	273+11	13.5 - 15.0	A-3(0)	14	NP	26.4	65.0	4.2	4.4	99.8	96	9	-	3.1
S-58	60 ft RT	277+04	4.0 - 4.5	A-3(0)	12	NP	27.9	66.3	0.8	5.0	99.9	96	6	-	1.3
S-59	60 ft RT	277+04	4.5 - 7.0	A-3(0)	13	NP	24.6	70.9	1.8	2.7	100	98	5	-	0.6
S-60	49 ft RT	281+02	4.0 - 5.5	A-2-4(0)	20	NP	38.2	48.7	5.4	7.7	99.5	91	14	-	5.5
S-61	49 ft RT	281+02	5.5 - 7.0	A-3(0)	17	NP	53.7	39.4	0.6	6.3	94.1	84	7	-	1.6
SS-68	61 ft LT	283+27	3.5 - 5.0	A-3(0)	9	NP	25.2	73.1	0.4	1.3	100	97	2	-	0.4

(A) LIGHT GRAY TO DARK BROWN,MED.DENSE TO DENSE,F.SAND. DRY TO MOIST.(ROADWAY EMBANKMENT)

(B) BLACK TO DARK BROWN,V.LOOSE TO LOOSE,LITTLE TO MODERATELY ORGANIC SILTY,F.SAND

SS-70
SS-71
60 LT
49 RT
46 LT
S-58
S-59
60 LT
60 RT
59 LT
S-60
S-61
49 RT
SS-68
61 LT

LIGHT GRAY TO DARK BROWN, V.LOOSE TO LOOSE,SILTY,F.SAND. NO TO TR.ORG. MOIST TO SAT.(U.C.P.)

LIGHT GRAY TO DARK BROWN,V.LOOSE TO LOOSE,SILTY,F.SAND. NO TO TR.ORG. MOIST TO SAT.(U.C.P.)

BT

120 110 100 90 80 70 60 50 40 30 20 10 0 –10 –20 –30 –40 –50 –60 –70

270+00 271+00 272+00 273+00 274+00 275+00 276+00 277+00 278+00 279+00 280+00 281+00 282+00 283+00 284+00

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jhudson
ST_STEFFENSEN_PF

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	17
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SOIL TEST RESULTS

SAMPLE NUMBER	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
S-62	51 ft RT	285+09	0.0 - 1.0	A-3(0)	15	NP	25.7	71.6	0.7	2.0	99.9	97	3	-	-
S-63	51 ft RT	285+09	1.0 - 6.0	A-3(0)	10	NP	33.2	63.0	1.4	2.4	99.8	94	4	-	-

Ⓐ LIGHT GRAY TO DARK BROWN.MED.DENSE TO DENSE.F.SAND.DRY TO MOIST.(ROADWAY EMBANKMENT)

SS-62
SS-63
51 RT
BT
03/16
Ⓐ

END GRADE
PROJECT U-4902D
-L- STA 285+86.00
ELEV. = 39.14

FEATHER TO EXISTING
-L- STA 286+35.00
EL = 38.94'

-L- STA 286+81.51 =
-Y34- STA 13+22.80

-L- STA 286+83.61 =
-Y35- STA 10+00.00

LIGHT GRAY TO DARK BROWN.V.LOOSE TO LOOSE.
NO TO TR.ORG. SILTY.F.SAND.MOIST TO SAT.(U.C.P.)

120 110 100 90 80 70 60 50 40 30 20 10 0 –10 –20 –30 –40 –50 –60 –70

284+00 285+00 286+00 287+00 288+00 289+00 290+00 291+00 292+00 293+00 294+00 295+00 296+00 297+00 298+00

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Shadow, ST, STEVEHILSMAN

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dmason

SOIL TEST RESULTS

SAMPLE NUMBER	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P. I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
S-67	42 ft RT	11+72	3.5 - 5.0	A-2-4(0)	31	NP	20.0	60.5	12.8	6.7	97.1	96	20	-	6.8
SS-69	20 ft LT	11+65	6.0 - 7.5	A-3(0)	10	NP	39.5	55.9	2.3	2.3	98.8	85	5	-	1.0
S-41	31 ft RT	10+82	2.0 - 3.0	A-2-4(0)	14	NP	29.8	55.4	4.3	10.5	99.7	95	15	-	2.1
S-42	31 ft RT	10+82	3.8 - 4.9	A-2-4(0)	27	NP	20.6	69.0	3.8	6.6	99.9	97	11	-	4.0

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	18
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

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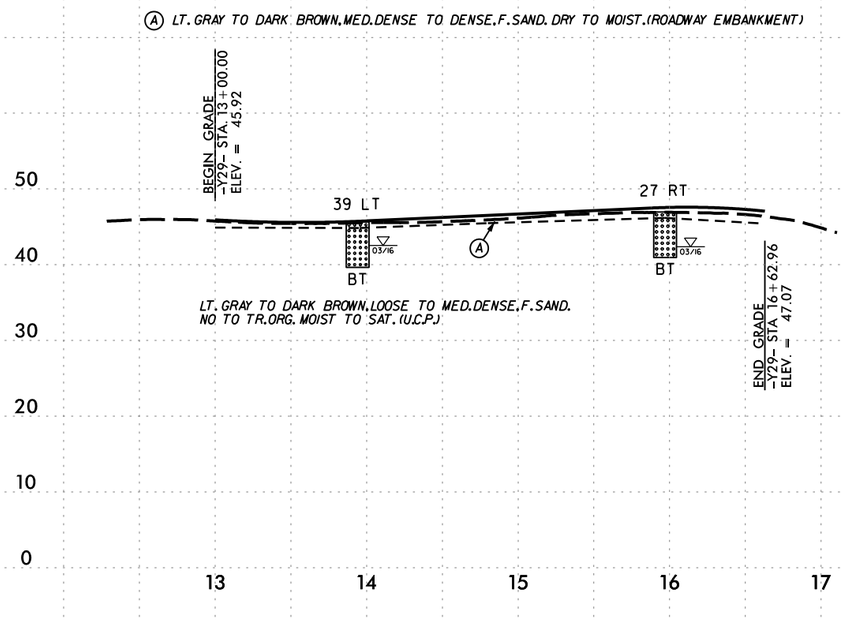

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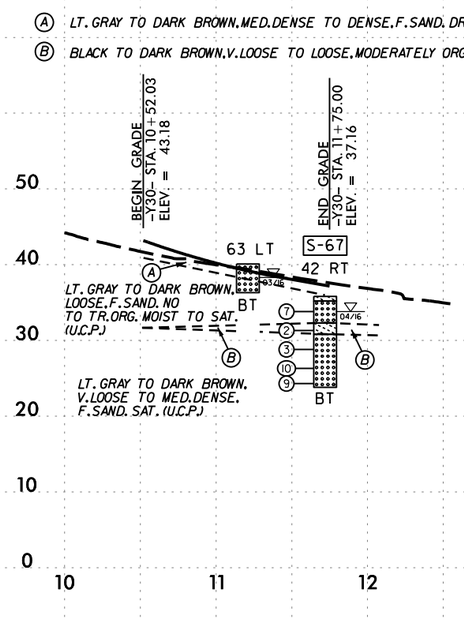

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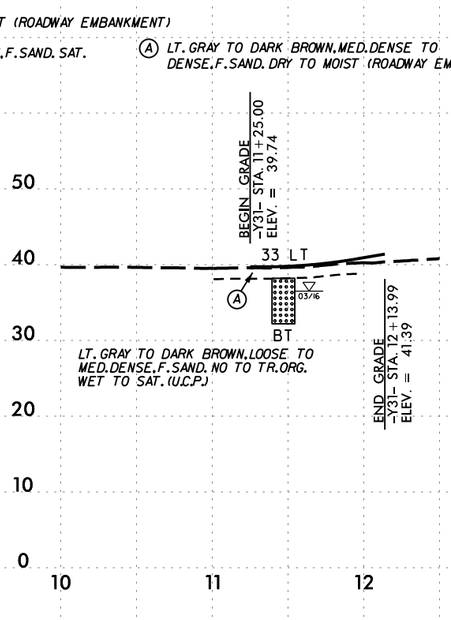

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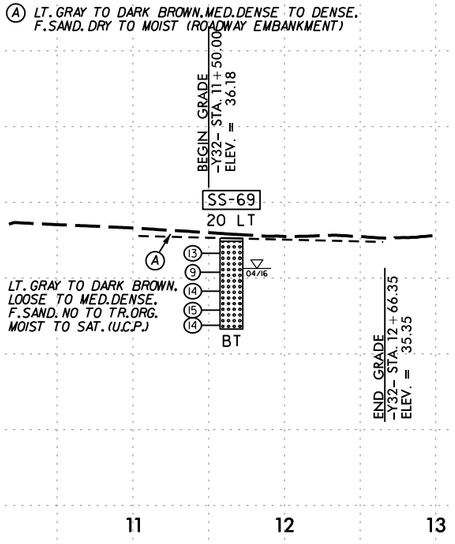

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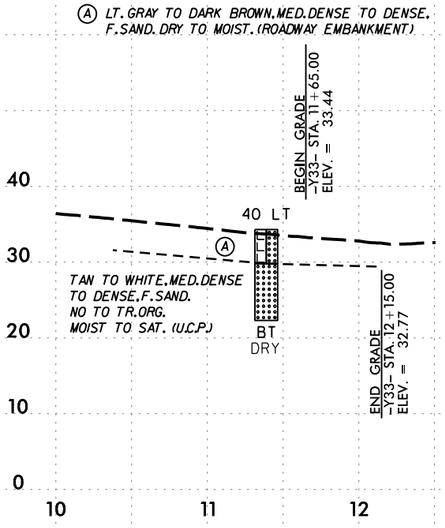

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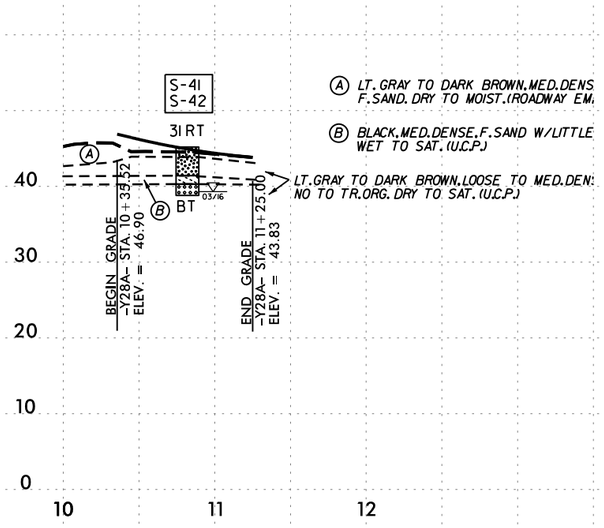

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CATLIN
Engineers and Scientists

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Wilmington, North Carolina 28404-0279

Telephone: (910) 452-5861
Fax: (910) 452-7563

www.catlinusa.com

May 15, 2017

MEMORANDUM TO: John L. Pilipchuk, LG, PE
State Geotechnical Engineer

FROM: Ben D. Lackey Jr, PE
CATLIN Senior Geotechnical Engineer

STATE PROJECT: 40238.1.4 (U-4902D)
F.A. NUMBER: NHS-0017(76)
COUNTY: NEW HANOVER

DESCRIPTION: US 17 Business (Market Street) from Lendire Road to Marsh Oaks Drive

SUBJECT: Geotechnical Report Addendum – Ground Improvement

CATLIN Engineers and Scientists (CATLIN) have completed a subsurface investigation and recommendations addendum to address the long term settlement and slope stability in the area listed below.

Line	Station +/-
-L-	277+47 to 279+77

CATLIN recommends the use of lightweight aggregate embankment with high strength fabric for embankment stabilization for the proposed roadway embankment and as a replacement for the existing roadway embankment in this area.

1. Fabric for Embankment Stabilization

The fabric for the embankment stabilization shall be installed in the following area, as shown on the detail plan, prior to placement of the lightweight aggregate embankment fill. Fabric for embankment construction shall meet the requirements of the attached "Fabric for Embankment Stabilization" special provision. Recommend a quantity of 3,650 square yards of Fabric for Embankment Stabilization in the contract.

Line	Station +/-
-L-	277+47 to 279+77

2. Removal of the existing Roadway Embankment

The existing roadway embankment shall be removed from the following area.

Line	Station +/-
-L-	277+47 to 279+77

Recommend 3,100 cubic yards of suitable unclassified excavation be included in the contract. Use of suitable unclassified excavation material shall meet the requirements of the attached "Special Handling of Unclassified Excavation" special provision.

3. Lightweight Aggregate

Lightweight aggregate shall be used to construct the proposed embankment to subgrade from -L- Station 277+47 ± to 279+77 ±. Lightweight aggregate for construction shall meet the requirements of the attached "Lightweight Aggregate" special provision. Include a quantity of 3,000 tons of Lightweight Aggregate in the contract.

4. Shoulder and Slope Material

The fill slope material should be placed to a height of 1 foot on the roadway side slopes which are formed with lightweight aggregate. Material for fill slope shall meet the requirements of the attached "Shoulder and Fill Slope Material" project special provision. Recommend 275 cubic yards of borrow excavation should be included in the contract.

5. Fabric for Soil Stabilization

The fabric for soil stabilization shall be installed between the lightweight aggregate embankment. Include 7,300 square yards of Fabric for Soil Stabilization in the contract to be used in the following sections, as shown on the detail plan.

Line	Station +/-
-L-	277+47 to 279+77

5. Attachments

- Quantity Summary

- Special Provisions

1. Fabric for Embankment Stabilization
2. Lightweight Aggregate
3. Shoulder and Fill Slope Material
4. Special Handling of Unclassified Excavation

- Plan Sheet

1. Lightweight Aggregate Embankment Detail Plan (1 sheet)

Prepared By:

Lee Stone, P.G.
CATLIN Senior Geologist

Ben D. Lackey Jr. P.E.
CATLIN Geotechnical Engineer

Quantity Summary

Item Number	Description	Quantity	Comment
	Fabric for Embankment Stabilization (SP)	3,650 SY	See Section 1
	Special Handling of Unclassified Excavation (SP)	3,100 CY	See Section 2
	Lightweight Aggregate (SP)	3,000 TON	See Section 3
0106000000-E	Borrow Excavation for Shoulder and Fill Slope Material	275 CY	See Section 4
0196000000-E	Fabric for Soil Stabilization	7,300 SY	See Section 5

FABRIC FOR EMBANKMENT STABALIZATION

DESCRIPTION:

This work consists of furnishing and installing synthetic fabric for stabilizing embankment in accordance with this provision or as directed by the Engineer. The work shall include maintaining the fabric in the required configuration until completion and acceptance of overlying work items. The fabric shall be placed at the locations shown in the plans or as directed by the Engineer.

MATERIAL:

The fabric material for embankment stabilization shall be made of high-tenacity polyester in the machine direction with a plain straight weave pattern and polyester or polypropylene in the cross direction or approved equal. The fabric shall be composed of strong rot-proof synthetic fibers formed into a fabric of the woven type. The fabric shall be free of any treatment or coating which might significantly alter its physical properties after insulation.

The fabric shall contain stabilizers and/or inhibitors to make the filaments resistant to deterioration resulting from ultraviolet or heat exposure. The fabric shall be a pervious sheet of synthetic fibers oriented into a stable network so that the fibers retain their relative positions with respect to each other. The edges of the fabric shall be furnished to prevent the outer yarn from pulling away from the fabric. The fabric shall be free of defects or flaws which significantly affect its physical and/or filtering properties. Sheets of fabric shall be sewn together with a seam that furnishes the required minimum strengths. The seam thread shall be made of synthetic fibers which are resistant to deterioration, as are the fabric fibers. Lamination of fabric sheets to produce the physical requirements of a fabric layer will not be accepted.

During all periods of shipment and storage, the fabric shall be wrapped in a heavy duty protective covering to protect the fabric from direct sunlight ultraviolet rays, mud, dust, dirt, and debris. The fabric shall not be exposed to temperatures greater than 140°F. After the protective wrapping has been removed, the fabric shall not be left uncovered under any circumstances for longer than one (1) week.

The fabric shall meet the following requirements:

All values represent minimum average roll values (any roll in a lot should meet or exceed the minimum values in this table).

Fabric Property	Test Method	Requirements
Min. Puncture Strength	ASTM D-4833	135 lbs
Min. Bursting Strength	ASTM D-3786	600 psi
Trapezoid Tear	ASTM D-4533	135 lbs
AOS, US STD Sieve	ASTM D-4751	20-70
Seams, Strength Cross Machine Direction Only	ASTM D-4884	500 lbs/ft
Ultraviolet (UV) % Strength Retained	ASTM D-4355	30%
Permeability	ASTM D-4491	.002 in/sec
Tensile Strength at 5% Strain	ASTM D-4595 (Wide Strip Test)	Machine Direction 8000 lbs/ft
Ultimate Tensile Strength	ASTM D-4595 (Wide Strip Test)	Machine Direction 20000 lbs/ft

The Contractor shall furnish certified reports by an approved independent testing laboratory with each shipment of material attesting that the fabric meets the requirements of this provision; however, the material shall be subject to inspection, test, or rejection by the Engineer at any time. The Contractor shall furnish the Engineer certified test reports by an approved independent testing laboratory attesting that the sewn seam provides the required strength.

The Contractor shall furnish and place over the embankment stabilization fabric as shown in the plan or as directed by the Engineer.

CONSTRUCTION METHODS:

The fabric for embankment stabilization shall be placed at locations shown in the plans or as directed by the Engineer. The locations should be cleared and free of obstructions, debris, and pockets. Stumps shall be cut smooth at the ground elevation with the root system left intact. At the time of installation, the fabric shall be rejected if it had defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

The fabric for embankment stabilization shall be placed with the machine direction as shown on the plans or as directed by the Engineer. Fabric shall be laid smooth and free from tension, stress folds, wrinkles, or creases. All joints parallel to the machine direction shall be sewn by an approved method to develop the required seam strength. All sewn seams shall be placed facing upwards to allow for inspection. No seams will be allowed perpendicular to the machine direction. The lightweight aggregate should be placed and compacted using low ground pressure equipment as directed by the Engineer. All fabric which is damaged as a result of installation will be required to be replaced or repaired at the direction of the Engineer with no additional cost to the Department. Compaction equipment shall be such that it will not harm the fabric.

A lightweight aggregate layer at a depth shown in the plan or as directed by the Engineer shall be placed over the geosynthetic layer. End dumping fill directly on the fabric is not permitted. Spreading and compaction of lightweight aggregate with low ground pressure (<4 psi) equipment is required until 2 feet of lightweight fill has been placed.

Any fabric which is damaged as a result of installation or which is left uncovered for longer than one week after placement shall be replaced at no additional cost to the Department.

METHOD OF MEASUREMENT

The quantity of fabric to be paid for will be the number of square yards of "Fabric for Embankment Stabilization" measured along the surface of the ground which has been acceptably placed. No separate measurement will be made of overlapping fabric.

BASIS OF PAYMENT:

The quantity of fabric, measured as provided above, will be paid for at the contract unit price per square yard for "Fabric for Embankment Stabilization". Such price and payment will be full compensation for furnishing, hauling, placing, compaction, and all incidentals necessary to complete the work.

Pay Item: Fabric for Embankment Stabilization…….....Square Yard

LIGHTWEIGHT AGGREGATE (SPECIAL)

GENERAL:

Furnish and place lightweight aggregate as shown on the plans, according to this provision, and as directed by the Engineer. Use ESCS (Expanded Shale Clay Slate) produced by the rotary kiln method conforming to ASTM C-330 (latest edition).

MATERIAL PROPERTIES:

Lightweight aggregate must have a proven record of durability, and be non-corrosive, with the following properties:

- Contains a maximum organic content of 0.1%
- Soundness Loss (AASHTO T104): Have a maximum soundness loss of less than 30% when subjected to four cycles of Magnesium Sulfate.
- Abrasion Resistance (ASTM C131): Have a maximum percentage of abrasion loss of less than 40%.
- Chloride Content (AASHTO T291): Have a chloride content of less than 100 ppm.
- Gradation (ASTM 136): use an aggregate gradation from ¾" to #4. Other gradations may be acceptable with approval of the Engineer.
- Aggregate loose unit weight (ASTM C29): Have a loose unit weight less than 55 lbs/ft^3.
- In-place unit weight (ASTM D4253, D4254): Have an in-place compacted dry unit weight between 55 and 60 lbs/ft^3. Material must be compacted to a minimum 65% relative density as determined by ASTM D4253 and D4254. Use a vibratory table when determining the maximum index density and unit weight in accordance with ASTM D4253. Determine the minimum index density and unit weight in accordance with ASTM D4254.
- Angle of Internal Friction (ASTM D3080): Minimum angle of internal friction of 40 degrees. Test a saturated representative sample (with particles larger than 0.75 inch removed) in a round or square shear box that is a minimum of 12 inches across.
- Resistivity (ASTM D1125): Have a resistivity greater than 3000 ohm-cm.
- pH (ASTM D1293): Have a pH greater than five but less than 10.

Before placing any backfill, furnish a Type IV certification in accordance with Article 106-3 of the Standard Specifications. Include a copy of all test results conducted in accordance with the above requirements in the certification. The Engineer determines how often NCDOT samples backfill material to assure compliance with gradation and other material properties.

METHOD OF CONSTRUCTION:

Place lightweight fill in uniform layers. Compact as needed to achieve the required density. Place layers not more than 12 inches in depth loose thickness and compact. Compact with three passes of an 8 – 10 ton vibratory roller in the vibratory mode, or as directed by the Engineer. In confined areas use vibratory plate compaction equipment (5 hp to 20 hp) with a minimum of two passes in 6" lifts for a 5 hp plate and 12" lifts for a 20 hp plate. Take all necessary precautions when working adjacent to the lightweight fill to ensure that the material is not over compacted. Construction equipment, other than for placement and compaction, must not operate on the exposed lightweight fill.

METHOD OF MEASUREMENT AND PAYMENT:

Lightweight aggregate will be measured and paid for per ton of "Lightweight Aggregate" that has been acceptably placed and compacted. Such price and payment will be full compensation for furnishing, hauling, placing, and compacting the fill and all incidentals necessary to complete the work.

Pay Item: Lightweight Aggregate……..... Ton

SHOULDER AND FILL SLOPE MATERIAL: (SPECIAL)

DESCRIPTION: Perform the required shoulder and slope construction for this project in accordance with the applicable requirements of Section 560 and Section 235 of the 2006 *Standard Specifications* except as follows:

Construct the top 12 inches of shoulder and fill slopes with soils capable of supporting vegetation.

Provide soil with a P. I. greater than 6 and less than 25 and with a pH ranging from 5.5 to 6.8. Remove stones and other foreign material 2 inches or larger in diameter. All soil in subject to test and acceptance or rejection by the Engineer.

Obtain material from within the project limits or approved borrow source.

COMPENSATION: When the Contractor elects to obtain material from an area located beneath a proposed fill sections which does not require excavation for any reason other than to generate acceptable shoulder and fill material, the work of performing the excavation will be considered incidental to the item of *Borrow Excavation* or *Shoulder Borro*w. If there is no pay item for Borrow or Shoulder Excavation in the contract, this work will be considered incidental to *Unclassified Excavation*. Stockpile the excavated material in a manner to facilitate measurement by the Engineer. Fill the void created by the excavation of the shoulder and fill slope material with suitable material. Payment for material used from the stockpile will be made at the contract unit price for *Borrow Excavation* or *Shoulder Borrow*. If there is no pay item for *Borrow Excavation* or *Shoulder Borrow*, then the material will be paid for at the contract unit price for *Unclassified Excavation*. The material used to fill the void created by the excavation of the shoulder and fill slope material will be made at the contract unit price for *Unclassified Excavation*, *Borrow Excavation*, or *Shoulder Borrow*, depending on the source of the material.

Material generated from undercut excavation, unclassified excavation, or clearing and grubbing operations that is placed directly on the shoulders or slope areas, will not be measured separately for payment, as payment for work requiring the excavation will be considered adequate compensation for depositing and grading the material on the shoulder slopes.

When undercut excavation is performed at the direction of the Engineer and the material excavated is found to be suitable for use as shoulder and fill slope material, and there is no area on the project currently prepared to receive the material generated by the undercut operation, the Contractor may construct a stockpile for use as borrow at a later date. Payment for the material used from the stockpile will be made at the contract unit price for *Borrow Excavation* or *Shoulder Borrow*.

When shoulder material is obtained from the borrow sources or from stockpiled material, payment for the work of shoulder construction will be made at the contract unit price per cubic yard for *Borrow Excavation* or *Shoulder Borrow* in accordance with the applicable provisions of Section 230 or Section 560 of the 2006 *Standard Specifications*.

SPECIAL HANDLING OF UNCLASSIFIED EXCAVATION (SPECIAL)

GENERAL

Use any suitable unclassified excavation material removed from the excavation from the stations listed below in accordance with NCDOT Standard Specification 225, except the material shall not be used in the top 3 feet of the proposed embankment or backfill. These soils may be utilized in areas outside the pavement section or in lower portions of high fills at the discretion of the Engineer.

Line	Station +/-
-L-	277+47 to 279+77

PROJECT REFERENCE NO.	SHEET NO.
U-4902D	13 of 13

GEOTECHNICAL ENGINEER

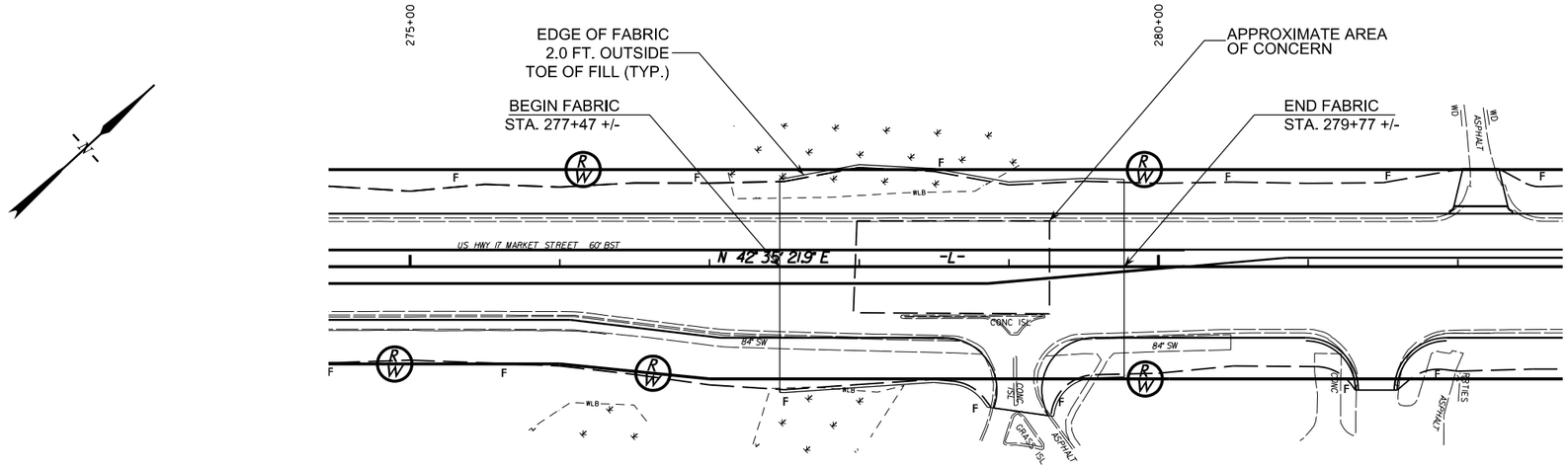
NORTH CAROLINA PROFESSIONAL SEAL 11292 ENGINEER BEN D LACKEY JR.

SIGNATURE DATE

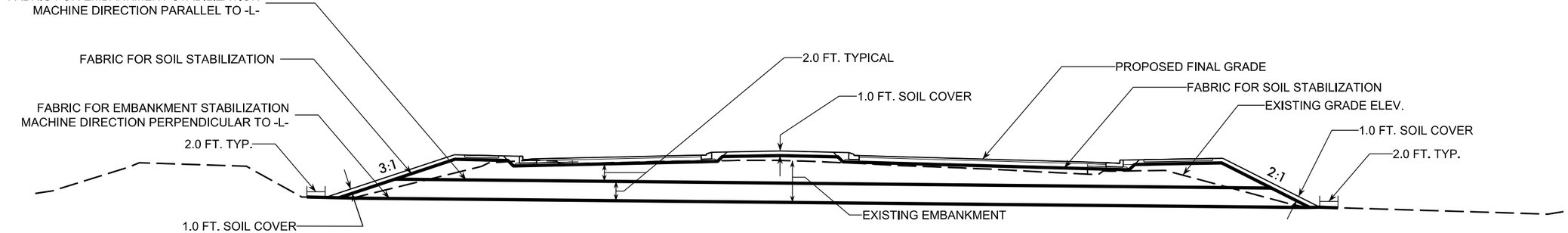
ENGINEER

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



FABRIC FOR EMBANKMENT STABILIZATION LAYOUT
NOT TO SCALE



REMOVE EXISTING EMBANKMENT AND REPLACE WITH LIGHTWEIGHT AGGREGATE

TYPICAL SECTION
NOT TO SCALE

PREPARED BY: _	Steve Hudson, P.G.	DATE 3/30/17
REVIEWED BY: _	Ben Lackey, P.E.	DATE 5/16/17

Prepared in the Office of:

CATLIN Engineers and Scientists

Wilmington, North Carolina

NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

LIGHTWEIGHT AGGREGATE FILL EMBANKMENT

REVISIONS

NO.	BY	DATE	NO.	BY	DATE
1	_	_	3	_	_
2	_	_	4	_	_

Transportation

PAT McCRORY
Governor

NICHOLAS J. TENNYSON
Secretary

June 13, 2016

MEMORANDUM TO:	David Leonard, P.E. DDC Engineer – Division 3
FROM:	Kyung Kim, P.E. Eastern Regional Geotechnical Manager
STATE PROJECT:	40238.1.4 (U-4902D)
FEDERAL PROJECT:	NHS-0017(76)
COUNTY:	New Hanover
DESCRIPTION:	US 17 Business (Market Street) from Lendire Road SR 2734 (Marsh Oaks Drive)
SUBJECT:	Roadway Subsurface Inventory Report and Roadway Design Recommendations Report

DocuSigned by:
K.J. Kim
[illegible]

The Geotechnical Engineering Unit has reviewed and presents the following report prepared by Catlin Engineers & Scientists for the above referenced project.

Roadway Subsurface Inventory Report: 20 pages
Roadway Design Recommendations Report: 5 pages

Please call Dean N Argenbright, L.G. at (252) 355-9054 or Majid Khazaei, P.E. at (919) 662-4710 if there are any questions concerning this memorandum.

Attachment KJK/DNA/MK

CATLIN
Engineers and Scientists

Post Office Box 10279
Wilmington, North Carolina 28404-0279

Telephone: (910) 452-5861
Fax: (910) 452-7563

www.catlinusa.com

June 13, 2016

MEMORANDUM TO:	John L. Pilipchuk, LG, PE State Geotechnical Engineer
FROM:	Steven V. Hudson, LG CATLIN Geotechnical Geologist
STATE PROJECT:	40238.1.4 (U-4902D)
F.A. NUMBER:	NHS-0017(76)
COUNTY:	NEW HANOVER
DESCRIPTION:	US 17 Business (Market Street) from Lendire Road to Marsh Oaks Drive
SUBJECT:	Geotechnical Report – Design and Construction Recommendations

CATLIN Engineers and Scientists (CATLIN) has completed a subsurface investigation for this project and presents the following recommendations:

I. SLOPE/EMBANKMENT STABILITY

A. Slope Design

Recommend roadway side slopes be constructed no steeper than 3:1 (H:V) in order to assist in erosion control and establish vegetation.

B. Undercut (Soft Foundation Soils)

Include 200 cubic yards in the contract as a contingency item to be used at the discretion of the Engineer.

C. Geotextile for Soil Stabilization

Include 200 square yards of fabric for soil stabilization in the contract as a contingency item to be used at the discretion of the Engineer.

II. SUBGRADE STABILITY

A. Subsurface Drainage – Subsurface Drains

Recommend including 200 linear feet of subdrain pipe (Roadway Standard Drawing 815.02) in the contract as a contingency item to be used at the discretion of the Engineer.

B. Undercut for Subgrade Stability

Include 200 cubic yards in the contract as a contingency item to be used at the discretion of the Engineer.

C. Aggregate Subgrade

Include 100 cubic yards of shallow undercut for aggregate subgrade in the contract as a contingency item to be used at the discretion of the Engineer.

D. Geotextile for Soil Stabilization

Recommend contingency of 200 square yards of soil stabilization fabric to be used for subgrade stability as outlined in Section II.B.

Recommend 300 square yards be included in the contract for soil stabilization as a contingency item for use with aggregate subgrade as outlined in Section II.C.

Recommend an additional 200 square yards for soil stabilization be included in the contract as a contingency item to be used at the discretion of the Engineer.

III. BORROW SPECIFICATIONS

A. Borrow Criteria

Common borrow for embankment construction to subgrade shall meet Coastal Plain specifications outlined in the Standard Specifications, Article 1018-2, Section II.

B. Select Granular Material

Recommend 400 cubic yards of Select Granular Material be included as a contingency in the contract for backfill as detailed in Sections I.B and II.B.

Recommend 200 cubic yards of Select Granular Material, Class II and/or III to be included in the contract as a contingency item. Select granular material for embankment/backfill for geotextile for soil stabilization if required, or backfill in

water shall meet the criteria outlined in the Standard Specifications, Article 1016-3, Class II and/or III.

C. Shrinkage Factor

A shrinkage factor of 25 percent is recommended for calculation of earthwork in the contract.

D. Borrow Reconnaissance and Availability

Sandy soils with good to excellent engineering properties are available in nearby areas.

E. Class IV Subgrade Stabilization Material

A quantity of 190 tons of Class IV subgrade stabilization material should be included in the project contract as backfill for the Aggregate Subgrade referenced in Section II.C. The material should meet the requirement of Standard Specifications, Article 10-16-3 Class IV.

IV. MISCELLANEOUS

A. Reduction of Unclassified Excavation – Loss Due to Clearing and Grubbing

No significant loss of unclassified excavation is anticipated due to clearing and grubbing.

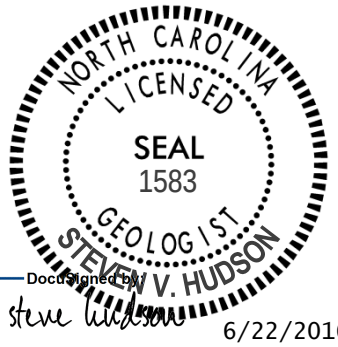
B. Reduction of Unclassified Excavation – Unsuitable Waste

Unclassified excavation will be predominantly derived from ditch and subgrade excavation and is comprised primarily of granular material which is estimated to be 100 percent suitable for embankment construction.

C. Water Wells

No water wells were identified with the proposed right of way limits on this project. However, if any water wells are identified during construction activities, the well/s should be sealed by a North Carolina Certified Well Contractor in accordance with the North Carolina Department of Transportation Standard Specification, Section 205, “Sealing Abandoned Wells”.

Prepared By:



DocuSigned by:
steve hudson
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6/22/2016

Steven V. Hudson, L.G.
CATLIN Project Geologist

Prepared By:

DocuSigned by:
Jacob Wessell
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6/26/2016

Jacob C. Wessell, P.E.
CATLIN Geotechnical Engineer

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
Summary of Quantities

DS JCW

DS SH

WBS Number: 40238.1.4 County: New Hanover Project Engineer: JCW (CATLIN)
TIP Number: U-4902D Field Office: GFO Project Geologist: SVH (CATLIN)
Description: US 17 Business (Market Street) from Lendire Road to Marsh Oaks Drive

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units / %
0036000000-E	Undercut Excavation	225 - Roadway Excavation	I. B	Contingency	N/A	N/A	200	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. B	Contingency	N/A	N/A	200	CY
						Total Quantity of Undercut Excavation =	**400**	**CY**
0195000000-E	Select Granular Material	265 - Select Granular Material	III. B	Contingency	N/A	N/A	600	CY
						Total Quantity of Select Granular Material =	**600**	**CY**
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	I. C	Contingency	N/A	N/A	200	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. D	Contingency	N/A	N/A	700	SY
						Total Quantity of Geotextile for Soil Stabilization =	**900**	**SY**
1099500000-E	Shallow Undercut	505 - Aggregate Subgrade	II. C	Contingency	N/A	N/A	100	CY
						Total Quantity of Shallow Undercut =	**100**	**CY**
1099700000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	III. E	Contingency	N/A	N/A	190	TON
						Total Quantity of Class IV Subgrade Stabilization =	**190**	**TON**
2044000000-E	6" Perforated Subdrain Pipe	815 - Subsurface Drainage	II. A	Contingency	N/A	N/A	200	LF
						Total Quantity of 6" Perforated Subdrain Pipe =	**200**	**LF**

These Items Only Impact Earthwork Totals								
N/A	Shrinkage Factor	235 - Embankments	III. C	N/A	N/A	N/A	25	%