

UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 7836

CR 737

OVER THE

HELLEWAGS CREEK

ST. LOUIS COUNTY



SEPTEMBER 27, 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. 7836, Box 1 and Box 2 of the culvert, were found to be in fair condition with defects of only minor structural significance. The concrete surfaces were typically smooth and sound with numerous areas of poor concrete consolidation and associated concrete section loss, as well as a 3 foot band of heavy scaling on all of the culvert walls. There were also several larger areas of poor concrete consolidation and concrete section loss ranging in size from 1 square foot to 16 square feet, with penetrations ranging from 1 to 6 inches and exposed reinforcing steel with no applicable loss of section. The culverts were typically free of debris and the concrete floor was exposed throughout the length of both boxes.

INSPECTION FINDINGS:

- (A) The culvert floor was typically clear of any debris or silt build up. There was a layer of silty sand and gravel allowing up to 3 inches of probe rod penetration covering a portion of the concrete apron at the upstream and downstream openings of Box 2.
- (B) The channel bottom material upstream and downstream of the culvert apron consisted of soft silt wallowing a maximum probe rod penetration of 1 foot.
- (C) A band of heavy scaling, extending from 1.5 feet above the waterline to the culvert floor was observed on all exposed concrete walls. The scaling had a typical penetration of 1/2 inch with a maximum penetration of 1 inch on the east and west walls and 2 inches on the center wall.
- (D) The apron floor was flush with the channel bottom at the upstream and downstream openings of Box 1 with no vertical face exposure.
- (E) A diagonal crack was observed on the northwest wingwall with a maximum width of 1/4 inch.

- (F) An area of concrete section loss measuring 2 feet long and 6 inches high with a maximum penetration of 6 inches was observed 2 feet above the waterline and 4 feet from the upstream opening on the west face of the center wall.
- (G) An area of concrete section loss measuring 1 foot long and 3 inches high with a maximum penetration of 3 inches was observed 1.5 feet above the waterline and 6 feet from the upstream opening on the west face of the center wall. One horizontal reinforcing bar was exposed with no appreciable loss of section.
- (H) An area of poor concrete consolidation and concrete section loss was observed on the ceiling and east haunch of Box 1 at approximately 15 feet from the downstream opening. The area on the ceiling measured 4 feet long by 4 feet wide with a maximum penetration of 2 inches and the area on the haunch measured approximately 4 feet long by 3 inches high with a maximum penetration of 6 inches and one exposed reinforcing bar with no appreciable loss of section.
- (I) Areas of concrete section loss with up to 2 inches of penetration were observed on the top of the southwest wingwall and the south center wall extension.
- (J) An area of poor concrete consolidation and concrete section loss was observed on the ceiling and east haunch of Box 2 at approximately 15 feet from the downstream opening. The area on the ceiling measured 4 feet long by 4 feet wide with a maximum penetration of 2 inches and the area on the haunch measured approximately 4 feet long by 3 inches high with a maximum penetration of 3 inches and several exposed reinforcing bars with no appreciable loss of section.
- (K) An area of poor concrete consolidation and concrete section loss was observed at the midpoint of the ceiling at the downstream opening of Box 2. The area measured 1.5 feet long by 6 inches wide with a maximum penetration of 2 inches and one exposed reinforcing bar with no appreciable loss of section.
- (L) The concrete of the walls from 1.5 feet above the waterline to the ceiling and the ceiling and haunches was generally smooth and sound. The ceiling and haunches had numerous random areas of poor concrete consolidation and associated areas of concrete section loss with up to 1 inch of penetration.

RECOMMENDATIONS:

- (A) The areas of concrete section loss and poor concrete consolidation with exposed reinforcing steel are not structural concerns at this time; however, they 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.
- (C) At the time of inspection of the submerged substructure units of Structure No. 7836, the waterline and water flow were noticeably lower than the mean values. As a result the inspection could be safely carried out by means of wading. During future inspections of the substructure units, a higher waterline elevation and/or increased flow may result in lower overhead clearance with a possibility of a confined space entrance requirements which may require a qualified dive team to safely carry out the inspection. If future inspections determine that the waterline consistently remains at a level which an inspection can be safely performed by the means of wading, consideration may be given to removing the structure from the underwater inspection list.

Inspection Team Leader:
Daniel G. Stromberg, P.E.

Respectfully submitted,

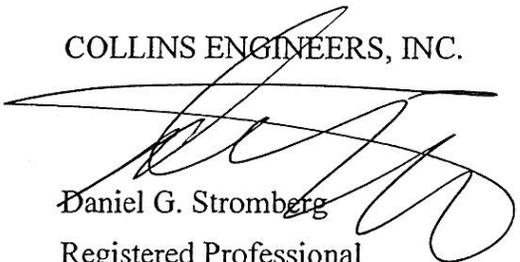
PROFESSIONAL ENGINEER

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: 7836

Feature Crossed: Hellewags Creek

Feature Carried: CR 737

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: Daniel G. Stromberg, P.E.

Dive Team: Marc B. Parker, Clayton Brookins

Date: September 27, 2012

Weather Conditions: Sunny, 55°F

Underwater Visibility: 2.0 feet

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 6 feet high and 32 feet long.

Maximum Water Depth at Substructure Inspected: Approximately 2.8 feet.

4. WATERLINE DATUM

Water Level Reference: The top of the concrete apron at the upstream opening of Box 1.

Water Surface: The waterline was approximately 2.3 feet above reference.
Assumed Waterline Elevation = 102.3 feet.

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

Item 62: Culvert Condition: Code 5

Item 61: Channel and Channel Protection: Code 7

Item 92B: Underwater Inspection: Code A/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	66	LF	0	51	15	0	n/a
387	Concrete Wingwalls	4	EA	0	4	0	0	n/a
388	Culvert Headwall	2	EA	0	2	0	0	n/a
985	Slopes and Slope Protection	1	EA	1	0	0	n/a	n/a



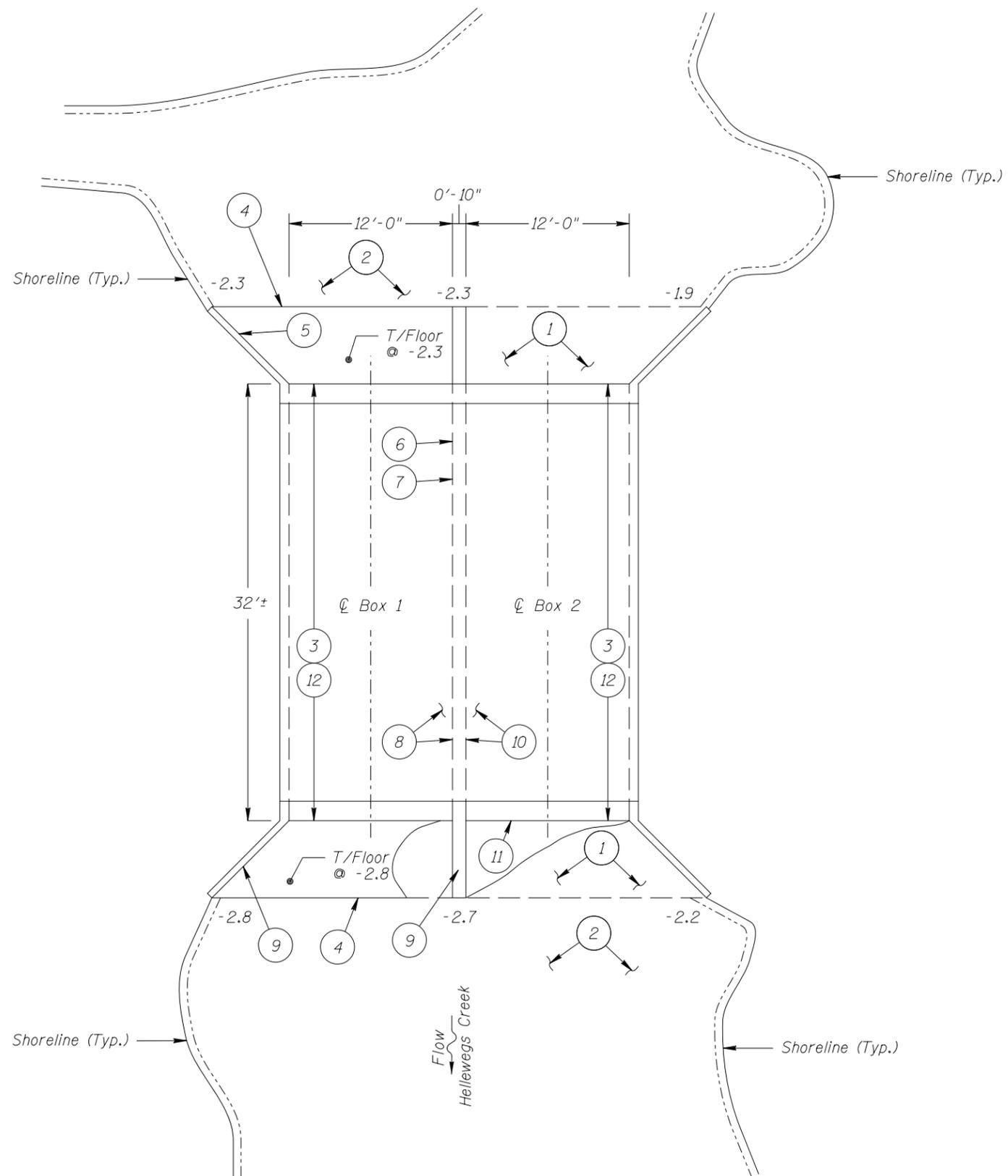
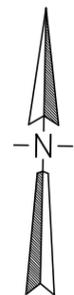
Photograph 1. Overall View of the Culvert, Looking Northwest.



Photograph 2. View of the Typical Band of Scaling on the Culvert Walls, Looking Northwest.



Photograph 3. View of an Area of Concrete Section Loss and Poorly Consolidated Concrete on the Ceiling of Box 2, Looking West. Note the Exposed Reinforcing Steel Bars.



SOUNDING PLAN

INSPECTION NOTES:

- 1 The culvert floor was typically clear of any debris or silt build up. There was a layer of silty sand and gravel allowing up to 3 inches probe rod of penetration covering a portion of the concrete apron at the upstream and downstream openings of Box 2.
- 2 The channel bottom material upstream and downstream of the culvert apron consisted of soft silt allowing a maximum probe rod penetration of 1 foot.
- 3 A band of heavy scaling, extending from 1.5 feet above the waterline to the culvert floor was observed on all exposed concrete walls. The scaling had a typical penetration of 1/2 inch with a maximum penetration of 1 inch on the east and west walls and 2 inches on the center wall.
- 4 The apron floor was flush with the channel bottom at the upstream and downstream openings of Box 1 with no vertical face exposure.
- 5 A diagonal crack was observed on the northwest wingwall with a maximum width of 1/4 inch.
- 6 An area of concrete section loss measuring 2 feet long and 6 inches high with a maximum penetration of 6 inches was observed 2 feet above the waterline and 4 feet from the upstream opening on the west face of the center wall.
- 7 An area of concrete section loss measuring 1 foot long and 3 inches high with a maximum penetration of 3 inches was observed 1.5 feet above the waterline and 6 feet from the upstream opening on the west face of the center wall. One horizontal reinforcing bar was exposed with no appreciable loss of section.
- 8 An area of poor concrete consolidation and concrete section loss was observed on the ceiling and east haunch of Box 1 at approximately 15 feet from the downstream opening. The area on the ceiling measured 4 feet long by 4 feet wide with a maximum penetration of 2 inches and the area on the haunch measured approximately 4 feet long by 3 inches high with a maximum penetration of 6 inches and one exposed reinforcing bar with no appreciable loss of section.
- 9 Areas of concrete section loss with up to 2 inches of penetration were observed on the top of the southwest wingwall and the south center wall extension.
- 10 An area of poor concrete consolidation and concrete section loss was observed on the ceiling and east haunch of Box 2 at approximately 15 feet from the downstream opening. The area on the ceiling measured 4 feet long by 4 feet wide with a maximum penetration of 2 inches and the area on the haunch measured approximately 4 feet long by 3 inches high with a maximum penetration of 3 inches and several exposed reinforcing bars with no appreciable loss of section.
- 11 An area of poor concrete consolidation and concrete section loss was observed at the midpoint of the ceiling at the downstream opening of Box 2. The area measured 1.5 feet long by 6 inches wide with a maximum penetration of 2 inches and one exposed reinforcing bar with no appreciable loss of section.
- 12 The concrete of the walls from 1.5 feet above the waterline to the ceiling and the ceiling and haunches was generally smooth and sound. The ceiling and haunches had numerous random areas of poor concrete consolidation and associated areas of concrete section loss with up to 1 inch of penetration.

GENERAL NOTES:

1. Box 1 and Box 2 of culvert were inspected underwater.
2. At the time of inspection, on September 27, 2012, the waterline was located approximately 2.3 feet above the culvert floor of Box 1 at the upstream opening. Since insufficient elevation information was available, an elevation of 100.0 was assumed. This corresponds to a waterline elevation of 102.3.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.

Legend

-0.4 Sounding Depth (9/27/2012)

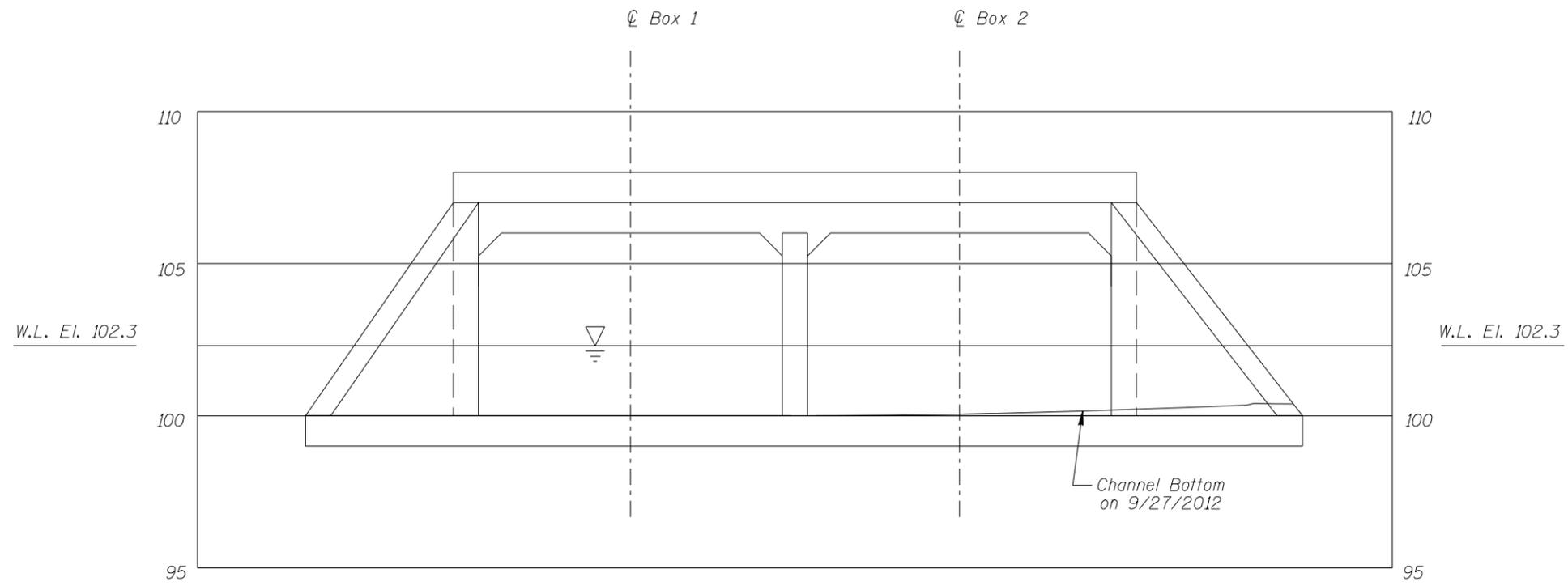
5 Inspection Note Number

**MINNESOTA
DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION**

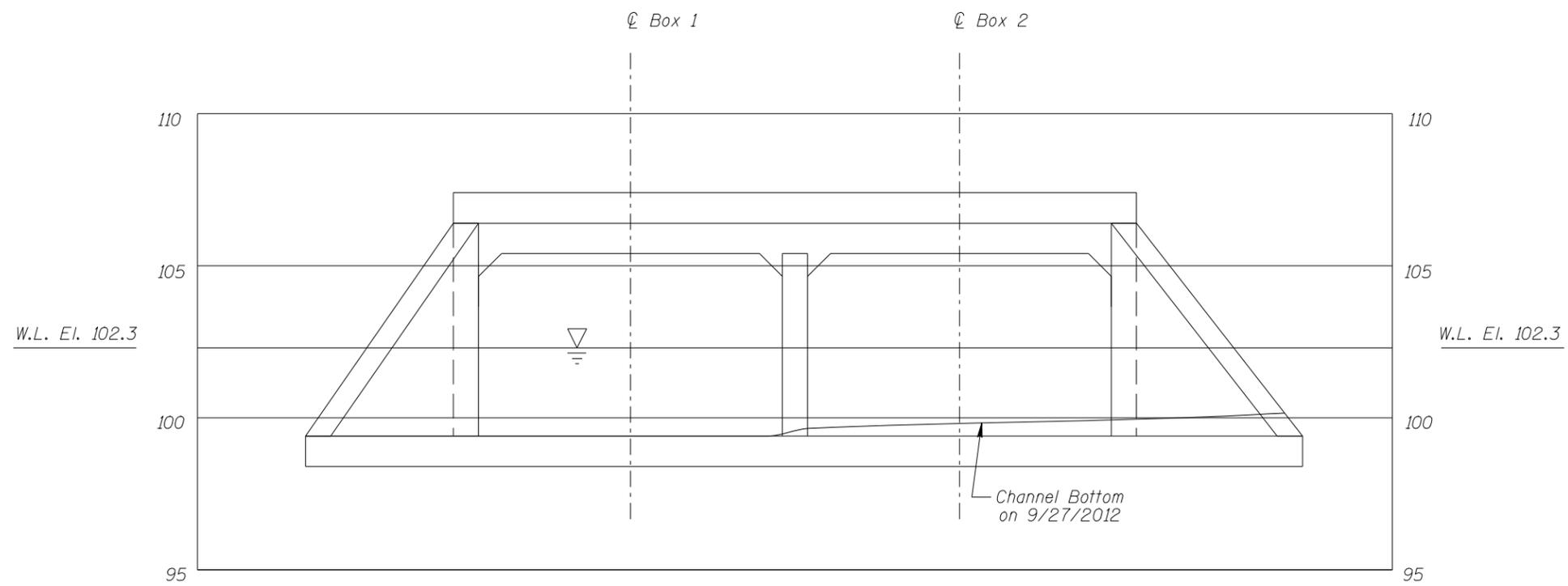
STRUCTURE NO. 7836
CR 737 OVER THE HELLEWEGS CREEK
ST. LOUIS COUNTY

INSPECTION AND SOUNDING PLAN

Drawn By: MBP	COLLINS ENGINEERS <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: NOV. 2012
Checked By: LJ		Scale: 1"=10'
Code: 74237836		Figure No.: 1



UPSTREAM OPENING PROFILE



DOWNSTREAM OPENING PROFILE

Note: _____

Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 7836 CR 737 OVER THE HELLEWAGS CREEK ST. LOUIS COUNTY		
UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
Drawn By: MBP	COLLINS ENGINEERS <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	Date: NOV. 2012
Checked By: LJ		Scale: 1"=5'
Code: 74237836		Figure No.: 2

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

INSPECTORS: Collins Engineers, Inc. DATE: September 27, 2012

ON-SITE TEAM LEADER: Daniel G. Stromberg, P.E.

BRIDGE NO: 7836 WEATHER: Sunny, 55° F

WATERWAY CROSSED: Hellewags Creek

DIVING OPERATION: _____ SCUBA _____ SURFACE SUPPLIED AIR

OTHER Inspection by Wading

PERSONNEL: Clayton Brookins, Marc B. Parker

EQUIPMENT: Dry Suit, Sounding Pole, Hand Tools, Camera, Underwater Light

TIME IN WATER: 11:15 A.M.

TIME OUT OF WATER: 11:50 A.M.

WATERWAY DATA: VELOCITY None/Negligible

VISIBILITY 2 feet

DEPTH 2.8 feet maximum at the downstream opening

ELEMENTS INSPECTED: Box 1 and Box 2

REMARKS: Overall, the substructure units inspected were found to be in fair condition with defects of only minor structural significance. The concrete surfaces were typically smooth and sound with numerous areas of poor concrete consolidation and associated concrete section loss, as well as a 3 foot band of heavy scaling on all of the culvert walls. There were also several larger areas of poor concrete consolidation and concrete section loss ranging in size from 1 square foot to 16 square feet, with penetrations ranging from 1 to 6 inches and exposed reinforcing steel with no applicable loss of section. The culverts were typically free of debris and the concrete floor was exposed throughout the length of both boxes.

FURTHER ACTION NEEDED: YES _____ NO

The areas of concrete section loss and poor concrete consolidation with exposed reinforcing steel are not structural concerns at this time; however, they 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 sixty (60) months.

At the time of inspection of the submerged substructure units of Structure No. 7836, the waterline and water flow were noticeably lower than the mean values. As a result the inspection could be safely carried out by means of wading. During future inspections of the substructure units, a higher waterline elevation and/or increased flow may result in lower overhead clearance with a possibility of a confined space entrance requirements which may require a qualified dive team to safely carry out the inspection. If future inspections determine that the waterline consistently remains at a level which an inspection can be safely performed by the means of wading, consideration may be given to removing the structure from the underwater inspection list.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 7836
 INSPECTORS Collins Engineers, Inc.
 ON-SITE TEAM LEADER Daniel G. Stromberg, P.E.
 WATERWAY CROSSED Hellewags Creek

INSPECTION DATE September 27, 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	SUBSTRUCTURE							CHANNEL					GENERAL					
		MAXIMUM DEPTH OF WATER	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	2.8'	N	5	N	N	5	5	N	7	N	N	7	5	N	N	5	N	N
2	Concrete Culvert Box 2	2.8'	N	5	N	N	5	5	N	7	N	N	7	5	N	N	5	N	N

*UNDERWATER PORTION ONLY

REMARKS: Overall, the substructure units inspected were found to be in fair condition with defects of only minor structural significance. The concrete surfaces were typically smooth and sound with numerous areas of poor concrete consolidation and associated concrete section loss, as well as a 3 foot band of heavy scaling on all of the culvert walls. There were also several larger areas of poor concrete consolidation and concrete section loss ranging in size from 1 square foot to 16 square feet, with penetrations ranging from 1 to 6 inches and exposed reinforcing steel with no applicable loss of section. The culverts were typically free of debris and the concrete floor was exposed throughout the length of both boxes.

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.