



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

August 15, 2012

MEMORANDUM TO: C. E. (Neil) Lassiter, Jr., P.E.
Division 2 Engineer

ATTENTION: Lang Jones
Division Design Engineer

FROM: *CMH for* K. J. Kim, Ph.D., P.E.
Eastern Regional Geotechnical Manager

STATE PROJECT: 17BP.2.R.38 (SF-060173)
FEDERAL PROJECT: N/A
COUNTY: Beaufort

DESCRIPTION: Bridge No. 173 on SR 1163 (Bear Creek Rd.) between Godley Rd.
and NC 33 over Bear Creek

SUBJECT: Bridge Foundation Recommendations

The Geotechnical Engineering Unit has completed the subsurface investigation and has prepared the foundation design recommendations for the above structure and presents the following project data:

- Bridge Inventory (6) pages
- Foundation Design Recommendations (3) pages
- Design Calculations () pages
- Special Provisions () pages

Please call Majid Khazaei, P.E. or Chris Kreider, P.E. at (919) 662-4710 if there are any questions concerning this memorandum.

KJK/CAK/MK
Attachment

MAILING ADDRESS:
EASTERN REGIONAL OFFICE
GEOTECHNICAL ENGINEERING UNIT
1570 MAIL SERVICE CENTER
RALEIGH NC 27699-1570

TELEPHONE: 919-662-4710
FAX: 919-662-3095
WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
3301 JONES SAUSAGE RD., SUITE 100
GARNER, NC 27529-9489

FOUNDATION RECOMMENDATIONS

WBS: 17BP.2.R.38

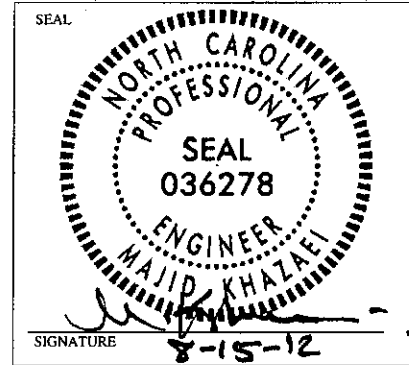
DESCRIPTION : Bridge No. 173 on SR 1163 (Bear Creek Rd.)

T.I.P. NO.: SF-060173

between Godley Rd. and NC 33 over Bear Creek

COUNTY: Beaufort

STATION: 13+23.50 -L-



| | INITIALS | DATE |
|----------|----------|---------|
| DESIGN | MK | 8/14/12 |
| CHECK | CAH | 8/15/12 |
| APPROVAL | CAH | 8/15/12 |

| BENT | STATION | FOUNDATION TYPE | FACTORED RESISTANCE | MISCELLANEOUS DETAILS |
|------------|-----------------|--|---------------------|---|
| END BENT 1 | 12+69.750 ± -L- | Cap on HP 12x53 Steel Piles | 55 tons/pile | Bottom of Cap El. = 14.0 ft ± Estimated Length of Pile = 55 ft ± Number of Piles = 5 |
| BENT 1 | 12+95.94 ± -L- | Cap on HP 14x73 Steel Piles with Steel H-Pile Points | 100 tons/pile | Bottom of Cap El. = 14.0 ft ± Point of Fixity = -13 ft ± Tip Elevation No Higher than = -28.0 ft Estimated Length of Pile = 55 ft ± Number of Piles = 7 |
| BENT 2 | 13+51.06 ± -L- | Cap on HP 14x73 Steel Piles with Steel H-Pile Points | 100 tons/pile | Bottom of Cap El. = 14.0 ft ± Point of Fixity = -13 ft ± Tip Elevation No Higher than = -28.0 ft Estimated Length of Pile = 55 ft ± Number of Piles = 7 |
| END BENT 2 | 13+75.25 ± -L- | Cap on HP 12x53 Steel Piles | 55 tons/pile | Bottom of Cap El. = 14.0 ft ± Estimated Length of Pile = 55 ft ± Number of Piles = 5 |

NOTES ON PLANS & COMMENTS

See Following Pages

FOUNDATION RECOMMENDATION NOTES ON PLANS

- 1) FOR PILES, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.
- 2) PILES AT END BENT NO. 1 AND 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 55 TONS PER PILE.
- 3) DRIVE PILES AT END BENT NO. 1 AND 2 TO A REQUIRED DRIVING RESISTANCE OF 95 TONS PER PILE.
- 4) PILES AT BENT NO. 1 AND 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 100 TONS PER PILE.
- 5) DRIVE PILES AT BENT NO. 1 AND 2 TO A REQUIRED DRIVING RESISTANCE OF 170 TONS PER PILE.
THIS REQUIRED DRIVING RESISTANCE INCLUDES ADDITIONAL RESISTANCE FOR DOWNDRAW OR SCOUR.
- 6) INSTALL PILES AT BENT NO. 1 AND BENT NO. 2 TO A TIP ELEVATION NO HIGHER THAN -28.0 FT.
- 7) STEEL H-PILE POINTS ARE REQUIRED FOR STEEL H-PILES AT BENT NO. 1 AND BENT NO. 2.
FOR STEEL PILE POINTS, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.
- 8) THE SCOUR CRITICAL ELEVATION FOR BENT NO. 1 AND 2 IS ELEVATION 0.0 FT. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.
- 9) IT HAS BEEN ESTIMATED THAT A HAMMER WITH AN EQUIVALENT RATED ENERGY IN THE RANGE OF 30 to 45 FT-KIPS PER BLOW WILL BE REQUIRED TO DRIVE PILES AT BOTH END BENT NO. 1 AND 2.
THIS ESTIMATED ENERGY RANGE DOES NOT RELEASE THE CONTRACTOR FROM PROVIDING DRIVING EQUIPMENT IN ACCORDANCE WITH SUBARTICLE 450-3(D)(2) OF THE STANDARD SPECIFICATIONS.
- 10) IT HAS BEEN ESTIMATED THAT A HAMMER WITH AN EQUIVALENT RATED ENERGY IN THE RANGE OF 40 to 60 FT-KIPS PER BLOW WILL BE REQUIRED TO DRIVE PILES AT BOTH BENT NO. 1 AND 2.
THIS ESTIMATED ENERGY RANGE DOES NOT RELEASE THE CONTRACTOR FROM PROVIDING DRIVING EQUIPMENT IN ACCORDANCE WITH SUBARTICLE 450-3(D)(2) OF THE STANDARD SPECIFICATIONS.
- 11) TESTING PILES WITH THE PDA DURING DRIVING, RESTRIKING OR REDRIVING MAY BE REQUIRED.
THE ENGINEER WILL DETERMINE THE NEED FOR PDA TESTING. FOR PDA TESTING, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS AND FOR PILE DRIVING CRITERIA, SEE PILE DRIVING CRITERIA PROVISION.

FOUNDATION RECOMMENDATION COMMENTS

- 1) 1½:1 (H:V) SLOPE AT THE END BENTS ARE OK WITH SLOPE PROTECTION.
- 2) REINFORCED BRIDGE APPROACH FILLS ARE REQUIRED AT EACH END BENT.
- 3) THE DESIGN SCOUR ELEVATION FOR BENT NO. 1 IS 4.1 FT.
- 4) THE DESIGN SCOUR ELEVATION FOR BENT NO. 2 IS 3.0 FT.
- 5) NO WAITING PERIOD IS REQUIRED BEFORE BEGINNING ANY WORK FOR END BENT CONSTRUCTION AFTER COMPLETION OF THE EMBANKMENT AT EACH END BENT.

PILE PAY ITEMS

(For 2012 Lettings and Later - Revised 4/18/11)

| | | | |
|-------------|--|-------------|-----------|
| WBS ELEMENT | 17BP.2.R.38 | DATE | 8/14/2012 |
| TIP NO. | SF-060173 | DESIGNED BY | MK |
| COUNTY | Beaufort | CHECKED BY | |
| STATION | 13+23.50 -L- | | |
| DESCRIPTION | Bridge No. 173 on SR 1163 (Bear Creek Rd.) between Godley Rd. and NC 33 over Bear Creek | | |

| | | |
|--------------------------------------|---|---|
| NUMBER OF BENTS WITH PILES _____ | } | Only required for "Predrilling for Piles" & "Pile Excavation" pay items |
| NUMBER OF PILES PER BENT _____ | | |
| NUMBER OF END BENTS WITH PILES _____ | | |
| NUMBER OF PILES PER END BENT _____ | | |

| Bent # or End Bent # | PILE PAY ITEM QUANTITIES | | | | | | PDA Testing (per each) |
|-------------------------|-------------------------------------|---------------------------------------|---|--------------------------------|---------------------------------------|----------------|------------------------------|
| | Steel Pile Points (yes/no) | Pipe Pile Plates (yes/no/maybe) | Predrilling For Piles (per linear ft) | Pile Redrives (per each) | Pile Excavation (per linear ft) | | |
| | | | | | In Soil | Not In Soil | |
| End Bent #1 | no | | | 2 | | | |
| Bent #1 | yes | | | 3 | | | |
| Bent #2 | yes | | | 3 | | | |
| End Bent #2 | no | | | 2 | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| TOTALS | | | 0 | 10 | 0 | 0 | 1 |

Notes:

Blanks or "no" represent quantity of zero.

If steel pile points are required, calculate quantity of "Steel Pile Points" as equal to the number of steel piles.

If pipe pile plates are or may be required, calculate the quantity of "Pipe Pile Plates" as equal to the number of pipe piles.

If PDA testing may be required, show quantities of "PDA Testing" on the substructure plans as totals only. If PDA testing is required, show quantities of "PDA Testing" on the substructure plans for each bent or end bent.

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 17BP.2.R.38 (SF-060173) F. A. PROJ.
 COUNTY BEAUFORT
 PROJECT DESCRIPTION BRIDGE NO. 173 ON SR 1163 (BEAR CREEK ROAD) OVER BEAR CREEK AT L- STA. 13+23.50

CONTENTS

| SHEET | DESCRIPTION |
|-------|-------------|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 | SITE PLAN |
| 4 | PROFILE |
| 5-6 | BORE LOGS |

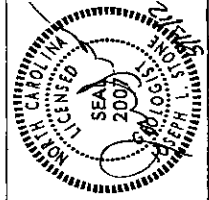
CAUTION NOTICE

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PERSONNEL
 C.M. WRIKE
 R.E. SMITH
 J.R. SWARTLEY
 D.G. PINTER

INVESTIGATED BY J.L. STONE
 CHECKED BY D.N. ARGENBRIGHT
 SUBMITTED BY D.N. ARGENBRIGHT
 DATE AUGUST 2012



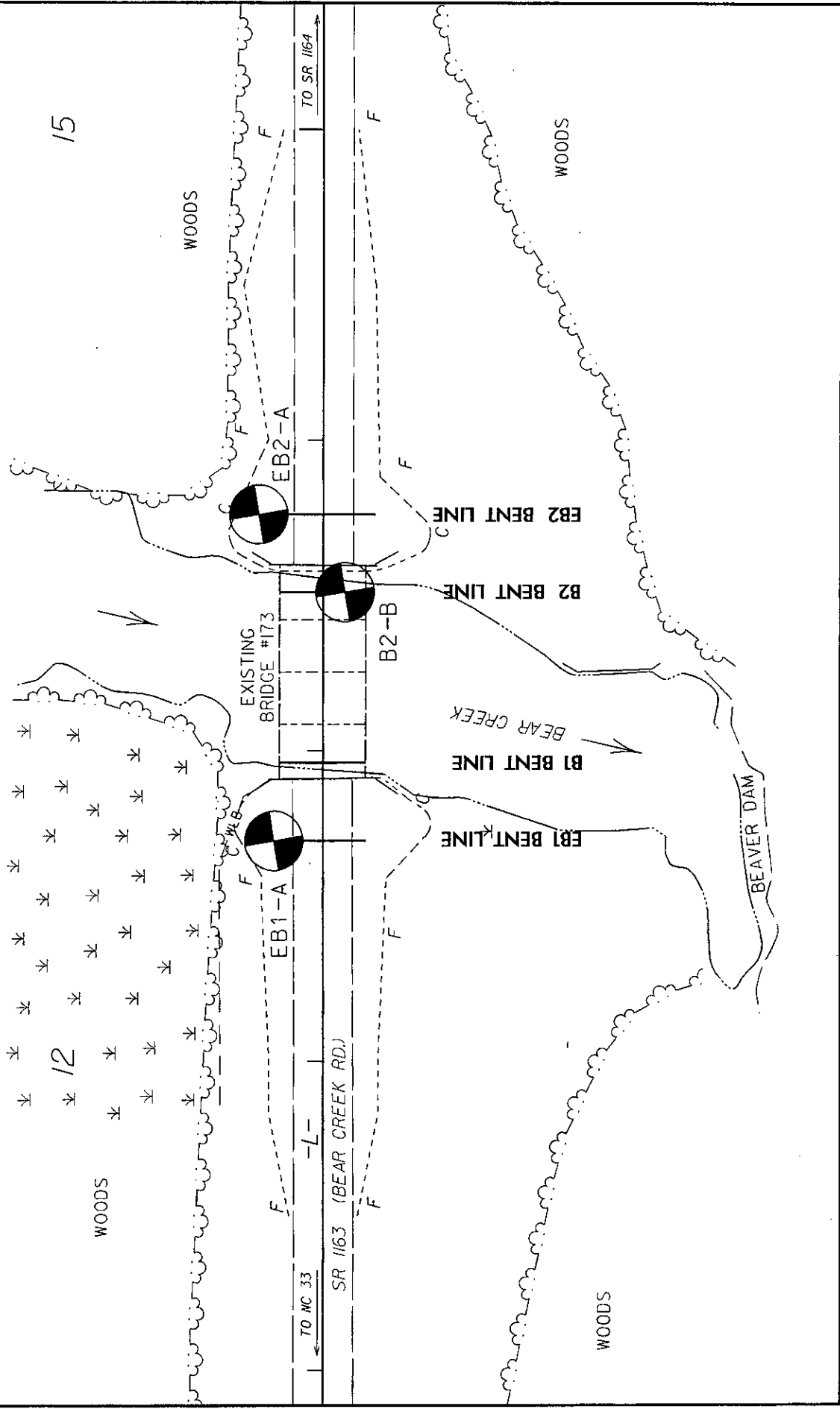
NOTE - IF HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCURRED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS SHOWN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT AWARED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION. IT IS BEING FURNISHED AS A SERVICE TO THE PUBLIC AND IS NOT TO BE USED FOR ANY OTHER PURPOSE.

DRAWN BY: C.P. TURNER

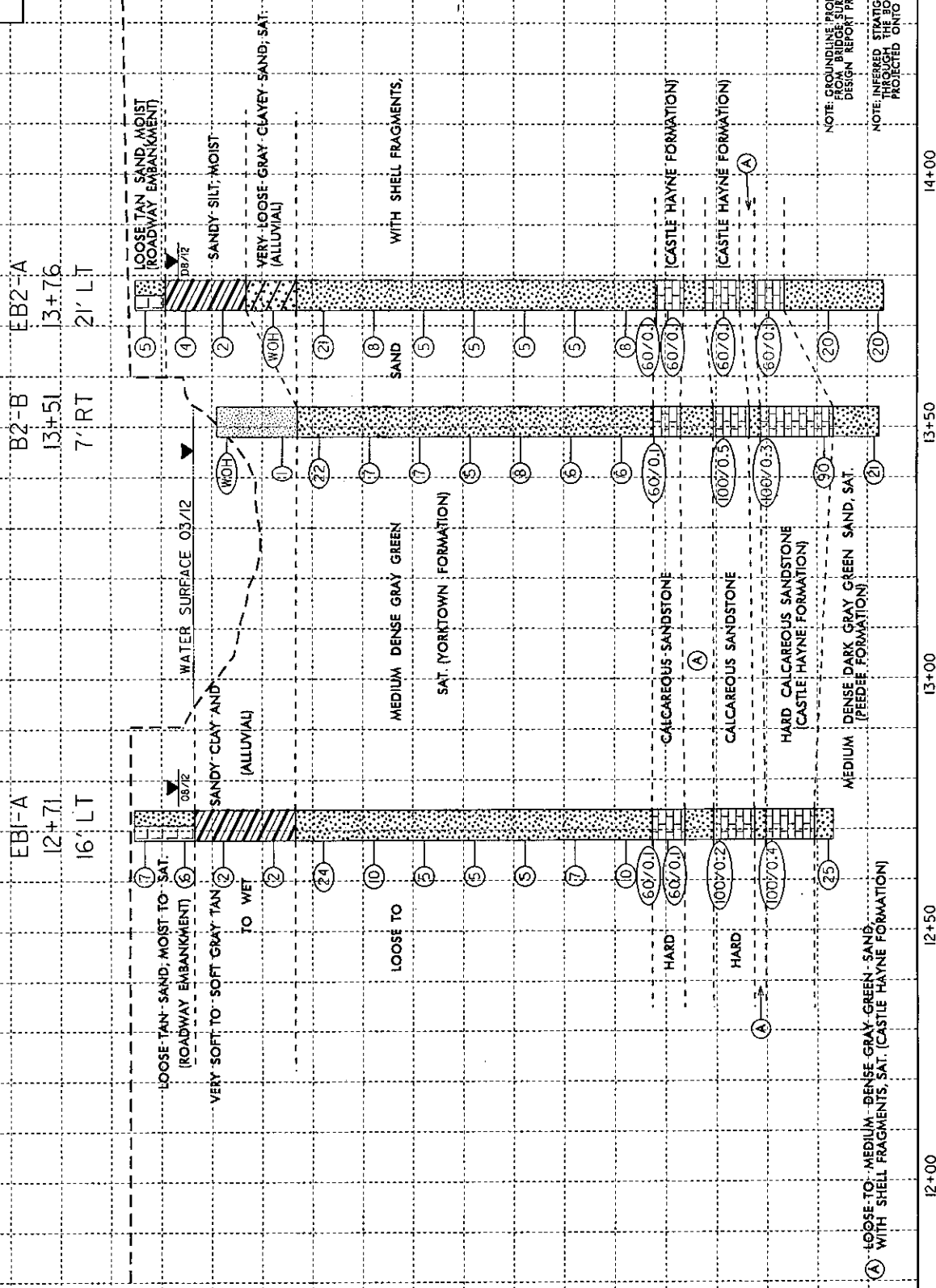
SKEW = 90°

15



| | |
|----------|-----|
| VE = 2.0 | 25 |
| | 20 |
| | 15 |
| | 10 |
| | 5 |
| | 0 |
| | -5 |
| | -10 |
| | -15 |
| | -20 |
| | -25 |
| | -30 |
| | -35 |
| | -40 |
| | -45 |
| | -50 |
| | -55 |
| | -60 |

PROFILE THROUGH BORINGS PROJECTED ALONG -L-



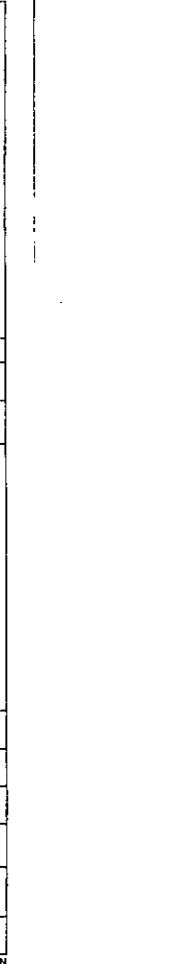
**NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT**

| WBS 17BP.2.R.38 | | | TIP SF-060173 | | | COUNTY BEAUFORT | | | GEOLOGIST: Wilkie, C. M. | | |
|---|-------|------|---------------|----|----|---------------------------|--|--|--------------------------|--|--|
| SITE DESCRIPTION: BRIDGE NO. 173 ON L-L (SR 1163) OVER BEAR CREEK | | | | | | GROUND WTR (ft) | | | | | |
| BORING NO. EB1-A | | | | | | ALIGNMENT -L- | | | | | |
| STATION 12+71 | | | | | | OFFSET 16 R/LT | | | | | |
| TOTAL DEPTH 69.3 ft | | | | | | NORTHING 654,128 | | | | | |
| DRILL RIG/HAMMER EFF./DATE GFO1042CME-550 91% 05/22/2012 | | | | | | EASTING 2,555,032 | | | | | |
| DRILLER Smith, R. E. | | | | | | SURFACE WATER DEPTH N/A | | | | | |
| START DATE 08/09/12 | | | | | | COMP. DATE 08/09/12 | | | | | |
| DRIVE ELEV (ft) | | | | | | BLOW COUNT | | | | | |
| DEPTH (ft) | | | | | | SOIL AND ROCK DESCRIPTION | | | | | |
| 20 | 17.7 | 0.0 | 4 | 4 | 3 | | | | | | GROUND SURFACE |
| 15 | 13.7 | 4.0 | 3 | 3 | 3 | | | | | | ROADWAY EMBANKMENT TAN SAND, MOIST TO SAT. |
| 10 | 9.9 | 7.8 | 1 | 1 | 1 | | | | | | ALLUVIAL GRAY SANDY CLAY, WET |
| 5 | 4.9 | 12.8 | 3 | 1 | 1 | | | | | | COASTAL PLAIN GRAY GREEN SAND WITH SHELL FRAGMENTS, SAT. (FORKTOWN FORMATION) |
| 0 | -0.1 | 37.8 | 10 | 11 | 13 | | | | | | |
| -5 | -5.1 | 22.8 | 8 | 5 | 5 | | | | | | |
| -10 | -10.1 | 27.8 | 2 | 2 | 3 | | | | | | |
| -15 | -15.1 | 32.8 | 2 | 2 | 3 | | | | | | |
| -20 | -20.1 | 37.8 | 1 | 2 | 3 | | | | | | |
| -25 | -25.1 | 42.8 | 3 | 3 | 4 | | | | | | |
| -30 | -30.1 | 47.8 | 6 | 5 | 5 | | | | | | |
| -35 | -35.1 | 51.4 | 10 | 11 | 13 | | | | | | 33.7 CALcareous SANDSTONE (CASTLE HAYNE FORMATION) |
| -40 | -40.1 | 57.8 | 10 | 11 | 13 | | | | | | 38.2 GRAY GREEN SAND WITH SHELL FRAGMENTS, SAT. (CASTLE HAYNE FORMATION) |
| -45 | -45.1 | 62.8 | 13 | 14 | 11 | | | | | | 39.7 CALcareous SANDSTONE (CASTLE HAYNE FORMATION) |
| -50 | -50.1 | 67.8 | 13 | 14 | 11 | | | | | | 43.8 GRAY GREEN SAND WITH SHELL FRAGMENTS, SAT. (CASTLE HAYNE FORMATION) |
| | | | | | | | | | | | 44.2 CALcareous SANDSTONE (CASTLE HAYNE FORMATION) |
| | | | | | | | | | | | 49.7 COASTAL PLAIN GRAY GREEN SAND WITH SHELL FRAGMENTS, SAT. (PEEDEE FORMATION) |
| | | | | | | | | | | | 51.6 Boring Terminated at Elevation -51.6 ft in MEDIUM DENSE SAND |

| WBS 17BP.2.R.38 | | | TIP SF-060173 | | | COUNTY BEAUFORT | | | GEOLOGIST: Wilkie, C. M. | | |
|---|-------|------|---------------|----|----|---------------------------|--|--|--------------------------|--|--|
| SITE DESCRIPTION: BRIDGE NO. 173 ON L-L (SR 1163) OVER BEAR CREEK | | | | | | GROUND WTR (ft) | | | | | |
| BORING NO. B2-B | | | | | | ALIGNMENT -L- | | | | | |
| STATION 13+51 | | | | | | OFFSET 7 R/RT | | | | | |
| TOTAL DEPTH 65.7 ft | | | | | | NORTHING 654,203 | | | | | |
| DRILL RIG/HAMMER EFF./DATE GFO1042CME-550 91% 05/22/2012 | | | | | | EASTING 2,555,068 | | | | | |
| DRILLER Smith, R. E. | | | | | | SURFACE WATER DEPTH 3.2ft | | | | | |
| START DATE 08/08/12 | | | | | | COMP. DATE 08/08/12 | | | | | |
| DRIVE ELEV (ft) | | | | | | BLOW COUNT | | | | | |
| DEPTH (ft) | | | | | | SOIL AND ROCK DESCRIPTION | | | | | |
| 10 | 6.9 | 0.0 | 4 | 4 | 3 | | | | | | GROUND SURFACE |
| 5 | 4.0 | 3.5 | 1 | 1 | 1 | | | | | | ALLUVIAL GRAY SANDY SILT, WET |
| 0 | 0.3 | 9.2 | 9 | 11 | 11 | | | | | | COASTAL PLAIN GRAY GREEN SAND WITH SHELL FRAGMENTS, SAT. (FORKTOWN FORMATION) |
| -5 | -4.7 | 14.2 | 4 | 3 | 4 | | | | | | |
| -10 | -8.7 | 19.2 | 5 | 4 | 3 | | | | | | |
| -15 | -14.7 | 24.2 | 2 | 3 | 2 | | | | | | |
| -20 | -18.7 | 29.2 | 3 | 3 | 3 | | | | | | |
| -25 | -24.7 | 34.2 | 2 | 3 | 3 | | | | | | |
| -30 | -28.7 | 39.2 | 2 | 2 | 4 | | | | | | |
| -35 | -33.8 | 43.3 | 14 | 10 | 10 | | | | | | 39.8 CALcareous SANDSTONE (CASTLE HAYNE FORMATION) |
| -40 | -38.7 | 48.2 | 14 | 10 | 10 | | | | | | 39.2 COASTAL PLAIN GRAY GREEN SAND WITH SHELL FRAGMENTS, SAT. (CASTLE HAYNE FORMATION) |
| -45 | -44.7 | 54.2 | 10 | 10 | 10 | | | | | | 43.3 CALcareous SANDSTONE (CASTLE HAYNE FORMATION) |
| -50 | -48.7 | 59.2 | 19 | 27 | 23 | | | | | | 44.2 GRAY GREEN SAND WITH SHELL FRAGMENTS, SAT. (CASTLE HAYNE FORMATION) |
| -55 | -54.7 | 64.2 | 12 | 11 | 10 | | | | | | 51.6 Boring Terminated at Elevation -51.6 ft in MEDIUM DENSE SAND |

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

| WBS 17BP 2.R.38 | | TIP SF 060173 | | COUNTY BEAUFORT | | GEOLOGIST Write, C. M. | | GROUND WTR (ft) | |
|--|------------|-------------------------|-------------|---------------------|---|-------------------------|---------------------------|-----------------|------------|
| SITE DESCRIPTION BRIDGE NO. 173 ON -L- (SR 1163) OVER BEAR CREEK | | | | | | | | | |
| BORING NO. EB2-A | | STATION 13+76 | | OFFSET 21 ft LT | | ALIGNMENT -L- | | 0 HR. N/A | |
| COLLAR ELEV. 17.6 ft | | TOTAL DEPTH 74.2 ft | | NORTHING 684,233 | | EASTING 2,555,045 | | 24 HR. 4.3 | |
| DRILL RIG/HAMMER EFF/DATE GFO/ARC/MC/MS-550 91% 05/22/2012 | | DRILL METHOD Mud Rotary | | HAMMER TYPE Adams | | | | | |
| DRILLER Smith, R. E. | | START DATE 08/08/12 | | COMP. DATE 08/07/12 | | SURFACE WATER DEPTH N/A | | | |
| ELEV (ft) | DEPTH (ft) | BLOW COUNT | BLOW COURTS | SAMP. NO. | SOIL AND ROCK DESCRIPTION | DEPTH (ft) | SOIL AND ROCK DESCRIPTION | | DEPTH (ft) |
| | | | | | | | MOI | CO | |
| 20 | 17.6 | 0 | 0 | 0 | GROUND SURFACE | 0.0 | | | |
| | | 2 | 2 | 3 | ROADWAY EMBANKMENT TAN SAND, MOIST | 17.6 | | | |
| 15 | 13.6 | 4 | 2 | 2 | ALLUVIAL TAN SANDY CLAY, MOIST TO WET | 16.6 | | | |
| 10 | 9.8 | 1 | 1 | 1 | ALLUVIAL | 6.6 | | | |
| 5 | 4.0 | 12 | 1 | 1 | GRAY CLAYEY SAND, SAT. | 11.0 | | | |
| 0 | -0.1 | 9 | 9 | 12 | COASTAL PLAIN GRAY GREEN SAND WITH SHELL FRAGMENTS, SAT. (YORKTOWN FORMATION) | 16.2 | | | |
| -5 | -5.1 | 4 | 5 | 3 | | | | | |
| -10 | -10.1 | 3 | 2 | 3 | | | | | |
| -15 | -15.1 | 2 | 2 | 3 | | | | | |
| -20 | -20.1 | 3 | 2 | 3 | | | | | |
| -25 | -25.1 | 2 | 2 | 3 | | | | | |
| -30 | -30.1 | 4 | 4 | 4 | | | | | |
| -35 | -34.0 | 800.1 | | | | | | | |
| | -35.1 | 800.1 | | | | | | | |
| -40 | -40.1 | 29 | 800.1 | | | | | | |
| -45 | -45.1 | 800.1 | | | | | | | |
| -50 | -50.1 | 10 | 9 | 11 | | | | | |
| -55 | -54.1 | 9 | 10 | 10 | | | | | |



NCDOT BORE DOUBLE BORINGS GPF NC DOT DOT 4/13/12