

UNDERWATER BRIDGE INSPECTION REPORT

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STRUCTURE NO. 27510

CSAH NO. 15

OVER THE

ARCOLA CHANNEL

HENNEPIN COUNTY

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MAY 21, 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 27510, Piers 1 through 7, were generally in satisfactory condition below water with minor defects of structural significance observed. Minor dents were found on several of the piles at various locations above and below the waterline. The steel pipe piles typically exhibited light corrosion and minor pitting near the waterline. The channel bottom around the substructure units appeared stable with no evidence of significant scour and no appreciable changes since the last inspection.

INSPECTION FINDINGS:

- (A) The steel pipe piles typically exhibited light corrosion with minor pitting and steel delaminations up to 1/8 inch thick from 2 feet above to 1 foot below the waterline. In some instances, deep indentations (lighter in extent) extended further above water.
- (B) Several of the steel pipe piles exhibited dents above and below the waterline ranging from 4 inches to 12 inches in diameter with up to 5 inches of penetration.
- (C) The concrete pile cap of Pier 7 exhibited areas of section loss approximately 1.5 feet long and 6 inches high on the west end with exposed reinforcing steel on the top and bottom edges where there was up to 3 inches of penetration.
- (D) Minor cracking was observed at the west end and heavy cracking at the east end of Pier 6 and Pier 2 pile caps. In addition Pier 6 had a spall 3 feet by 2.5 feet with up to 2.5 inches of penetration and exposed reinforcing steel with up to 25 percent loss of section.

- (E) The pile cap at Pier 5 had a spall 1 foot long by 6 inches high with up to 1 inch of penetration and partially exposed reinforcing steel at the east end on the south side of the pier.
- (F) The pile cap at Pier 2 exhibited map cracking and a spall on the entire east end with up to 6 inches of penetration and exposed reinforcing steel with up to 15 percent loss of section.

RECOMMENDATIONS:

- (A) The spalled areas on the pier caps with exposed reinforcing steel should be properly repaired to prevent further deterioration. Repairs should include removal of all unsound concrete to a minimum of one inch behind the reinforcing steel, cleaning and replacing the reinforcing steel as necessary, and placing concrete designed for high durability and low permeability.
- (B) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of sixty (60) months.

Inspection Team Leader:



Ryan P. Breen, P.E.

Respectfully submitted,

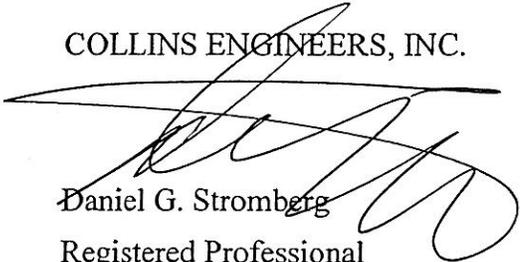
PROFESSIONAL ENGINEER

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: 27510

Feature Crossed: Arcola Channel

Feature Carried: CSAH No. 15

Location: District 5 - Hennepin County

Bridge Description: The superstructure consists of eight spans of multiple steel girders supporting a reinforced concrete deck. The superstructure is supported by seven steel cast-in-place concrete pipe pile bent piers and two reinforced concrete abutments. The abutments are founded on treated timber piling. The piers are numbered 1 through 7 starting from the south end of the bridge.

2. INSPECTION DATA

Professional Engineer/ Team Leader: Ryan P. Breen, P.E.

Dive Team: Marc B. Parker, Michael J. Banasiak

Date: May 21, 2012

Weather Conditions: Sunny, 70 °F

Underwater Visibility: 10.0 feet

Waterway Velocity: Negligible/None

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Piers 1 through 7

General Shape: Piers 1, 3, 5, and 7 consist of a single row of nine steel pipe piles.  
Piers 2, 4, and 6 consist of two rows of five battered steel pipe piles. The piles of each pier support a rectangular reinforced concrete pier cap.

Maximum Water Depth at Substructure Inspected: Approximately 12.1 feet.

4. WATERLINE DATUM

Water Level Reference: The top of the pier cap at the west end of Pier 7.

Water Surface: The waterline was approximately 12.2 feet below reference.  
Waterline Elevation = 929.7

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/05/12

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

6. STRUCTURAL MEMBER CONDITION RATING:

Item #	Element Description	Quantity	Unit	Conditions				
				1	2	3	4	5
419	Painted Steel Piling	67	EA	66	1			
985	Slopes and Slope Protection	2	EA	2				



Photograph 1. View of Pier 1, Looking Southwest.



Photograph 2. View of Pier 2, Looking Southwest.



Photograph 3. View of Pier 3, Looking Southwest.



Photograph 4. View of Pier 4, Looking Northwest.



Photograph 5. View of Pier 5, Looking Northwest.



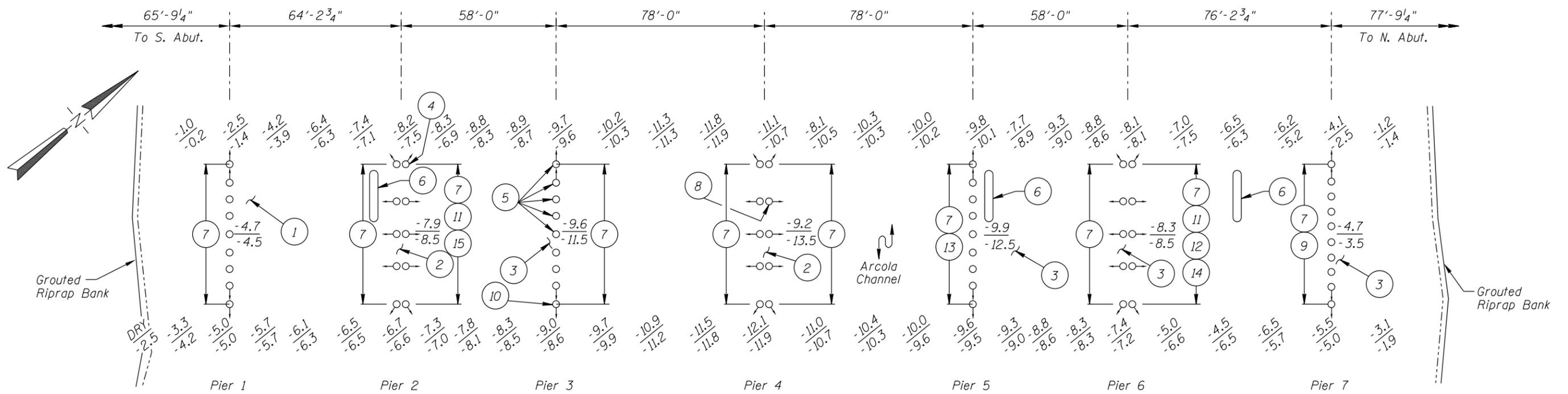
Photograph 6. View of Pier 6, Looking Northwest.



Photograph 7. View of Pier 7, Looking Northwest.



Photograph 8. View of Spall with Exposed Reinforcing Steel on the Underside of Pier 6 Pile Cap, Looking North



SOUNDING PLAN

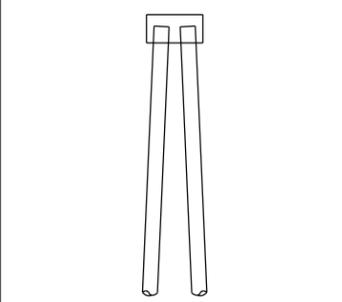
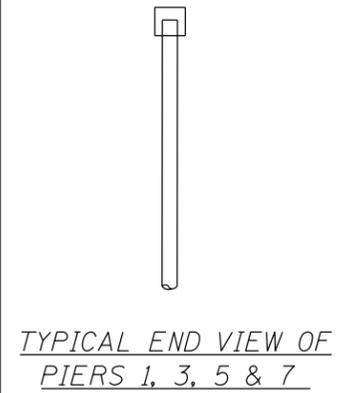
INSPECTION NOTES:

- 1 The channel bottom material around Pier 1 consisted of sand and gravel with 3 inches of maximum probe rod penetration.
- 2 The channel bottom material around Piers 2 and 4 consisted of gravel, concrete rubble, and abandoned timber piles.
- 3 The channel bottom material around Piers 3, 5, 6 and 7 consisted of silty sand and scattered rocks up to 2 feet in diameter.
- 4 The northwest pile of Pier 2 exhibited a dent that was 4 inches in diameter and 2 inches deep located 5 feet below the waterline.
- 5 Five steel pipe piles at the west end of Pier 3 exhibited dents that were 12 inches long with 1 inch deep indentation and were located 5 to 7 feet below the waterline.
- 6 Abandoned concrete piers were encountered between Piers 1 and 2, 5 and 6, and 6 and 7, and extended approximately 2 feet above the waterline.
- 7 The steel pipe pile typically exhibited light surface corrosion with minor pitting and rust scale delaminations up to 1/8 inch thick from 2 feet above to 1 foot below the waterline.
- 8 The steel pipe piles exhibited a dent 4 feet above the waterline that was 8 inches in diameter with 1/2 inch of penetration. A second 12 inch diameter dent was observed from 1 foot above to 2 feet below the waterline, with a 5 inch deep indentation.
- 9 The concrete pile cap at Pier 7 exhibited areas of section loss approximately 1.5 feet long and 6 inches high on the west end with exposed reinforcing steel on the top and bottom faces where there was 2 to 3 inches of penetration and wide spread cracking with rust staining.
- 10 The concrete repair to the pile cap at the east end of Pier 3 exhibited map cracking and spalling with up to 4 inches of penetration and exposed reinforcing steel, extending from the top to the bottom of the pile cap on the south face.
- 11 Minor cracking at west end and heavy cracking at east end of pier cap at Piers 6 and 2.

- 12 The piles exhibited lighter corrosion and/or coating loss from channel bottom to 6 feet above waterline.
- 13 The pier cap at Pier 5 had a spall measuring 1 foot long by 6 inches high with 1 inch of penetration with partially exposed reinforcing steel at the east end on the south face.
- 14 The pier cap at Pier 6 had a spall measuring 3 feet by 2.5 feet with 2-1/2 inches of penetration and exposed reinforcing steel that had approximately 25 percent loss of section.
- 15 The pier cap at Pier 2 exhibited map cracking and spalling on the entire east end with up to 6 inches of penetration and up to 15 percent section loss on the exposed reinforcing steel.

GENERAL NOTES:

1. Piers 1 through 7 were inspected underwater.
2. At the time of inspection on May 21, 2012, the waterline was located approximately 12.2 feet below the top of the pier cap at west end of Pier 7. This corresponds to a waterline elevation of 929.7.
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.



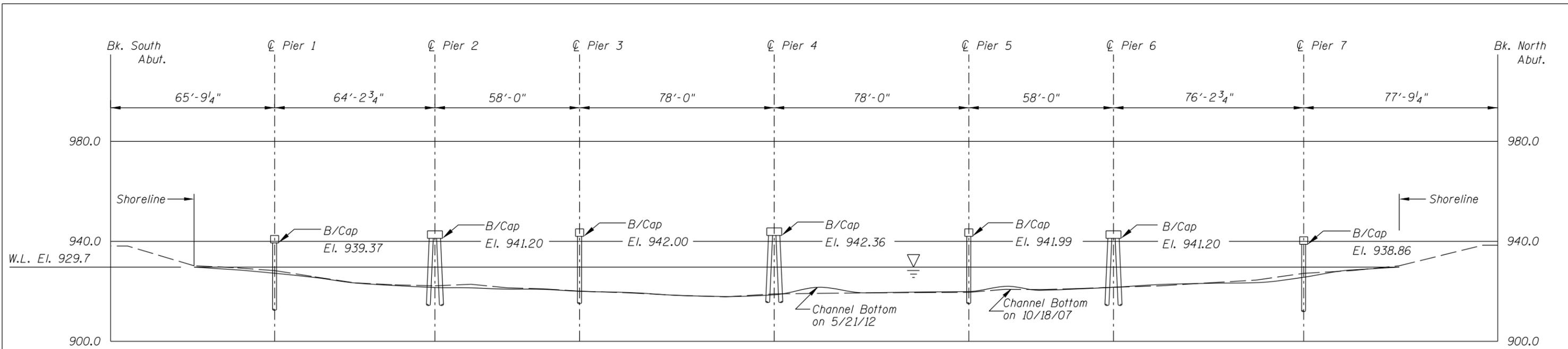
**Legend**

-2.0 Sounding Depth (5/21/12)  
 -5.2 Sounding Depth (10/18/07)

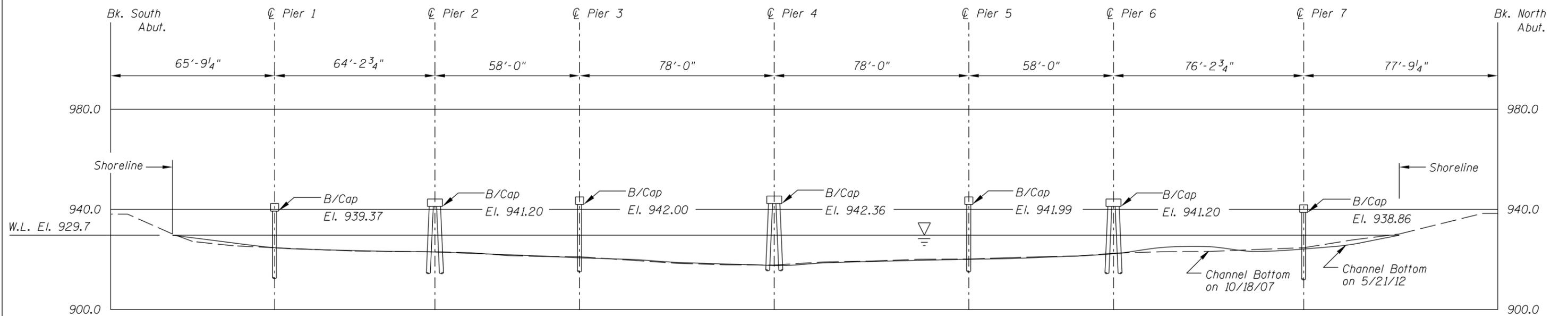
○ CIP Concrete Pipe Pile  
 ○→ CIP Concrete Battered Pipe Pile

**Note:**  
 All soundings based on 2012 waterline location.

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 27510 CSAH NO. 15 OVER THE ARCOLA CHANNEL DISTRICT 5, HENNEPIN COUNTY		
INSPECTION AND SOUNDING PLAN		
Drawn By: BLV	<b>COLLINS ENGINEERS</b> <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinseng.com</small>	Date: MAY, 2012
Checked By: RPB		Scale: NTS
Code: 742327510		Figure No.: I



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. 27510 CSAH NO. 15 OVER THE ARCOLA CHANNEL DISTRICT 5, HENNEPIN COUNTY		
WEST AND EAST FASCIA PROFILES		
Drawn By: BLV	<b>COLLINS ENGINEERS</b> <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: MAY, 2012
Checked By: RPB		Scale: 1"=40'
Code: 742327510		Figure No.: 2

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

INSPECTORS: Collins Engineers, Inc. DATE: May 21, 2012

ON-SITE TEAM LEADER: Ryan P. Breen

BRIDGE NO: 27510 WEATHER: Sunny, 70° F

WATERWAY CROSSED: Arcola Channel

DIVING OPERATION:  SCUBA  SURFACE SUPPLIED AIR  
 OTHER

PERSONNEL: Marc B. Parker, Michael J. Banasiak

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

TIME IN WATER: 9:25 A.M.

TIME OUT OF WATER: 10:20 A.M.

WATERWAY DATA: VELOCITY Negligible/None

VISIBILITY 10.0 feet

DEPTH 12.1 feet maximum at Pier 4

ELEMENTS INSPECTED: Piers 1 through 7

REMARKS: Overall, the piers were in satisfactory condition with minor defects of structural significance observed. The steel pipe piles exhibited light corrosion from 2 feet above to 1 foot below the waterline with minor pitting and steel delaminations up to 1/8 inch deep. Several of the piles exhibited minor dents above and/or below the waterline. Piers 1,3, and 6 exhibited cracks extending from the top to the bottom of the pile cap (other caps had similar random cracks). The end of the pile cap at Piers 2, 5 and 7 exhibited areas of section loss with exposed reinforcing steel. Some of the piles (especially at Pier 6) exhibited corrosion (lighter in extent) from the channel bottom to 4 feet above the waterline. The channel bottom at the bridge appeared stable with no significant scour or change since the last inspection.

FURTHER ACTION NEEDED:      X   YES               NO

The spalled areas on the pier caps with exposed reinforcing steel should be properly repaired to prevent further deterioration. Repairs should include removal of all unsound concrete to a minimum of one inch behind the reinforcing steel, cleaning and replacing the reinforcing steel as necessary, and placing concrete designed for high durability and low permeability.

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. 27510  
 INSPECTORS Collins Engineers, Inc.  
 ON-SITE TEAM LEADER Ryan P. Breen, P.E.  
 WATERWAY CROSSED Arcola Channel

INSPECTION DATE May 21, 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	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 (CAP)	OTHER
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Pier 1	4.7'	7	N	N	8	N	7	N	8	8	N	8	N	7	N	7	N	N
	Pier 2	7.9'	7	N	N	8	N	7	N	N	N	N	8	N	7	N	7	N	N
	Pier 3	9.6'	7	N	N	8	N	7	N	N	N	N	8	N	7	N	7	N	N
	Pier 4	9.2'	6	N	N	8	N	6	N	N	N	N	8	N	6	N	7	N	N
	Pier 5	9.9'	7	N	N	8	N	7	N	N	N	N	8	N	7	N	7	N	N

\*UNDERWATER PORTION ONLY

REMARKS: Overall, the piers were in satisfactory condition with minor defects of structural significance observed. The steel pipe piles exhibited light corrosion from 2 feet above to 1 foot below the waterline with minor pitting up to 1/8 inch deep. Several of the piles exhibited minor dents above and/or below the waterline. Piers 1,3, and 6 exhibited cracks extending from the top to the bottom of the pile cap (other caps had similar random cracks). The end of the pile cap at Piers 2, 5 and 7 exhibited areas of section loss with exposed reinforcing steel. Some of the piles (especially at Pier 6) exhibited corrosion (lighter in extent) from the channel bottom to 4 feet above the waterline. The channel bottom at the bridge appeared stable with no significant scour or change since the last 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.

MINNESOTA DEPARTMENT OF TRANSPORTATION  
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 27510  
 INSPECTORS Collins Engineers, Inc.  
 ON-SITE TEAM LEADER Ryan P. Breen, P.E.  
 WATERWAY CROSSED Arcola Channel

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CONDITION RATING

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			PILING	COLUMNS, SHAFTS, OR FACES*	FOOTINGS	DISPLACEMENT	OTHER	OVERALL SUBSTRUCTURE CONDITION CODE*	SCOUR	EMBANKMENT EROSION	EMBANKMENT PROTECTION	OTHER (DRIFT/DEBRIS)	OVERALL CHANNEL & PROTECTION CONDITION	CONCRETE (CAP)	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
	Pier 6	8.3'	7	N	N	8	N	7	N	N	N	N	8	N	7	N	7	N	N
	Pier 7	4.7'	7	N	N	8	N	7	N	8	8	N	8	N	7	N	7	N	N

\*UNDERWATER PORTION ONLY

REMARKS: Overall, the piers were in satisfactory condition with minor defects of structural significance observed. The steel pipe piles exhibited light corrosion from 2 feet above to 1 foot below the waterline with minor pitting up to 1/8 inch deep. Several of the piles exhibited minor dents above and/or below the waterline. Piers 1,3, and 6 exhibited cracks extending from the top to the bottom of the pile cap (other caps had similar random cracks). The end of the pile cap at Piers 2, 5 and 7 exhibited areas of section loss with exposed reinforcing steel. Some of the piles (especially at Pier 6) exhibited corrosion (lighter in extent) from the channel bottom to 4 feet above the waterline. The channel bottom at the bridge appeared stable with no significant scour or change since the last 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