

UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 36504

CR NO. 98

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. 36504, Piers 1 through 4 and the North and South Abutments, were found to be generally in satisfactory to fair condition. The minor checking, random surface splintering, and delamination on the piles has progressed since the previous inspection, but overall, has still not appreciably compromised pile capacity or structural integrity. The lateral stability of the piers, however, has been somewhat compromised as a result of the bracing deficiencies encountered. The channel bottom around the substructure units is currently stable with no evidence of significant scour and no appreciable changes since the previous inspection.

INSPECTION FINDINGS:

- (A) The channel bottom material around all of the piers typically consisted of sand and gravel with a maximum probe rod penetrations of 6 inches.
- (B) Bracing split over length of 10 feet and separated through pile fastener at south side of Pier 1, 3, and 4 and the north side of Pier 4.
- (C) Outer layer of Piles 5 and 6 at Pier 1 were softer than typical with approximately 1 inch surface delamination from 3 feet above the waterline to the channel bottom.
(ice related damage)
- (D) Approximately 10 feet of cap above the easternmost pile of Pier 2 has crushed. The pile seems to have shifted downstream.
- (E) Heavier surface splintering and delamination, typically extending 1 foot above the waterline to channel bottom with penetration/depth of 1 inch at Pile 2 of Pier 1.
- (F) Steel channel replacement cross bracing was used to replace the old timber cross

bracing on the downstream north side of Pier 1, the upstream south side of Pier 1, all of the timber cross bracing at Pier 2, on the upstream north and south sides of Pier 3, and at the downstream north side of Pier 4.

- (G) Old abandoned timber piles that were protruding 2 to 6 feet above the mud line at midspan between Pier 4 and the north abutment.
- (H) Light timber debris consisting of branches up to 6 inches in diameter was present around piers 1 and 2. Most of the debris extended from the channel bottom to 1 foot above the channel bottom.
- (I) The south steel channel at Pier 2 was deformed between the 3rd and 4th pile in from the upstream fascia, and was not engaged to the 4th pile in from the upstream fascia.
- (J) The south steel channel at Pier 2 was no longer engaged to the upstream pile and had been deformed by ice flow and drift.
- (K) The timber Pile 4 at Pier 2 exhibited a 3 inch diameter, with 1 inch penetration, area of abrasion that was caused by rubbing contact with the unconnected steel channel, and was located 1-1/2 feet below the waterline.
- (L) A 6 foot long by 2 inch wide split in timber bracing through the pile fastener was present at the north side of Pier 3 near Pile 4.

RECOMMENDATIONS:

- (A) Consideration could be given to repairing the damaged cross brace members and restoring adequate bracing-to-pile connections in order to ensure sufficient lateral capacity of the piers. Until the repairs are carried out, the lateral bracing system should be monitored during future inspections.
- (B) 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,

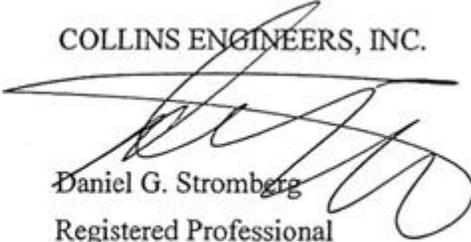
PROFESSIONAL ENGINEER

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: 36504

Feature Crossed: The Rat Root River

Feature Carried: CR NO. 98

Location: District 1 – Koochiching County

Bridge Description: The bridge superstructure consists of five spans of timber deck and stringers. The superstructure is supported by four timber piers and two timber pile abutments. The substructure units are designated as Piers 1 through 4 starting from the south end of the bridge and the abutments are designated south and north abutments.

2. INSPECTION DATA

Professional Engineer/Team Leader: Roy A. Forsyth, P.E.

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

Date: August 13, 2012

Weather Conditions: Sunny, 80°F

Underwater Visibility: 1.0 feet

Waterway Velocity: 0.5 ft/s

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Piers 1 through 4 and the North and South Abutments.

General Shape: Each of the piers consists of a single row of six timber piles under a common cap with timber and steel channel cross bracing between the piles. The abutments and their skewed wingwalls are constructed of horizontal timber planking retained in place by a single row of six piles along the abutment breast wall (with cap) and wing walls (two piles).

Maximum Water Depth at Substructure Inspected: Approximately 7.5 feet.

4. WATERLINE DATUM

Water Level Reference: The top of the pier cap on the west end of the south abutment.

Water Surface: The waterline was approximately 6.6 feet below reference.

Assumed Waterline Elevation = 1107.4.

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 6

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 X No

6. STRUCTURAL ELEMENT CONDITION RATING

Item #	Element Description	Quantity	Unit	Conditions				
				1	2	3	4	5
216	Timber Abutment	52	LF		52			
228	Timber Piling	44	EA		41	3		
386	Timber Wingwall	4	EA		4			
361	Scour	1	EA	1				



Photograph 1. View of North Abutment, Looking Northeast.



Photograph 2. View of Pier 4, Looking Northeast.



Photograph 3. View of Pier 3, Looking Northeast.



Photograph 4. View of Pier 2, Looking Northeast.



Photograph 5. View of Pier 1, Looking Northeast.



Photograph 6. View of South Abutment, Looking Southeast.



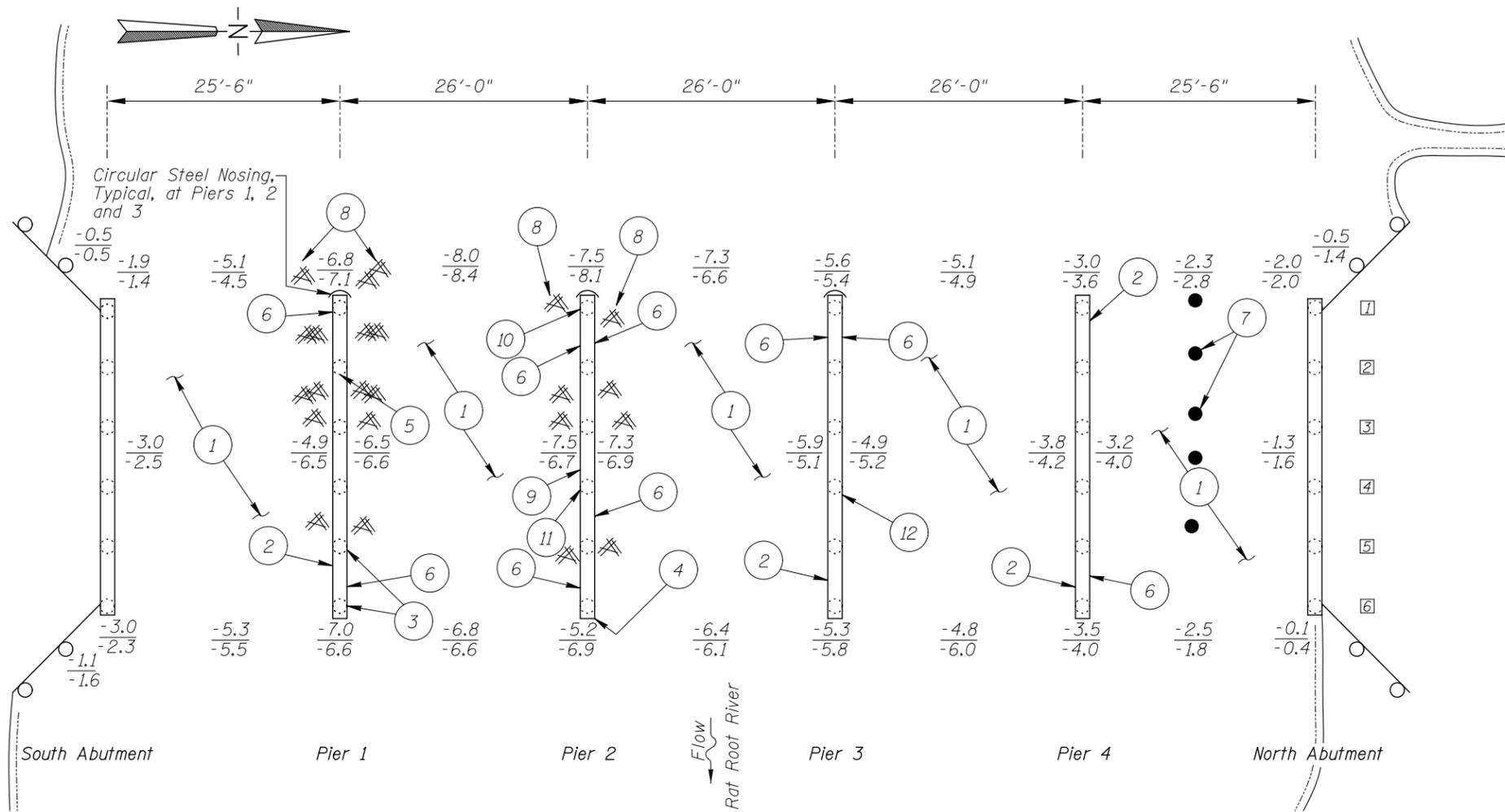
Photograph 7. View of Pier 1, Pile 6 splintering, Looking West.



Photograph 8. Overall View of the Structure, Looking Northwest.



Photograph 9. Overall View of the Structure, Looking Southeast.



SOUNDING PLAN

GENERAL NOTES:

1. Piers 1 through 4 and the South and North Abutments were inspected at this bridge.
2. At the time of inspection on August 13, 2012, the waterline was located 6.6 feet below the top of the west end of the South Abutment. This corresponds to a waterline elevation of 1107.4 based on design drawings.
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 mid point intervals between the substructure units.
5. All of the timber piles around the waterline and below exhibited random 1/4 inch soft outer layer with checking and delamination due to normal weathering, age, and ice damage. Random 1/4 inch wide checking was also present at most piles.

Note:

All soundings based on 2012 waterline location.



TYPICAL END VIEW OF PIERS

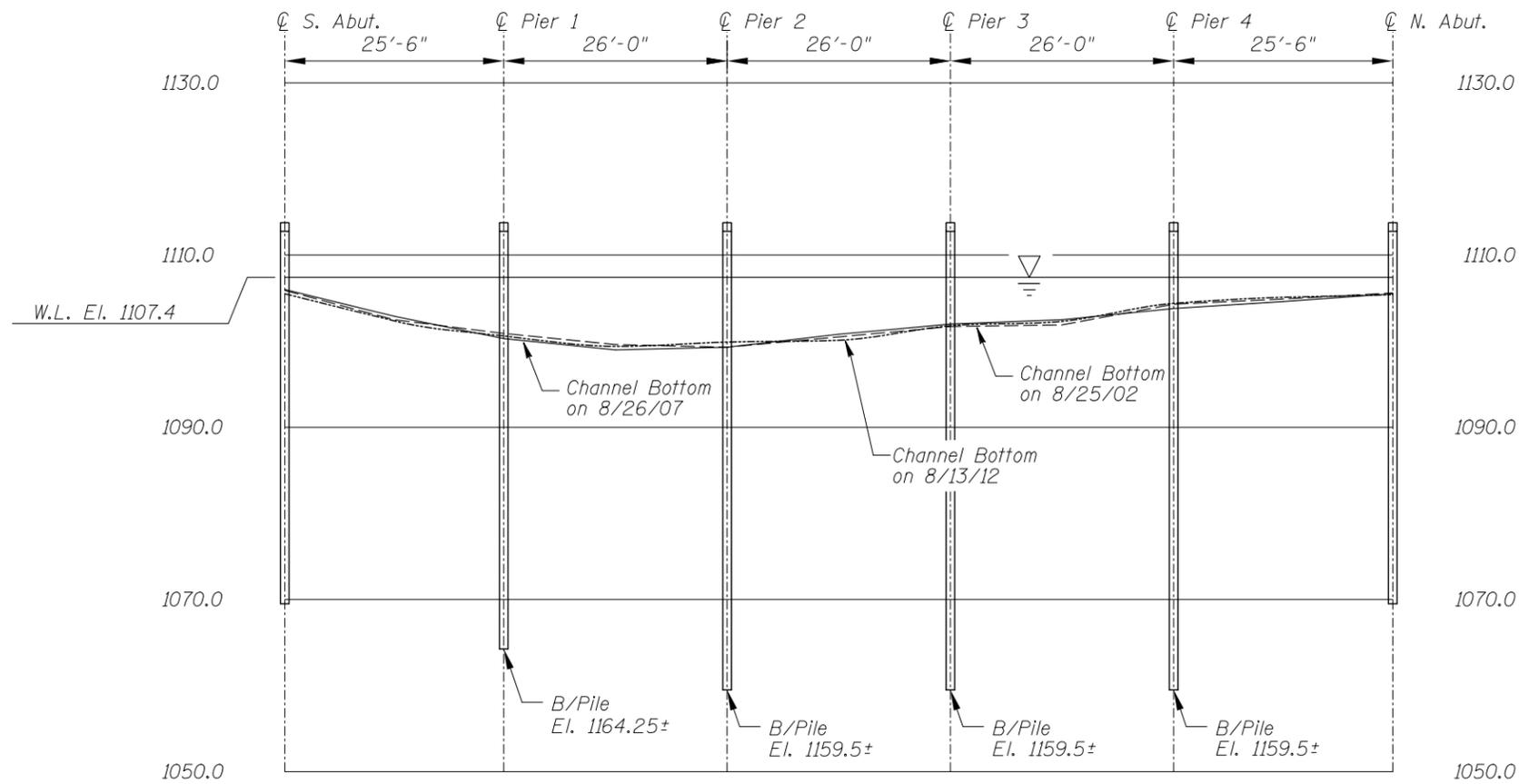
INSPECTION NOTES:

1. The channel bottom material around all of the piers typically consisted of sand and gravel with a maximum probe rod penetrations of 6 inches.
2. Bracing split over length of 10 feet and separated through pile fastener at south side of Pier 1, 3, and 4 and the north side of Pier 4.
3. Outer layer of Piles 5 and 6 at Pier 1 were softer than typical with approximately 1 inch surface delamination from 3 feet above the waterline to the channel bottom. (ice related damage)
4. Approximately 10 feet of cap above Pile 6 of Pier 2 has been crushed. The pile appears to have shifted downstream.
5. Heavier surface splintering and delamination, typically extending 1 foot above the waterline to channel bottom with penetration/depth of 1 inch at Pile 2 of Pier 1.
6. Steel channel replacement cross bracing was used to replace the old timber cross bracing on the downstream north side of Pier 1, the upstream south side of Pier 1, all of the timber cross bracing at Pier 2, on the upstream north and south sides of Pier 3, and at the downstream north side of Pier 4.
7. Old abandoned timber piles were protruding 2 to 6 feet above the mudline at midspan between Pier 4 and the north abutment.
8. Light timber debris consisting of branches up to 6 inches in diameter was present around Piers 1 and 2. Most of the debris extended from the channel bottom to 1 foot above the channel bottom.
9. The south steel channel at Pier 2 was deformed between Piles 3 and 4, and was not engaged to Pile 4.
10. The south steel channel at Pier 2 was no longer engaged to the upstream pile and had been deformed by ice flow and drift.
11. Pile 4 at Pier 2 exhibited a 3 inch diameter, with 1 inch penetration, area of abrasion that was caused by rubbing contact with the unconnected steel channel, and was located 1-1/2 feet below the waterline.
12. A 6 feet long by 2 inch wide split in timber bracing through the pile fastener was present at the north side of Pier 3 near Pile 4.

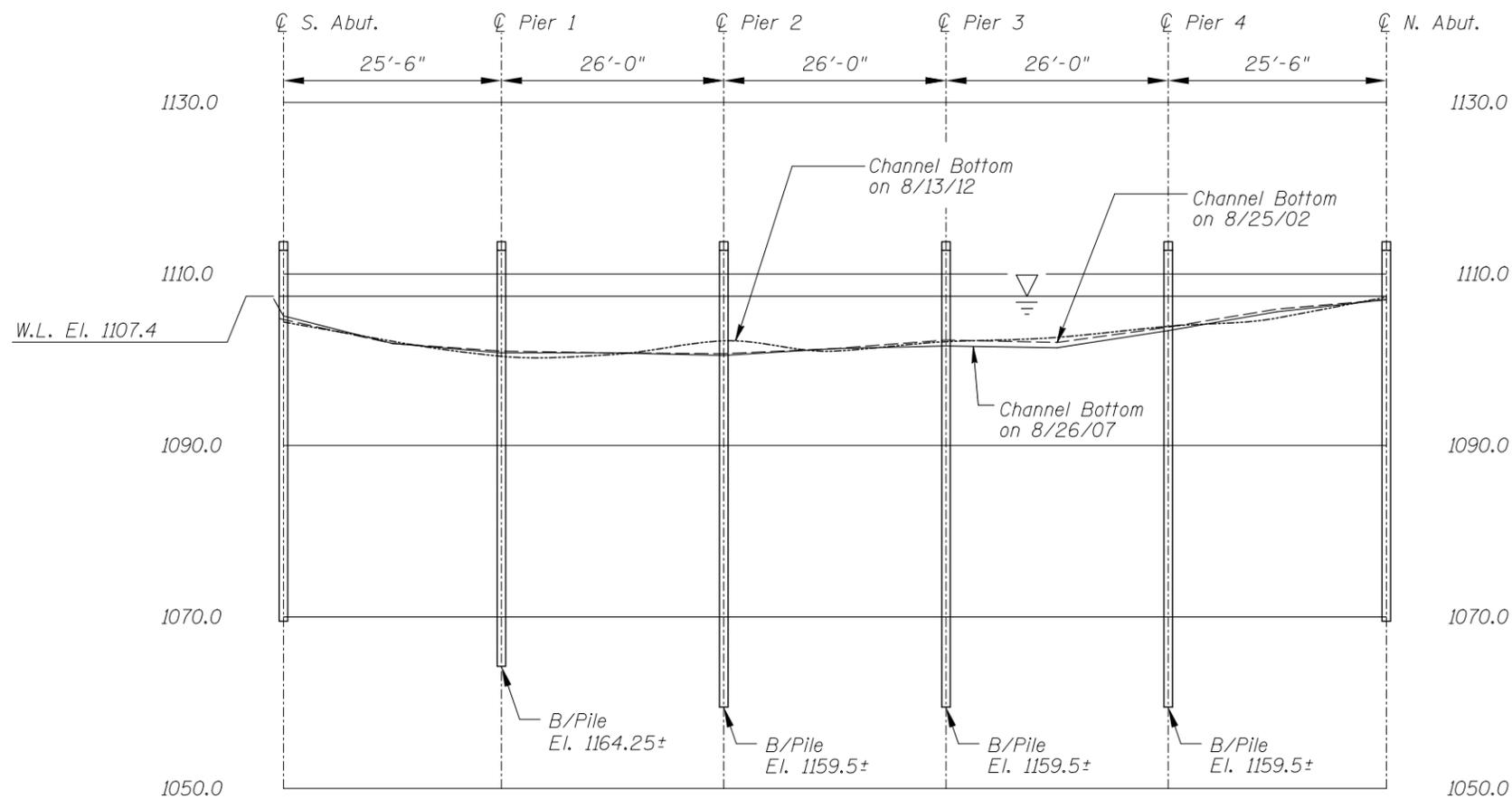
Legend

- 5.5 Sounding Depth from Waterline (8/13/12)
- 5.7 Sounding Depth from Waterline (8/26/07)
- Timber Pile
- ⊙ Timber Pile
- Old Abandoned Timber Pile
- ⊗ Timber Debris
- ⊠ Pile Identification Designation

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 36504 OVER THE RAT ROOT RIVER DISTRICT I, KOOCHICHING COUNTY		
INSPECTION AND SOUNDING PLAN		
Drawn By: CRE	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
Code: 522I0016		Figure No.: I



UPSTREAM FASCIA PROFILE



DOWNSTREAM FASCIA PROFILE

Note:
Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 36504 OVER THE RAT ROOT RIVER DISTRICT I, KOOCHICING COUNTY		
UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
Drawn By: CRE	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: 1"=20'
Code: 52210016		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: 36504 WEATHER: Sunny, 80°F

WATERWAY CROSSED: The Rat Root River

DIVING OPERATION: SCUBA SURFACE SUPPLIED AIR
 OTHER

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

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

TIME IN WATER: 4:20 p.m.

TIME OUT OF WATER: 5:00 p.m.

WATERWAY DATA: VELOCITY 0.5 ft/s

VISIBILITY 1.0 foot

DEPTH 7.5 feet maximum at Pier 2

ELEMENTS INSPECTED: South and North Abutments and Piers 1 through 4.

REMARKS: Overall, Piers 1 through 4 and the north and south abutments, were found to be generally in satisfactory to fair condition. The minor checking, random surface splintering, and delamination on the piles has progressed since the previous inspection, but overall, has still not appreciably compromised pile capacity or structural integrity. The lateral stability of the piers, however, has been somewhat compromised as a result of the bracing deficiencies encountered. The channel bottom around the substructure units is currently stable with no evidence of significant scour and no appreciable changes since the previous inspection.

FURTHER ACTION NEEDED: YES NO

Consideration could be given to repairing the damaged cross brace members and restoring adequate bracing-to-pile connections in order to ensure sufficient lateral capacity of the piers. Until the repairs are carried out, the lateral bracing system should be monitored during future inspections.

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. 36504
 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
	North Abutment	2.0'	6	N	N	7	N	6	7	7	7	7	6	N	7	6	7	N	N
	Pier 4	3.8'	6	N	N	7	5	5	7	N	N	N	6	N	7	5	6	N	N
	Pier 3	5.7'	6	N	N	7	5	5	7	N	N	N	6	N	7	5	6	N	N
	Pier 2	7.5'	6	N	N	7	5	5	7	N	N	6	6	N	7	5	6	N	N
	Pier 1	7.0'	6	N	N	7	5	5	7	N	N	6	6	N	7	5	6	N	N
	South Abutment	3.0'	6	N	N	7	N	6	7	7	7	N	6	N	7	6	7	N	N

*UNDERWATER PORTION ONLY

REMARKS: Overall, Piers 1 through 4 and the north and south abutments, were found to be generally in satisfactory to fair condition. The minor checking, random surface splintering, and delamination on the piles has progressed since the previous inspection, but overall, has still not appreciably compromised pile capacity or structural integrity. The lateral stability of the piers, however, has been somewhat compromised as a result of the bracing deficiencies encountered. The channel bottom around the substructure units is currently stable with no evidence of significant scour and no 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.