

UNDERWATER BRIDGE INSPECTION REPORT

---

STRUCTURE NO. 88631

CR 958

OVER A

STREAM

ST. LOUIS COUNTY

---



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. 7763, a single concrete box culvert, was found to be in satisfactory condition with only minor defects of structural significance. All concrete surfaces were generally smooth and sound. Several vertical cracks with efflorescence, up to 1/8 inch wide, were observed extending from the channel bottom to the culvert ceiling. Areas of concrete section loss were associated with the cracks measuring up to 2 inches wide with 1 inch of penetration. A longitudinal 1/32 inch wide crack was observed along the bottom of both haunches. A small area of the top of the concrete apron was exposed at the upstream end of the culvert. No vertical apron exposure was observed. Scattered timber debris consisting of branchy material was observed throughout the culvert. Minor erosion was present behind the wingwalls at the south end.

INSPECTION FINDINGS:

- (A) The channel bottom material consisted of soft silt with a maximum probe rod penetration of 1 foot.
- (B) The concrete of the culvert was typically smooth and sound.
- (C) Voids with efflorescence (1/2 inch diameter holes) were observed throughout the culvert spaced at approximately 5 feet on center, at 3 feet above the waterline on both walls. The voids appeared to be formed.
- (D) Vertical cracks with efflorescence, up to 1/8 inch wide, were observed on both walls of the culvert extending from the channel bottom to the ceiling at the upstream end, the midpoint, and the downstream end of the culvert. The cracks had areas of associated concrete section loss up to 2 inches wide with 1 inch of penetration.
- (E) A longitudinal crack was observed at the bottom of the haunch on both sides of the culvert. The cracks were up to 1/32 inch wide and ran the entire length of the culvert.
- (F) A 3 foot diameter area of apron was exposed at the upstream end of the culvert. Only the top of the apron was exposed, no vertical exposure was observed.

- (G) All four wingwalls exhibited random vertical cracks with efflorescence extending from the channel bottom to the top of the wingwall. The cracks had a maximum width of 1/16 inch.
- (H) Scattered timber debris, consisting of small branches, was observed throughout the culvert length.
- (I) There were two areas of minor erosion behind the south wingwalls measuring approximately 2 feet deep and 3 feet long.

RECOMMENDATIONS:

- (A) Monitor vertical cracks and associated areas of concrete section loss.
- (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.

*[Signature]*  
Daniel G. Stromberg

Registered Professional  
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 88631

Feature Crossed: Stream

Feature Carried: CR 958

Location: St. Louis County

Bridge Description: The culvert consists of a reinforced concrete single box culvert.

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, 55°F

Underwater Visibility: 1.0 foot

Waterway Velocity: None/Negligible

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Concrete Box Culvert

General Shape: The culvert consists of one reinforced concrete box barrel measuring 10 feet wide by 8 feet high and 54 feet long.

Maximum Water Depth at Substructure Inspected: Approximately 4.5 feet.

4. WATERLINE DATUM

Water Level Reference: The bottom of the south headwall.

Water Surface: The waterline was approximately 5.5 feet below reference.  
Assumed Waterline Elevation = 94.5 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	54	LF	48	6	0	0	n/a
387	Concrete Wingwalls	4	EA	0	4	0	0	n/a
388	Culvert Headwall	2	EA	1	1	0	0	n/a
985	Slopes and Slope Protection	1	EA	1	0	0	n/a	n/a



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



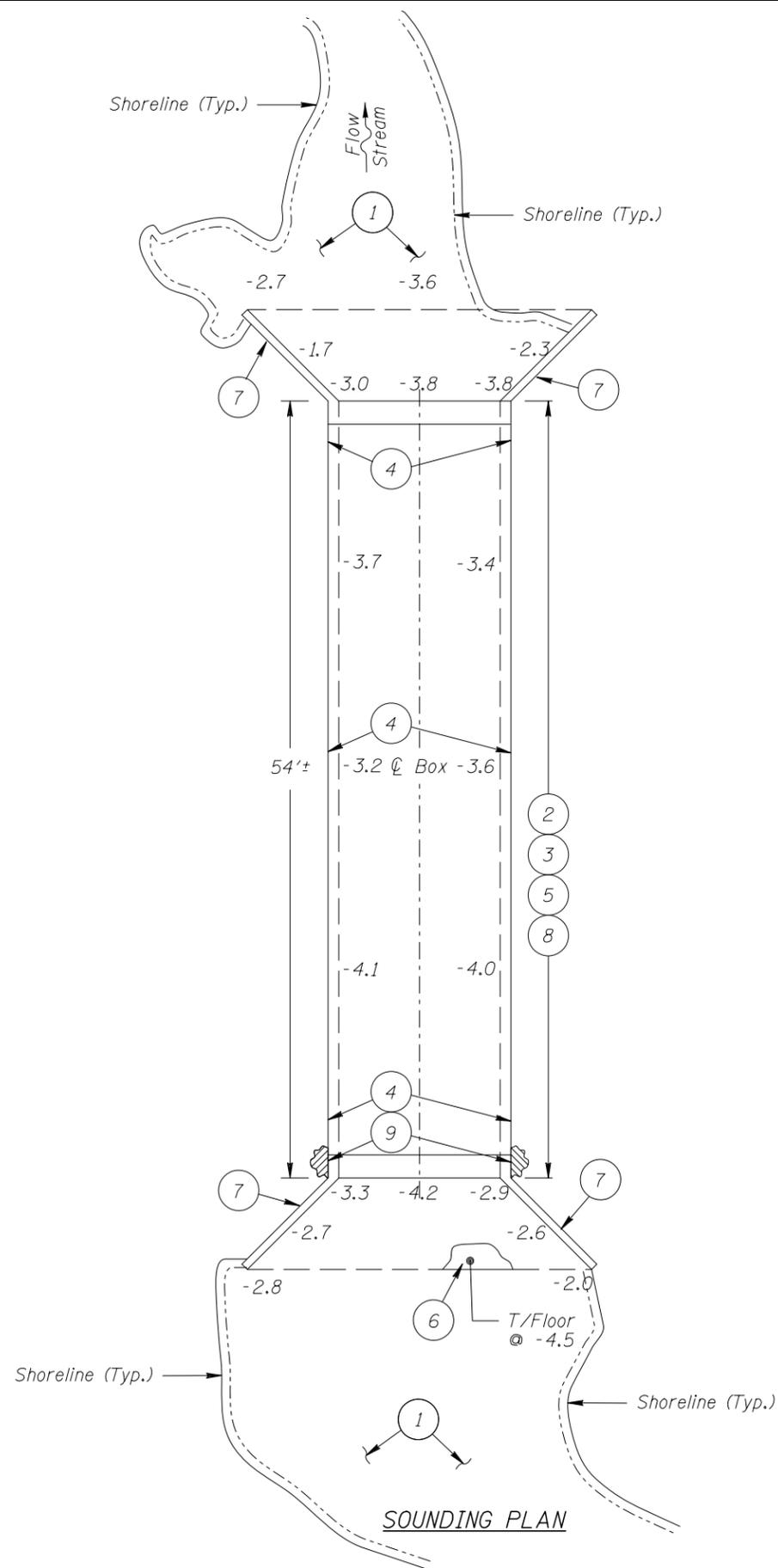
Photograph 2. View of Voids in Concrete With Efflorescence, Looking West.



Photograph 3. View of Longitudinal Crack at the Bottom of the Concrete Haunch, Looking East.



Photograph 4. View of Vertical Crack at Southeast Corner of the Culvert, Looking East and Up.



**INSPECTION NOTES:**

- 1 The channel bottom material consisted of soft silt with a maximum probe rod penetration of 1 foot.
- 2 The concrete of the culvert was typically smooth and sound.
- 3 Voids with efflorescence ( $\frac{1}{2}$  inch  $\phi$  holes) were observed throughout the culvert spaced at approximately 5 feet on center, at 3 feet above the waterline on both walls. Voids appeared to be formed.
- 4 Vertical cracks with efflorescence, up to  $\frac{1}{8}$  inch wide, were observed on both walls of the culvert extending from the channel bottom to the ceiling at the upstream end, the midpoint, and the downstream end of the culvert. The cracks had areas of associated concrete section loss up to 2 inches wide with 1 inch of penetration.
- 5 A longitudinal crack was observed at the bottom of the haunch on both sides of the culvert. The cracks were up to  $\frac{1}{32}$  inch wide and ran the entire length of the culvert.
- 6 A 3 foot diameter area of apron was exposed at the upstream end of the culvert. Only the top of the apron was exposed, no vertical exposure was observed.
- 7 All four wingwalls exhibited random vertical cracks with efflorescence extending from the channel bottom to the top of the wingwall. The cracks had a maximum width of  $\frac{1}{16}$  inch.
- 8 Scattered timber debris, consisting of small branches, was observed throughout the culvert length.
- 9 There were two areas of minor erosion behind the south headwall measuring approximately 2 feet deep and 3 feet long.

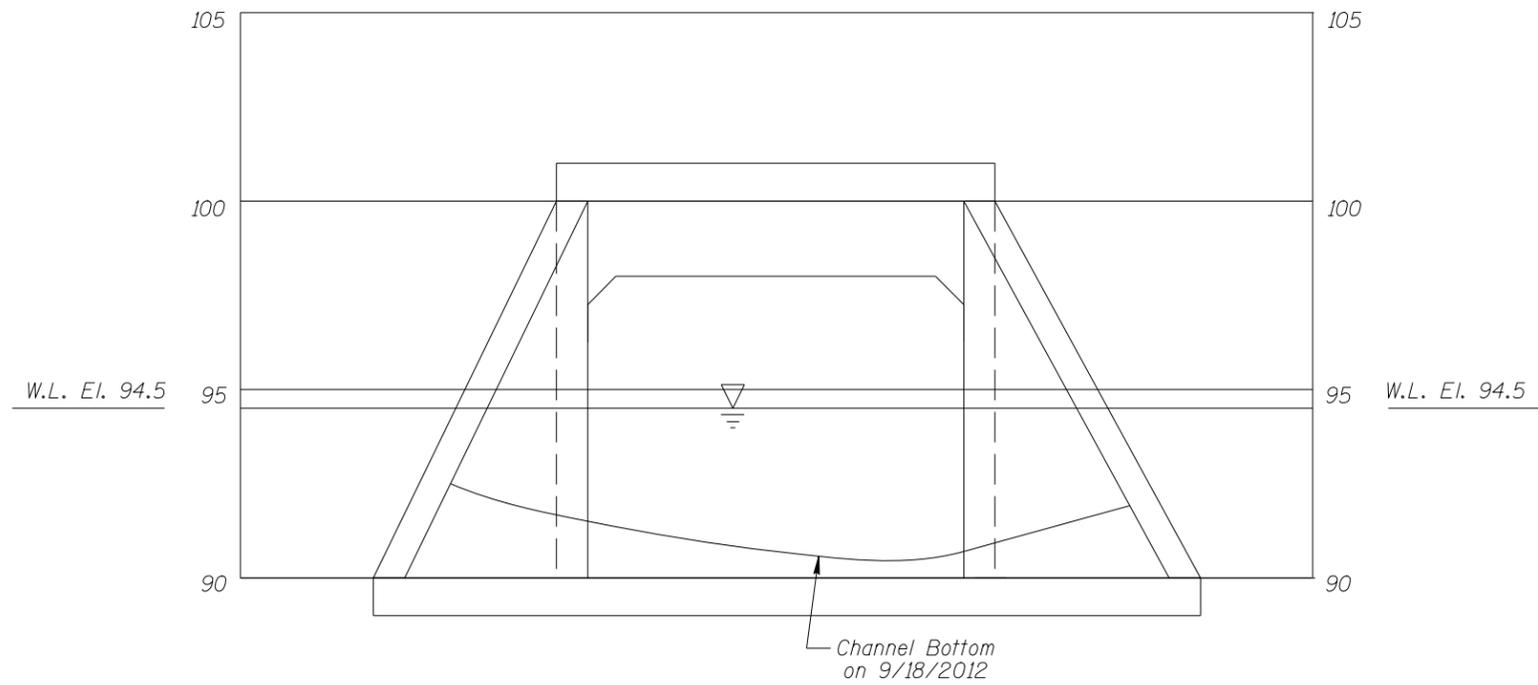
**GENERAL NOTES:**

1. The concrete box culvert was inspected underwater.
2. At the time of inspection, on September 18, 2012, the waterline was located approximately 5.5 feet below the bottom of the south headwall. Since insufficient elevation information was available, an elevation of 100.0 was assumed. This corresponds to a waterline elevation of 94.5.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.

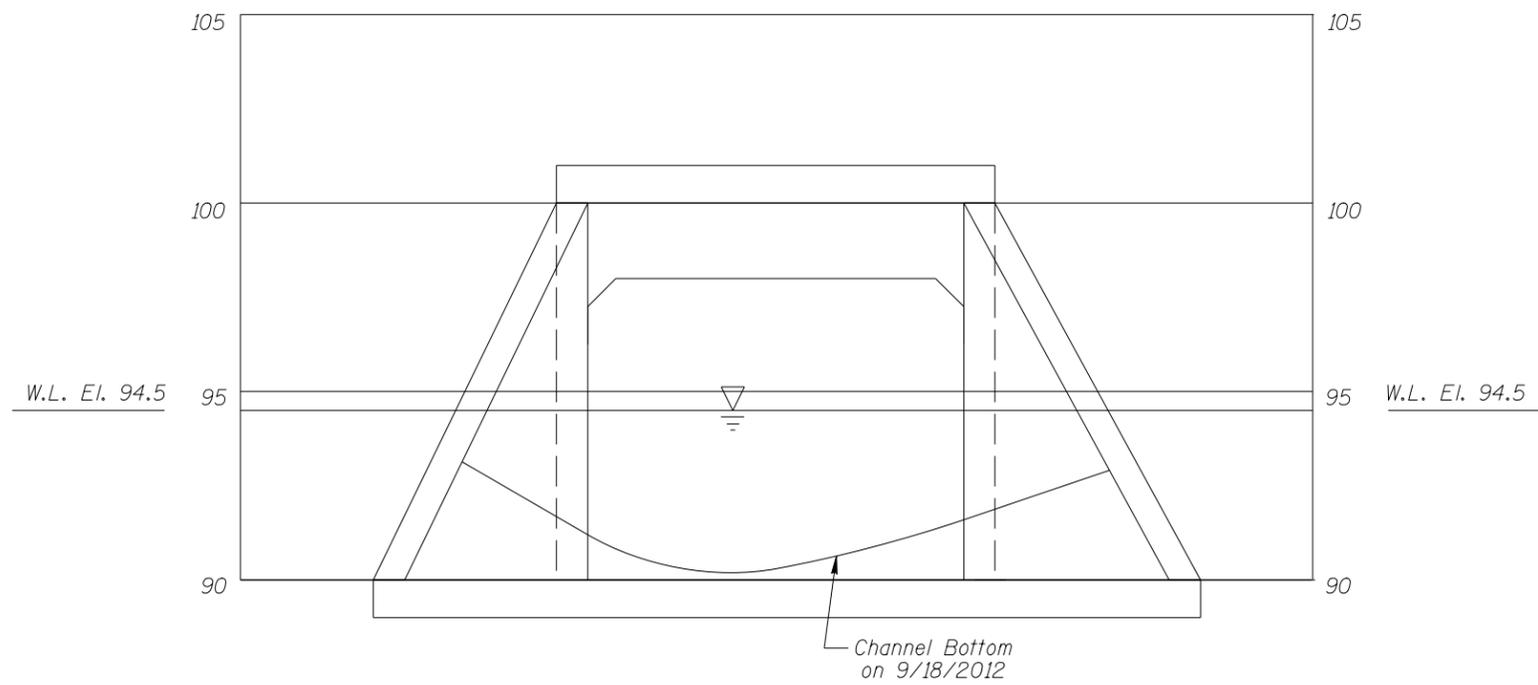
**Legend**

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

<b>MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION</b>		
STRUCTURE NO. 88631 CR 958 OVER A STREAM ST. LOUIS COUNTY		
<b>INSPECTION AND SOUNDING PLAN</b>		
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: N.T.S.
Code: 742388631		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. 8863I CR 958 OVER A STREAM ST. LOUIS COUNTY		
UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
Drawn By: MBP	<b>COLLINS ENGINEERS</b>	Date: OCTOBER 2012
Checked By: LJ		Scale: 1"=5'
Code: 74238863I		Figure No.: 2

123 North Wacker Drive  
Suite 900  
Chicago, IL 60606  
(312) 704-9300  
www.collinsengr.com

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: 88631 WEATHER: Sunny, 55° F

WATERWAY CROSSED: Stream

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: 1:15 P.M.

TIME OUT OF WATER: 2:00 P.M.

WATERWAY DATA: VELOCITY None/Negligible

VISIBILITY 1 foot

DEPTH 4.5 feet maximum at the south opening

ELEMENTS INSPECTED: Concrete Box Culvert

REMARKS: Overall, the substructure unit inspected was found to be in satisfactory condition with only minor defects of structural significance. All concrete surfaces were generally smooth and sound. Several vertical cracks with efflorescence, up to 1/8 inch wide, were observed extending from the channel bottom to the culvert ceiling. Areas of concrete section loss were associated with the cracks measuring up to 2 inches wide with 1 inch of penetration. A longitudinal 1/32 inch wide crack was observed along the bottom of both haunches. A small area of the top of the concrete apron was exposed at the upstream end of the culvert. No vertical apron exposure was observed. Scattered timber debris consisting of branchy material was observed throughout the culvert. Minor erosion was present behind the wingwalls at the south end.

FURTHER ACTION NEEDED:  YES  NO

Monitor vertical cracks and associated areas of concrete section loss.

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

MINNESOTA DEPARTMENT OF TRANSPORTATION  
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 88631  
 INSPECTORS Collins Engineers, Inc.  
 ON-SITE TEAM LEADER Nicholas R. Triandafilou, P.E.  
 WATERWAY CROSSED Stream

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 Box Culvert	4.5'	N	6	N	N	6	6	N	6	N	6	6	6	N	N	6	N	N

\*UNDERWATER PORTION ONLY

REMARKS: Overall, the substructure unit inspected was found to be in satisfactory condition with only minor defects of structural significance. All concrete surfaces were generally smooth and sound. Several vertical cracks with efflorescence, up to 1/8 inch wide, were observed extending from the channel bottom to the culvert ceiling. Areas of concrete section loss were associated with the cracks measuring up to 2 inches wide with 1 inch of penetration. A longitudinal 1/32 inch wide crack was observed along the bottom of both haunches. A small area of the top of the concrete apron was exposed at the upstream end of the culvert. No vertical apron exposure was observed. Scattered timber debris consisting of branchy material was observed throughout the culvert. Minor erosion was present behind the wingwalls at the south end.

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.