

2016 UNDERWATER BRIDGE INSPECTION REPORT



BRIDGE # 7678 CSAH 22 over SAND RIVER

DISTRICT: District 1

COUNTY: St. Louis

CITY/TOWNSHIP: MORCOM

STATE: Minnesota

Date of Inspection: 06/20/2016

Equipment Used:

Owner: County Highway Agency

Inspected By: Janulis, Lukas

Report Written By: Lukas Janulis

Report Reviewed By:

Final Report Date:



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UNDERWATER INSPECTION

REPORT SUMMARY

The substructure units inspected at Bridge No. 7678, Box 1 and Box 2 of the culvert, were found to be in satisfactory to fair condition with only minor defects of structural significance below water. 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 at the headwall and all exhibited less than 10 percent loss of section. The concrete apron toe was exposed at the upstream opening of Box 1 with no vertical exposure present. Minor erosion was exhibited on both of the upstream and downstream banks.

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 1 foot 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 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 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 exposed 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 2 culvert floor was covered with a 5 inch thick layer of silt from the midpoint to the downstream opening.
- (I) The apron toe was exposed at the upstream opening of Box 1 with no vertical exposure present.
- (J) 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 ideally 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 #: 7678
Feature Intersected: SAND RIVER
Facility Carried: CSAH 22
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 west to east.

2. INSPECTION DATA

Professional Engineer/Team Leader: Lukas Janulis
Inspection Diver: Lukas Janulis
Date of Underwater Inspection: 06/20/2016
Weather Conditions: Sunny, 70°
Underwater Visibility (feet): 2 feet
Waterway Velocity (ft/sec): 0.5 ft/sec

3. SUBSTRUCTURE INSPECTION DATA

Substructure(s) 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(s) Inspected (feet): 4.5 feet

4. WATERLINE DATUM

Water Level Reference: Below the bottom of the south headwall at the east wall of Box 1.
Waterline Elevation (feet): 96.3 feet
Description: The waterline was located approximately 3.7 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 06/2016

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	102	LF		82	20	
870	Culvert End Treatment	2	EA		1	1	
885	Scour	1	EA	1			

UNDERWATER INSPECTION

INSPECTION PROCEDURES

The routine underwater inspection of Bridge 7678 (CSAH 22 over Sand River) was completed on June 20, 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. The inspection utilized commercial dive equipment and techniques in accordance with OSHA regulations. Channel bottom profiles were taken along the upstream and downstream openings of the culvert to determine the presence, location and area of scour.

The bridge elements inspected were the two reinforced concrete culvert boxes. 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: 7678

CSAH 22 over SAND RIVER

Date: 09/06/2016

+ GENERAL +	+ ROADWAY +	+ INSPECTION +																				
Agency Br. No. 653 Crew District 01 Maint. Area County 069 - St. Louis City Township 69047 - MORCOM Desc. Loc. 0.8 MI E OF JCT CSAH5 Sect., Twp., Range 15 - 061N - 21W Latitude 47 ° 46 ' 41.80 " Longitude 93 ° 0 ' 4.94 " Custodian 02 - County Highway Agency Owner 02 - County Highway Agency BMU Agreement Year Built 1939 MN Year Reconstructed FHWA Year Reconstructed MN Temporary Status Bridge Plan Location 3 - COUNTY Date Opened to Traffic On - Off System 1 - ON 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 22 Roadway Name or Description CSAH 22 Level of Service 1 - MAINLINE Roadway Type 2 - 2-way traffic Control Section (TH Only) Reference Point 003+00.810 Detour Length 7.0 mi. Lanes ON 2 UNDER 0 ADT 430 YEAR 2008 HCA DT ADTT % Functional Class 07 - Rural - Major Collector	Userkey 109 Structurally Deficient N Functionally Obsolete N Sufficiency Rating 80.5 Routine Inspection Date 10/26/2015 Routine Inspection Frequency 24 Inspector Name Janulis, Lukas Status A - Open																				
		+ NBI CONDITION RATINGS +																				
		Deck N Unsound Deck % Superstructure N Substructure N Channel 6 Culvert 5																				
	+ RDWY DIMENSIONS +	+ NBI APPRAISAL RATINGS +																				
	If Divided NB-EB SB-WB Roadway Width 24.00 ft. ft. Vertical Clearance ft. ft. Max. Vert. Clear. ft. ft. Horizontal Clear. ft. ft. Lateral Clearance ft. ft. Appr. Surface Width 32.0 ft. Bridge Roadway Width 0.0 ft. Median Width On Bridge ft.	Structure Evaluation 5 Deck Geometry N Underclearances N Waterway Adequacy 8 Approach Alignment 8																				
+ STRUCTURE +		+ SAFETY FEATURES +																				
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 W128D Barrel Length 51 Cantilever ID Number of Spans MAIN: 2 APPR: 0 TOTAL: Main Span Length 12.0 ft. Structure Length 26.3 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 3.50 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	+ MISC. BRIDGE DATA +																					
	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	+ IN DEPTH INSP. +																				
	+ PAINT +	<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 style="text-align: center;">Y</td> <td style="text-align: center;">60</td> <td style="text-align: center;">06/20/2016</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	Y	60	06/20/2016	Pinned Asbly.				Spec. Feat.			
	Y/N	Freq	Date																			
Frac. Critical																						
Underwater	Y	60	06/20/2016																			
Pinned Asbly.																						
Spec. Feat.																						
		+ WATERWAY +																				
		Drainage Area (sq. mi.) Waterway Opening (sf.) 192 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																				
	+ BRIDGE SIGNS +	+ CAPACITY RATINGS +																				
	Year Painted Unsound Paint % Painted Area sq. ft. Primer Type Finish Type Posted Load 0 - Not Required Traffic 0 - Not Required Horizontal 1 - Object Markers Vertical N - Not Applicable	Design Load 4 - H 20 Operating Rating 1 - H TRUCK 20.0 Inventory Rating 1 - H TRUCK 15.0 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

10/28/2016

Inspector: CO Bridge

BRIDGE 7678 CSAH 22 OVER SAND RIVER

County: St. Louis	Location: 0.8 MI E OF JCT CSAH5	Length: 26.3 ft.
City:	Route: 04 - CSAH 22 Ref. Pt.: 003+00.810	Deck Width: 0.0 ft.
Township: 69047 - MORCOM	Control Section:	Rdwy. Area/ Pct. Unsnd: sq. ft. / %
Section: 15 Township: 061N Range: 21W Maint. Area:		Paint Area/ Pct. Unsnd: sq. ft. / %
Span Type: 1 - Concrete 19 - Culvert (includes frame culverts)	Local Agency Bridge Nbr.: 653	Culvert: W128D
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: 8	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	80.5

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	09/06/2016	102 LF	0	82	20	0
		Migrated Values		102 LF	1	81	20	0
<p>Notes: [2015-2013] Leaching and leakage through construction joint on top haunch barrel 1. Leakage through culvert top south end of barrel 2. Some rebar exposed with surface corrosion and little to no section loss. [2012 Underwater] Scaling with maximum penetration of 0.25". Areas of poor consolidation with maximum penetration of 1.5". Rebar exposed top of barrel 2 with less than 5% section loss. 2x4 form board left in top of barrel 2. Areas of concrete section loss and poor consolidation along construction joints of all top haunches of both barrels with maximum penetration of 3/4". Leaching in W. barrel.</p>								
800	Critical Deficiencies or Safety Hazards	Underwater	09/06/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
<p>Notes: [2015-2013] No critical findings during this inspection.</p>								
870	Culvert End Treatment	Underwater	09/06/2016	2 EA	0	1	1	0
		Migrated Values		2 EA	0	2	0	0
<p>Notes: [2015] East half on south headwall top spalling with exposed rebar. 0.25" crack along NW wing and barrel joint. Minor to moderate scale along wetted perimeter. [2013] South headwall spalling exposing 2.5' of rebar with corrosion with minor section loss. SE wing 2' long spall on top middle of wing. Spalling along crack at top of south middle wing wall. [2012 Underwater] 15" by 6" area of concrete section loss on SE Wing with maximum penetration of 2", no exposed rebar. Diagonal crack, up to 0.25" in width, observed on SE and NW wings. Spall south headwall 15' by 1' with maximum penetration of 3". Rebar exposed with less than 10% section loss. South deteriorating, rebar exposed. Crack in NW wing. Minor cracking in S wing.</p>								
871	Roadway Over Culvert	Underwater	09/06/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
<p>Notes: [2015] Minor cracking in bituminous with no signs of settlement or undermining. [2013] Road over culvert was repaved. Bituminous.</p>								
885	Scour	Underwater	09/06/2016	1 EA	1	0	0	0
891	Other Bridge Signing	Underwater	09/06/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
<p>Notes: [2015] 2 culvert markers added, for a total of 4. No notable deterioration. [2013] 2 culvert markers present.</p>								

BRIDGE 7678 CSAH 22 OVER SAND RIVER

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
892	Slopes & Slope Protection	Underwater	09/06/2016	2 EA	0	2	0	0
		Migrated Values		2 EA	0	2	0	0
Notes: [2015-2013] Erosion behind all wings. Minor erosion on S. & NW.								
894	Deck & Approach Drainage	Underwater	09/06/2016	2 EA	0	2	0	0
		Migrated Values		2 EA	0	2	0	0
Notes: [2015] Minor shoulder erosion above all wings. [2013] No notable ponding or drainage-related slope erosion.								
900	Protected Species	Underwater	09/06/2016	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 3
 Inspected by: [2015-2013] CG.
 [2013] Possible addition to underwater inspection, water regularly high due to beaver activity.
 No Guardrail.

58. Deck NBI:

36A. Brdg Railings NBI: No rail attached to culvert.

36B. Transitions NBI: Not required due to no rail attached to culvert.

36C. Appr Guardrail NBI: South headwall 24.5' from form centerline which is inside clear zone for ADT 150 - 749. Roadway ADT is 430 in 2008. No guardrail present.

36D. Appr Guardrail Terminal NBI: South headwall 24.5' from form centerline which is inside clear zone for ADT 150 - 749. Roadway ADT is 430 in 2008. No guardrail present.

59. Superstructure NBI:

60. Substructure NBI:

61. Channel NBI: [2015] Little to no flow in channel due to beaver activity. Minor channel deterioration due to continuous high water.
 [2012 Underwater] Barrel 1 floor covered with 2" of silt from midpoint to down stream opening. Barrel 2 floor covered with 5" of silt from upstream quarter point to downstream opening. No undermining was observed. Minor erosion along stream banks.

62. Culvert NBI: [2015-2013] Leaching and leakage through construction joint on top haunch barrel 1. Leakage through culvert top south end of barrel 2. Some rebar exposed with surface corrosion and little to no section loss.
 [2012 Underwater] Scaling with maximum penetration of 0.25". Areas of poor consolidation with maximum penetration of 1.5". Rebar exposed top of barrel 2 with less than 5% section loss. 2x4 form board left in top of barrel 2. Areas of concrete section loss and poor consolidation along construction joints of all top haunches of both barrels with maximum penetration of 3/4".

71. Waterway Adeq NBI: [2015] Low spot in roadway 250' to the west that will overtop before the roadway over culvert.

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 - Upstream Opening, Looking Northeast



Photo 2 - Downstream Opening, Looking Southwest

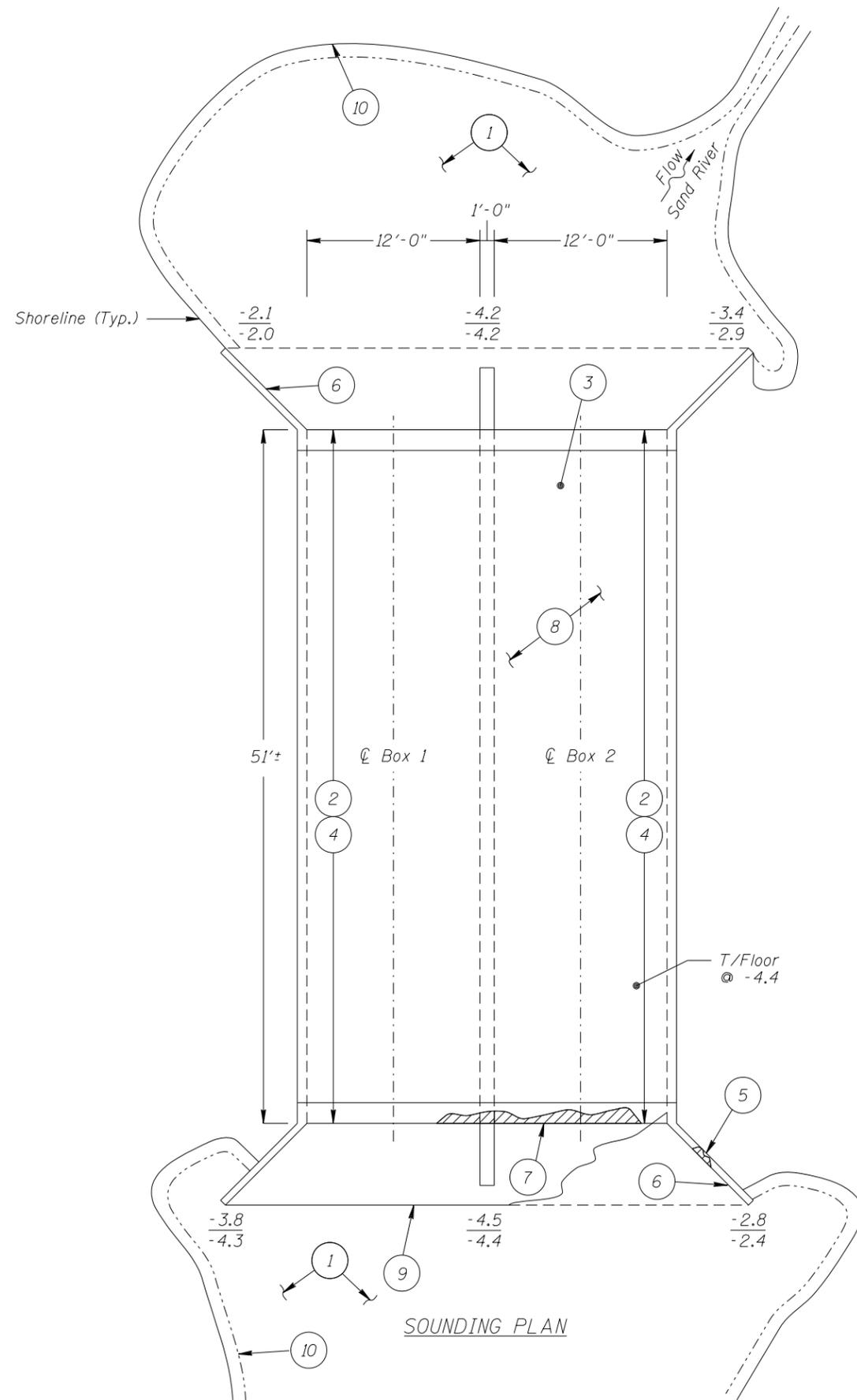
Pictures



Photo 3 - Typical Concrete Condition (Box 1 Shown), Looking West



Photo 4 - Spall along top of Upstream Headwall, Looking East



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 4 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 1 foot 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 exposed 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 2 culvert floor was covered with a 5 inch thick layer of silt from the midpoint to the downstream opening. The culvert floor within Box 1 was typically clear of any infill.
- 9 The apron toe was exposed at the upstream opening of Box 1 with no vertical exposure present.
- 10 The upstream and downstream banks exhibited minor erosion.

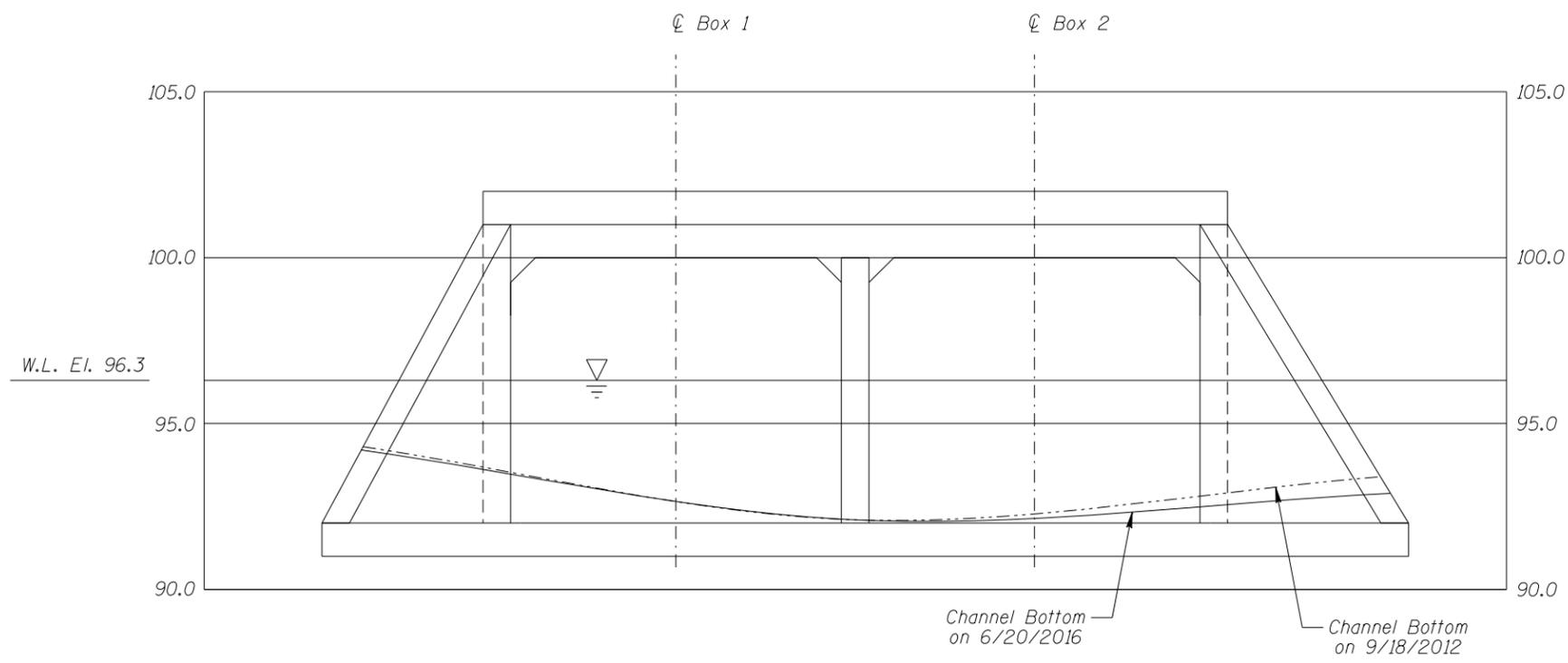
GENERAL NOTES:

1. Box 1 and Box 2 of culvert were inspected underwater.
2. At the time of inspection, on June 20, 2016, the waterline was located approximately 3.7 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 96.3.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.

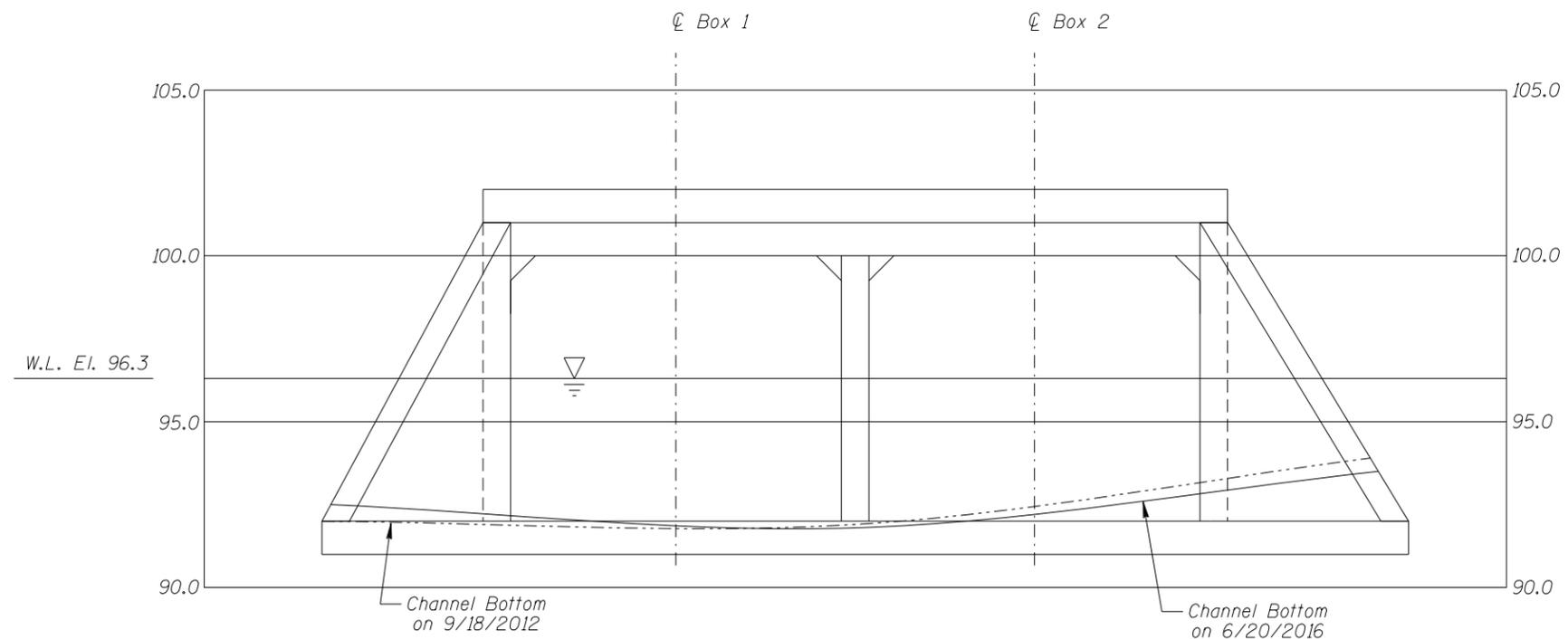
Legend

- 3.0 Sounding Depth (6/20/2016)
- 3.1 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 DISTRICT 1, ST. LOUIS COUNTY		
INSPECTION AND SOUNDING PLAN		
DRAWN BY: ELN	COLLINS ENGINEERS	DATE: JUNE 20, 2016
CHECKED BY: LJ	<small>133 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	SCALE: 1"=10'-0"
CODE: 96877678		FIGURE NO.: 1



DOWNSTREAM OPENING PROFILE



UPSTREAM OPENING PROFILE

Note:
Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 7678 CSAH 22 OVER THE SAND RIVER DISTRICT I, ST. LOUIS COUNTY		
UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
DRAWN BY: ELN	COLLINS ENGINEERS <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	DATE: JUNE 20, 2016
CHECKED BY: LJ		SCALE: 1"=5'-0"
CODE: 96877678		FIGURE NO.: 2