

UNDERWATER BRIDGE INSPECTION REPORT

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STRUCTURE NO. 7678

CSAH 22

OVER THE

SAND RIVER

ST. LOUIS COUNTY

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SEPTEMBER 18, 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 below water at Structure No. 7678, Box 1 and Box 2 of the culvert, were found to be in satisfactory condition with only minor defects of structural significance. The concrete surfaces exhibited light scaling with a maximum penetration of 1/4 inch and random areas of poor concrete consolidation with a maximum penetration of 1.5 inches. A spall and areas of concrete section loss were observed on the ceiling of Box 2, the top of the southeast wingwall, the south headwall, and along all the construction cold joints of all the haunches. Several reinforcing bars were exposed in the wingwall and headwall spalls exhibiting less than 10 percent loss of section. There was a 2 inch layer of silt covering half the length of Box 1 and a 5 inch thick layer of silt covering 3/4 the length of Box 2. The concrete apron was exposed at Box 1 with a maximum vertical exposure of 6 inches and 1 inch at the downstream and upstream openings respectively. The upstream and downstream banks exhibited minor erosion.

INSPECTION FINDINGS:

- (A) The channel bottom material upstream and downstream of the culvert apron consisted of rocks, cobbles and silt with a maximum probe rod penetration of 6 inches.
- (B) A band of light scaling and random areas of poor concrete consolidation were observed on the culvert floor, ceiling and walls extending from the floor to 2 feet above the waterline. The scaling had a maximum penetration of 1/4 inch and the poor concrete consolidation had a maximum penetration of 1.5 inches.
- (C) An area of concrete section loss and left-in-plane 2x4 form board were observed in the ceiling of Box 2, 1 foot from the north opening. The area of section loss measured 6 inches long by 3 inches wide with a maximum penetration of 1.5 inches, and there was one exposed reinforcing bar exhibiting less than 5 percent loss of section.

- (D) Areas of concrete section loss and poor concrete consolidation were observed along the horizontal construction joints of all the top haunches of both Box 1 and 2. The areas had a maximum penetration of 3/4 inch.
- (E) An area of concrete section loss was observed on the top of the southeast wingwall. The area measured 15 inches wide by 6 inches high with a maximum penetration of 2 inches. No reinforcing steel was observed.
- (F) A diagonal crack, up to 1/4 inch wide, was observed on the southeast and northwest wingwalls extending from the apron to the top of the wingwall.
- (G) A spall was observed on the south headwall above Box 2. The spall measured 15 feet long by 1 foot high with a maximum penetration of 3 inches. Several reinforcing bars were exposed exhibiting less than 10 percent loss of section.
- (H) The Box 1 culvert floor was covered with a 2 inch thick layer of silt from the culvert midpoint to the downstream opening.
- (I) The Box 2 culvert floor was covered with a 5 inch thick layer of silt from the upstream quarter point to the downstream opening.
- (J) The apron toe was exposed at the downstream midpoint of Box 1 with a maximum vertical exposure of 6 inches and the upstream opening of Box 1 with a maximum vertical exposure of 1 inch. No undermining was observed at the upstream or downstream aprons.
- (K) The upstream and downstream banks exhibited minor erosion.

RECOMMENDATIONS:

- (A) The areas of concrete section loss and spalling with exposed reinforcing steel are not structural concerns at this time; however, it should be repaired to prevent further deterioration. The repairs should include removal of concrete to a minimum of 1 inch behind the reinforcing steel, cleaning and replacing reinforcing steel as required, and placing concrete designed to provide high durability with low permeability.
  
- (B) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of sixty (60) months.

Inspection Team Leader:

*Nicholas R. Triandafilou*

Nicholas R. Triandafilou, 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*  
Daniel G. Stromberg

Registered Professional  
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 7678

Feature Crossed: The Sand River

Feature Carried: CSAH 22

Location: St. Louis County

Bridge Description: The culvert consists of two reinforced concrete culvert boxes designated as Box 1 and Box 2 from west to east.

2. INSPECTION DATA

Professional Engineer Diver: Nicholas R. Triandafilou, P.E.

Dive Team: Marc B. Parker, Clayton Brookins

Date: September 18, 2012

Weather Conditions: Sunny, 50°F

Underwater Visibility: 1.0 foot

Waterway Velocity: None/Negligible

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Box 1 and Box 2

General Shape: The culvert consists of two reinforced concrete box barrels measuring 12 feet wide by 8 feet high and 51 feet long.

Maximum Water Depth at Substructure Inspected: Approximately 3.4 feet.

4. WATERLINE DATUM

Water Level Reference: The bottom of the south headwall at the west side of Box 1.

Water Surface: The waterline was approximately 4.7 feet below reference.  
Assumed Waterline Elevation = 95.3 feet.

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

Item 62: Culvert Condition: Code 6

Item 61: Channel and Channel Protection: Code 6

Item 92B: Underwater Inspection: Code B/09/12

Item 113: Scour Critical Bridges: Code E/12

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
241	Concrete Culvert	102	LF	0	100	2	0	n/a
387	Concrete Wingwalls	4	EA	2	2	0	0	n/a
388	Culvert Headwall	2	EA	1	0	1	0	n/a
985	Slopes and Slope Protection	1	EA	1	0	0	n/a	n/a



Photograph 1. Overall View of the South Headwall, Looking Northeast.



Photograph 2. Overall View of the North Headwall, Looking South.



Photograph 3. Typical Concrete Condition at the Waterline, Looking West.



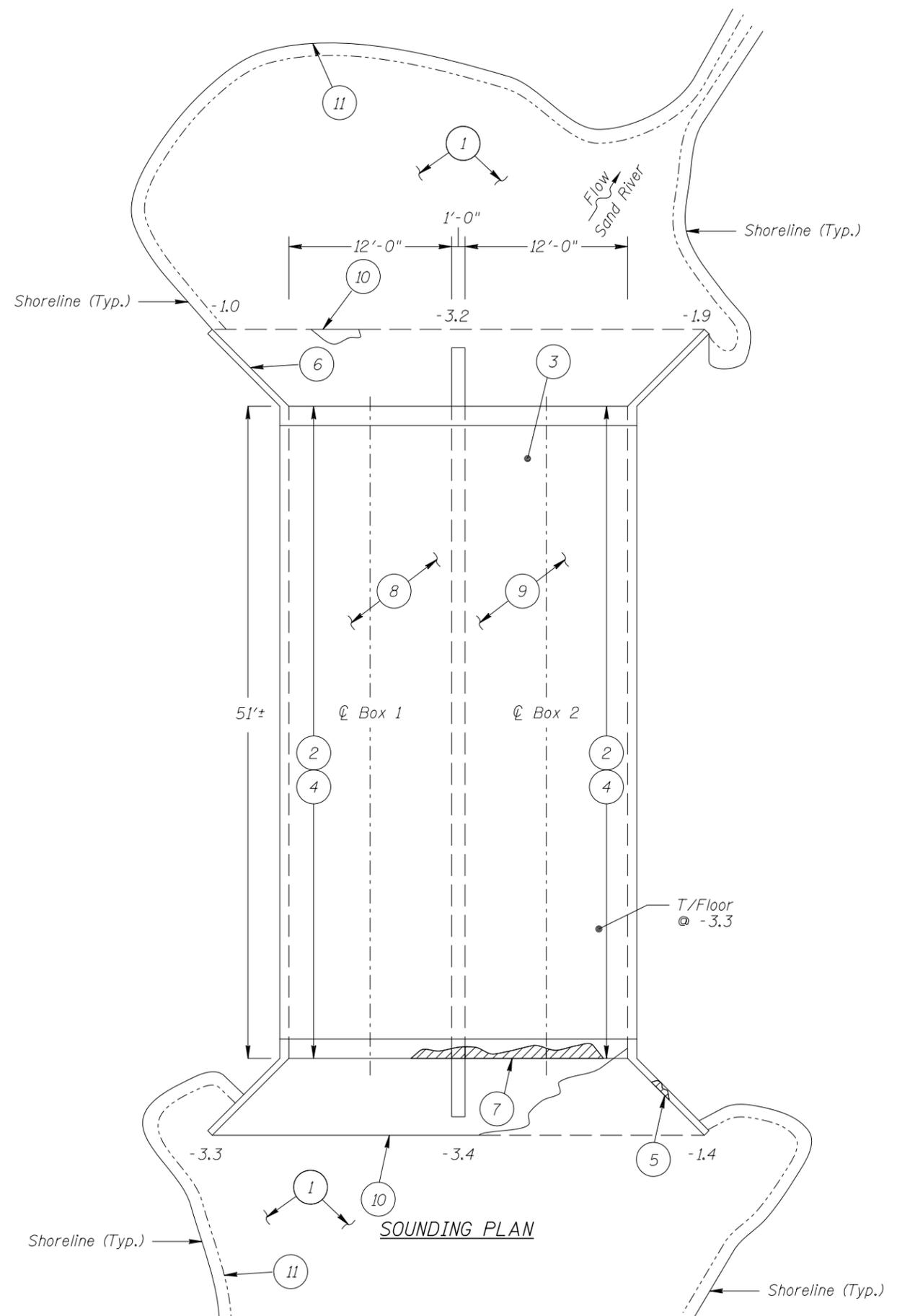
Photograph 4. View Concrete Section Loss and Left-in-Plane Form Board, Looking up.



Photograph 5. View Diagonal Crack on Northwest Wingwall, Looking West.



Photograph 6. View of Concrete Section Loss and Exposed Reinforcing Bars on the South Headwall, Looking North.



**INSPECTION NOTES:**

- 1 The channel bottom material upstream and downstream of the culvert apron consisted of rocks, cobbles and silt with a maximum probe rod penetration of 6 inches.
- 2 A band of light scaling and random areas of poor concrete consolidation were observed on the culvert floor, ceiling and walls extending from the floor to 2 feet above the waterline. The scaling had a maximum penetration of 1/4 inch and the poor concrete consolidation had a maximum penetration of 1.5 inches.
- 3 An area of concrete section loss and residual 2"x4" form work was observed in the ceiling of Box 2, 1 foot from the north opening. The area of section loss measured 6 inches long by 3 inches wide with a maximum penetration of 1.5 inches and one exposed reinforcing bar exhibiting less than 5 percent loss of section.
- 4 Areas of concrete section loss and poor concrete consolidation were observed along the horizontal construction joints of all the top haunches of both Box 1 and 2. The areas had a maximum penetration of 3/4 inch.
- 5 An area of concrete section loss was observed on the top of the southeast wingwall. The area measured 15 inches wide by 6 inches high with a maximum penetration of 2 inches. No reinforcing steel was observed.
- 6 A diagonal crack, up to 1/4 inch wide, was observed on the southeast and northwest wingwalls extending from the apron to the top of the wingwall.
- 7 A spall was observed on the south headwall above Box 2. The spall measured 15 feet long by 1 foot high with a maximum penetration of 3 inches. Several reinforcing bars were exposed exhibiting less than 10 percent loss of section.
- 8 The Box 1 culvert floor was covered with a 2 inch thick layer of silt from the culvert midpoint to the downstream opening.
- 9 The Box 2 culvert floor was covered with a 5 inch thick layer of silt from the upstream quarter point to the downstream opening.
- 10 The apron toe was exposed at the downstream midpoint of Box 1 with a maximum vertical exposure of 6 inches and the upstream opening of Box 1 with a maximum vertical exposure of 1 inch. No undermining was observed at the upstream or downstream aprons.
- 11 The upstream and downstream banks exhibited minor erosion.

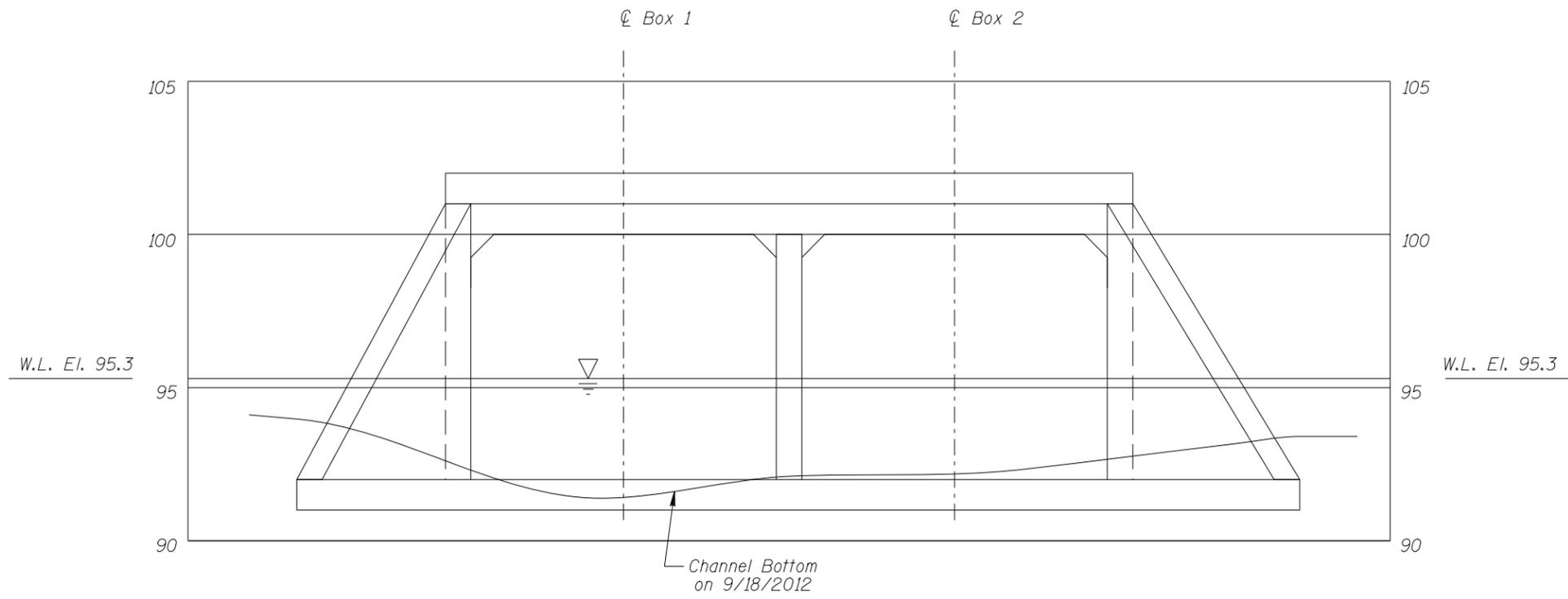
**GENERAL NOTES:**

1. Box 1 and Box 2 of culvert were inspected underwater.
2. At the time of inspection, on September 18, 2012, the waterline was located approximately 4.7 feet below the bottom of the south headwall at the east wall of Box 1. Since insufficient elevation information was available, an elevation of 100.0 was assumed. This corresponds to a waterline elevation of 95.3.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.

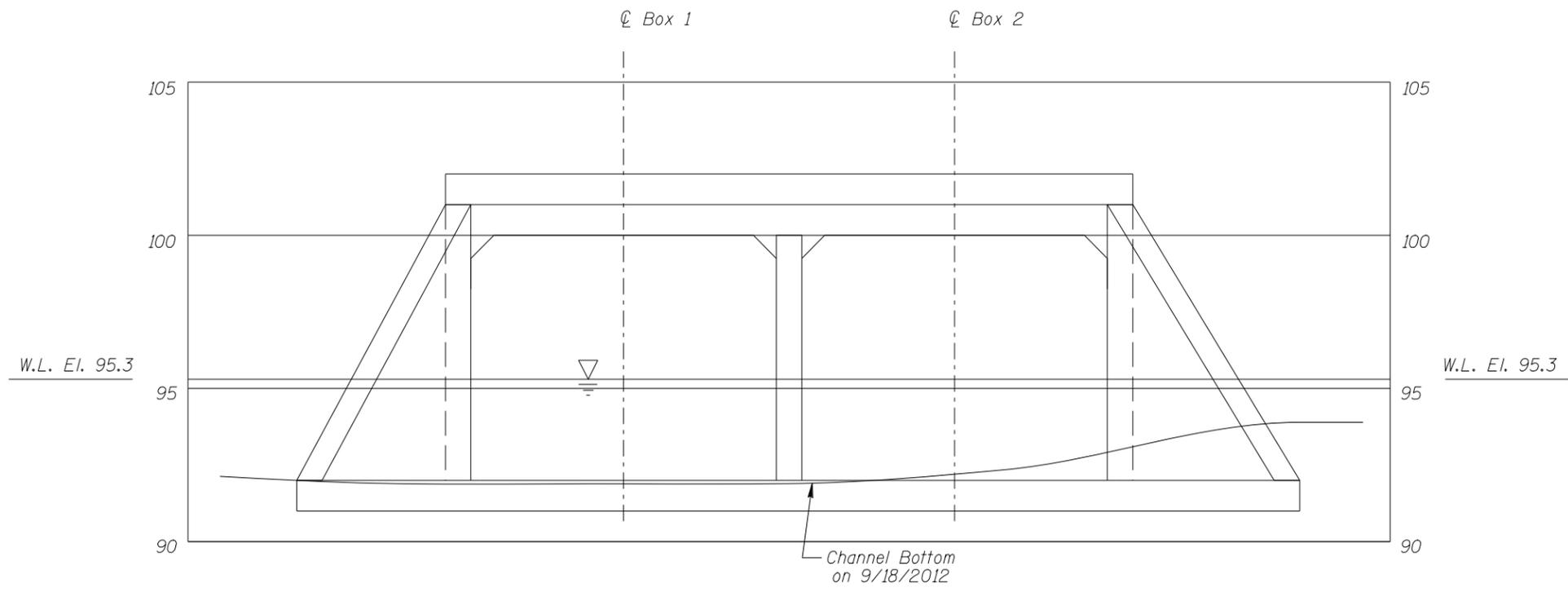
**Legend**

-0.4	Sounding Depth (9/18/2012)
5	Inspection Note Number
	Area of Concrete Section Loss

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 7678 CSAH 22 OVER THE SAND RIVER ST. LOUIS COUNTY		
INSPECTION AND SOUNDING PLAN		
Drawn By: MBP	<b>COLLINS ENGINEERS</b>	Date: OCTOBER 2012
Checked By: LJ	<small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Scale: 1"=10'
Code: 74237678		Figure No.: 1



DOWNSTREAM OPENING PROFILE



UPSTREAM OPENING PROFILE

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

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 7678 CSAH 22 OVER THE SAND RIVER ST. LOUIS COUNTY		
<b>UPSTREAM AND DOWNSTREAM FASCIA PROFILES</b>		
Drawn By: MBP	<b>COLLINS ENGINEERS</b>	Date: OCTOBER 2012
Checked By: LJ	<small>133 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Scale: 1"=5'
Code: 74237678		Figure No.: 2

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

INSPECTORS: Collins Engineers, Inc. DATE: September 18, 2012

ON-SITE TEAM LEADER: Nicholas R. Triandafilou, P.E.

BRIDGE NO: 7678 WEATHER: Sunny, 50° F

WATERWAY CROSSED: Sand River

DIVING OPERATION:  SCUBA  SURFACE SUPPLIED AIR  
 OTHER

PERSONNEL: Clayton Brookins, Marc B. Parker

EQUIPMENT: Commercial Scuba, Sounding Pole, Hand Tools, Camera, Underwater Light

TIME IN WATER: 10:50 A.M.

TIME OUT OF WATER: 11:15 A.M.

WATERWAY DATA: VELOCITY None/Negligible

VISIBILITY 1 foot

DEPTH 3.4 feet maximum at the north opening

ELEMENTS INSPECTED: Box 1 and Box 2

REMARKS: Overall, the substructure units inspected were found to be in satisfactory condition with only minor defects of structural significance. The concrete surfaces exhibited light scaling with a maximum penetration of 1/4 inch and random areas of poor concrete consolidation with a maximum penetration of 1.5 inches. A spall and areas of concrete section loss were observed on the ceiling of Box 2, the top of the southeast wingwall, the south headwall, and along all the construction cold joints of all the haunches. Several reinforcing bars were exposed in the wingwall and headwall spalls exhibiting less than 10 percent loss of section. There was a 2 inch layer of silt covering half the length of Box 1 and a 5 inch thick layer of silt covering 3/4 the length of Box 2. The concrete apron was exposed at Box 1 with a maximum vertical exposure of 6 inches and 1 inch at the downstream and upstream openings respectively. The upstream and downstream banks exhibited minor erosion.

FURTHER ACTION NEEDED:      X   YES               NO

The areas of concrete section loss and spalling with exposed reinforcing steel are not structural concerns at this time; however, it should be repaired to prevent further deterioration. The repairs should include removal of concrete to a minimum of 1 inch behind the reinforcing steel, cleaning and replacing reinforcing steel as required, and placing concrete designed to provide high durability with low permeability.

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

MINNESOTA DEPARTMENT OF TRANSPORTATION  
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 7678  
 INSPECTORS Collins Engineers, Inc.  
 ON-SITE TEAM LEADER Nicholas R. Triandafilou, P.E.  
 WATERWAY CROSSED Sand River

INSPECTION DATE September 18, 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	REINFORCED CONCRETE BOX CULVERT	FOOTINGS	DISPLACEMENT	OTHER (HEADWALL/WINGWALL)	OVERALL SUBSTRUCTURE CONDITION CODE*	SCOUR	EMBANKMENT EROSION	EMBANKMENT PROTECTION	OTHER (SILT BUILDUP)	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
1	Concrete Culvert Box 1	3.4'	N	6	N	N	5	6	N	6	N	N	6	5	N	N	5	N	N
2	Concrete Culvert Box 2	3.9'	N	6	N	N	5	6	N	6	N	N	6	5	N	N	5	N	N

\*UNDERWATER PORTION ONLY

REMARKS: Overall, the substructure units inspected were found to be in satisfactory condition with only minor defects of structural significance. The concrete surfaces exhibited light scaling with a maximum penetration of 1/4 inch and random areas of poor concrete consolidation with a maximum penetration of 1.5 inches. A spall and areas of concrete section loss were observed on the ceiling of Box 2, the top of the southeast wingwall, the south headwall, and along all the construction cold joints of all the haunches. Several reinforcing bars were exposed in the wingwall and headwall spalls exhibiting less than 10 percent loss of section. There was a 2 inch layer of silt covering half the length of Box 1 and a 5 inch thick layer of silt covering 3/4 the length of Box 2. The concrete apron was exposed at Box 1 with a maximum vertical exposure of 6 inches and 1 inch at the downstream and upstream openings respectively. The upstream and downstream banks exhibited minor erosion.

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.