

2017 UNDERWATER BRIDGE INSPECTION REPORT



BRIDGE # 7688 CSAH 25 over BEAR RIVER

DISTRICT: District 1

COUNTY: St. Louis

CITY/TOWNSHIP: GREAT SCOTT

STATE: Minnesota

Date of Inspection: 09/12/2016

Equipment Used:

Owner: County Highway Agency

Inspected By: Parker, Marc

Report Written By: Marc Parker

Report Reviewed By:

Final Report Date:



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UNDERWATER INSPECTION

REPORT SUMMARY

The substructure units inspected at Structure No. 7688, Box 1 and Box 2 of the culvert, were found to be in fair condition with only minor defects of structural significance below water. Light scaling and areas of poor consolidation were observed throughout both culvert barrels. The concrete apron was exposed at the east opening with up to 2 inches of vertical exposure and no undermining observed. Overall the structure has not significantly changed since the previous underwater inspection.

INSPECTION FINDINGS

(A) The channel bottom material upstream and downstream of the culvert apron consisted of rocks and sand with a maximum probe rod penetration of 1 foot.

(B) The concrete of both culvert boxes and headwalls exhibited light scaling on all surfaces with a typical penetration of 1/8 inch and a maximum penetration of 1/2 inch.

(C) Random areas of poor concrete consolidation were observed on the walls of both culvert boxes. The areas exhibited a maximum penetration of 1 inch.

(D) Widespread areas of poor concrete consolidation were observed on the haunches and culvert ceilings. The areas exhibited a maximum penetration on 2 inches with random areas of longitudinal and transverse reinforcing steel exposed. The areas of poor consolidation with exposed reinforcing steel covered approximately 15 percent of the total ceiling surface area and the steel exhibited less than 5 percent loss of section.

(E) A spall was observed at the waterline, 6 feet from the east opening, on the north face of the center wall. The spall measured 1 foot in diameter with a maximum of 3 inches.

(F) Vertical hairline to 1/16 inch wide cracks were observed at the midpoint of all four wingwalls, extending from the top of the wall to the concrete apron.

(G) The culvert floor was exposed throughout the length of both culvert boxes. Random areas of silt and debris buildup, less than 1 foot thick, were observed throughout Box 1 with no significant reduction in hydraulic opening.

(H) The concrete apron was observed at the east end opening of the culvert boxes from the midpoint of Box 1 to the midpoint of Box 2. The apron had a maximum vertical exposure of 2 inches. No undermining was observed at the apron toe.

RECOMMENDATIONS

(A) The areas of 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.

Contractor: Collins Engineers, Inc.

Contractor Job Number: 9687

UNDERWATER INSPECTION

1. BRIDGE DATA

Bridge #: 7688
Feature Intersected: BEAR RIVER
Facility Carried: CSAH 25
District: District 1
County: 069 - St. Louis
Bridge Description:

The culvert consists of two reinforced concrete culvert boxes designated as Box 1 and Box 2 from north to south.

2. INSPECTION DATA

Professional Engineer/Team Leader: Marc Parker
Inspection Diver: Marc Parker
Date of Underwater Inspection: 09/12/2016
Weather Conditions: Overcast, 65°F
Underwater Visibility (feet): 1.0 foot
Waterway Velocity (ft/sec): Negligible

3. SUBSTRUCTURE INSPECTION DATA

Substructure(s) Inspected: Box 1 and Box 2.
General Shape:

The culvert consists of two reinforced concrete box barrels measuring 10 feet wide by 48 feet long.

Maximum Water Depth at Substructure(s) Inspected (feet): 4.5 feet

4. WATERLINE DATUM

Water Level Reference: The top of the west headwall at Box 2.
Waterline Elevation (feet): 96.9 feet
Description: The waterline was located approximately 3.1 feet below the reference.

5. NBIS CODING INFORMATION

(Minnesota specific codes are used for 92B and 113)

Item 60: Substructure: Code:
Item 61: Channel and Channel Protection: Code: 6
Item 62: Culvert: Code: 5
Item 92B: Underwater Inspection: Code: Y 48 09/2016

Item 113: Scour Critical Bridge:

Code: E

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

Yes No (Mark your selection with an X)

6. STRUCTURAL ELEMENT CONDITION RATING

ELEM #	Element Description	Quantity	Unit	Conditions			
				CS1	CS2	CS3	CS4
241	Concrete Culvert	95	LF		80	15	
870	Culvert End Treatment	2	EA		2		
885	Scour	1	EA	1			

UNDERWATER INSPECTION

INSPECTION PROCEDURES

The routine underwater inspection of Bridge 7688 (CSAH 25 over Bear River) was completed on September 12, 2016. The underwater inspection was conducted from shore. The inspection was conducted by a team consisting of a Professional Engineer Diver with a valid MnDOT Team Leader certification, a backup diver and dive tender. Due to waterway conditions at the time of the inspection, the inspection could be accomplished by wading in accordance with OSHA regulations. Channel bottom profiles were taken along the upstream and downstream openings to determine the presence, location and area of scour.

The bridge elements inspected were the two precast concrete box culverts. Inspection procedures followed FHWA guidance and the MnDOT Bridge and Structure Inspection Program Manual with channel bottom probing to search for foundations. The maximum routine underwater inspection frequency is recommended to remain at 60 months based on those findings and risk factors. Also, inspection procedures should continue to follow the above approach and standard guidance with 100% Level I and 10% Level II intensity efforts.

Minnesota Structure Inventory Report

Bridge ID: 7688

CSAH 25 over BEAR RIVER

Date: 01/06/2017

+ GENERAL +	+ ROADWAY +	+ INSPECTION +																				
Agency Br. No. 617 Crew District 01 Maint. Area County 069 - St. Louis City Township 69033 - GREAT SCOTT Desc. Loc. 2.5 MI N OF JCT CSAH66 Sect., Twp., Range 9 - 059N - 19W Latitude 47 ° 36 ' 31.13 " Longitude 92 ° 45 ' 46.77 " Custodian 02 - County Highway Agency Owner 02 - County Highway Agency BMU Agreement Year Built 1941 MN Year Reconstructed FHWA Year Reconstructed MN Temporary Status Bridge Plan Location 0 - NO PLAN Date Opened to Traffic On - Off System 0 - OFF Legislative District 05A Potential ABC 2 - N/A	Bridge Match ID (TIS) 0 Roadway O/U Key Route On Structure Route Sys 04 - CSAH Number 25 Roadway Name or Description CSAH 25 Level of Service 1 - MAINLINE Roadway Type 2 - 2-way traffic Control Section (TH Only) Reference Point 024+00.880 Detour Length 6.0 mi. Lanes ON 2 UNDER 0 ADT 420 YEAR 2008 HCA DT ADTT % Functional Class 08 - Rural - Minor Collector	Userkey 109 Structurally Deficient N Functionally Obsolete N Sufficiency Rating 87.1 Routine Inspection Date 08/26/2015 Routine Inspection Frequency 24 Inspector Name Parker, Marc Status A - Open																				
	+ RDWY DIMENSIONS +	+ NBI CONDITION RATINGS +																				
	If Divided NB-EB SB-WB Roadway Width 26.00 ft. ft. Vertical Clearance ft. ft. Max. Vert. Clear. ft. ft. Horizontal Clear. ft. ft. Lateral Clearance ft. ft. Appr. Surface Width 36.0 ft. Bridge Roadway Width 0.0 ft. Median Width On Bridge ft.	Deck N Unsound Deck % Superstructure N Substructure N Channel 6 Culvert 5																				
+ STRUCTURE +	+ MISC. BRIDGE DATA +	+ NBI APPRAISAL RATINGS +																				
Service On 1 - Highway Service Under 5 - Waterway Main Span Type 1 - Concrete Main Span Design 13 - Box Culvert Main Span Detail Appr. Span Type Appr. Span Design Appr. Span Detail Skew 0 Culvert Type W106D Barrel Length 48 Cantilever ID Number of Spans MAIN: 2 APPR: 0 TOTAL: Main Span Length 10.0 ft. Structure Length 22.0 ft. Deck Width (Out-to-Out) 0.0 ft. Deck Material N - Not Applicable Wear Surf Type 6 - Bituminous Wear Surf Install Year Wear Course/Fill Depth 2.50 ft. Deck Membrane N - Not Applicable (applies) Deck Rebars N - Not Applicable (no deck) Deck Rebars Install Year Structure Area (Out-to-Out) 0 sq. ft. Roadway Area (Curb-to-Curb) sq. ft. Sidewalk Width 50A. Lt 0.00 ft. 50B. Rt 0.00 ft. Curb Height Lt 0.00 ft. Rt 0.00 ft. Rail Type Lt NN Rt NN	Structure Flared 0 - No flare Parallel Structure N - No parallel structure Field Conn. ID Abutment Foundation (Material/Type) N - N/A Pier Foundation (Material/Type) N - N/A Historic Status 5 - Not eligible	Structure Evaluation 5 Deck Geometry N Underclearances N Waterway Adequacy 7 Approach Alignment 8																				
	+ PAINT +	+ SAFETY FEATURES +																				
	Year Painted Unsound Paint % Painted Area sq. ft. Primer Type Finish Type	Bridge Railing N - NOT REQUIRED GR Transition N - NOT REQUIRED Appr. Guardrail 1 - MEETS STANDARDS GR Termini 1 - MEETS STANDARDS																				
	+ BRIDGE SIGNS +	+ IN DEPTH INSP. +																				
	Posted Load 0 - Not Required Traffic 0 - Not Required Horizontal 1 - Object Markers Vertical N - Not Applicable	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">Y/N</th> <th style="text-align: center;">Freq</th> <th style="text-align: center;">Date</th> </tr> </thead> <tbody> <tr> <td>Frac. Critical</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Underwater</td> <td></td> <td style="text-align: center;">60</td> <td style="text-align: center;">09/12/2016</td> </tr> <tr> <td>Pinned Asbly.</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Spec. Feat.</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Y/N	Freq	Date	Frac. Critical				Underwater		60	09/12/2016	Pinned Asbly.				Spec. Feat.			
	Y/N	Freq	Date																			
Frac. Critical																						
Underwater		60	09/12/2016																			
Pinned Asbly.																						
Spec. Feat.																						
		+ WATERWAY +																				
		Drainage Area (sq. mi.) Waterway Opening (sf.) 120 Navigation Control 0 - No nav. control on Pier Protection - Nav. Clr. (ft.) Vert. 0.0 Horiz. 0.0 Nav. Vert. Lift Bridge Clear. (ft.) MN Scour Code E - CULVERT Year																				
		+ CAPACITY RATINGS +																				
		Design Load 4 - H 20 Operating Rating 1 - H TRUCK 25.0 Inventory Rating 1 - H TRUCK 18.0 Posting VEH: SEMI: DBL: Rating Date 2/1/1991 Overweight Permit Codes A N - N/A B N - N/A C N - N/A																				

MINNESOTA BRIDGE INSPECTION REPORT

01/09/2017

Inspector: CO Bridge

BRIDGE 7688 CSAH 25 OVER BEAR RIVER

County: St. Louis	Location: 2.5 MI N OF JCT CSAH66	Length: 22.0 ft.
City:	Route: 04 - CSAH 25 Ref. Pt.: 024+00.880	Deck Width: 0.0 ft.
Township: 69033 - GREAT SCOTT	Control Section:	Rdwy. Area/ Pct. Unsnd: sq. ft. / %
Section: 9 Township: 059N Range: 19W Maint. Area:		Paint Area/ Pct. Unsnd: sq. ft. / %
Span Type: 1 - Concrete 19 - Culvert (includes frame culverts)	Local Agency Bridge Nbr.: 617	Culvert: W106D
List:		Postings:
NBI Deck: N Super: N Sub: N Chan: 6 Culv: 5		
	Open, Posted, Closed: A - Open	
	MN Scour Code: E - CULVERT	

Appraisal Ratings - Approach: 8	Waterway: 7	Unofficial Structurally Deficient	N
Required Bridge Signs - Load Posting: 0 - Not Required	Traffic: 0 - Not Required	Unofficial Functionally Obsolete	N
Horizontal: 1 - Object Markers	Vertical: N - Not Applicable	Unofficial Sufficiency Rating	87.1

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
241	Reinforced Concrete Culvert	Underwater	01/06/2017	95 LF	0	80	15	0
		Migrated Values		95 LF	0	80	15	0
	Notes: [2015] Condition same as 2012 underwater inspection. Culvert slopes to the west. [2013] Water within 6" of top of culvert inlet and within 1" of top of culvert outlet. Possible beaver dam in culvert. [2012 Underwater inspection] Light to moderate scaling of 1/8" typ. to max. of 1/2" throughout both barrels. Random honey combing with max. pen. of 1" on all walls. Widespread honey combing at upper haunches and ceilings with max. pen. of 2" depth with random areas of long. and trans reinforcement. Areas of honey coming with exposed rein. covers approx. 15% total ceiling surface with <5% section loss of reinforcement. Spall of 1' diameter, 3" deep located 6' from E. end center wall of barrel 2 with no exposed reinforcement.							
800	Critical Deficiencies or Safety Hazards	Underwater	01/06/2017	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: [2015-2013] No critical findings during this inspection.							
870	Culvert End Treatment	Underwater	01/06/2017	2 EA	0	2	0	0
		Migrated Values		2 EA	0	2	0	0
	Notes: [2015-2013] Vertical crack in NW & NE wingwalls. Spalling at top of NW and NE wings near connection with culvert. Scaling on wing exposing aggregates with little to no loss of aggregate. [2012 Underwater inspection] Hairline to 1/16" cracks located at midpoint of all 4 wings. East apron has max. vert. exposure of 4 inches. No undermining observed.							
871	Roadway Over Culvert	Underwater	01/06/2017	1 EA	0	1	0	0
		Migrated Values		1 EA	0	1	0	0
	Notes: [2015] Crack along north and south edge of culvert. Slight settlement of roadway north and south of culvert. [2013] No signs of settlement or undermining. Bituminous.							
885	Scour	Underwater	01/06/2017	0 EA	1	0	0	0
891	Other Bridge Signing	Underwater	01/06/2017	1 EA	0	0	1	0
		Migrated Values		1 EA	0	0	1	0
	Notes: [2015-2013] West culvert marker missing.							
892	Slopes & Slope Protection	Underwater	01/06/2017	2 EA	1	1	0	0
		Migrated Values		2 EA	1	1	0	0
	Notes: [2015] Minor erosion end of NE wing. [2013] Slopes protected by vegetation.							

BRIDGE 7688 CSAH 25 OVER BEAR RIVER

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
893	Guardrail	Underwater	01/06/2017	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
Notes: [2015] No notable impact damage present. Few dents throughout. [2013] Flex Beam w/ET 2000 ends								
894	Deck & Approach Drainage	Underwater	01/06/2017	2 EA	2	0	0	0
		Migrated Values		2 EA	2	0	0	0
Notes: [2015-2013] No notable ponding or drainage-related slope erosion.								
900	Protected Species	Underwater	01/06/2017	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
Notes: Use this element to track the presence of protected species living on this structure.								

General Notes: SLC District 7
 Inspected by: [2015] CG, TM : [2013] CG, BH.
 [2015] Was able to walk through culvert. Culvert slopes to the west, no beaver dam in culvert.
 [2013] Water within 6" of top of culvert inlet and within 1" of top of culvert outlet. Possible beaver dam in culvert.

58. Deck NBI:

36A. Brdg Railings NBI:

36B. Transitions NBI:

36C. Appr Guardrail NBI: Flexbeam with timber posts.

36D. Appr Guardrail Terminal NBI: 4 ET 2000 ends

59. Superstructure NBI:

60. Substructure NBI:

61. Channel NBI: [2015] Beaver dam 150' to west of bridge. Damage to stream banks due to regularly high water from beaver dams.

62. Culvert NBI: [2015] Condition same as 2012 underwater inspection. Culvert slopes to the west.
 [2013] Water within 6" of top of culvert inlet and within 1" of top of culvert outlet. Possible beaver dam in culvert.
 [2012 Underwater inspection] Light to moderate scaling of 1/8" typ. to max. of 1/2" throughout both barrels. Random honey combing with max. pen. of 1" on all walls. Widespread honey combing at upper haunches and ceilings with max. pen. of 2" depth with random areas of long. and trans reinforcement. Areas of honey coming with exposed rein. covers approx. 15% total ceiling surface with <5% section loss of reinforcement. Spall of 1' diameter, 3" deep located E. end center wall of barrel 2 with no exposed reinforcement.

71. Waterway Adeq NBI: [2015] Culvert regularly full of water due to beaver activity causing slight chance of overtopping.

72. Appr Roadway Alignment NBI: [2015] No sight distance issues or speed reduction required.

Inventory Notes:

Inspector's Signature

Reviewer's Signature

Pictures



Photo 1 - West Opening, Looking Northeast

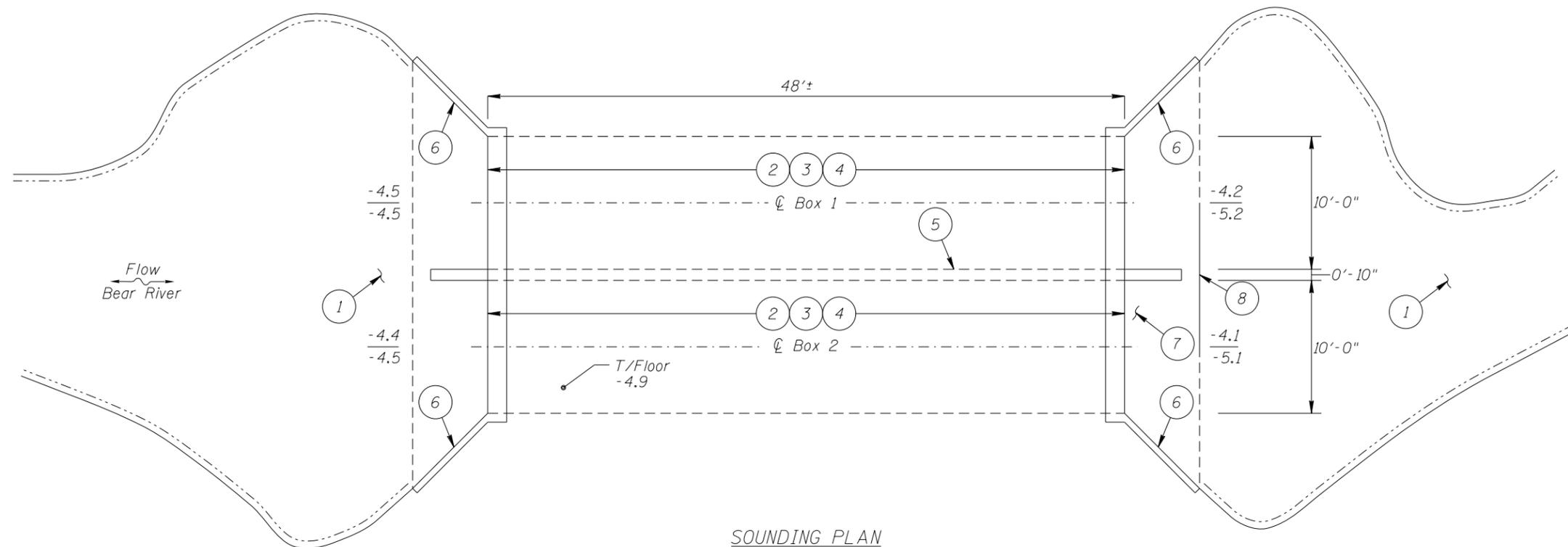


Photo 2 - East Opening, Looking Southwest

Pictures



Photo 3 - Typical Concrete Condition at the Waterline (North Barrel Shown), Looking South



SOUNDING PLAN

INSPECTION NOTES:

- 1 The channel bottom material upstream and downstream of the culvert apron consisted of rocks and sand with a maximum probe rod penetration of 1 foot.
- 2 The concrete of both culvert boxes and headwalls exhibited light scaling on all surfaces with a typical penetration of $\frac{1}{8}$ inch and a maximum penetration of $\frac{1}{2}$ inch.
- 3 Random areas of poor concrete consolidation were observed on the walls of both culvert boxes. The areas exhibited a maximum penetration of 1 inch.
- 4 Widespread areas of poor concrete consolidation were observed on the haunches and culvert ceilings. The areas exhibited a maximum penetration on 2 inches with random areas of longitudinal and transverse reinforcing steel exposed. The areas of poor consolidation with exposed reinforcing steel covered approximately 15 percent of the total ceiling surface area and the steel exhibited less than 5 percent loss of section.
- 5 A spall was observed at the waterline, 6 feet from the east opening, on the north face of the center wall. The spall measured 1 foot in diameter with a maximum penetration of 3 inches.
- 6 Vertical hairline to $\frac{1}{16}$ inch wide cracks were observed at the midpoint of all four wingwalls, extending from the top of the wall to the concrete apron.
- 7 The culvert floor was exposed throughout the length of both culvert boxes. Random areas of silt and debris buildup, less than 1 foot thick, were observed throughout Box 1 with no significant reduction in hydraulic opening.
- 8 The concrete apron was observed at the east opening end of the culvert boxes from the midpoint of Box 1 to the midpoint of Box 2. The apron had a maximum vertical exposure of 2 inches. No undermining was observed at the apron toe.

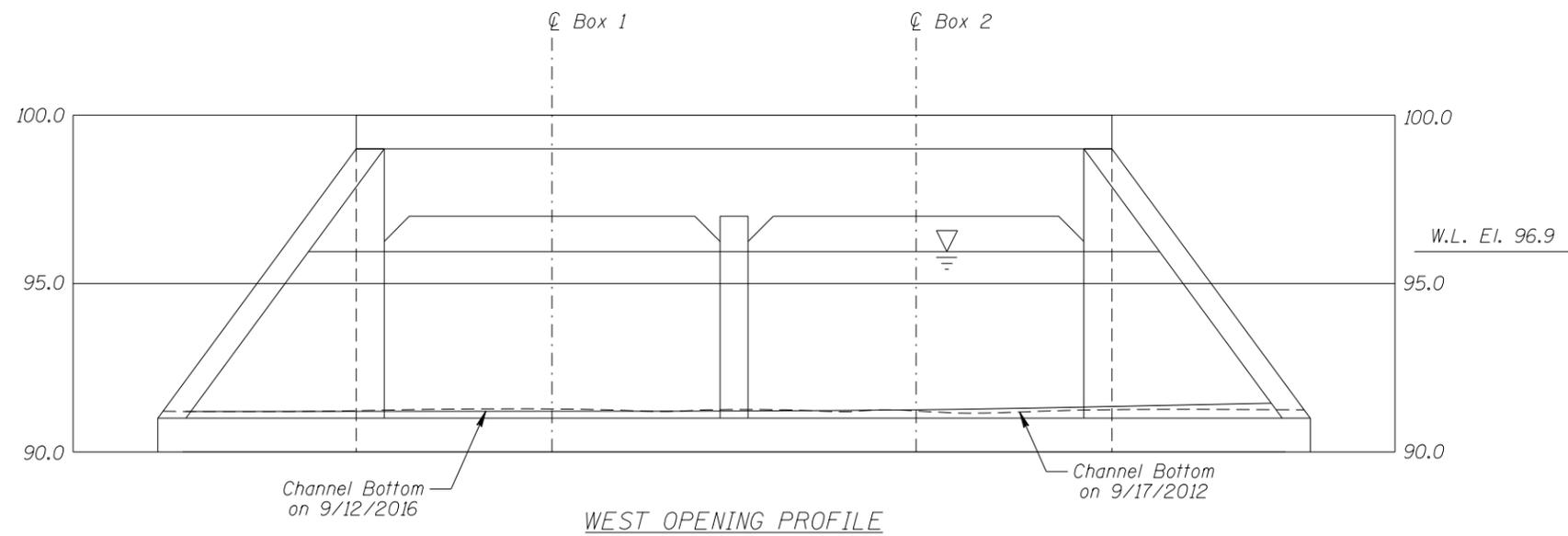
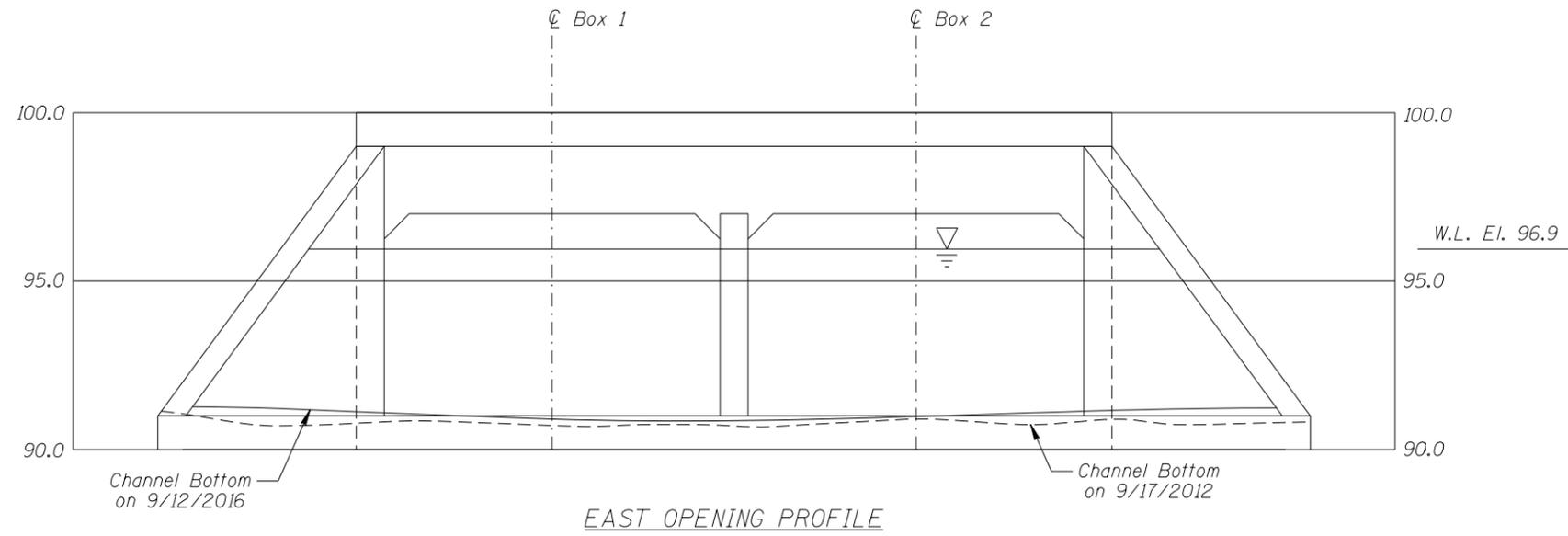
GENERAL NOTES:

1. Box 1 and Box 2 of culvert were inspected underwater.
2. At the time of inspection, on September 12, 2016, the waterline was located approximately 3.1 feet below the top of west headwall at Box 2. Since insufficient elevation information was available, an elevation of 100.0 was assumed. This corresponds to a waterline elevation of 96.9.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.

Legend

- 4.4 Sounding Depth (9/12/2016)
- 4.5 Sounding Depth (9/17/2012)

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 7688 CSAH 25 OVER THE BEAR RIVER DISTRICT 1, ST. LOUIS COUNTY		
INSPECTION AND SOUNDING PLAN		
DRAWN BY: ELN	COLLINS ENGINEERS	DATE: SEPT 12, 2016
CHECKED BY: MBP		SCALE: 1"=10'-0"
CODE: 96877688		FIGURE NO.: 1



Note:
 Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 7688 CSAH 25 OVER THE BEAR RIVER DISTRICT I, ST. LOUIS COUNTY EAST AND WEST OPENINGS		
DRAWN BY: ELN	COLLINS ENGINEERS	DATE: SEPT 12, 2016
CHECKED BY: MBP		SCALE: 1"=5'-0"
CODE: 96877688		FIGURE NO.: 2