

UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 36503
CR NO. 145
OVER THE
RAT ROOT RIVER
DISTRICT 1 - KOOCHICHING COUNTY



AUGUST 13, 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. 36503, the East and West Abutments and Piers 1 and 2, were found to be in satisfactory condition. The timber piles exhibited moderate amounts of checking, splintering, cracking and deterioration. Cross bracing members have been repaired since the previous inspection, however, some have still exhibited instances of significant loss of section and cracking. The channel bottom was covered at various locations with light to moderate accumulations of timber debris, but otherwise appeared to be stable with no significant scour or appreciable changes since the previous inspection.

INSPECTION FINDINGS:

- (A) The channel bottom material consisted of soft silty clay with random 1 foot in diameter and smaller rock with 1 foot of probe rod penetration.
- (B) All piles exhibited random 1/8 inch wide typical and 1/4 inch wide maximum checking unless otherwise noted.
- (C) A timber pile at the Southwest wingwall had a 1/2 inch wide crack from the top down 6 feet with 4 inches penetration.
- (D) Random timber piles at Pier 1 and 2 exhibited a 10 inch wide to half the pile circumference wide area of splintering and delaminating with up to 1.5 inch penetration from the channel bottom to 2 feet above the waterline. (ice abrasion damage)
- (E) Timber cross bracing at the east face of Pier 2 exhibited up to 3 foot long split below the fastener.
- (F) Timber pile at the downstream end of the east abutment had a 1 inch wide split from the top down 6 feet with penetration through 1/2 of the pile.
- (G) A moderate accumulation of timber debris consisting of 6-inch-diameter and smaller branches was observed at Pier 2 and extended from the channel bottom up to 2 feet.

- (H) Light timber drift accumulation between East Abutment and Pier 1 hung up on cut off piles. In addition, light timber debris up to 6 inches in diameter was scattered around Pier 1.
- (I) Timber cross bracing is no longer attached to Pile 2 on the west side of Pier 2.
- (J) The pile cap over Piles 1 and 2 of the West Abutment was rotated slightly to the west, with some minor diagonal torsional cracking along the south side, and as a result the cap was only bearing on 50 percent of the top of the piles.
- (K) Timber cross bracing had a 3 inch by 1-1/2 foot area of timber missing and the fastener to Pile 3 was no longer engaged to the cross bracing on the west side of Pier 2.
- (L) A 1/2 inch wide split with 6 inches of penetration, extended 3 feet down from the top of Pile 7 at the West Abutment.
- (M) Piles 4, 5, and 6 at the West Abutment exhibited a 3 inch wide are of splintering and delamination with up to 1 inch penetration from the channel bottom to 2 feet above the waterline. (ice abrasion damage)

RECOMMENDATIONS:

- (A) The timber cross bracing members that exhibited cracking or loss of section should be repaired or replaced during routine maintenance operations.
- (B) Monitor the extent of the pile cap rotation at the West Abutment during future inspections and repair if bearing loss becomes excessive.
- (C) Monitor the extent of drift accumulation at the bridge during future inspections, and if found to be progressing, removal may be warranted at that time.
- (D) 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,

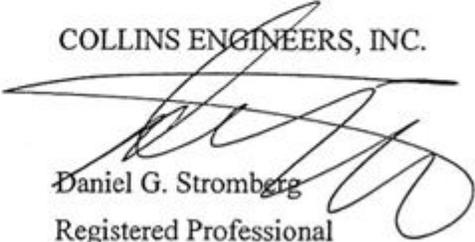
PROFESSIONAL ENGINEER

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: 36503

Feature Crossed: The Rat Root River

Feature Carried: CR No. 145

Location: District 1 - Koochiching County

Bridge Description: The superstructure consists of three spans of multiple timber stringers with a timber plank deck. The superstructure is supported by two timber pile abutments and two timber pile bent piers. The piers are numbered 1 and 2 from east to west.

2. INSPECTION DATA

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

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

Date: August 13, 2012

Weather Conditions: Sunny, 80° F

Underwater Visibility: 0.5 feet

Waterway Velocity: Negligible

3. SUBSTRUCTURE INSPECTION DATA

Substructures Inspected: East and West Abutments, and Piers 1 and 2.

General Shape: The abutments consist of seven timber piles with a timber pile cap, timber lagging, and adjacent timber pile and lagging wingwalls. The piers consist of six timber piles with a timber pile cap and timber cross bracing.

Maximum Water Depth at Substructures Inspected: Approximately 5.3 feet.

4. WATERLINE DATUM

Water Level Reference: The top of the pile cap on the north end of the East Abutment.

Water Surface: The waterline was approximately 7.5 feet below reference.
Assumed Waterline Elevation = 92.5.

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 7

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

Item 113: Scour Critical Bridges: Code I/92

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

 Yes X No

6. STRUCTURAL ELEMENT CONDITION RATING

Item #	Element Description	Quantity	Unit	Conditions				
				1	2	3	4	5
216	Timber Abutment	66	LF		56	10		
228	Timber Piling	34	EA		34			
386	Timber Wingwall	4	EA		4			



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



Photograph 2. View of Pier 1, Looking Southeast.



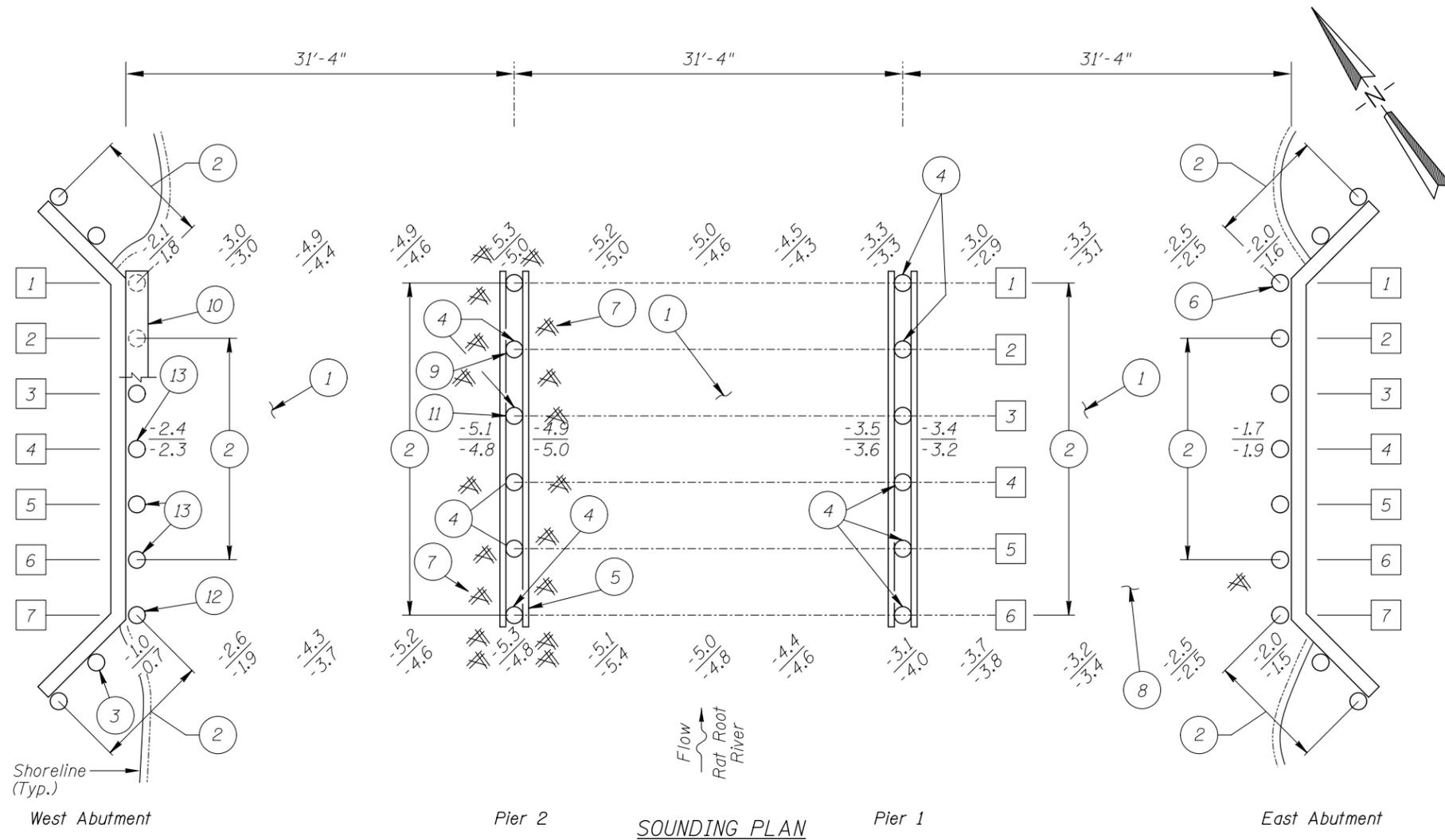
Photograph 3. View of Pier 2, Looking Southeast.



Photograph 4. View of East Abutment, Looking Southeast.

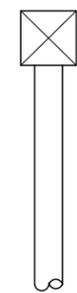


Photograph 5. View of West Abutment, Looking West.



GENERAL NOTES:

1. The East and West Abutments, and Piers 1 and 2 were inspected underwater.
2. At the time of inspection, on August 13, 2012, the waterline was located approximately 7.5 feet below the top of the cap at the North end of the East 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 92.5.
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 END VIEW OF PIERS

INSPECTION NOTES:

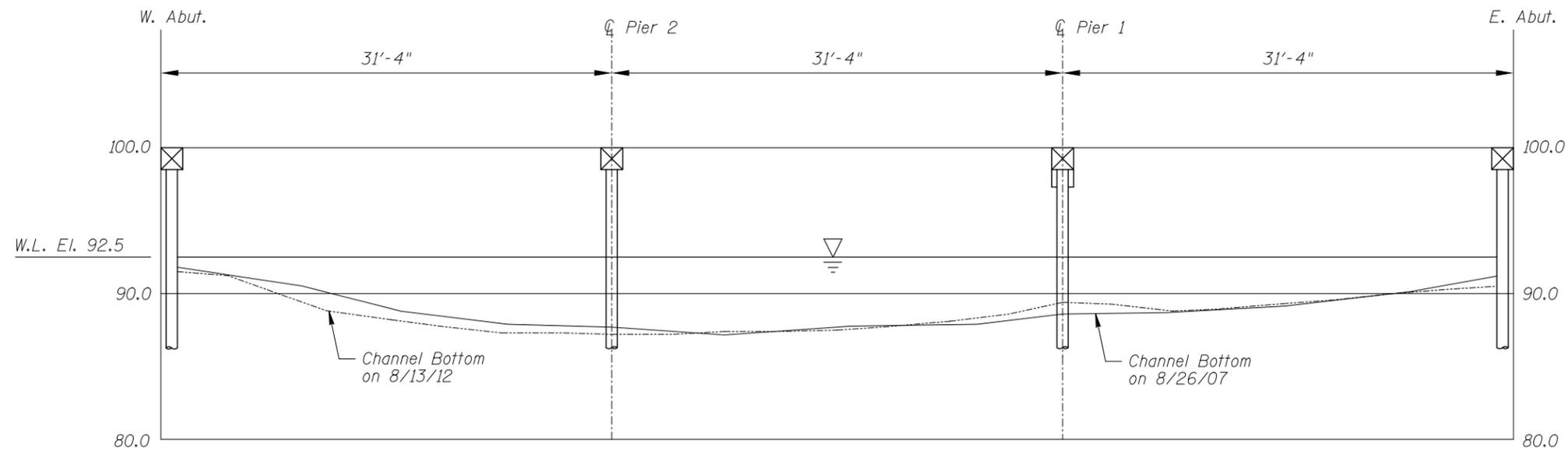
- | | |
|---|--|
| <p>1 The channel bottom material consisted of soft silty clay with random 1 foot in diameter and smaller rock with 1 foot of probe rod penetration.</p> <p>2 All piles exhibited random 1/8 inch wide typical and 1/4 inch wide maximum checking unless otherwise noted.</p> <p>3 A timber pile at the Southwest wingwall had a 1/2 inch wide crack from the top down 6 feet with 4 inches penetration.</p> <p>4 Random timber piles at Pier 1 and 2 exhibited a 10 inch wide to half the pile circumference wide area of splintering and delaminating with up to 1.5 inch penetration from the channel bottom to 2 feet above the waterline. (ice abrasion damage)</p> <p>5 Timber cross bracing at the east face of Pier 2 exhibited up to 3 foot long split below the fastener.</p> <p>6 Timber pile at the downstream end of the east abutment had a 1 inch wide split from the top down 6 feet with penetration through 1/2 of the pile.</p> | <p>7 A moderate accumulation of timber debris consisting of 6-inch-diameter and smaller branches was observed at Pier 2 and extended from the channel bottom up to 2 feet.</p> <p>8 Light timber drift accumulation between East Abutment and Pier 1 hung up on cut off piles. In addition, light timber debris up to 6 inches in diameter was scattered around Pier 1.</p> <p>9 Timber cross bracing is no longer attached to Pile 2 on the west side of Pier 2.</p> <p>10 The pile cap over Piles 1 and 2 of the West Abutment was rotated slightly to the west, with some minor diagonal torsional cracking along the south side, and as a result the cap was only bearing on 50 percent of the top of the piles.</p> <p>11 Timber cross bracing had a 3 inch by 1-1/2 foot area of timber missing and the fastener to Pile 3 was no longer engaged to the cross bracing on the west side of Pier 2.</p> <p>12 A 1/2 inch wide split with 6 inches of penetration, extended 3 feet down from the top of Pile 7 at the West Abutment.</p> <p>13 Piles 4, 5, and 6 at the West Abutment exhibited a 3 inch wide area of splintering and delamination with up to 1 inch penetration from the channel bottom to 2 feet above the waterline. (ice abrasion damage)</p> |
|---|--|

Legend

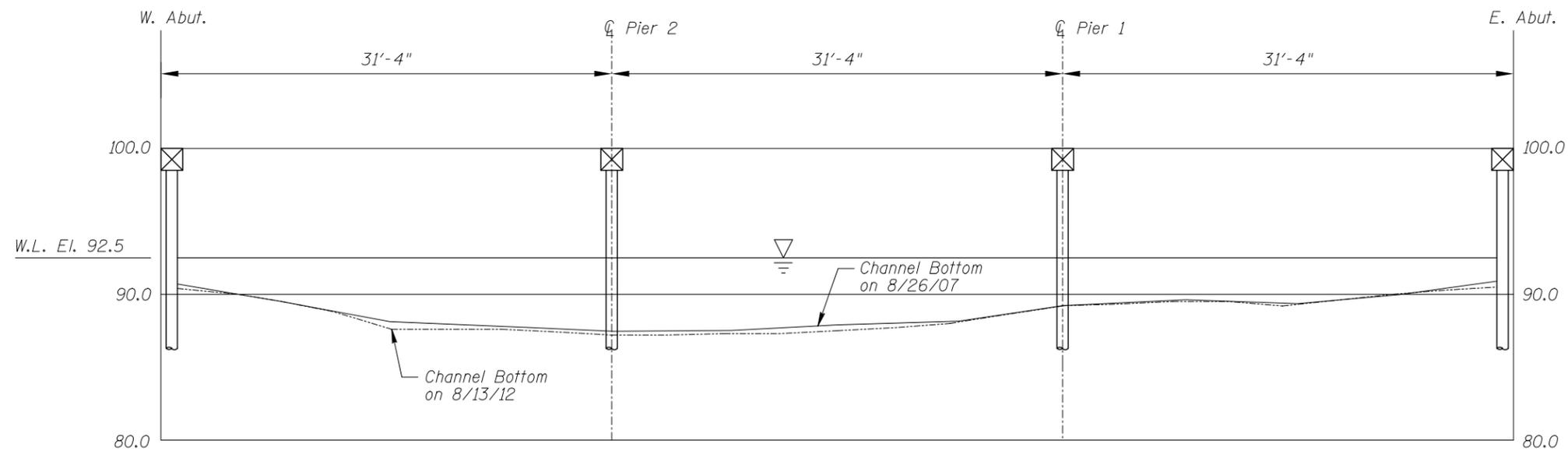
- 2.0 Sounding Depth (8/13/12)
- 5.2 Sounding Depth (8/26/07)
- Timber Pile
- Timber Pile
- 5 Pile Number Designation
- Timber Debris

Note:
All soundings based on 2012 waterline location.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 36503 OVER THE RAT ROOT RIVER DISTRICT 1, KOOCHICHING COUNTY		
INSPECTION AND SOUNDING PLAN		
Drawn By: JTF	COLLINS ENGINEERS	Date: AUGUST 2012
Checked By: DGS	<small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Scale: NTS
Code: 52210017		Figure No.: 1



UPSTREAM FASCIA PROFILE
Vertical Scale: 1"=10'-0"



DOWNSTREAM FASCIA PROFILE
Vertical Scale: 1"=10'-0"

Note:
Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 36503 OVER THE RAT ROOT RIVER DISTRICT I, KOOCHICING COUNTY		
UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
Drawn By: JTF	COLLINS ENGINEERS <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: AUGUST 2012
Checked By: DGS		Scale: NTS (U.O.N.)
Code: 52210017		Figure No.: 2

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

INSPECTORS: Collins Engineers, Inc. DATE: August 13, 2012
ON-SITE TEAM LEADER: Roy A. Forsyth, P.E.
BRIDGE NO: 36503 WEATHER: Sunny, 80 °F
WATERWAY CROSSED: The Rat Root River
DIVING OPERATION: SCUBA SURFACE SUPPLIED AIR
 OTHER
PERSONNEL: Jordan Furlan, P.E., Charles Euwema
EQUIPMENT: Scuba, U/W Light, Scraper, Lead Line, Probe Rod, Camera
TIME IN WATER: 3:00 P.M.
TIME OUT OF WATER: 3:30 P.M.
WATERWAY DATA: VELOCITY None
VISIBILITY 0.5 feet
DEPTH 5.3 Feet maximum at Pier 2

ELEMENTS INSPECTED: East and West Abutments and Piers 1 and 2

REMARKS: The East and West Abutments and Piers 1 and 2, were found to be in satisfactory condition. The timber piles exhibited moderate amounts of checking, splintering, cracking and deterioration. Cross bracing members have been repaired since the previous inspection, however, some exhibited instances of significant loss of section and cracking. The channel bottom was covered at various locations with light to moderate accumulations of timber debris, and otherwise appeared to be stable with no significant scour or appreciable changes since the previous inspection.

FURTHER ACTION NEEDED: YES NO

The timber cross bracing members that exhibited cracking or loss of section should be repaired or replaced during routine maintenance.

Monitor the extent of the pile cap rotation at the West Abutment during future inspections and repair if bearing loss becomes excessive.

Monitor the drift accumulations at the bridge during future inspections, and if found to be progressing, removal may be warranted at that time.

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

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 36503
 INSPECTORS Collins Engineers, Inc.
 ON-SITE TEAM LEADER Roy A. Forsyth, P.E.
 WATERWAY CROSSED The Rat Root River

INSPECTION DATE August 13, 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
	East Abutment	2.5'	7	N	N	8	N	7	8	8	8	N	8	N	N	7	N	N	N
	Pier 1	3.5'	6	N	N	8	6	6	8	N	N	7	7	N	N	6	N	N	N
	Pier 2	5.3'	6	N	N	8	6	6	8	N	N	7	7	N	N	6	N	N	N
	West Abutment	2.4'	7	N	N	8	N	7	8	8	8	N	8	N	N	7	N	N	N

*UNDERWATER PORTION ONLY

REMARKS: The East and West Abutments and Piers 1 and 2, were found to be in satisfactory condition. The timber piles exhibited moderate amounts of checking, splintering, cracking and deterioration. Cross bracing members have been repaired since the previous inspection, however, some exhibited instances of significant loss of section and cracking. The channel bottom was covered at various locations with light to moderate accumulations of timber debris, and otherwise appeared to be stable with no significant scour or appreciable changes since the previous inspection.

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.