

# UNDERWATER BRIDGE INSPECTION REPORT

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STRUCTURE NO. 4992  
CSAH NO. 4  
OVER THE  
CLEARWATER RIVER (DAM)  
DISTRICT 2 - CLEARWATER COUNTY

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PREPARED FOR THE  
MINNESOTA DEPARTMENT OF TRANSPORTATION  
BY  
COLLINS ENGINEERS, INC.  
JOB NO. 5221 (CEI 36)

MINNESOTA DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected at Bridge No. 4992, Pier 1 and the North and South Abutments, were found to be in satisfactory condition with some defects of minor structural significance. Since the previous inspection, the abutments and their wingwalls, and the pier have been repaired, and riprap has been added to the downstream portion of the bridge. In addition to these repairs, the North Abutment and Pier 1 now have concrete encasements extending from the channel bottom to 4 to 5 feet above the waterline. The channel bottom up and downstream of the bridge is well established and appeared stable with no evidence of significant scour and no appreciable changes since the previous inspection.

INSPECTION FINDINGS:

- (A) The concrete of the abutments and their wingwalls, and Pier 1 was typically smooth and sound; however, random hairline shrinkage cracking was observed.
- (B) There was a spalled, cracked, and unsound concrete area centered at the waterline, 2 feet wide by 1 foot high with exposed aggregate and up to 2 inches maximum penetration, observed at the east wingwall of the South Abutment.
- (C) There was a corner spall, 6 inches wide by 6 inches high with 1 inch maximum penetration, observed at the upstream nose of Pier 1 at waterline.
- (D) An area of minor section loss, 1.5 feet by 6 inches with a maximum penetration of 6 inches, was located at the end of southeast wingwall with up to 2 inches maximum penetration.

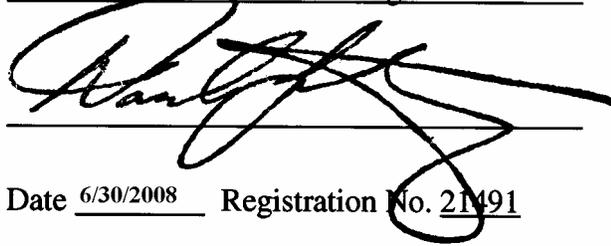
- (E) The channel bottom material at the upstream side of bridge consisted of sandy gravel with random riprap and up to 2 inches of probe rod penetration. The channel bottom material at the downstream side of bridge consisted of 6 to 18 inch diameter riprap with no probe rod penetration.

RECOMMENDATIONS:

- (A) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

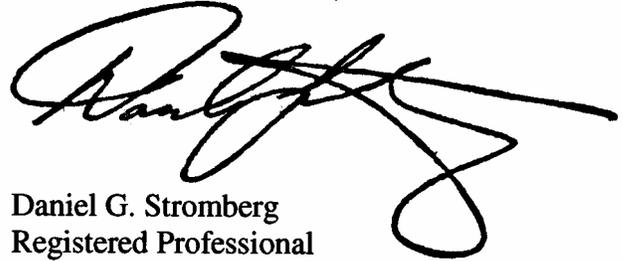
Daniel G. Stromberg



Date 6/30/2008 Registration No. 21491

Respectfully submitted,

COLLINS ENGINEERS, INC.



Daniel G. Stromberg  
Registered Professional  
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 4992

Feature Crossed: The Clearwater River (Dam)

Feature Carried: CSAH No. 4

Location: District 2 - Clearwater County

Bridge Description: The superstructure consists of two spans of multiple steel beams. The superstructure is supported by two reinforced concrete abutments and one reinforced concrete pier. The bridge was built as an integral part of a concrete dam. Both the dam and the substructure units are founded on a spread footing/apron slab which extends under the entire bridge.

2. INSPECTION DATA

Professional Engineer Diver: Bradley A. Syler, P.E., S.E.

Dive Team: John J. Loftus, Valerie Rouston

Date: August 17, 2007

Weather Conditions: Sunny, 69° F

Underwater Visibility: 5.0 feet

Waterway Velocity: Negligible / None

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: North and South Abutments and Pier 1

General Shape: The abutments each consist of a transverse breastwall and two skewed wingwalls. The pier consists of an oblong rectangular shaft.

Maximum Water Depth at Substructure Inspected: Approximately 8.1 feet (upstream),  
and 1.0 foot (downstream).

4. WATERLINE DATUM

Water Level Reference: Top of the curb at the east and west ends of Pier 1.

Water Surface: The upper pool was 6.7 feet below reference.  
Upper Pool Elevation = 97.8.  
The lower pool was 19.8 feet below reference.  
Lower Pool Elevation = 84.4.

5. NBIS CODING INFORMATION (Minnesota specific codes are used for 92B and 113)

Item 60: Substructure: Code 6

Item 61: Channel and Channel Protection: Code 8

Item 92B: Underwater Inspection: Code B/08/07

Item 113: Scour Critical Bridges: Code I/91

Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site.

       Yes   X   No



Photograph 1. Overall View of the Upstream Fascia of the Structure, Looking Northwest.



Photograph 2. View of Overall of the West Wingwall of the North Abutment, Looking Northeast.



Photograph 3. View of North Abutment, Looking North.



Photograph 4. View of Pier 1, Looking Southeast.



Photograph 5. View of Pier 1, Looking Northeast.



Photograph 6. View of South Abutment, Looking South.



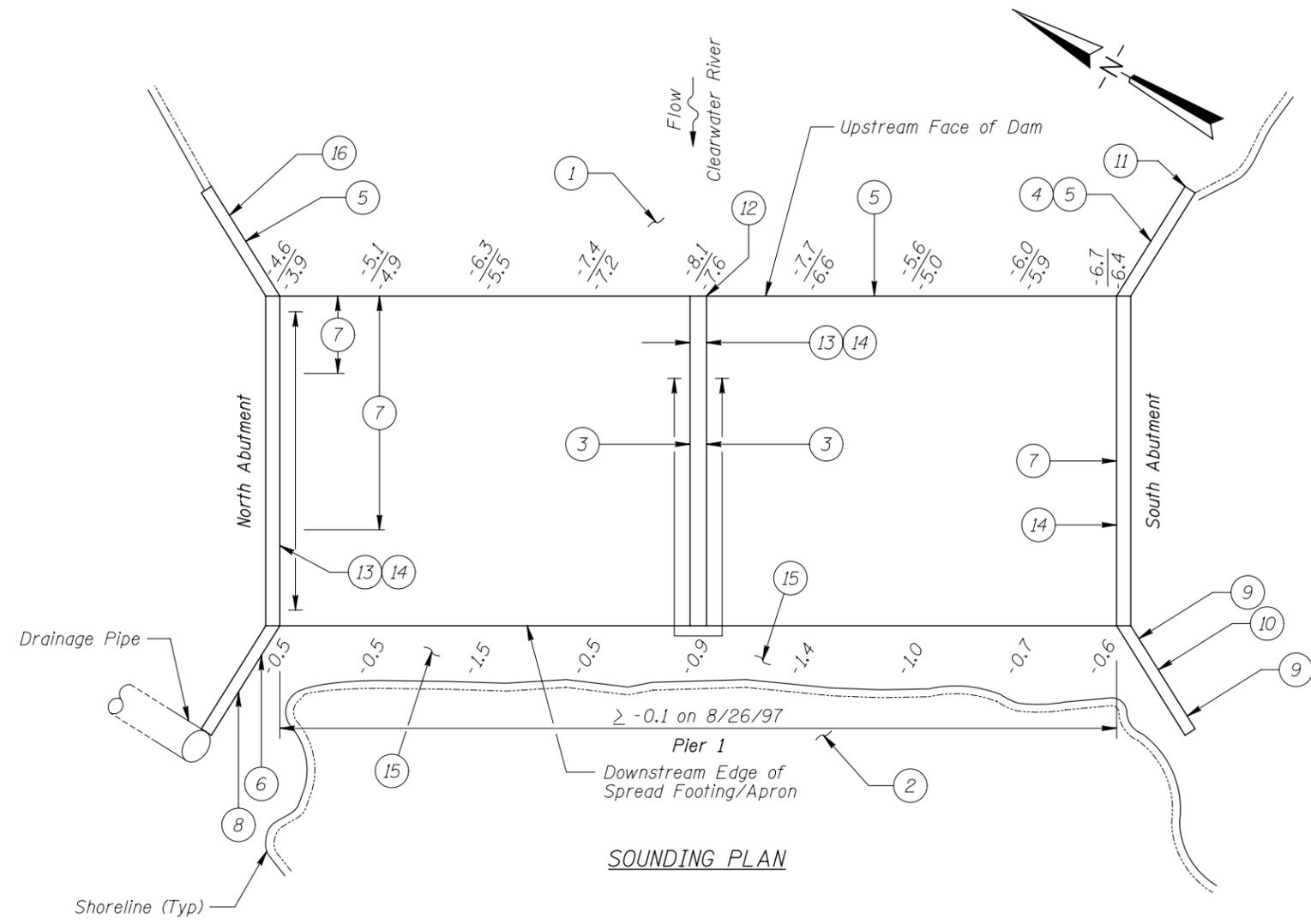
Photograph 7. View of the West Wingwall of the South Abutment, Looking East.



Photograph 8. View of Crack and Spalling (failed patch repair) at center of West Wingwall of the North Abutment, Looking Northeast.

INSPECTION NOTES:

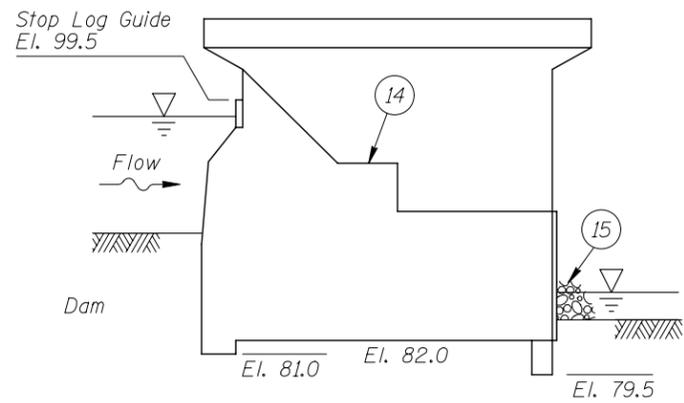
- 1 The channel bottom material consisted of sandy gravel with random riprap and up to 2 inches of probe rod penetration.
- 2 The channel bottom material consisted of 6 to 18 inch diameter riprap with no probe rod penetration.
- 3 Three diagonal 1/16 inch wide cracks on both sides of Pier 1 extending from the the bottom of pier cap to the top of concrete pier encasement.
- 4 Spalled, cracked, and unsound concrete area centered at the waterline, 2 feet wide by 2 feet high, with exposed aggregate and up to 2 inches maximum penetration.
- 5 Random light scaling of below water concrete surfaces with up to 1/8 inch penetration.
- 6 Vertical 1/16 inch wide crack extending from the footing slab up 8 feet through a failing repair patch with a 6 inch diameter spall 2.5 feet above the channel bottom.
- 7 Two vertical 1/16 inch wide cracks extending from 3 to 4 feet above the waterline to the bottom of the wall.
- 8 Vertical 1/16 inch wide crack extending from the top of footing slab up 8 feet through a failing repair patch with 1 foot diameter spall at the footing.
- 9 Vertical 1/16 inch wide crack extending up from the top of footing 8 feet and continuing diagonally to the top of the wingwall.
- 10 Vertical 1/8 inch wide crack extending up from the top of footing 8 feet and continuing diagonally to the top of the wingwall.
- 11 Area of minor section loss 1 1/2 inch by 6 inch with maximum penetration of 6 inches located at the end of the southeast wingwall.
- 12 Corner spall, 6 inches wide by 6 inches high, with 1 inch maximum penetration was observed at the upstream nose of Pier 1 at the waterline.
- 13 In addition to repairs, the North Abutment and Pier 1 have concrete encasements extending from the channel bottom to 4 feet to 5 feet above the waterline. The concrete encasements exhibited minor hairline shrinkage cracking, but were smooth and sound.
- 14 Since the previous inspection, both abutment wingwalls and pier have areas of concrete repair.
- 15 Since the 2002 inspection, riprap has been added to the downstream portion of the bridge.
- 16 Deterioration of skin coat grout facing, with 1/4 inch penetration near waterline.



SOUNDING PLAN

GENERAL NOTES:

1. The North and South Abutments, and Pier 1 were inspected underwater.
2. At the time of inspection on August 17, 2007, the waterline of the upper pool was located approximately 6.7 feet below the top of the curb at the east end of Pier 1. The waterline of the lower pool was located approximately 19.8 feet below the top of the curb at the west end of Pier 1. These correspond to a upper pool waterline elevation of 97.8, and a lower pool waterline elevation of 84.4.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.
4. Soundings were taken parallel to the bridge at 1/4 point intervals between the substructure units.



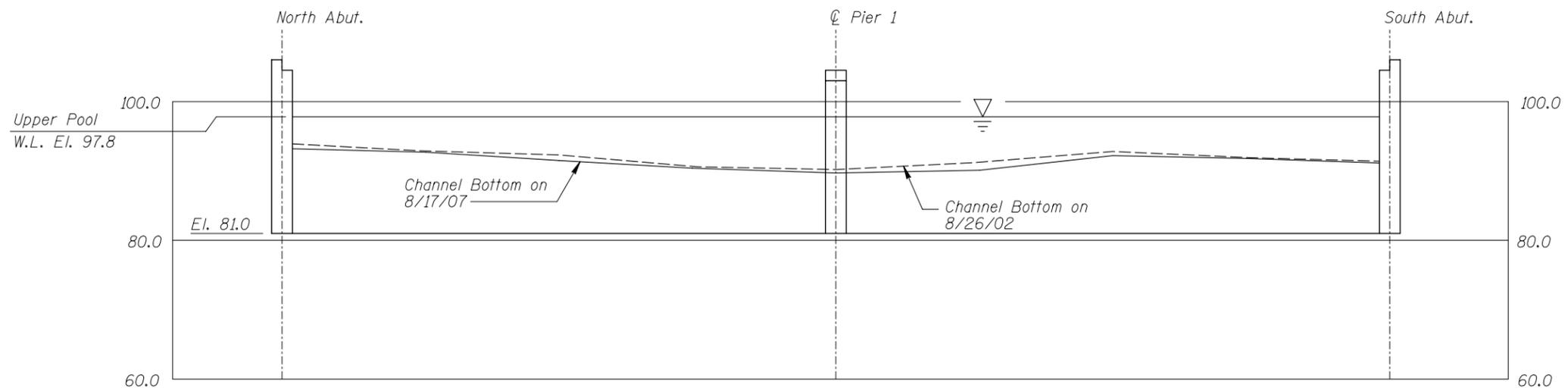
TYPICAL BRIDGE/DAM SECTION

Legend

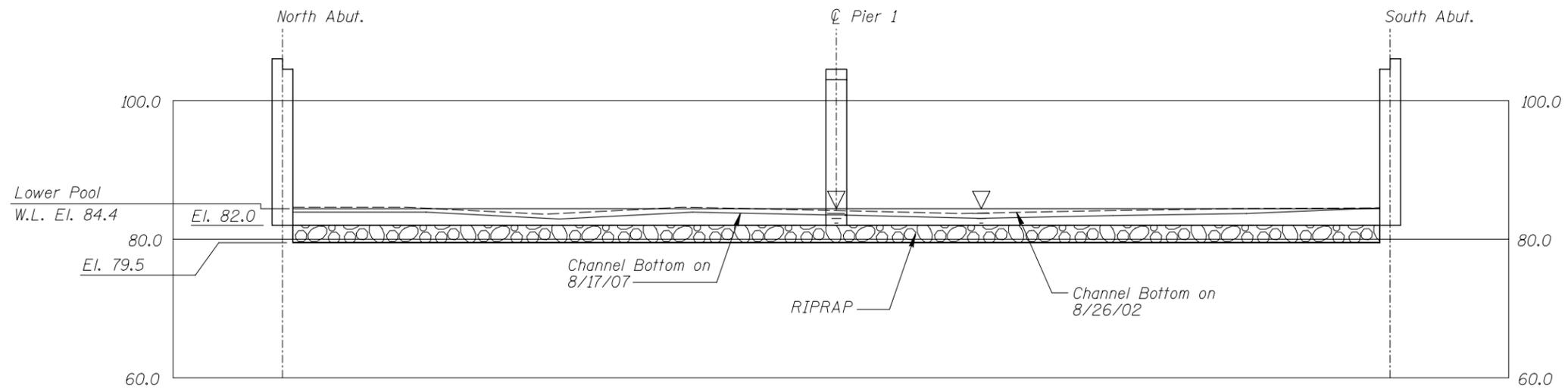
-2.0	Sounding Depth (8/17/07)
-5.2	Sounding Depth (8/26/02)

Note:  
All soundings based on 2007 waterline location.

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 4992 OVER THE CLEARWATER RIVER DAM DISTRICT 2, CLEARWATER COUNTY		
<b>INSPECTION AND SOUNDING PLAN</b>		
Drawn By: RR	<b>COLLINS ENGINEERS</b> <small>133 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: Nov., 2007
Checked By: MDK		Scale: NTS
Code: 52210036		Figure No.: 1



**EAST FASCIA PROFILE**  
Vertical Scale: 1"=20'-0"



**WEST FASCIA PROFILE**  
Vertical Scale: 1"=20'-0"

Note:  
Refer to Figure 1 for General Notes.

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 4992 OVER THE CLEARWATER RIVER DAM DISTRICT 2, CLEARWATER COUNTY		
<b>EAST AND WEST FASCIA PROFILES</b>		
Drawn By: RR	<b>COLLINS ENGINEERS</b> <small>123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: Nov., 2007
Checked By: MDK		Scale: 1"=20'
Code: 52210036		Figure No.: 2

MINNESOTA DEPARTMENT OF TRANSPORTATION  
OFFICE OF BRIDGES AND STRUCTURES  
DAILY DIVING REPORT

INSPECTORS: Collins Engineers, Inc. DATE: August 17, 2007

ON-SITE TEAM LEADER: Bradley A. Syler, P.E., S.E.

BRIDGE NO: 4992 WEATHER: Sunny, 69 °F

WATERWAY CROSSED: Clearwater River

DIVING OPERATION:  SCUBA  SURFACE SUPPLIED AIR  
 OTHER

PERSONNEL: John J. Loftus, Valerie Roustan

EQUIPMENT: Scuba, U/W Light, Scraper, Sounding Pole, Lead Line, Probe Rod,  
Camera

TIME IN WATER: 12:45 P.M.

TIME OUT OF WATER: 1:20 P.M.

WATERWAY DATA: VELOCITY Negligible

VISIBILITY 5.0 Feet

DEPTH 8.1 feet maximum upstream of Pier 1.

ELEMENTS INSPECTED: The North and South Abutments and Pier 1.

REMARKS: Overall, the concrete was in satisfactory condition. Since the previous inspection, abutments, wingwalls, and piers have been repaired, and riprap has been added to the downstream portion of the bridge. In addition to these repairs, the North Abutment and Pier 1 now have concrete encasement extending from the channel bottom to 4 to 5 feet above the waterline. The concrete encasements exhibited minor random hairline shrinkage cracking, but were still smooth and sound. The concrete surface of abutments, piers and wingwalls (20%) was still observed to be spalled, cracked, and scaled, with areas of greatest section loss at the southeast wingwall with up to 2 inches of penetration.

FURTHER ACTION NEEDED:  YES  NO

Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

MINNESOTA DEPARTMENT OF TRANSPORTATION  
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 4992  
 INSPECTORS Collins Engineers, Inc.  
 ON-SITE TEAM LEADER Bradley A. Syler, P.E., S.E.  
 WATERWAY CROSSED Clearwater River

INSPECTION DATE August 17, 2007  
 NOTE: USE ALL APPLICABLE CONDITION  
 DEFINITIONS AS DEFINED IN THE MINNESOTA  
 RECORDING AND CODING GUIDE INCLUDING  
 GENERAL, SUBSTRUCTURE, CHANNEL AND  
 PROTECTION, AND CULVERTS AND WALL  
 DEFINITIONS TO COMPLETE THIS FORM.

CONDITION RATING

UNIT REFERENCE NO.	UNIT DESCRIPTION	MAXIMUM DEPTH OF WATER	SUBSTRUCTURE					CHANNEL					GENERAL						
			PILING	COLUMNS, SHAFTS, OR FACES*	FOOTINGS	DISPLACEMENT	OTHER (BRACING)	OVERALL SUBSTRUCTURE CONDITION CODE*	SCOUR	EMBANKMENT EROSION	EMBANKMENT PROTECTION	OTHER (DRIFT/DEBRIS)	OVERALL CHANNEL & PROTECTION CONDITION	CONCRETE	STEEL	TIMBER	LOSS OF SECTION	PREVIOUS REPAIR OR MAINTENANCE	OTHER
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	North Abutment	0.5' or 4.6'	N	6	N	8	N	6	8	8	8	N	8	6	N	N	N	8	N
	Pier 1	0.9' or 8.1'	N	6	N	8	N	6	8	N	N	N	8	6	N	N	N	8	N
	South Abutment	0.6' or 6.7'	N	6	N	8	N	6	8	8	8	N	8	6	N	N	N	8	N

\*UNDERWATER PORTION ONLY

REMARKS: Overall, the concrete was in satisfactory condition. Since the previous inspection, abutments, wingwalls, and piers have been repaired, and riprap has been added to the downstream portion of the bridge. In addition to these repairs, the North Abutment and Pier 1 now have concrete encasement extending from the channel bottom to 4 to 5 feet above the waterline. The concrete encasements exhibited minor random hairline shrinkage cracking, but were still smooth and sound. The concrete surface of abutments, piers and wingwalls (20%) was still observed to be spalled, cracked, and scaled, with areas of greatest section loss at the southeast wingwall with up to 2 inches of penetration.

NOTES: ATTACH SKETCHES AS NEEDED, IDENTIFY REMARK BY REFERRING TO UNIT REFERENCE NO. AND REMARK NO.  
 USE GENERAL SECTION TO IDENTIFY OVERALL PRESENCE OF SPALLS, CRACKS, CORROSION, ETC.