

UNDERWATER BRIDGE INSPECTION REPORT

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STRUCTURE NO. 6413

CSAH NO. 6

OVER THE

CALDWELL BROOK

DISTRICT 1 - KOOCHICHING COUNTY

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AUGUST 14, 2012

PREPARED FOR THE

MINNESOTA DEPARTMENT OF TRANSPORTATION

BY

COLLINS ENGINEERS, INC.

JOB NO. 7423

MINNESOTA DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected at Bridge No. 6413, Bents 1 and 2 and the North and South Abutments, were found to be in satisfactory to fair condition with moderate deterioration. The timber piles of the units were typically firm and sound with random checking, although with more extensive checking and splitting present at three piles. The south abutment was displaced 6 inches to the north over 6 feet vertically and piles were leaning, with approximately 50 percent loss of bearing area. The channel bottom at the bridge appeared stable with no significant scour noted.

INSPECTION FINDINGS:

- (A) The channel bottom material consisted of firm silty clay with less than 3 inches of probe rod penetration.
- (B) The timber piles typically exhibited moderate weathering with random checking up to 1/2 inch wide and 1/8 inch splits.
- (C) The timber pile cap exhibited a 1-inch-wide split along the eastern end of the bent.
- (D) Timber pile exhibited up to 100 percent loss of section in the top 3 feet of pile and delamination with up to 2 inches of awl penetration along the remaining portion of the pile, which has allowed up to 6 inches of wingwall displacement to the south.
- (E) The top of the northeast wingwall exhibited up to 12 inches of displacement to the South with no active loss of backfill noted.
- (F) The south brace exhibited a 3-foot-long split with a failed connection to the westernmost pile at Bent 2.
- (G) The south brace exhibited a 5-foot-long split with a failed connection to the easternmost pile at Bent 1.

- (H) Channel bottom consisted of soft silt with up to 8 inches of probe rod penetration and random 12 inch riprap.
- (I) The connection hardware typically exhibited corrosion with no appreciable loss of section noted.
- (J) The easternmost pile of Bent 2 was delaminated from the top of the pile down to waterline with up to 3 inches of awl penetration.
- (K) Two steel piles have been added to the Northwest wingwall since the previous inspection.
- (L) The south abutment was displaced 6 inches to the north over 6 feet vertically and piles are leaning. The piles lost approximately 50 percent of bearing area.

RECOMMENDATIONS:

- (A) The abutment displacement is not excessive; however, it should be monitored, and if found to be progressing, further action may be needed.
- (B) Replace timber cross bracing members with splits and failed connections.
- (C) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of sixty (60) months.

**Inspection Team Leader**



**Roy A. Forsyth, PE**

**Date 6/30/2014 License# 49270**

Respectfully submitted,

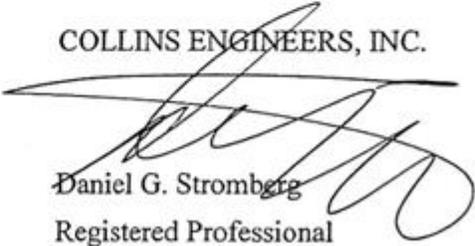
**PROFESSIONAL ENGINEER**

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 6/30/14 License # 21491

**COLLINS ENGINEERS, INC.**



**Daniel G. Stromberg**

**Registered Professional**

**Engineer, State of Minnesota**

MINNESOTA DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 6413

Feature Crossed: Caldwell Brook

Feature Carried: CSAH NO. 6

Location: District 1 – Koochiching County

Bridge Description: The bridge superstructure consists of three spans of timber deck on multiple timber stringers. The superstructure is supported by two timber pile bents and two timber pile abutments. The bents are numbered 1 and 2 starting from the south end of the bridge.

2. INSPECTION DATA

Professional Engineer Diver: Roy A. Forsyth, P.E.

Dive Team: Jordan T. Furlan, P.E., Charles R. Euwema

Date: August 14, 2012

Weather Conditions: Partly Cloudy, 80 °F

Underwater Visibility: 1.0 foot

Waterway Velocity: Negligible / None

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: North and South Abutments and Bents 1 and 2.

General Shape: The bents each consist of five timber piles interconnected with timber cross bracing. The abutments each consists of a vertical timber plank breastwall flanked by wingwalls and supported by 10 timber piles.

Maximum Water Depth at Substructure Inspected: Approximately 4.8 foot.

4. WATERLINE DATUM

Water Level Reference: The top of pile cap at east end of Bent 1.

Water Surface: The waterline was approximately 6.0 feet below reference.  
Assumed Waterline Elevation = 94.0 feet.

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

Item 60: Substructure: Code 5

Item 61: Channel and Channel Protection: Code 7

Item 92B: Underwater Inspection: Code B/08/12

Item 113: Scour Critical Bridges: Code K/95

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

Yes  No

6. STRUCTURAL ELEMENT CONDITION RATING

Item #	Element Description	Quantity	Unit	Conditions				
				1	2	3	4	5
216	Timber Abutment	52	LF		26	26		
386	Wing Wall	4	EA		2	2		
228	Timber Piling	30	EA		24	6		
361	Scour	1	EA	1				
419	Steel Piles	2	EA		2			



Photograph 1. Overall View of the Structure, Looking Southeast.



Photograph 2. View of the South Abutment, Looking Southeast.



Photograph 3. View of Bent 1, Looking Southeast.



Photograph 4. View of Bent 2, Looking Southeast.



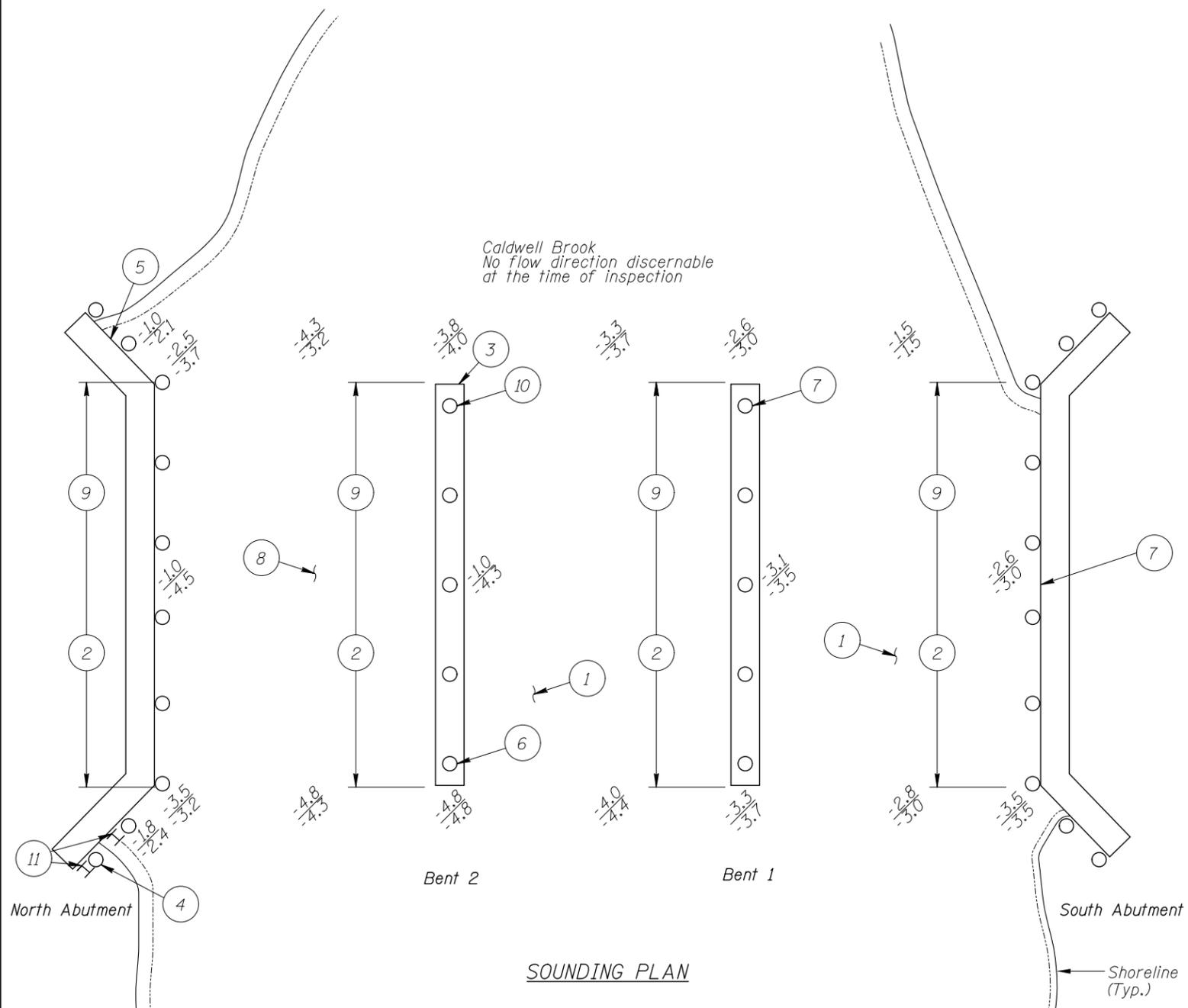
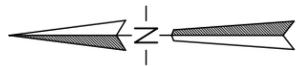
Photograph 5. View of North Abutment, Looking Northeast.



Photograph 6. View of Split in Brace on Bent 2 and Failed Connection, Looking East.



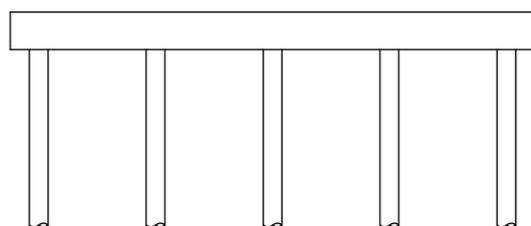
Photograph 7. View of Weight Limit Sign, Looking South.



**SOUNDING PLAN**

**GENERAL NOTES:**

1. The North and South Abutments and Bents 1 and 2 were inspected underwater.
2. At the time of inspection, on August 14, 2012, the waterline was located approximately 6 feet below the top of the pier cap of the west end of Bent 1. Since insufficient bridge elevation information was available, a reference elevation of 100.0 was assumed. Based on the assumed reference, the waterline elevation was 94.0.
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 midpoints between the substructure units as well as around the structures.



**TYPICAL PIER ELEVATION**

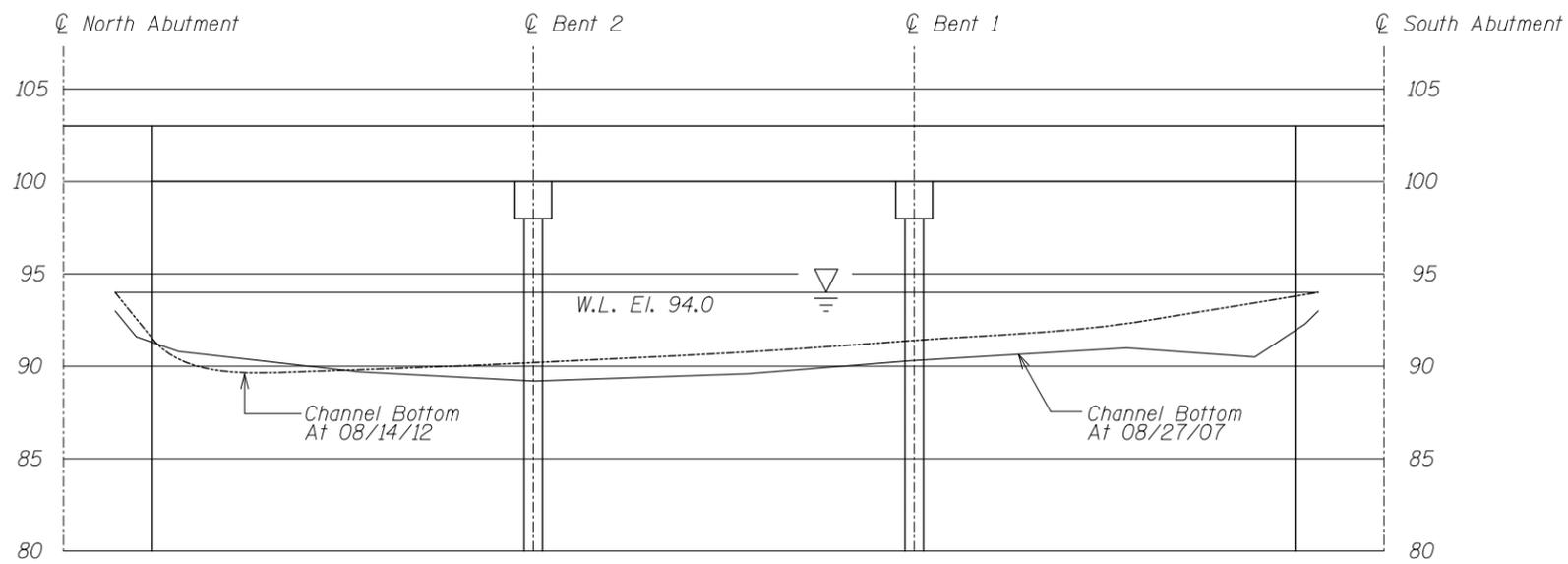
**INSPECTION NOTES:**

- 1 The channel bottom material consisted of firm silty clay with less than 3 inches of probe rod penetration.
- 2 The timber piles typically exhibited moderate weathering with random checking up to 1/2 inch wide and 1/8 inch splits.
- 3 The timber pile cap exhibited a 1-inch-wide split along the eastern end of the bent.
- 4 Timber pile exhibited up to 100 percent loss of section in the top 3 feet of pile and delamination with up to 2 inches of awl penetration along the remaining portion of the pile, which has allowed up to 6 inches of wingwall displacement to the south.
- 5 The top of the northeast wingwall exhibited up to 12 inches of displacement to the south with no active loss of backfill noted.
- 6 The south brace exhibited a 3-foot-long split with a failed connection to the westernmost pile at Bent 2.
- 7 The south brace exhibited a 5-foot-long split with a failed connection to the easternmost pile at Bent 1.
- 8 Channel bottom consisted of soft silt with up to 8 inches of probe rod penetration and random 12 inch riprap.
- 9 The connection hardware typically exhibited corrosion with no appreciable loss of section noted.
- 10 The easternmost pile of Bent 2 was delaminated from the top of the pile down to waterline with up to 3 inches of awl penetration.
- 11 Two steel piles have been added to the Northwest wingwall since the previous inspection.
- 12 The south abutment was displaced 6 inches to the north over 6 feet vertically and piles are leaning. The piles lost approximately 50 percent of bearing area.

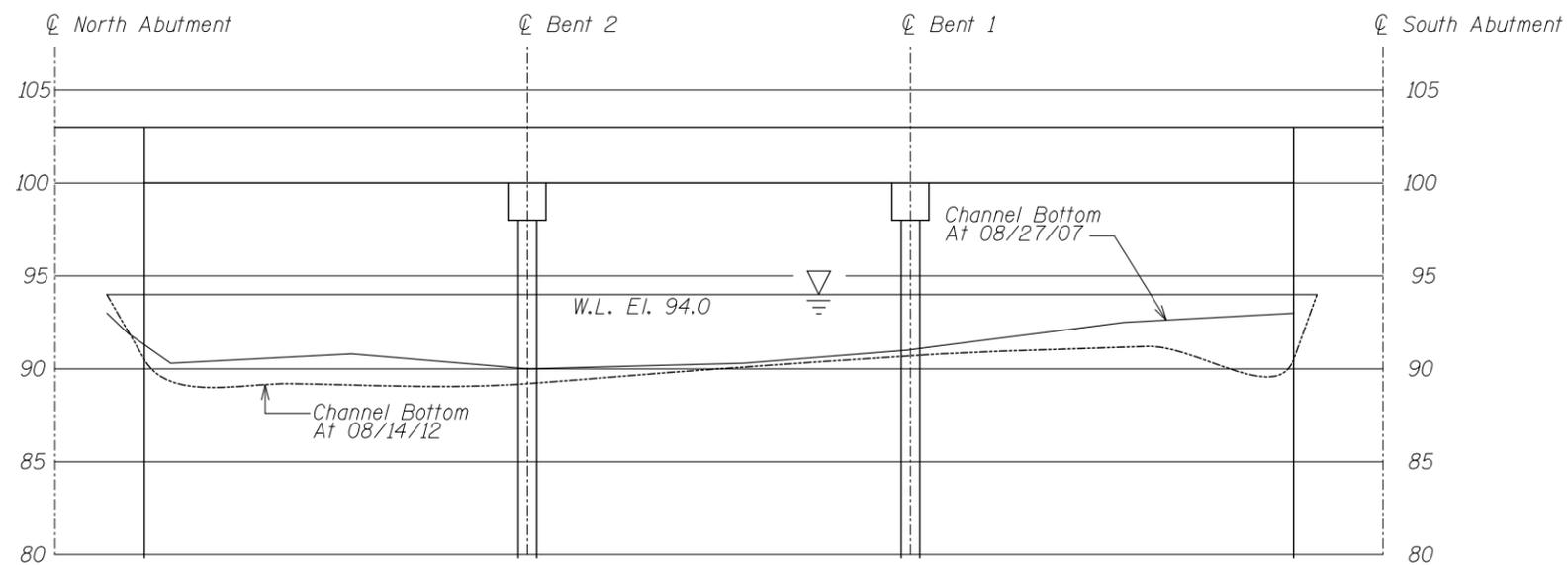
**Legend**

- 1.0 Sounding Depth (8/14/12)
- 0.4 Sounding Depth (8/27/07)

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 6413 OVER THE CALDWELL BROOK DISTRICT 1, KOOCHICHING COUNTY		
<b>INSPECTION AND SOUNDING PLAN</b>		
Drawn By: CRE	<b>COLLINS ENGINEERS</b> <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: AUGUST 2012
Checked By: MDK		Scale: NTS
Code: 52210037		Figure No.: 1



WEST FASCIA PROFILE



EAST FASCIA PROFILE

Note: \_\_\_\_\_  
 Refer to Figure 1 for General Notes.

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 6413 OVER THE CALDWELL BROOK DISTRICT I, KOOCHICHING COUNTY		
<b>UPSTREAM AND DOWNSTREAM FASCIA PROFILES</b>		
Drawn By: CRE	<b>COLLINS ENGINEERS</b> <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: AUGUST 2012
Checked By: MDK		Scale: 1"=10'
Code: 52210037		Figure No.: 2

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

INSPECTORS: Collins Engineers, Inc. DATE: August 14, 2012

ON-SITE TEAM LEADER: Roy A. Forsyth, P.E.

BRIDGE NO: 6413 WEATHER: Cloudy, 80 °F

WATERWAY CROSSED: Caldwell Brook

DIVING OPERATION:  SCUBA  SURFACE SUPPLIED AIR  
 OTHER

PERSONNEL: Jordan T. Furlan, P.E., Charles R. Euwema

EQUIPMENT: Scraper, Lead Line, Sounding Pole, Probe Rod, Sounding Pole, Camera

TIME IN WATER: 1:15 P.M.

TIME OUT OF WATER: 1:45 P.M.

WATERWAY DATA: VELOCITY Negligible/None

VISIBILITY 1.0 foot

DEPTH 4.8 feet maximum at Bent 2

ELEMENTS INSPECTED: North and South Abutments and Bents 1 and 2

REMARKS: Overall, Bents 1 and 2 and the North and South Abutments, were found to be in satisfactory to fair condition with moderate deterioration. The timber piles of the units were typically firm and sound with random checking, although with more extensive checking and splitting present at three piles. The south abutment was displaced 6 inches to the north over 6 feet vertically and piles were leaning, with approximately 50 percent loss of bearing area. The channel bottom at the bridge appeared stable with no significant scour noted.

FURTHER ACTION NEEDED:  YES  NO

The abutment displacement is not excessive; however, it should be monitored, and if found to be progressing, further action may be needed.

Replace timber cross bracing members with splits and failed connections.

Reinspect the submerged substructure units at the normal maximum recommended interval of sixty (60) months.

MINNESOTA DEPARTMENT OF TRANSPORTATION  
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 6413  
 INSPECTORS Collins Engineers, Inc.  
 ON-SITE TEAM LEADER Roy A. Forsyth, P.E.  
 WATERWAY CROSSED Caldwell Brook

INSPECTION DATE August 14, 2012

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	4.5'	6	6	N	6	7	6	8	8	7	N	7	N	N	6	N	N	N
	Bent 1	3.3'	6	6	N	7	6	6	8	N	N	N	7	N	N	6	N	N	N
	Bent 2	4.8'	6	6	N	7	5	6	8	N	N	N	7	N	N	6	N	N	N
	South Abutment	3.5'	6	6	N	5	5	5	8	8	7	N	7	N	N	6	N	N	N

\*UNDERWATER PORTION ONLY

REMARKS: Overall, Bents 1 and 2 and North and South Abutments, were found to be in satisfactory to fair condition with moderate deterioration. The timber piles of the units were typically firm and sound with random checking, although with more extensive checking and splitting present at three piles. The south abutment was displaced 6 inches to the north over 6 feet vertically and piles were leaning, with approximately 50 percent loss of bearing area. The channel bottom at the bridge appeared stable with no significant scour noted.

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.