STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

May 3, 2010

MEMORANDUM TO: Mr. Don Idol
Assistant Bridge Inspection Engineer

FROM: Jerry Beard, P.E.
Scour Engineer
Hydraulic Design Unit

SUBJECT: **Transmittal of Bridge Scour Assessments**

Attached are copies of Bridge Scour Assessments and Item 113 Code T Reports for the following bridges as researched by Moffatt & Nichol and Parsons Brinckerhoff.

County	Bridge #	Code	
Brunswick	014	5	Monitoring Required
Brunswick	074	5	
Craven	012	5	
Craven	207	3	Scour Critical, Monitoring Required
Hyde	020	8	
Hyde	056	5	
Jones	009	5	
✓ New Hanover	012	3	Scour Critical, Monitoring Required and Increase Underwater Inspection Frequency
New Hanover	014	5	
New Hanover	019	5	
New Hanover	030	5	
New Hanover	134	N	

If you have any questions or comments concerning the above please feel free to contact me at 250-4100.

cc: D.R. Henderson, P.E.
J. L. Lindsey, P.E.

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
HYDRAULICS UNIT
1590 MAIL SERVICE CENTER
RALEIGH NC 27699-1590

TELEPHONE: 919-250-4100
FAX: 919-250-4108

WEBSITE:
HTTP://WWW.NCDOT.ORG/DOH/PRECONSTRUCT/HIGHWAY/HYDRO/

LOCATION:
CENTURY CENTER COMPLEX
BUILDING B
1020 BIRCH RIDGE DRIVE
RALEIGH NC

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

DATE : 5-7-10

MEMORANDUM TO : A.T. GLYNN
DIVISION BRIDGE ENGINEER

FROM : DANIEL D. HOLDERMAN, PE
STATE BRIDGE MANAGEMENT ENGINEER
NCDOT-BRIDGE MANAGEMENT UNIT

SUBJECT : BRIDGE SCOUR INFORMATION (SCOUR CRITICAL)

THE BRIDGE SCOUR EVALUATION REPORT FOR BRIDGE NUMBER 12 IN New Hanover COUNTY IS AVAILABLE FOR VIEWING ON THE WEBSITE *NCDOT BRIDGE DOCUMENT MANAGEMENT SYSTEM*. PLEASE READ THE REPORT AND TAKE THE APPROPRIATE ACTION. COUNTERMEASURES ARE REQUIRED. PLEASE COMPLETE THE WORK AS SOON AS POSSIBLE. PLEASE INDICATE THE DATE THAT YOU COMPLETED THE WORK ON THE BOTTOM OF THIS LETTER AND RETURN IT TO ME WITH THE FORM 501 OR OTHER APPROPRIATE DESCRIPTION OF THE WORK ACCOMPLISHED.

THE COUNTERMEASURES SHOWN IN THE REPORT ARE A PROMPT ACTION. THE BRIDGE WILL BE ADDED TO THE PROMPT ACTION LIST.

IF YOU HAVE ANY QUESTIONS, PLEASE CALL DON IDOL AT 919-835-8226.

SPECIAL MONITORING? : YES

TYPE MONITORING : Monitor Bent 8 and 9 for exposed piles or timber piles damaged by marine borers; Contact Hydraulic unit.

COUNTERMEASURES REQUIRED? : NO

TYPE COUNTERMEASURES : None

DIVISION BRIDGE ENGINEER : —— DATE WORK COMPLETED : ——

DDH / CC /

CC : DIVISION ENGINEER
BRIDGE MAINTENANCE SUPERVISOR
AREA BRIDGE INSPECTION SUPERVISOR
T. S. EARP
JIM AHLMARK
SCOUR PROJECT DATA FILE

MAILING ADDRESS:
BRIDGE MANAGEMENT UNIT
1565 MAIL SERVICE CENTER
RALEIGH NC 27699-1565

TELEPHONE: 919-733-4362
FAX: 919-733-2348
WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
4809 BERYL ROAD
RALEIGH NC

rev. 8/2009

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL

NCDOT UNITS:
BRIDGE MAINTENANCE UNIT
HYDRAULIC DESIGN UNIT
UNIT
STRUCTURE DESIGN UNIT
SOILS AND FOUNDATION UNIT

BRIDGE SCOUR REPORT

COUNTY: New Hanover **BRIDGE:** 640012 **ROUTE:** US74&76 **STREAM CROSSED:** Intracoastal Waterway

ASSESSMENT: yes **EVALUATION:** _____ **BY:** JJB **DATE:** 1/20/2010

FHWA STRUCTURE INVENTORY & APPRAISAL CODES:

SUBSTRUCTURE CONDITION (ITEM 60)
CHANNEL AND CHANNEL PROTECTION (ITEM 61)
WATERWAY ADEQUACY (ITEM 71)
SCOUR CRITICAL BRIDGE (ITEM 113)

MONITORING:

PLAN REQUIRED? YES ✓ **NO** _____

- Monitor Bent 8 and 9 for exposed piles or timber piles damaged by marine borers;

REQUIRED ACTION: Contact NCDOT Hydraulic Unit.

- **CRITICAL MONITORING DEPTH (UPSTREAM FACE, FROM TOP OF RAIL):**

REQUIRED ACTION: _____

- **CRITICAL HIGH WATER DEPTH (UPSTREAM FACE, FROM TOP OF RAIL):**

REQUIRED ACTION: _____

- **SCOUR CRITICAL DEPTH (UPSTREAM FACE, FROM TOP OF RAIL):**

REQUIRED ACTION: _____

INCREASE UNDERWATER INSPECTION CYCLE? YES ✓ **NO** _____ **FREQUENCY** 2 yr If no problems are found after two cycles, return to 4yr frequency.

COUNTER MEASURES:

PLAN REQUIRED? **YES** _____ **NO** ✓
SUMMARY OF PLAN:

CONSTRUCTION COMPLETE DATE: _____
FINAL CODING AFTER WORK IS COMPLETED (ITEM 113) _____ **DATE:** _____

BRIDGE MAINTENANCE COMMENTS:

Increase U/W inspection to every 2 years; if no problems are found after two cycles, return to 4 yr. frequency.

BRIDGE SCOUR EVALUATION ASSESSMENT

AND

DATA SUMMARY REPORT

ASSESSED: 1/20/2010
BY: JJB
CODE: 3
CLASSIFIED: Scour Critical

SITE IDENTIFICATION:

COUNTY New Hanover CITY/TOWN Wrightsville Beach BRIDGE NO. 640012
ROUTE US74&76 STREAM Intracoastal Waterway ROAD MILE
DUAL BRIDGE NO. IS US/DS
ORIGINAL PROJECT NO. 8.13535 YEAR BUILT 1956
REHAB PROJECT NO. YEAR BUILT
CURRENT ADT 23000 YEAR 2007 FUTURE ADT 46000 YEAR 2025

INFORMATION RESOURCES AVAILABLE:

HYDRAULIC STUDY REPORT (DATE):
AS-BUILT CONSTRUCTION PLANS (DATE): 1956
FOUNDATION REPORT (DATE):
OTHER AGENCY STUDIES (DATE):
(FEMA, CORPS, T.V.A., SCS)
QUAD MAPS (NAME & DATE):
AERIAL PHOTOGRAPHY (DATE):
GAGE DATA (TYPE, NO., DRAINAGE AREA):
DISTANCE TO SITE (UP/DOWN STREAM):
BRIDGE INSPECTION REPORT (DATE): 12/9/2008
UNDERWATER INSPECTION (DATE, CYCLE): 4/21/2009, 4yr
STRUCTURE DATA FILE (DATE):
OTHER SCOUR REPORT (DATE): 1998

HYDRAULIC DATA:

DRAINAGE AREA SQ. MILE SOURCE
100 YR. WATERWAY OPENING (NORMAL TO FLOW) 14,229 sq. ft.

HISTORICAL FLOODS

DATE	ELEV. (FT BELOW TOP OF RAIL)	APPROX. FREQ. (YEARS)	APPROX. DISCH.	ADJUSTED TO SITE

SOURCE

FLOOD FREQUENCY (YRS)	Q 100	Q___	Q___	Q___
ELEVATION (FT)	16			
DISCHARGE (CFS)	58,616	Orifice Equation		
AVG. VELOCITY (Q/A)	4.1 fps	Orifice Equation		

SOURCE FEMA, PB computations

COMMENTS:

rev. /82009

STRUCTURE DATA:

BRIDGE LENGTH: 731'
SUFFICIENCY RATING 32.2
NO. OF SPANS 15
BED TO CROWN 47

EST. REMAINING LIFE YRS: 7 **DATE:** 04/17/2009
SPAN LENGTHS 14 @40', 1 Bascule@171
SIMPLE OR CONTINUOUS SIMPLE
TOP OF RAIL ELEVATION 0(Measure down from rail) **T HALWEG ELEVATION** 46.5'

BENT NO. (W-E, N-S)		EB1	B1	B2	B3	B4	B5	B6
TYPE		RC CAP	RC CAP	RC CAP	RC CAP	RC CAP	RC CAP	RC CAP
SKEW								
FTG./FOUNDATION TYPE		PILE	PILE	PILE	PILE	PILE	PILE	PILE
FOOTING THICKNESS								
TOP FTG. ELEV.	LT							
	CTR							
	RT							
BOTTOM FTG. ELEV.	LT							
	CTR							
	RT							
TOP SILL ELEV.	LT							
	CTR							
	RT							
BOTTOM SILL ELEV.	LT							
	CTR							
	RT							
CONC./ RIP RAP PROTECTION								
PILE TYPE		20"OCT PPC	22"OCT PPC	22"OCT PPC	22"OCT PPC	22"OCT PPC	22"OCT PPC	22"OCT PPC
PILE LENGTH (AVERAGE)		44.5	46.0	54.6	56.7	56.6	57.7	56.2
PILE TIP ELEV. (AVERAGE)		54.5	56.0	64.6	66.7	66.6	67.7	66.2
PILE EMBED BELOW THALWEG		8	9.5	18.1	20.2	20.1	21.2	19.7
FTG. EMBED BELOW THALWEG								

COMMENTS: Pile lengths fron plans.

STRUCTURE DATA:

BRIDGE LENGTH: 731'
SUFFICIENCY RATING 32.2
NO. OF SPANS 15
BED TO CROWN 47

EST. REMAINING LIFE YRS: 7 **DATE:** 04/17/2009
SPAN LENGTHS 14 @40', 1 Bascule@171
SIMPLE OR CONTINUOUS SIMPLE
TOP OF RAIL ELEVATION 0(Measure down from rail) **T HALWEG ELEVATION** 46.5'

BENT NO. (W-E, N-S)		B7	B8	B9	B10	B11	B12	B13
TYPE		RC CAP	RC PIER	RC PIER	RC CAP	RC CAP	RC CAP	RC CAP
SKEW								
FTG./FOUNDATION TYPE		PILE	FTG/PILE	FTG/PILE	PILE	PILE	PILE	PILE
FOOTING THICKNESS								
TOP FTG. ELEV.	LT							
	CTR		-9 EL	-9 EL				
	RT							
BOTTOM FTG. ELEV.	LT							
	CTR		-14 EL	-14 EL				
	RT							
TOP SILL ELEV.	LT							
	CTR		-14 EL	- 14 EL				
	RT							
BOTTOM SILL ELEV.	LT							
	CTR		-22 EL	-22 EL				
	RT							
CONC./ RIP RAP PROTECTION								
PILE TYPE		22"OCT PPC	TIMBER	TIMBER	22"OCT PPC	22"OCT PPC	22"OCT PPC	22"OCT PPC
PILE LENGTH (AVERAGE)		61.3	26.1	27.2	55.3	54.8	54.5	53.6
PILE TIP ELEV. (AVERAGE)		71.3	69.9	70.7	65.3	64.8	64.5	63.6
PILE EMBED BELOW THALWEG		24.8	23.1	24.2	18.8	18.3	18.0	17.1
FTG. EMBED BELOW THALWEG								

COMMENTS:

rev. 8/2009

STRUCTURE DATA:

BRIDGE LENGTH: 731'
SUFFICIENCY RATING 32.2
NO. OF SPANS 15
BED TO CROWN 47

EST. REMAINING LIFE YRS: 7 **DATE:** 04/17/2009
SPAN LENGTHS 14 @40', 1 Bascule@171
SIMPLE OR CONTINUOUS SIMPLE
TOP OF RAIL ELEVATION 0(Measure down from rail) **T HALWEG ELEVATION** 46.5'

BENT NO. (W-E, N-S)		B14	EB2					
TYPE		RC CAP	RC CAP					
SKEW								
FTG./FOUNDATION TYPE		PILE	PILE					
FOOTING THICKNESS								
TOP FTG. ELEV.	**LT**							
	CTR							
	RT							
BOTTOM FTG. ELEV.	**LT**							
	CTR							
	RT							
TOP SILL ELEV.	**LT**							
	CTR							
	RT							
BOTTOM SILL ELEV.	**LT**							
	CTR							
	RT							
CONC./ RIP RAP PROTECTION								
PILE TYPE		22"OCT PPC	20"OCT PPC					
PILE LENGTH (AVERAGE)		54.0	49.7					
PILE TIP ELEV. (AVERAGE)		64.0	59.7					
PILE EMBED BELOW THALWEG		17.5	13.2					
FTG. EMBED BELOW THALWEG								

COMMENTS:

GEOMORPHIC DATA: (LOOKING DOWNSTREAM)

CHANNEL (NORMAL TO FLOW):

AVG. BASE WIDTH_____ AVG. TOP WIDTH_____ AVG. DEPTH_____

AT CROSSING:

STRAIGHT ✓ MILD CURVE_____ SHARP BEND_____

FLOW ANGLE OF APPROACH:

LOW ✓ MILD_____ HIGH_____

(0°-5°) (5°-20°) (20°+)

CROSSING WIDTH COMPARED TO:

UPSTREAM: WIDER_____ SAME ✓ NARROWER_____

DOWNSTREAM: WIDER_____ SAME ✓ NARROWER_____

BASED ON COMPARISON OF SECTIONS TAKEN AT DATES 1999, 2009

CHANNEL HAS:

WIDENED	**_____ FT**	**SAME ✓**		**NARROWED**	**_____ FT**
AGGRADATED	**_____ FT**	**SAME**		**DEGRADATED**	1.5 **FT**
SHIFTED LT	**_____ FT**	**SAME ✓**		**SHIFTED RT.**	**_____ FT**

THALWEG HAS:

SHIFTED LT	**_____ FT**	**SAME ✓**		**SHIFTED RT.**	**_____ FT**

REPORTED SITE SCOUR PROBLEM:

	MINOR	MODERATE	SEVERE	UNKNOWN
LT. BANK				
RT. BANK				
LT. SPILL SLOPE				
RT. SPILL SLOPE				
PIER(S)			✓	
DEBRIS		✓		
CHANNEL BED	✓			
OTHER_____				

IS REPORTED PROBLEM CHANNEL FLOW ASSOCIATED? N/A

BASED ON THE AVAILABLE GEOMORPHIC DATA, THE CHANNEL STABILITY POTENTIAL OVER THE LIFETIME OF THE EXISTING STRUCTURE CAN BEST BE DESCRIBED AS:

1. **RELATIVELY STABLE WITH LITTLE EXPECTED CHANGE** NO
2. **POTENTIAL FOR SLOW CHANGE OVER TIME. NOT PRONE TO A MAJOR ONE-EVENT CHANGE.** N/A
3. **UNSTABLE SUBJECT TO RAPID EVOLUTIONARY CHANGE** N/A

ASSESSMENT CRITERIA:

1) SPREAD FOOTINGS WITHIN THE POTENTIAL CHANNEL SCOUR AREA ARE INDICATED BY FIELD INVESTIGATION OR BORING LOG ANALYSIS TO BE ON SCOUR RESISTANT MATERIAL.
GEOTECHNICAL CONCURRENCE BY:_____

2) AS-BUILT PLANS INDICATE THE SPREAD FOOTINGS WITHIN THE POTENTIAL CHANNEL SCOUR AREA TO BE KEYED AT LEAST 6" INTO ROCK. _____

3) STEEL PILE BENTS WITHIN THE POTENTIAL CHANNEL SCOUR AREA HAVE a) AVERAGE PILE TIPS THAT PENETRATE A MINIMUM OF 12 FEET BELOW STREAM BED OR b) HAVE LESS THAN 22 +/- FEET (LONGER IF BRACING CONSIDERED)OF TOTAL PILE LENGTH AND INDICATED BY: BORINGS LOGS, PILE DRIVE RECORDS, OR ROD SOUNDINGS TO BE TIPPED INTO POINT BEARING MATERIAL. a)_____ b)_____

4) CONCRETE OR TIMBER BENTS WITHIN THE POTENTIAL CHANNEL SCOUR AREA HAVE a) AVERAGE PILE TIPS THAT PENETRATE A MINIMUM OF 15 FEET BELOW THE STREAM BED OR b) HAVE LESS THAN 18 FEET +/- (LONGER IF BRACING CONSIDERED)OF TOTAL PILE LENGTH AND INDICATED BY BORING LOGS OR ROD SOUNDINGS TO BE TIPPED INTO POINT BEARING MATERIAL. a)_____ b)_____

5) ALL PIERS AND ABUTMENTS ARE OUTSIDE THE NORMAL CHANNEL SECTION. _____

6) THE BRIDGE HAS EXPERIENCED A FLOOD GREATER THAN A 50-YEAR MAGNITUDE WITH NO REPORTED OR APPARENT SCOUR PROBLEM. _____

7) THE BOTTOMS OF THE CHANNEL PIER SPREAD FOOTINGS ARE GREATER THAN 7 FEET BELOW THE STREAM BED. _____

8) THE APPROACH ROADWAY OR BRIDGE IS OVERTOPPED DURING MINOR FLOODS (<10-YEAR EVENT) REQUIRING CLOSURE AND INSPECTION BEFORE REOPENING. _____

9) DRILLED PIERS WITHIN THE POTENTIAL CHANNEL SCOUR AREA ARE INDICATED BY FIELD INVESTIGATION OR BORING LOG ANALYSIS TO BE IN SCOUR RESISTANT MATERIAL _____

THIS STRUCTURE MEETS WHICH OF THE ABOVE LISTED ITEMS FOR CLASSIFICATION AS A LOW RISK STRUCTURE? _____

BASED ON AN ENGINEERING EVALUATION OF THE AVAILABLE DATA AND REPORTS, THE LOW RISK CLASSIFICATION OF THIS STRUCTURE FOR THE REASON(S) LISTED ABOVE APPEARS REASONABLE. N/A

COMMENTS:

22" piles shall be driven to a minimum bearing capacity of 60 tons per plans.

20" piles shall be driven to a minimum bearing capacity of 60 tons per plans.

ASSESSMENT DATA:

COUNTY: New Hanover ASSESSMENT DATE:_____
BRIDGE NO.: 640012

	YES OR NO
INSPECTION REPORTS:	
DATE OF INSPECTION REPORT 04/17/2009	
EXISTING SCOUR HOLES PRESENT	YES
UNDERMINING OF FOOTINGS	YES
72 FIELD SCOUR EVALUATION- SCOUR HAS OCCURRED	YES
HYDRAULIC DATA:	
HIGH WATER- OVERTOP OF BRIDGE DECK	N/A
CHANNEL SHIFTING OR DEGRADING	YES
BAD ANGLE OF ATTACK- STREAM CURVES AT BRIDGE	NO
DEBRIS PROBLEM AT BRIDGE- LEANING TREES ON BANK	N/A
GEOTECHNICAL DATA:	
FOUNDATION MATERIAL IS SCOURABLE	N/A
STREAMBED IS SAND W/ NO ARMOR MATERIAL	N/A
STRUCTURAL DATA:	
SMALL ABUTMENTS (NOT MASSIVE)- EASY TO DAMAGE	N/A
WIDE WEBS- ADVERSE ANGLE- CREATES PIER SCOUR	N/A
ROTATION OR SETTLEMENT OF PIERS OR ABUTMENTS	N/A
ADDITIONAL CONSIDERATIONS:	
DAM-UPSTREAM/ DOWNSTREAM	N/A
PREVIOUS COUNTERMEASURES DAMAGED	YES
RIP RAP ERODE	N/A
SAND OR GRAVEL MINING IN VICINITY OF BRIDGE	N/A

THIS ASSESSMENT WAS CONDUCTED BY AN INTERDISCIPLINARY TEAM OF HYDRAULIC, GEOTECHNICAL, STRUCTURAL, BRIDGE MAINTENANCE, AND FHWA ENGINEERS BASED UPON INFORMATION PROVIDED AND ENGINEERING JUDGMENT.

NOTE:
BRIDGE INSPECTORS TO NOTIFY THE HYDRAULICS UNIT IF ANY OF THE ABOVE CONDITIONS CHANGE ENOUGH TO WARRANT RECORDING OF ITEM 113.

DECISION:

CLASSIFIED AS:

SCOUR CRITICAL	✓
UNKNOWN FOUNDATION	
LOW RISK	

RECOMMENDED SCOUR CODE: 3

ASSESSMENT COMMENTS:

See pages 3 through 5 of this report for pile tip data.

22" piles shall be driven to a minimum bearing capacity of 60 tons per plans.

20" piles shall be driven to a minimum bearing capacity of 60 tons per plans.

1991 prompt action repair on footing No. 1 of bent 8. Current scouring is occurring at footing No. 2 of bent 8 and extends downstream along the eastern face of the pier. A 2004 prompt action was issued for the scouring occurring on footing No two and was re-issued in 2007.

Monitor Bent 8 and 9 for exposed piles or timber piles damaged by marine borers.

Increase U/W inspection frequency to every 2 years. If no problems are found after two cycles, return to 4yr frequency

SCHEDULE FOR DETAILED STUDY

SCHEDULE FOR FURTHER IN-HOUSE STUDY

ASSESSED BY: JJB
FIRM: NCDOT
DATE: 1/20/2010
CHECKED BY:
DATE:
FIRM:

APPROVED BY: JJ I
DATE: 1/20/2010

FINAL COMMENTS:

Scour committee recommends code: 3

See report by Parsons Brinckerhoff dated 1/20/2010.

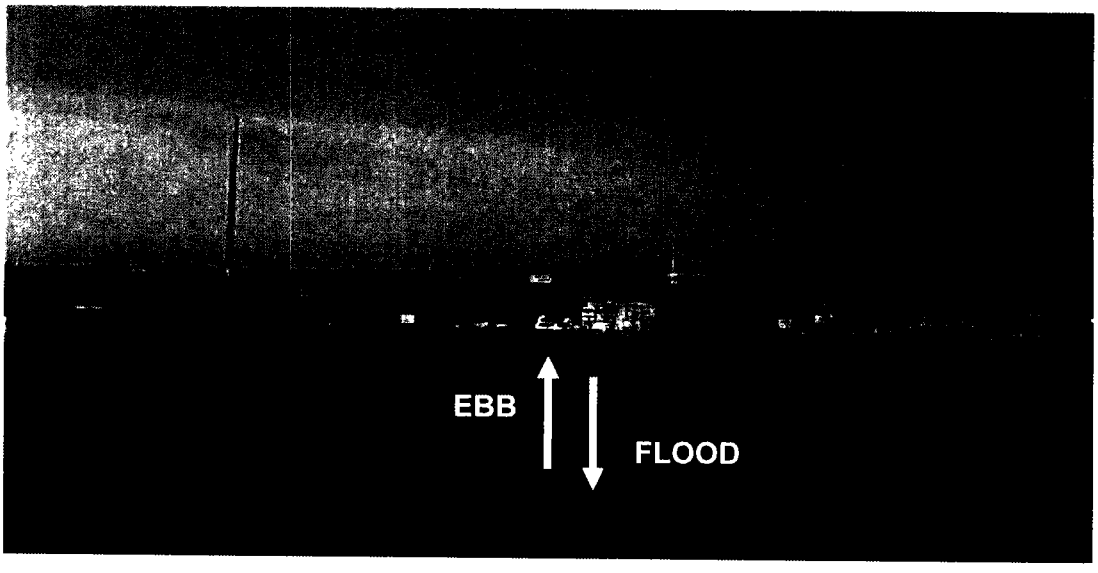
Scour committee recommends monitoring Bent 8 and 9 for exposed piles or timber piles damaged by marine borers.

Contact hydraulics unit if occurs.

PB PARSONS BRINCKERHOFF

909 AVIATION PARKWAY
SUITE 1500, MORRISVILLE, NC 27560
(919) 467-7272
www.pbworld.com

FINAL REPORT OF CODE T BRIDGE FOUNDATION INVESTIGATION
BRIDGE # 640012
NEW HANOVER COUNTY
ROUTE US 74 &76
INTRACOASTAL WATERWAY



SUBMITTED TO: JERRY BEARD, P.E.
NORTH CAROLINA DEPT OF TRANSPORTATION
HYDRAULICS UNIT
1590 MAIL SERVICE CENTER
RALEIGH, N.C. 27699-1590

AUTHORED BY: DAVIN WALLACE
PARSONS BRINCKERHOFF
909 AVIATION PARKWAY
SUITE 1500, MORRISVILLE, NC 27560

INTRODUCTION: Bridge # 640012 is a 731 feet long 15 span structure with one bascule span. Bridge 640012 carries route US 74&76 over a straight section of the Intracoastal Waterway. A repair was made for previous scouring beneath the footing of bent 8, and is documented to have active souring in recent inspection reports.

SCOPE OF RECORD SEARCH:

BRIDGE PLANS - 1956
INSPECTION REPORTS - 04/17/2009
UNDER/WATER INSPECTION - 12/9/2008, 8/29/2002
PROMPT ACTION - 4/21/2009, 8/29/2002, and 1991
SCOUR REPORT - 1998

BRIDGE INFORMATION:

LATEST INSPECTION REPORT:	04/17/2009	YEAR BUILT: 1956
SUBSTRUCTURE CONDITION:	5	YEAR REHAB:
CHANNEL AND CHANNEL PROTECTION:	6	CURRENT ADT: 23000 YR: 2007 EB1 - RC CAP/PPC PILE
WATERWAY ADEQUACY:	8	B1-B8- RC CAP/PPC PILE
BRIDGE LENGTH:	731	B8&B9 - RC PIER/TIM PILE
SUFFICIENCY RATING:	32.2	B10-B14 - RCP&B/TIM PILE
# OF SPANS:	15	EB2 - RC CAP/PPC PILE
SPAN LENGTHS: 14 @40', 1 Bascule@171'		FIELD SCOUR EVALUATION: E

LIST AND NOTES FOUND ON PLANS ABOUT FOOTINGS OR PILES:

"22 inch piles shall be driven to a minimum bearing of 60 tons."
"20 inch piles shall be driven to a minimum bearing of 40 tons."

INSPECTION REPORT OBSERVATIONS:

- ANGLE OF STREAM ATTACK: STRAIGHT
- ANY SCOUR NOTED
  - BANKS: N
  - STREAMS: Y
  - FOOTINGS: Y
- DEBRIS
  - LARGE TREES LEANING ON BANKS? N
  - DEBRIS PILED UP ON BENTS? Y
  - HAS THALWEG SHIFTED? N

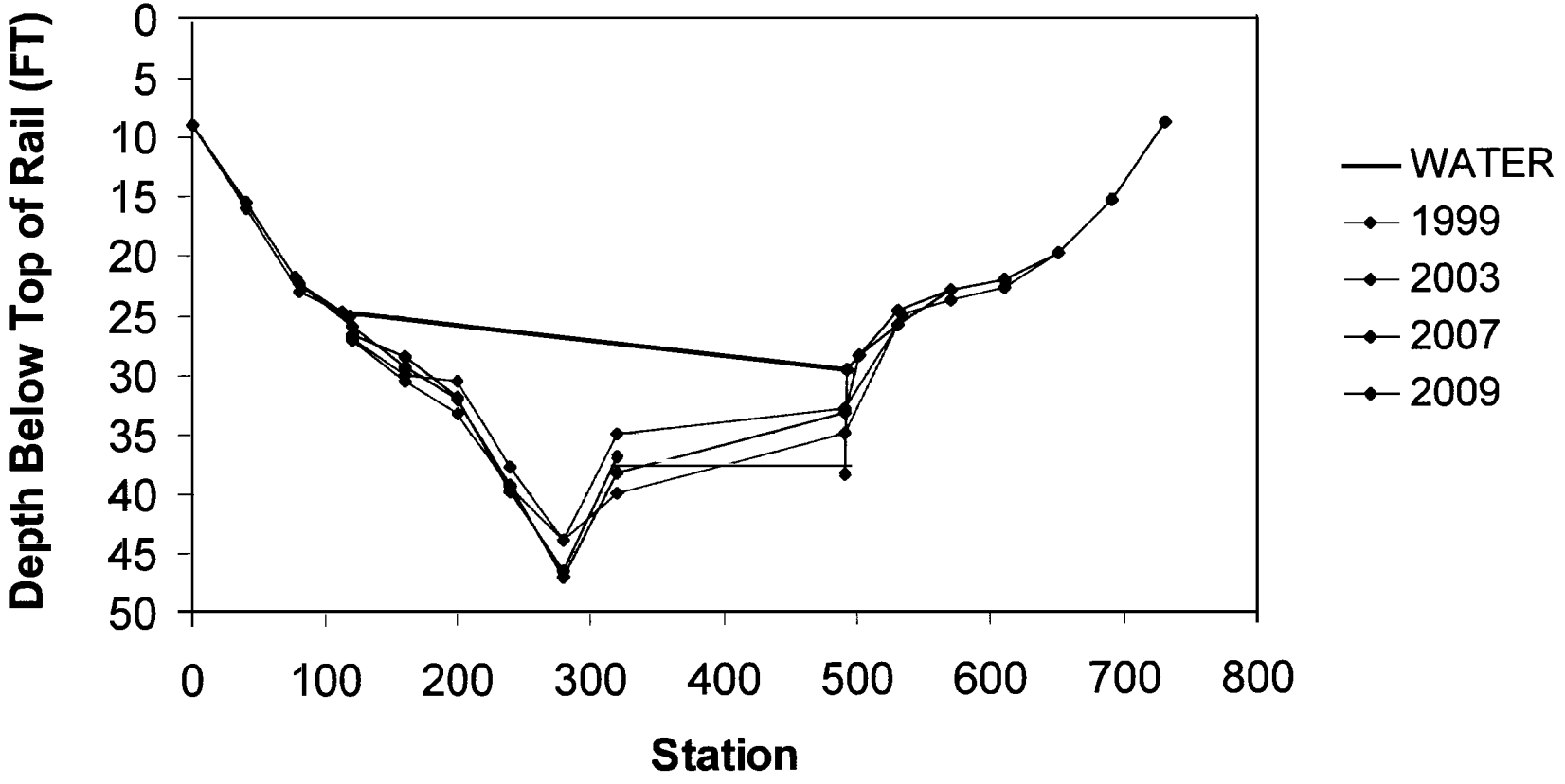
TABLE: PILE TIP FROM PLANS				
LOCATION	COMPUTED PILE LENGTH (FT)	TOP OF RAIL TO BOTTOM OF PILE TIP (FT)*	EMBEDMENT BELOW THALWEG (FT)	PILE TIP EMBEDMENT MATERIAL
EB1	44.5	54.5	8.0	MARL
B1	46.0	56.0	9.5	MARL
B2	54.6	64.6	18.1	MARL
B3	56.7	66.7	20.2	MARL
B4	56.6	66.6	20.1	MARL
B5	57.7	67.7	21.2	MARL
B6	56.2	66.3	19.8	MARL
B7	61.3	71.3	24.8	MARL
B8	26.1	69.6	23.1	MARL
B9	27.2	70.7	24.2	MARL
B10	55.3	65.3	18.8	MARL
B11	54.8	64.8	18.3	MARL
B12	54.5	64.5	18.0	MARL
B13	53.6	63.6	17.1	MARL
B14	54.0	64.0	17.5	MARL
EB2	49.7	59.7	13.2	MARL

* Top of Rail is based on crown line elevations from plans.

THALWEG (LOWEST POINT IN STREAMBED) = 46.5' Below Top of Rail

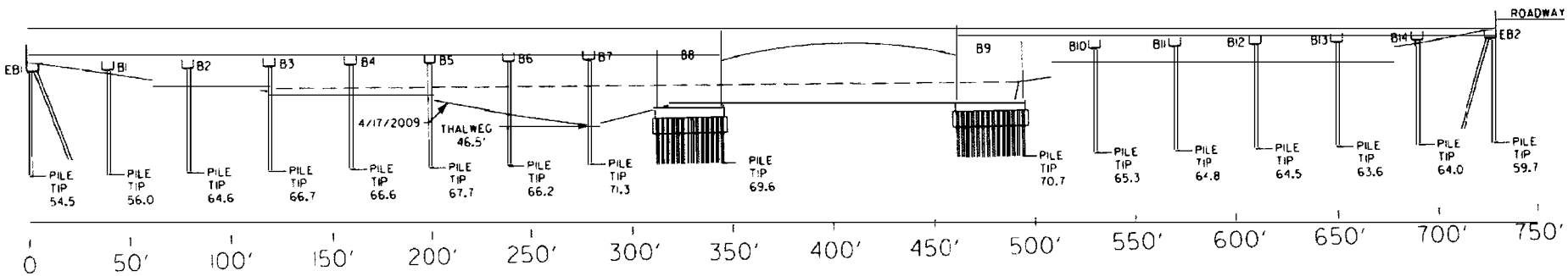
CONCLUSIONS: The current field scour evaluation is coded E.
A 1990 inspection found that scour had exposed the timber piles beneath footing No. 1 of bent 8, and that 30 of the 91 piles had been exposed with 12 of the piles "100% eaten away by borers". A prompt action report states that a coffer dam was driven around the pier, pilings were legged up, and 300 cu yd of concrete was poured beneath the pier in 1991. Details of this repair are provided in the 1990 prompt action report and the 1991 underwater report.
A 1998 underwater inspection report notes an irregular surface and the presence of scour holes caused by sand bags that remain from the 1991 repair. The same report mentioned that the repair appeared stable at that time.
A 2002 inspection found scouring conditions beneath the eastern side of bent 8 starting at footing No. 2 and extending downstream along the face. A 2002 prompt action report was issued with no remedial work performed. Prompt action was re-issued in 2004 due to increased scour and severed foundation piles. A new prompt action was issued in 2007. The latest underwater inspection report stated that the scour mentioned in the 2004 inspection was still active at that time.
Bents 6 and 7 have shown scouring to 3 feet in past inspection. Recent inspection reports indicate that the previous scour at bents 6 and 7 appear stable at the time of inspection.

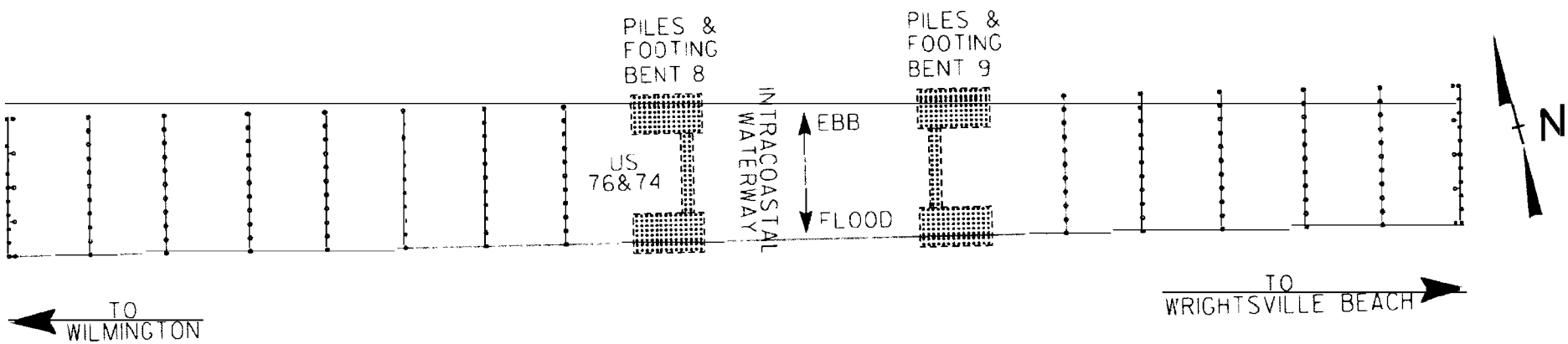
Down Stream Bed Soundings



PARSONS BRINCKERHOFF 909 AVIATION PKWY SUITE 1500 MORRISVILLE N.C. 27560 (919) 467-7272

CROSS SECTION



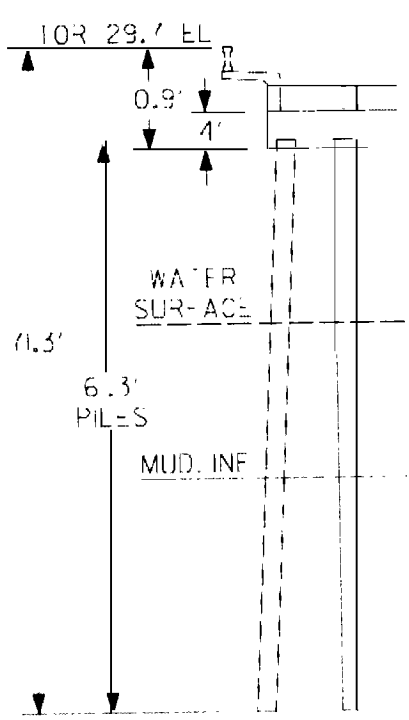


PLAN VIEW

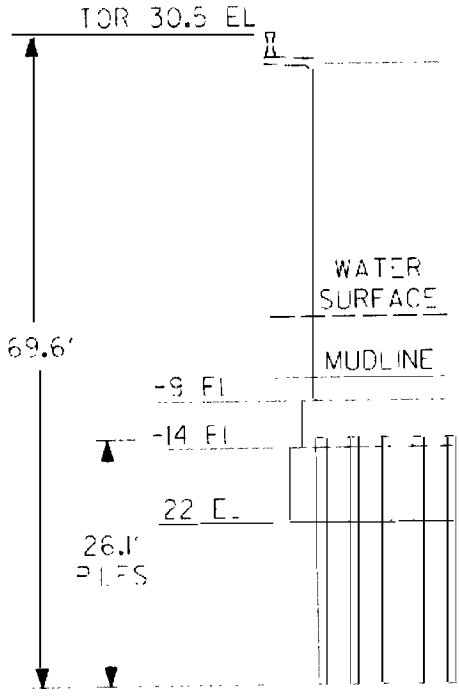
PARSONS BRINCKERHOFF

909 AVIATION PKWY
SUITE 1500
MORRISVILLE N.C. 27560

(919) 467-7272


TOR 29.7' EL
0.9'
4'
WATER SUR-ACE
11.3'
6.3' PILES
MUD. INE

BENT 7


TOR 30.5 EL
WATER SURFACE
MUDLINE
69.6'
-9 EL
-14 EL
22 E.
26.1' PILES

BENT 8

STRUCTURE DATA:

** NG seems like the most [illegible] embedment reference because Thalweg in the [illegible], appears to be more [illegible].

BRIDGE LENGTH 731'

SUFFICIENCY RATING 39.[illegible]   EST. REMAINING LIFE (YRS.) ?   DATE: ?

NO. OF SPANS 15   SPAN LENGTHS 14@ 10' ; 1@ 171'

UNDERCLEARANCE (BED TO LOW BEAM) ______   SIMPLE OR CONTINUOUS ?

TOP OF RAIL ELEV. ______   THALWEG ELEV. -31.0'

BENT NO. (W-E), (S-N)	EB-1	B-1	B-2	B-3	B-4	B-5	B-6	B-7	Pier 1 **	Pier 2 **	B-8	B-9	B-10	B-11	B-12	EB-2
TYPE	Spill thru	Pile Bent	←		→		Pile Bent		Pile Footing		Pile Bent	←		→	Pile Bent	Spill thru
SKEW	90°	←													→	90°
FTG./FOUNDATION TYPE																
COLUMN WIDTH																
COLUMN/BENT SHAPE																
FOOTING THICKNESS																
TOP FTG. ELEV. LT.																
CTR.																
RT.																
BOTTOM FTG. ELEV. LT.																
CTR.																
RT.																
TOP SILL ELEV. LT.																
CTR.																
RT.																
BOTTOM SILL ELEV. LT.																
CTR.																
Top of pile elev → ~~RT.~~		10.97	12.57	14.16	15.59	16.8	17.8	18.58	-13.0	-13.0' ✓	18.58	17.5	16.6	14.79	14.16	[illegible]
CONC./RIP RAP PROTECTION																
PILE TYPE	Conc.	←												→		
PILE LENGTHS (AVERAGE)	43.0	46'	48.0	50.0	52.0	54.0	56.0	56.0	35.0	35.0	54.0	56.0	54.0	54.0	52.0	40/50
PILE TIP ELEV. (AVERAGE)		-35.0	-35.1	-35.8	-36.1	-37.2	-38.2	-37.1	-38.0	-38.0	-37.1	-38.2	-37.1	-39.2	-37.8	
PILE EMBEDMENT		4.0/41	4.4/34.1	4.8/33.8	5.1/36	6.2/33	7.2/31	6.1/21	7'/19'	7'/24'	6.1/35.4	7.2/39.2	6.4/37.1	8.2/41.2	6.8/40.3	
MIN. BEARING CAPACITY	50 tons	←												→		50 tons
SPREAD FOOTING EMBED.																
EMBEDMENT REFERENCE +		TH	NG	*	*	*	*	*	*	*		TH			TH/NG	

COMMENTS: Fathometer readings only available for B-3 thru B-8

+ THALWEG OR NATURAL GROUND

Bridge Seat Elev - (4'-0") + (1'-0") + [illegible]) · top of pile elev = Bridge [illegible] - ~~3.3'~~ - 3.[illegible]

PARSONS BRINCKERHOFF

Page	1
Made by:	M. Yadav
Date:	1/14/2010
Checked by:	J. Lennon
Date:	1/19/2010

Tidal Hydrologic and Hydraulic Computations

Bridge #::	**640012**
Location:	0.8 miles east of Jct SR14

Bridge Information

FEMA 100-yr Stillwater Elevation		16	feet-NAVD
Mean Sea Level (MSL)	0.46	feet-NAVD	
100-yr Stillwater Elev.	15 54	feet above MSL	
Type of tidal system	Estuary with Multiple Entrances		
Bridge Opening Area:	14,229	sq. ft	(Below the 100-yr WSEL)
Channel Width @ MSL	381	feet	
Bridge Opening Width	731	feet	
Bridge Opening Skew	0	Degrees	
Avg Floodplain Width U/S of Bridge		800 feet	(FP width adjusted to 100' to keep drawdown factor at 40%)
Skew Adj Bridge Opening Width		731 feet	
Skew Adj. Channel Width		381 feet	
Skew Adj Bridge Opening Area		14,229 sq. ft.	

Hydrologic and Hydraulic Computations

FEMA/NCDOT Discharge (100-Year)

Discharge (Q_{100})	*N/A*	*cfs*	(Discharge is from FEMA Flood Insurance Study - Riverine Q Only)
Velocity	*N/A*	*fps*	

Coastal Storm Surge Properties (Based on NWS-38 and HEC-25 Methods)

Radius of Maximum Winds (R)		27 nmi	
Forward Storm Speed (f)		12 knots	
ΔWSEL	8.23	feet	(Maximum water surface change from storm surge hydrograph)
Δt	3	hour	(Time period corresponding to maximum WSEL change)

Orifice Equation

C	0 8	(Average Values Assumed, based on HEC-25 documentation)
Bridge Opening Ratio	91%	(Assumes that amount of drawdown is a function of floodplain width to bridge opening width)
Drawdown factor	15%	(Reduces the amount of drawdown to account for the bridge opening ratio, as the bridge ratio approaches 100%, negligble drawdown is assumed, as the value approaches 0%, the drawdown approaches the max hourly water surface increase amount)
ΔH	0.4	(Max hourly water surface increase adjusted by the drawdown factor)
Velocity	*4 1 fps*	
Discharge (Q_{100})	*58,616 cfs*	

Tidal Prism ***Tidal Prism Methodology is Not Valid for Crossing***

Influenced Length		*feet*	*(Assumes a 20% attenuation of storm surge and measured off FEMA profiles)*
Channel Sinuosity (k)	*2 1*		*(k = stream length / valley length, value is estimated)*
Volume	*0 000E+00*	*cu ft*	*(assumes triangular base - prism shape to flood wedge)*
Discharge (Q_{100})	*N/A*	*cfs*	(Δvolume / Δtime)
Velocity	*N/A*	*fps*	

Resultant 100-Year Peak Discharge and Velocity

Discharge (Q_{100})	**58,616**	**cfs**
Velocity	**4.1**	**fps**

Tidal Bridge Scour Computations

Bridge #:: **640012**
Location: 0.8 miles east of Jct SR14

Bridge Information

FEMA Stillwater Elev	16 feet-NAVD	
100-Year Peak Velocity	4.1 fps	
100-Year Peak Discharge	58,616 cfs	
Typical Pier Width	36 feet	(Use Pile Diameter for Bents)
Typical Pier Length	20 feet	(Use Number of Piles x Pile Diameter for Bents)
Number of Piers	8	
Pier Skew / Angle of Attack	0 degrees	
Depth of Bed below 100-Yr WSEL at Pier	37.5 feet	(Taken at the Deepest Pier)
Depth of Bank at Abutment below 100-Yr	0 feet	
U/S Channel Enlargement Factor	0	

Contraction Scour Computations - Laursen Method (Live-Bed)

Bottom Width of Channel U/S of Bridge	W_1	381.00	feet	
Bottom Width of Channel less Pier Widths	W_2	298.00	feet	
Average Depth of Channel at Bridge	y_o	19 46	feet	
Bed Mode Exponent	k_1	0.69		(Assumed worst-case value)
$y_2 / y_1 = (Q_2 / Q_1)^{6/7}(W_1 / W_2)^{k1}$	y_2 / y_1	1.18		
Average Depth of Channel after Contraction Scour		23 06	feet	
Depth of Contraction Scour		***3.6***	***feet***	

Pier Scour Computations - CSU Method

Pier Nose Shape Correction Factor	K_1	1.1		(1.0 for Circular, 1 1 for Square)
Correction Factor for Angle of Attack	K_2	1.0		
Bed Form Correction Factor	K_3	1 1		(1.1 for Plane Bed)
Armoring Correction Factor	K_4	1 0		(No Armoring Assumed)
Froude Number	Fr	0 16		
Wide Pier Correction Factor	Kw	0 64		
Minimum Scour Depth	$y_{s\,min}$	86 4	feet	
Local Pier Scour Depth	***y_s***	***26.0***	***feet***	(bascule pier)

Abutment Scour Computations - Modified Froelich Method

Assumed Approach Embankment Length		L	35	feet	
Assumed Effective Embankment Length		L'	10	feet	Effective Embankment % 30%
Velocity at Abutment	0 6	fps			
Velocity Adjustment Factor	0.15		(0 15 for centered thalweg, 0 4 for shifted thalweg near abutment, 0 8 for abutment in active channel)		
Floodplain Depth Adjustment	0.3		(Assumes that average floodplain depth is 30% of depth at abutment)		
Abutment Shape Coefficient	K_1	1.0	(1.0 for vertical wall, 0 82 for wing walls, 0.0 for spill through)		
Abutment Skew Coefficient	K_2	1 1			
Froude Number at Abutment	Fr	0.00			
Abutment Scour Depth	***y_s***	***0.0***	***feet***	(Froelich method modified following research by ConnDOT)	

Scour Computation Results

Total Pier Scour	**29.6**	**feet**
Total Abutment Scour	**3.6**	**feet**