

UNDERWATER BRIDGE INSPECTION REPORT

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STRUCTURE NO. 88594  
CSAH NO. 44  
OVER THE  
INDIAN CREEK  
DISTRICT 1 – ST. LOUIS COUNTY

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PREPARED FOR THE  
MINNESOTA DEPARTMENT OF TRANSPORTATION  
BY  
COLLINS ENGINEERS, INC.  
JOB NO. 5221 (CEI 6)

MINNESOTA DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected at Bridge No. 88594, the North and South Abutments, were in fair to poor condition. The North Abutment exhibited considerable movement with backfill escaping through gaps in the backwall planking. Repair measures, consisting of steel beams and shims, have held the pile cap in its present position thus far; however, the North Abutment should be further stabilized and repaired. A portion of the timber piles exhibited splitting up to 1/2 inch wide and delamination around the entire circumference. At the time of inspection, the roadway over the bridge was being used as a detour route for another closed roadway, and as a result, the bridge is being subjected to high speed heavy truck traffic. This situation should be closely monitored with regard to the impact imposed on the bridge and its structural integrity.

INSPECTION FINDINGS:

- (A) The east end of the pile cap at the South Abutment exhibited a 3-inch-wide vertical split, which extended from the end of the pile cap to Pile 2.
- (B) Three timber piles at the North Abutment exhibited splitting and delamination around the entire circumference with the outer 1-inch thick shell being most affected.
- (C) The pile cap at the North Abutment was rotated towards the embankment and was held in place with steel beams and shims. The northeast wingwall has failed and the east end of the backwall exhibited considerable movement with backfill escaping through 1-inch gaps between the planking. A portion of the backwall along the west end also exhibited a 1-foot-wide by 6-inch-high gap with 6 inches of penetration and signs of backfill escaping.
- (D) Pile 6 at the South Abutment exhibited a 1/2-inch-wide, 1.5-inch-deep split extending from the pile cap to the channel bottom.



MINNESOTA DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 88594

Feature Crossed: Indian Creek

Feature Carried: CSAH NO. 44

Location: District 1 – St. Louis County

Bridge Description: The bridge superstructure consists of a one span timber deck on multiple steel stringers. The superstructure is supported by two timber pile abutments.

2. INSPECTION DATA

Professional Engineer Diver: Daniel G. Stromberg, P.E., S.E.

Dive Team: John J. Loftus, Valerie Roustan

Date: August 24, 2007

Weather Conditions: Sunny, 55° F

Underwater Visibility: 1.0 foot

Waterway Velocity: None/Negligible

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: North and South Abutments.

General Shape: The North Abutment consists of a single row of six timber piles in front of timber planking which forms a breastwall, and the South Abutment consists of two rows of six timber piles in front of timber planking which forms a breastwall. Both abutments have skewed timber pile and plank wingwalls.

Maximum Water Depth at Substructure Inspected: Approximately 0.5 foot.

4. WATERLINE DATUM

Water Level Reference: The top of pile cap at downstream end of the North Abutment.

Water Surface: The waterline was approximately 2.8 feet below reference.  
Assumed Waterline Elevation = 97.2.

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

Item 60: Substructure: Code 4

Item 61: Channel and Channel Protection: Code 7

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

Item 113: Scour Critical Bridges: Code I/02

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. View of the North Abutment, Looking Northwest.



Photograph 2. View of the Backwall at North Abutment, Looking North.



Photograph 3. View of the Failed Wingwall and Pile 1 at the North Abutment, Looking North.



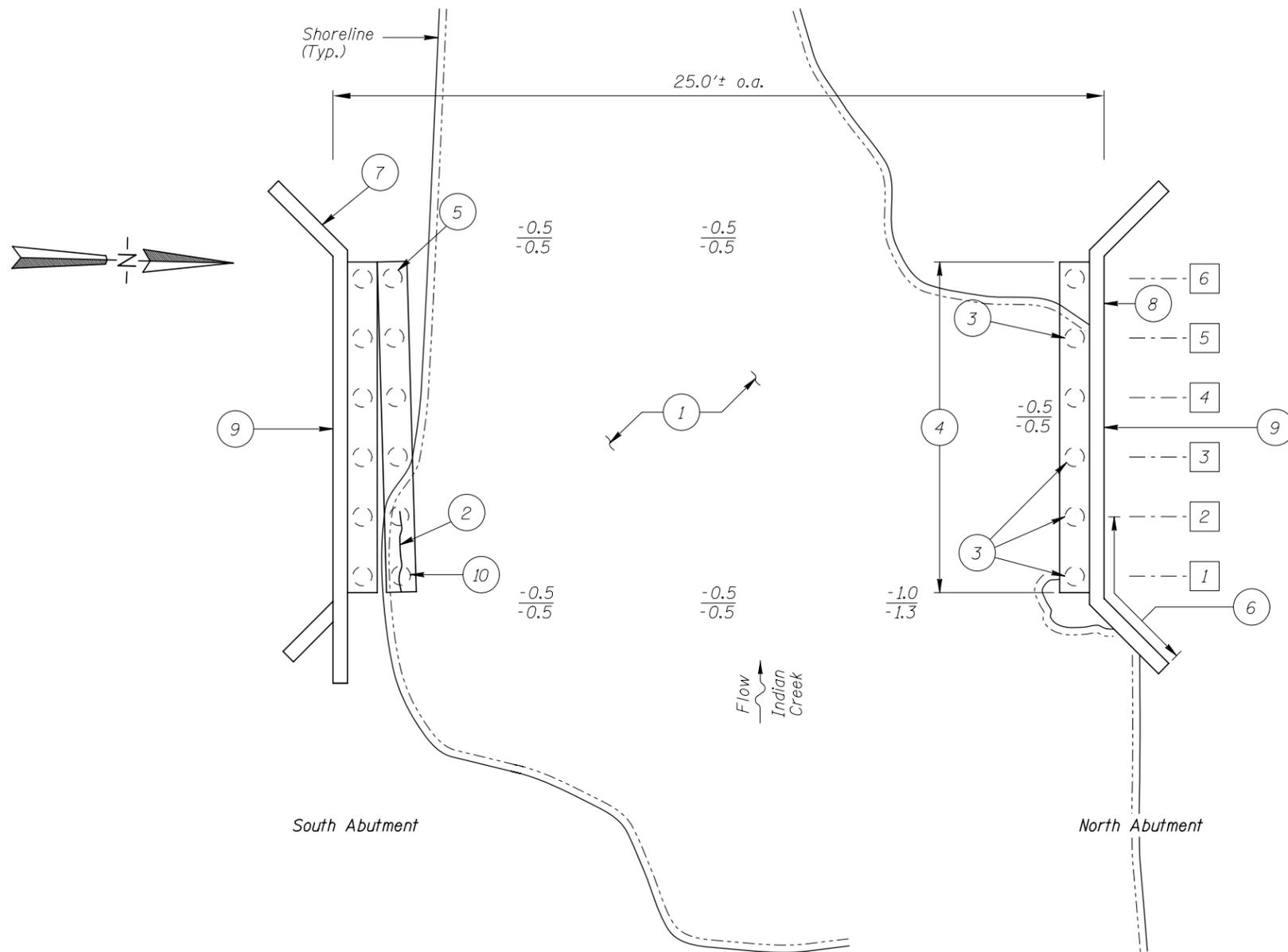
Photograph 4. View of South Abutment, Looking Southeast.



Photograph 5. View of the Backwall at South Abutment, Looking South.



Photograph 6. View of Pile Cap Failure (split), Looking Southwest.



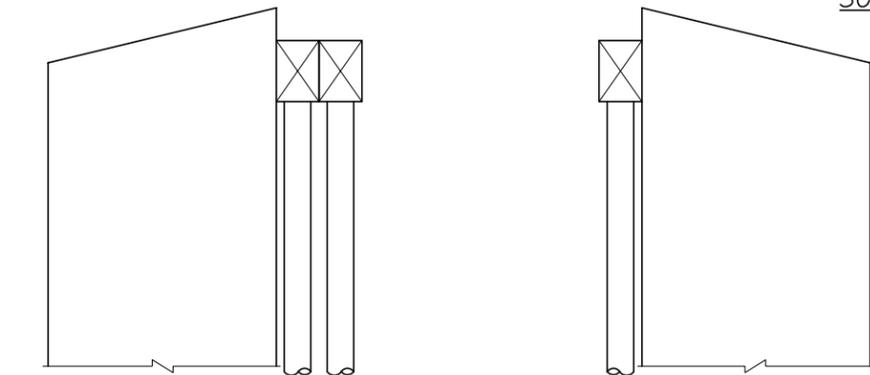
SOUNDING PLAN

GENERAL NOTES:

1. The South and North Abutments were inspected underwater.
2. At the time of inspection on August 24, 2007, the waterline was located approximately 2.8 feet below the top of the cap at the downstream end of the North Abutment. Since insufficient bridge elevation information was available a reference elevation of 100.0 was assumed. Based on the assumed reference the waterline elevation was 97.2.
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.

INSPECTION NOTES:

- 1 The channel bottom consisted of silty sand with a maximum probe rod penetration of 1.5 feet.
- 2 The pile cap exhibited a 3-inch-wide vertical split which extended from the end of the pile cap to Pile 2. Also, there is up to 25% loss of section over the first pile related to decay due to the splitting.
- 3 The timber pile exhibited splitting and delamination around the entire circumference with the outer 1.5 inch thick shell being the most affected.
- 4 The pile cap was rotated towards the embankment and was held in place with steel beams and shims.
- 5 The timber pile exhibited a 1/2-inch-wide, 1.5-inch-deep split extending from the pile cap to the channel bottom.
- 6 The wingwall has failed and the east end of the backwall exhibited considerable movement with backfill escaping through 1-inch-gaps between the planking.
- 7 Bottom plank was 6 inches above channel bottom with 1 foot of penetration behind wall. There is loss of backfill between backwall and wingwall.
- 8 Portion of backwall exhibited 1-foot-wide by 6-inch-high gap with 6 inches of penetration and signs of backfill escaping.
- 9 There is evidence of movement of the backwall planking allowing loss of backfill/embankment on both North and South Abutments.
- 10 The timber pile exhibited splitting and delamination on the South face of the pile with the outer 1 inch thick shell being the most affected.



END VIEW OF SOUTH ABUTMENT

END VIEW OF NORTH ABUTMENT

Legend

- 3.0 Sounding Depth (8/24/07)
- 3.0 Sounding Depth (8/30/02)
- ( ) Timber Pile
- [ 1 ] Pile Identification Designation

Note:

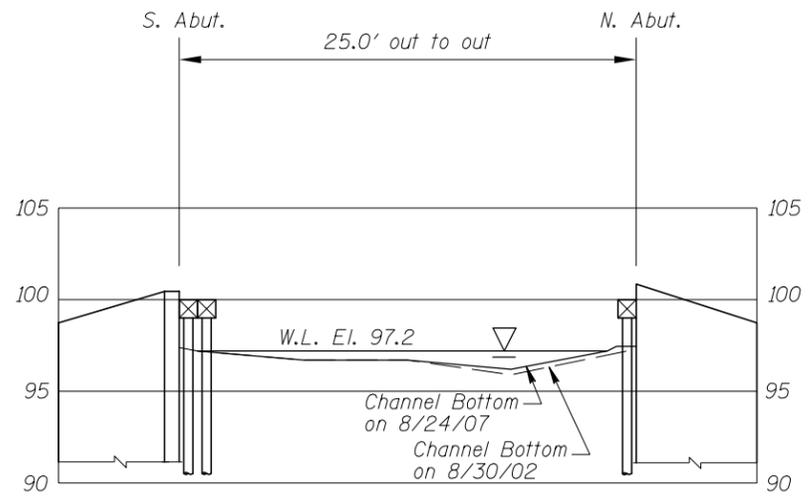
All soundings based on 2007 waterline location.

**MINNESOTA  
DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION**

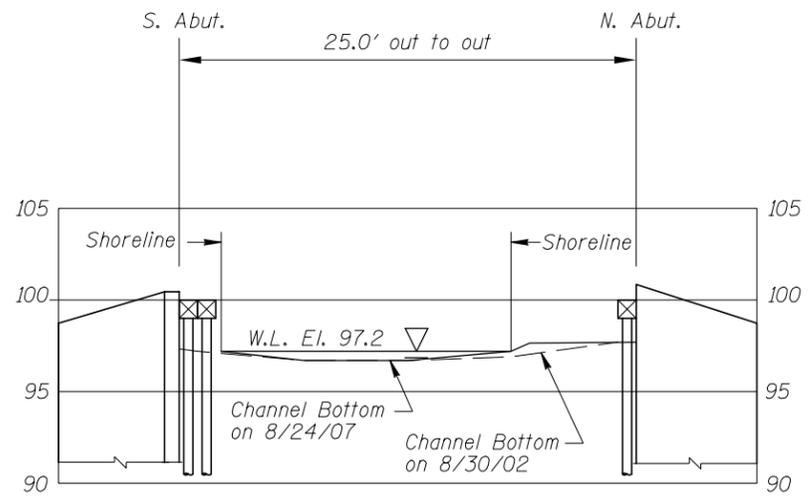
STRUCTURE NO. 88594  
OVER INDIAN CREEK  
DISTRICT I, ST. LOUIS COUNTY

**INSPECTION AND SOUNDING PLAN**

Drawn By: PRH	<b>COLLINS ENGINEERS</b> <small>123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: AUGUST, 2007
Checked By: MDK		Scale: NTS
Code: 52210006		Figure No.: 1



UPSTREAM FASCIA PROFILE



DOWNSTREAM FASCIA PROFILE

Note:  
Refer to Figure 1 for General Notes.

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 88594 OVER INDIAN CREEK DISTRICT I, ST. LOUIS COUNTY		
<b>UPSTREAM AND DOWNSTREAM FASCIA PROFILES</b>		
Drawn By: PRH	<b>COLLINS ENGINEERS</b> <small>123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: AUGUST, 2007
Checked By: MDK		Scale: 1"=10'
Code: 52210006		Figure No.: 2



FURTHER ACTION NEEDED:      X   YES               NO

Ideally, the North Abutment backwall and its northeast wingwall should be rebuilt and/or repaired to prevent further loss of backfill under the approach. Given the overall condition of the bridge, complete replacement of the structure should also be a consideration. Until repairs and/or replacement can be made, above and below water inspection should monitor the failing North Abutment components, especially in light of the current high speed truck traffic being carried by the bridge.

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. 88594  
 INSPECTORS Collins Engineers, Inc.  
 ON-SITE TEAM LEADER Daniel G. Stromberg, P.E., S.E.  
 WATERWAY CROSSED Indian Creek

INSPECTION DATE August 24, 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 (BACKWALL)	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'	5	N	N	5	4	4	7	N	N	N	7	N	N	5	N	N	N
	South Abutment	0.0'	6	N	N	6	5	5	7	N	N	N	7	N	N	6	N	N	N

\*UNDERWATER PORTION ONLY

REMARKS: The North Abutment was in poor condition. The northeast wingwall has failed and the backwall exhibited considerable movement with backfill escaping through 1-inch gaps between the planking. There was also a 1-foot-wide by 6-inch-high gap with escaping backfill in the North Abutment backwall. The pile cap at the North Abutment has been displaced and has rotated towards the embankment. Repair measures, consisting of steel beams and shims, have held the pile cap in its present position thus far. There is a sizeable split in the east end of the South Abutment pile cap extending over two of the piles. The bottom board of the southwest wingwall was 6 inches above the channel bottom with 1 foot of penetration behind the planking. A few of the timber piles exhibited delamination and splitting around the whole circumference of the pile. There is evidence of movement of the backwall planking allowing loss of backfill and embankment on both North and South Abutments.

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.