

# 2016 UNDERWATER BRIDGE INSPECTION REPORT



## BRIDGE # 88620 CSAH 133 over JOULA CREEK

DISTRICT: District 1

COUNTY: St. Louis

CITY/TOWNSHIP: ELMER

STATE: Minnesota

Date of Inspection: 06/24/2016

Equipment Used:

Owner: County Highway Agency

Inspected By: Janulis, Lukas

Report Written By: Lukas Janulis

Report Reviewed By:

Final Report Date:



## TABLE OF CONTENTS

	<b>PAGE NUMBER</b>
UNDERWATER SUMMARY	3
UNDERWATER INSPECTION	4
UNDERWATER INSPECTION PROCEDURES	6
STRUCTURE INVENTORY	7
ELEMENTS	8
PHOTOGRAPHS	10
BRIDGE 88620 UNDERWATER INSPECTION DRAWINGS 2016	13

## UNDERWATER INSPECTION

### REPORT SUMMARY

The culvert (Bridge No. 88620) was found to be in satisfactory to fair condition with no defects of structural significance below water. The concrete exhibited areas of poor consolidation with exposed reinforcing steel and moderate scaling with exposed large aggregate extending from the channel bottom to 2 feet above the waterline. A heavy accumulation of timber debris was present between the downstream quarter-point and the midpoint of the barrel which has caused a hydraulic drop of 2 inches. The upstream and downstream apron toes were exposed up to 0.9 feet, but no apron undermining was present at the time of the inspection.

### INSPECTION FINDINGS

(A) The channel bottom material along the upstream and downstream toe consisted of soft silt allowing 6 inches of probe rod penetration.

(B) The toe at the upstream and downstream apron was exposed with 0.9 feet of maximum vertical exposure. No apron undermining was observed.

(C) A spall with exposed reinforcing steel measured 2 feet wide by 6 inches long along the bottom of the upstream headwall. Exposed reinforcing steel typically exhibited less than 5 percent section loss.

(D) A heavy accumulation of timber debris between the downstream quarter-point and the midpoint extended from the culvert bottom to 2 feet above the waterline along the west half and from the culvert bottom to the waterline along the east half of the structure. Due to the accumulation a hydraulic drop of approximately 2 inches was observed along the west half of the culvert.

(E) A moderate accumulation of timber debris from the downstream fascia to the downstream quarter-point of the structure extended from the culvert bottom to 2 feet below the waterline.

(F) Random areas of poor consolidation were observed on the concrete ceiling of the structure with up to 2 inches of penetration. Exposed reinforcing steel was present at several locations. The exposed reinforcing steel typically exhibited less than 5 percent section loss.

(G) The concrete surfaces typically exhibited moderate scaling with up to 1/4 inch of penetration and exposed large aggregate extending from the culvert bottom to 2 feet above the waterline.

### RECOMMENDATIONS

(A) Monitor the apron toe exposure at both ends of the culvert.

(B) Remove the timber debris to restore the full hydraulic capacity.

(C) Monitor the concrete deterioration during future underwater inspections.

(E) Reinspect the culvert 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 #: 88620  
Feature Intersected: JOULA CREEK  
Facility Carried: CSAH 133  
District: District 1  
County: 069 - St. Louis  
Bridge Description:

The bridge consists of one concrete box culvert.

### 2. INSPECTION DATA

Professional Engineer/Team Leader: Lukas Janulis  
Inspection Diver: Lukas Janulis  
Date of Underwater Inspection: 06/24/2016  
Weather Conditions: Sunny, 80°F  
Underwater Visibility (feet): 1 foot  
Waterway Velocity (ft/sec): 0.5 ft/sec

### 3. SUBSTRUCTURE INSPECTION DATA

Substructure(s) Inspected: Culvert  
General Shape:

Concrete box culvert 10 feet wide by 5 feet high.

Maximum Water Depth at Substructure(s) Inspected (feet): 4.2 feet

### 4. WATERLINE DATUM

Water Level Reference: Below the bottom of the concrete ceiling at the upstream and downstream ends of the culvert.  
Waterline Elevation (feet): 98.0 feet  
Description: The waterline was located approximately 2.0 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: 5  
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	39	LF		19	20	
870	Culvert End Treatment	2	EA		2		
885	Scour	1	EA	1			

## UNDERWATER INSPECTION

### INSPECTION PROCEDURES

The routine underwater inspection of Bridge 88620 (CSAH 133 over Joula Creek) was completed on June 24, 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 faces of the culvert to determine the presence, location and area of scour.

The bridge element inspected was the concrete box culvert. 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: 88620

CSAH 133 over JOULA CREEK

Date: 08/26/2016

+ GENERAL +	+ ROADWAY +	+ INSPECTION +																				
<b>Agency Br. No.</b> 820 <b>Crew</b> <b>District</b> 01 <b>Maint. Area</b> <b>County</b> 069 - St. Louis <b>City</b> <b>Township</b> 69022 - ELMER <b>Desc. Loc.</b> 0.3 MI W OF JCT CR189 <b>Sect., Twp., Range</b> 17 - 053N - 20W <b>Latitude</b> 47 ° 4' 8.94 " <b>Longitude</b> 92 ° 54' 10.14 " <b>Custodian</b> 02 - County Highway Agency <b>Owner</b> 02 - County Highway Agency <b>BMU Agreement</b> <b>Year Built</b> 1940 <b>MN Year Reconstructed</b> <b>FHWA Year Reconstructed</b> <b>MN Temporary Status</b> <b>Bridge Plan Location</b> 0 - NO PLAN <b>Date Opened to Traffic</b> <b>On - Off System</b> 0 - OFF <b>Legislative District</b> 05B <b>Potential ABC</b> 2 - N/A	<b>Bridge Match ID (TIS)</b> 0 <b>Roadway O/U Key</b> Route On Structure <b>Route Sys</b> 04 - CSAH <b>Number</b> 133 <b>Roadway Name or Description</b> CSAH 133 <b>Level of Service</b> 1 - MAINLINE <b>Roadway Type</b> 2 - 2-way traffic <b>Control Section (TH Only)</b> <b>Reference Point</b> 007+00.430 <b>Detour Length</b> 4.0 <b>mi.</b> <b>Lanes</b> <b>ON</b> 2 <b>UNDER</b> 0 <b>ADT</b> 245 <b>YEAR</b> 2008 <b>HCA DT</b> <b>ADTT</b> % <b>Functional Class</b> 08 - Rural - Minor Collector	<b>Userkey</b> 109 <b>Structurally Deficient</b> N <b>Functionally Obsolete</b> N <b>Sufficiency Rating</b> 74.0 <b>Routine Inspection Date</b> 09/09/2014 <b>Routine Inspection Frequency</b> 24 <b>Inspector Name</b> Janulis, Lukas <b>Status</b> A - Open																				
	<b>+ RDWY DIMENSIONS +</b>	<b>+ NBI CONDITION RATINGS +</b>																				
	<b>If Divided</b> <b>NB-EB</b> <b>SB-WB</b> <b>Roadway Width</b> 30.00 <b>ft.</b> <b>ft.</b> <b>Vertical Clearance</b> <b>ft.</b> <b>ft.</b> <b>Max. Vert. Clear.</b> <b>ft.</b> <b>ft.</b> <b>Horizontal Clear.</b> <b>ft.</b> <b>ft.</b> <b>Lateral Clearance</b> <b>ft.</b> <b>ft.</b> <b>Appr. Surface Width</b> 30.0 <b>ft.</b> <b>Bridge Roadway Width</b> 0.0 <b>ft.</b> <b>Median Width On Bridge</b> <b>ft.</b>	<b>Deck</b> N <b>Unsound Deck %</b> <b>Superstructure</b> N <b>Substructure</b> N <b>Channel</b> 5 <b>Culvert</b> 5																				
<b>+ STRUCTURE +</b>	<b>+ MISC. BRIDGE DATA +</b>	<b>+ NBI APPRAISAL RATINGS +</b>																				
<b>Service On</b> 1 - Highway <b>Service Under</b> 5 - Waterway <b>Main Span Type</b> 1 - Concrete <b>Main Span Design</b> 13 - Box Culvert <b>Main Span Detail</b> <b>Appr. Span Type</b> <b>Appr. Span Design</b> <b>Appr. Span Detail</b> <b>Skew</b> 0 <b>Culvert Type</b> W105 <b>Barrel Length</b> 40 <b>Cantilever ID</b>  <b>Number of Spans</b> <b>MAIN:</b> 1 <b>APPR:</b> 0 <b>TOTAL:</b> <b>Main Span Length</b> 10.0 <b>ft.</b> <b>Structure Length</b> 11.3 <b>ft.</b> <b>Deck Width (Out-to-Out)</b> 0.0 <b>ft.</b> <b>Deck Material</b> N - Not Applicable <b>Wear Surf Type</b> 6 - Bituminous <b>Wear Surf Install Year</b> <b>Wear Course/Fill Depth</b> 1.75 <b>ft.</b> <b>Deck Membrane</b> N - Not Applicable (applies <b>Deck Rebars</b> N - Not Applicable (no deck) <b>Deck Rebars Install Year</b> <b>Structure Area (Out-to-Out)</b> 0 <b>sq. ft.</b> <b>Roadway Area (Curb-to-Curb)</b> <b>sq. ft.</b> <b>Sidewalk Width</b> 50A. Lt 0.00 <b>ft.</b> 50B. Rt 0.00 <b>ft.</b> <b>Curb Height</b> <b>Lt</b> 0.00 <b>ft.</b> <b>Rt</b> 0.00 <b>ft.</b> <b>Rail Type</b> <b>Lt</b> NN <b>Rt</b> NN	<b>Structure Flared</b> 0 - No flare <b>Parallel Structure</b> N - No parallel structure <b>Field Conn. ID</b> <b>Abutment Foundation (Material/Type)</b> N - N/A <b>Pier Foundation (Material/Type)</b> N - N/A  <b>Historic Status</b> 5 - Not eligible	<b>Structure Evaluation</b> 5 <b>Deck Geometry</b> N <b>Underclearances</b> N <b>Waterway Adequacy</b> 9 <b>Approach Alignment</b> 8																				
	<b>+ PAINT +</b>	<b>+ SAFETY FEATURES +</b>																				
	<b>Year Painted</b> <b>Unsound Paint %</b> <b>Painted Area</b> <b>sq. ft.</b> <b>Primer Type</b> <b>Finish Type</b>	<b>Bridge Railing</b> N - NOT REQUIRED <b>GR Transition</b> N - NOT REQUIRED <b>Appr. Guardrail</b> 1 - MEETS STANDARDS <b>GR Termini</b> 1 - MEETS STANDARDS																				
	<b>+ BRIDGE SIGNS +</b>	<b>+ IN DEPTH INSP. +</b>																				
	<b>Posted Load</b> 0 - Not Required <b>Traffic</b> 0 - Not Required <b>Horizontal</b> 1 - Object Markers <b>Vertical</b> N - Not Applicable	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 10%; text-align: center;">Y/N</th> <th style="width: 10%; text-align: center;">Freq</th> <th style="width: 10%; text-align: center;">Date</th> </tr> </thead> <tbody> <tr> <td><b>Frac. Critical</b></td> <td></td> <td></td> <td></td> </tr> <tr> <td><b>Underwater</b></td> <td></td> <td></td> <td style="text-align: right;">06/24/2016</td> </tr> <tr> <td><b>Pinned Asbly.</b></td> <td></td> <td></td> <td></td> </tr> <tr> <td><b>Spec. Feat.</b></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Y/N	Freq	Date	<b>Frac. Critical</b>				<b>Underwater</b>			06/24/2016	<b>Pinned Asbly.</b>				<b>Spec. Feat.</b>			
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<b>Spec. Feat.</b>																						
		<b>+ WATERWAY +</b>																				
		<b>Drainage Area (sq. mi.)</b> <b>Waterway Opening (sf.)</b> 50 <b>Navigation Control</b> 0 - No nav. control on <b>Pier Protection</b> - <b>Nav. Clr. (ft.)</b> <b>Vert.</b> 0.0 <b>Horiz.</b> 0.0 <b>Nav. Vert. Lift Bridge Clear. (ft.)</b> <b>MN Scour Code</b> E - CULVERT <b>Year</b>																				
		<b>+ CAPACITY RATINGS +</b>																				
		<b>Design Load</b> 0 - Other/Unknown <b>Operating Rating</b> 1 - H TRUCK                    18.0 <b>Inventory Rating</b> 1 - H TRUCK                    12.0 <b>Posting VEH:</b> <b>SEMI:</b> <b>DBL:</b> <b>Rating Date</b> 2/1/1991  <b>Overweight Permit Codes</b> <b>A</b> N - N/A <b>B</b> N - N/A <b>C</b> N - N/A																				

**MINNESOTA BRIDGE INSPECTION REPORT**

09/06/2016

Inspector: CO Bridge

**BRIDGE 88620 CSAH 133 OVER JOULA CREEK**

County: St. Louis	Location: 0.3 MI W OF JCT CR189	Length: 11.3 ft.
City:	Route: 04 - CSAH 133 Ref. Pt.: 007+00.430	Deck Width: 0.0 ft.
Township: 69022 - ELMER	Control Section:	Rdwy. Area/ Pct. Unsnd: sq. ft. / %
Section: 17 Township: 053N Range: 20W Maint. Area:		Paint Area/ Pct. Unsnd: sq. ft. / %
Span Type: 1 - Concrete 19 - Culvert (includes List: frame culverts)	Local Agency Bridge Nbr.: 820	Culvert: W105
NBI Deck: N Super: N Sub: N Chan: 5 Culv: 5		Postings:
	Open, Posted, Closed: A - Open	
	MN Scour Code: E - CULVERT	

Appraisal Ratings - Approach: 8 Waterway: 9		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 74.0

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	08/26/2016	39 LF	0	19	20	0
		Migrated Values		39 LF	0	19	20	0
	Notes: [2015] Heavy scale exposing aggregates throughout culvert bottom and walls with loss of some aggregate. Scale on culvert top is moderate. Areas of rebar exposed on culvert top 2' in from north end and a 2' x 2' area 12' in from north end. Exposed rebar has corrosion with section loss. [2014] Water within 6" of culvert top. [2013 Oct.] Culvert Shows moderate scaling at wetted perimeter							
800	Critical Deficiencies or Safety Hazards	Underwater	08/26/2016	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	08/26/2016	2 EA	0	2	0	0
		Migrated Values		2 EA	0	2	0	0
	Notes: [2015] Heavy scale on wings and apron bottoms with loss of some aggregate. [2014-2013 Oct.] Both headwalls have scaling and spalling. Moderate scaling at wetted perimeter of both aprons. [2013 May] South headwall shows minor deterioration.							
871	Roadway Over Culvert	Underwater	08/26/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
	Notes: [2015] No signs of settlement or undermining. Chip seal was added to roadway in July 2015. [2014] Roadway reclaimed and overlaid in 2014. [2013] Minor sealed cracks. Bituminous.							
885	Scour	Underwater	08/26/2016	1 EA	1	0	0	0
891	Other Bridge Signing	Underwater	08/26/2016	1 EA	0	0	1	0
		Migrated Values		1 EA	0	0	1	0
	Notes: [2015-2013 Oct.] No culvert markers present. 4 plow markers for guardrail.							
892	Slopes & Slope Protection	Underwater	08/26/2016	2 EA	0	2	0	0
		Migrated Values		2 EA	0	2	0	0
	Notes: [2015] Some erosion around wing ends. [2014-2013] No Erosion present. Slopes are protected by vegetation.							

**BRIDGE 88620 CSAH 133 OVER JOULA CREEK**

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
893	Guardrail	Underwater	08/26/2016	1 EA	0	1	0	0
		Migrated Values		1 EA	0	1	0	0
Notes: [2015-2014] Guardrail leaning out from road way. [2013 Oct.] No deterioration. Flex Beam w/ ET 2000 ends. Needs to be aligned vertically.								
894	Deck & Approach Drainage	Underwater	08/26/2016	2 EA	2	0	0	0
		Migrated Values		2 EA	2	0	0	0
Notes: [2015] Minor washing of north and south shoulders above culvert from drainage. [2014-2013] No notable drainage related slope erosion.								
900	Protected Species	Underwater	08/26/2016	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 5  
 Inspected by: [2015] CG, TM : [2014] CG, BH : [2013 Oct.] JRS, JDO  
 [2015] Update inspection due water level finally low enough to walk through culvert.  
 [2014] Water within 6' if culvert top. Underwater inspection recommended.  
 [2013 Oct.] Update inspection completed. Approx 12" of free board. Underwater inspection recommended.  
 [2013] May 8 Water within 6" of culvert top return inspection required. Candidate for under water inspection due water being regularly too high for proper inspection.

58. Deck NBI:

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

36B. Transitions NBI: No rail attached to the culvert, no transitions required.

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] Moderate bank erosion and slumping from regular high water. Debris in middle of culvert from old beaver dam or accumulation from removal of old dam. Debris is blocking 75% of culvert. Some scour along edge of apron bottoms but no undermining of aprons.  
 [2014] Possible beaver dam to south. Large pool at outlet of culvert .

62. Culvert NBI: [2015] Heavy scale exposing aggregates throughout culvert bottom and walls with some loss of aggregate. Scale on culvert top is moderate. Areas of rebar exposed on culvert top 2' in from north end and a 2' x 2' area 12' in from north end. Exposed rebar has corrosion with section loss.  
 [2014] Water within 6" of culvert top.  
 [2013 Oct.] Culvert Shows moderate scaling at wetted perimeter

71. Waterway Adeq NBI: [2015-2014] Water did not over top the road during the 2012 flood which was over a 500 year event.

72. Appr Roadway Alignment NBI: [2015-2014] No sight distance issues or speed reduction required. Road is flat and straight.

Inventory Notes:

Inspector's Signature

Reviewer's Signature

## Pictures



Photo 1 - Upstream Opening, Looking South



Photo 2 - Downstream Opening, Looking Northeast

## Pictures



Photo 3 - Typical Poor Consolidation with Exposed Reinforcing Steel (Ceiling Shown)

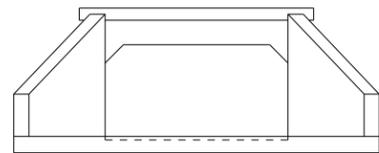
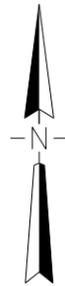


Photo 4 - Typical Concrete Scaling, Looking West

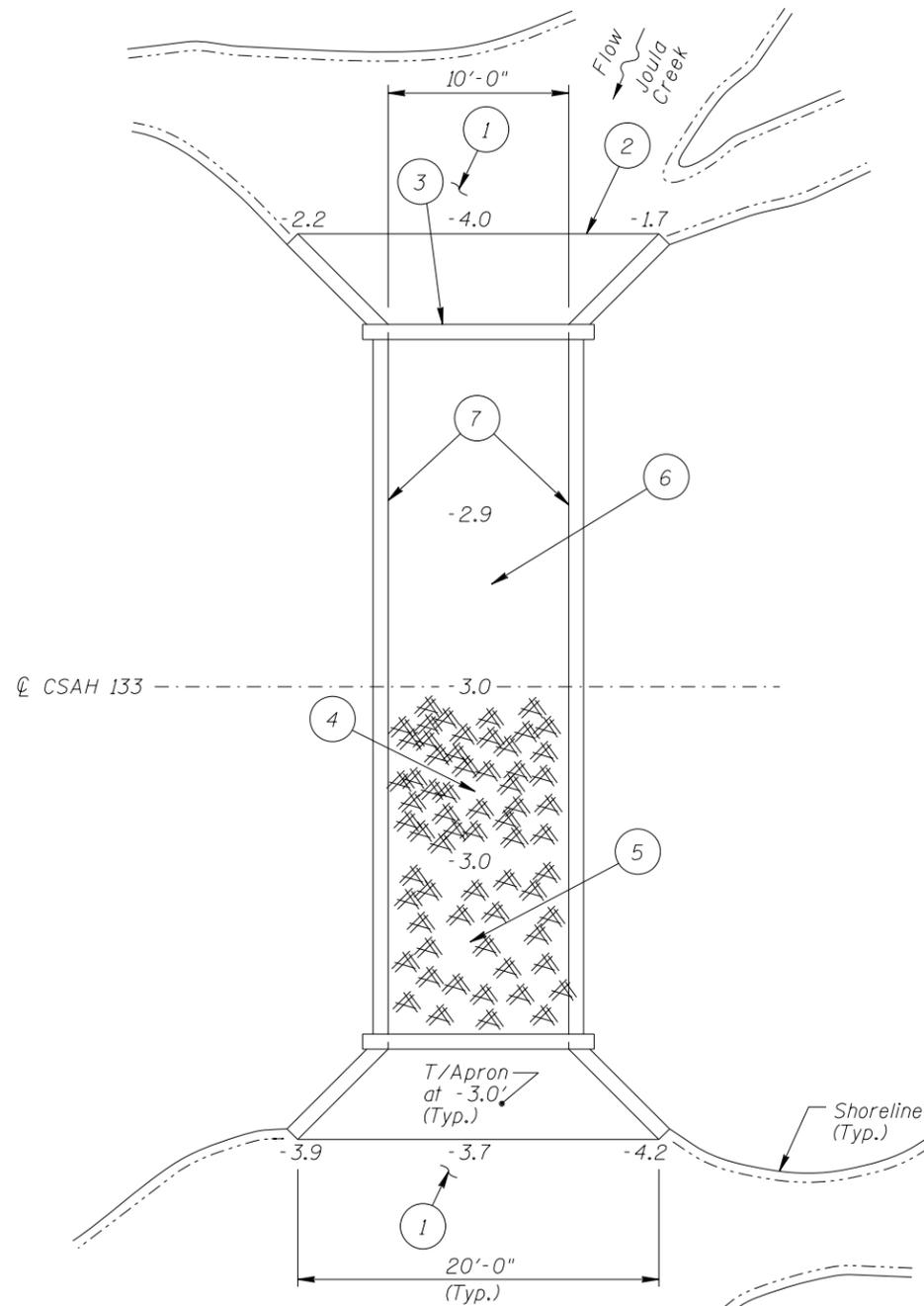
## Pictures



Photo 5 - Timber Debris Accumulation, Looking South



TYPICAL END VIEW OF CULVERT



SOUNDING PLAN

INSPECTION NOTES:

- 1 Channel bottom material along the upstream and downstream toe consisted of soft silt allowing 6 inches of probe rod penetration.
- 2 Toe at the upstream and downstream apron was exposed with 0.9 feet of maximum vertical exposure. No apron undermining was observed.
- 3 Spall with exposed reinforcing steel measured 2 feet wide by 6 inches long along the bottom of the upstream headwall. Exposed reinforcing steel typically exhibited less than 5 percent section loss.
- 4 Heavy accumulation of timber debris between the downstream quarter-point and the midpoint extended from the culvert bottom to 2 feet above the waterline along the west half and from the culvert bottom to the waterline along the east half of the structure. Due to the accumulation a hydraulic drop of approximately 2 inches was observed along the west half of the culvert.
- 5 Moderate accumulation of timber debris from the downstream fascia to the downstream quarter-point of the structure extended from the culvert bottom to 2 feet below the waterline.
- 6 Random areas of poor consolidation were observed on the concrete ceiling of the structure with up to 2 inches of penetration. Exposed reinforcing steel was present at several locations. The exposed reinforcing steel typically exhibited less than 5 percent section loss.
- 7 Concrete surfaces typically exhibited moderate scaling with up to 1/4 inch of penetration and exposed large aggregate extending from the culvert bottom to 2 feet above the waterline.

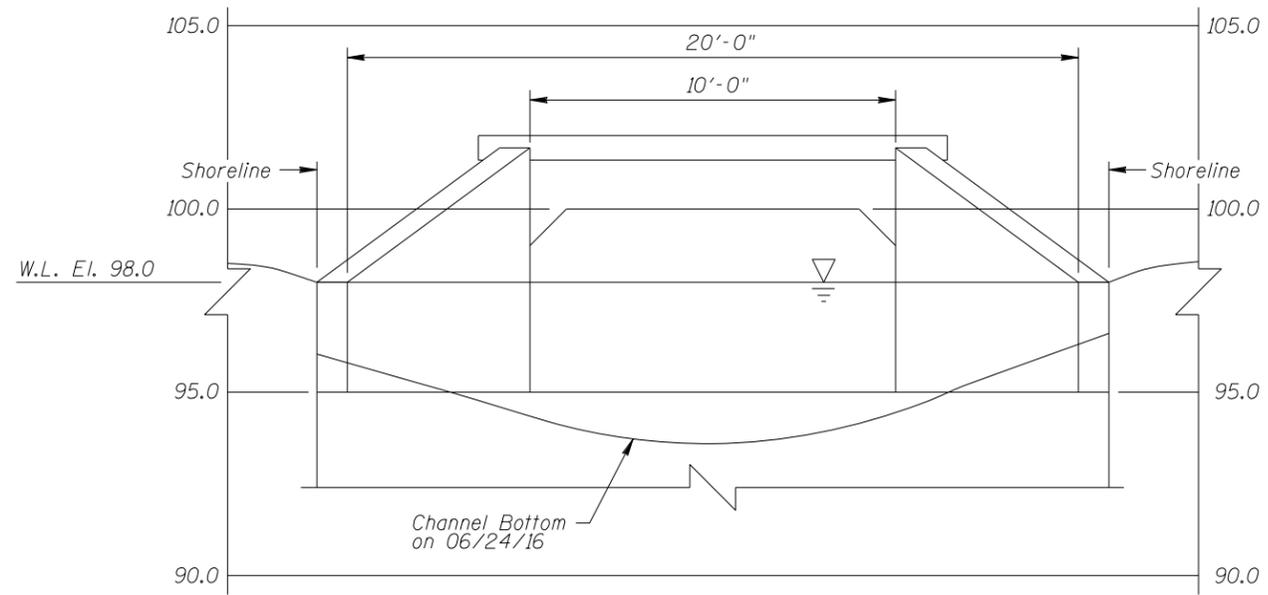
GENERAL NOTES:

1. Concrete culvert was inspected underwater.
2. At the time of inspection on June 24, 2016, the waterline was located approximately 2 feet below the bottom of the concrete ceiling at the upstream and downstream ends of the culvert. Since elevation information was not available, a reference elevation of 100.0 was assumed. Based on the assumed reference the waterline elevation was 98.0.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.
4. Soundings were taken parallel to the toe at the upstream and downstream ends and at the quarter-points along the center of the structure.

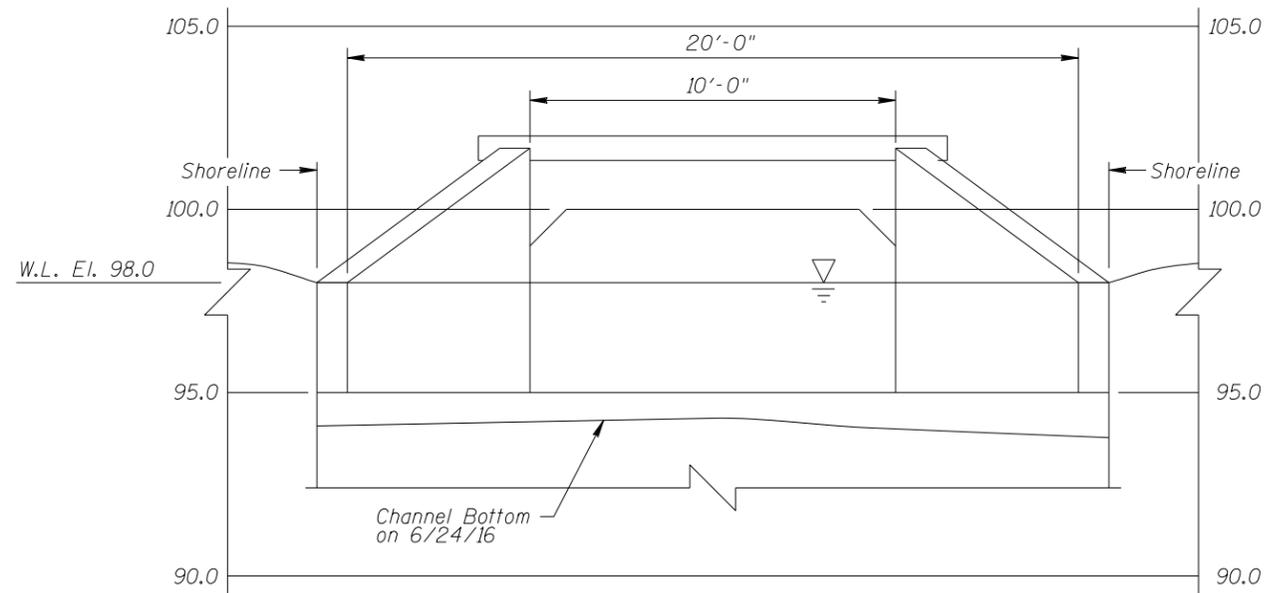
Legend

- 5.8 Sounding Depth from Waterline (6/24/16)
- Timber Debris

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 88620 CSAH 133 OVER JOULA CREEK DISTRICT I, ST. LOUIS COUNTY		
INSPECTION AND SOUNDING PLAN		
DRAWN BY: PRH	<b>COLLINS ENGINEERS</b> <small>Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	DATE: JUNE 24, 2016
CHECKED BY: LJ		SCALE: NTS
CODE: 968788620		FIGURE NO.: 1



UPSTREAM FASCIA PROFILE



DOWNSTREAM FASCIA PROFILE

*Note:*  
Refer to Figure 1 for General Notes.

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 88620 CSAH 133 OVER JOULA CREEK DISTRICT I, ST. LOUIS COUNTY		
<b>UPSTREAM AND DOWNSTREAM FASCIA PROFILES</b>		
DRAWN BY: PRH	<b>COLLINS ENGINEERS</b> <small>123 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	DATE: JUNE 24, 2016
CHECKED BY: LJ		SCALE: 1"=5'-0"
CODE: 968788620		FIGURE NO.: 2