

UNDERWATER BRIDGE INSPECTION REPORT

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STRUCTURE NO. L8500  
WEST GATE BLVD (MUN 191)  
OVER  
KEENE CREEK  
CITY OF DULUTH

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DECEMBER 3, 2012

PREPARED FOR THE

MINNESOTA DEPARTMENT OF TRANSPORTATION

BY

COLLINS ENGINEERS, INC.

AND

WSB & ASSOCIATES, INC.

JOB NO. 2107

MINNESOTA DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The structure unit inspected at Structure No. L8500, the culvert barrel, was found in fair to poor condition, but overall appeared stable. The concrete of the arch exhibited up to 1/8 inch deep scaling from 1 foot above the waterline to the channel bottom. Widespread cracking with efflorescence was also observed and numerous small concrete spalls with exposed reinforcing steel were present throughout the culvert. Areas of undermining were observed due to deterioration of concrete and bedrock erosion along the bottom of the culvert walls. The undermining cavities measured up to 1 foot vertically with 1.5 foot of maximum horizontal penetration. Moderate slope erosion was noted above water behind the northwest wingwall.

INSPECTION FINDINGS:

- (A) The culvert floor consisted of bedrock and was clear of debris and sedimentation.
- (B) Random cracks up to 1/8 inch wide with efflorescence were observed throughout the culvert walls and ceiling.
- (C) Several small spalls with exposed reinforcing were present along the length of the culvert.
- (D) Up to 1/8 inch deep scaling was observed from 1 foot above the waterline to the channel bottom.
- (E) Areas of undermining measuring up to 1 foot vertically and 1.5 feet of penetration were observed along the culvert walls.

RECOMMENDATIONS:

- (A) Repair the undermining along the culvert walls.
- (B) Monitor timber debris accumulation during future inspections.
- (C) Repair eroded slope behind the northwest wingwall.
- (D) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of sixty (60) months.

Inspection Team Leader

WSB and Associates



Barritt Lovelace  
Registered Professional Engineer  
Bridge Safety Inspection Team Leader

Respectfully submitted,

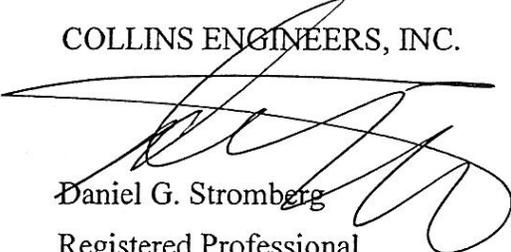
PROFESSIONAL ENGINEER

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: L8500

Feature Crossed: Keene Creek

Feature Carried: West Gate Blvd

Location: City of Duluth

Bridge Description: The structure consists of a single barrel concrete arch culvert with tapered wingwalls at both openings.

2. INSPECTION DATA

Professional Engineer/Team Leader: Barritt Lovelace, P.E. (WSB)

Dive Team: Kasey L. Yoder (WSB)

Date: December 3, 2012

Weather Conditions: Light Rain, 40° F

Underwater Visibility: 6 feet

Waterway Velocity: 3.0 ft/s

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Reinforced Arch Culvert.

General Shape: The structure consists of reinforced concrete arch culvert.

Maximum Water Depth at Substructure Inspected: Approximately 3.8 feet.

4. WATERLINE DATUM

Water Level Reference: The bottom of headwall at the downstream opening.  
Assumed Elevation = 100.0

Water Surface: The waterline was approximately 4.5 feet below reference.  
Assumed Waterline Elevation = 95.5

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

Item 62: Culvert: Code 4

Item 61: Channel and Channel Protection: Code 5

Item 92B: Underwater Inspection: Code A/12/12

Item 113: Scour Critical Bridges: Code E

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

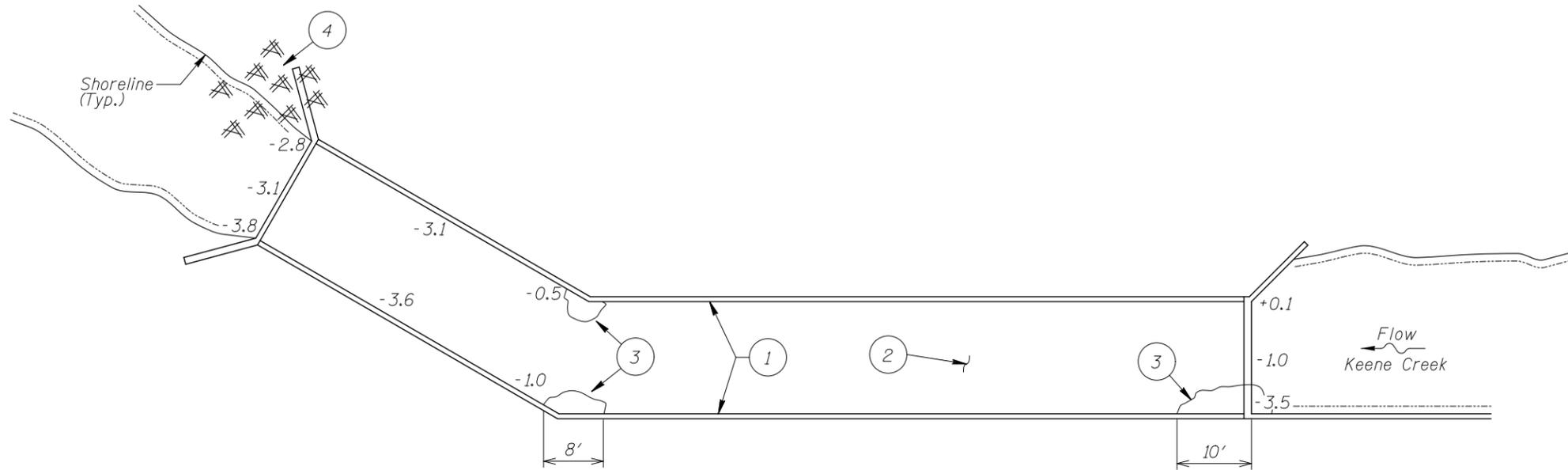
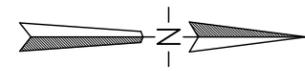
Item #	Element Description	Quantity	Unit	Conditions				
				1	2	3	4	5
144	Reinforced Concrete Arch	135	LF	94	20	20		



Photograph 1. Overall View of the Upstream Opening, Looking Southeast.



Photograph 2. Overall View of the Downstream Opening, Looking North.



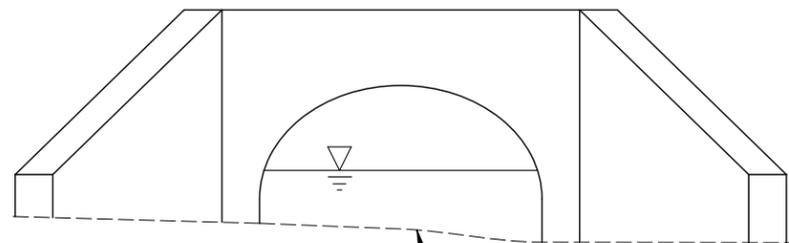
SOUNDING PLAN

INSPECTION NOTES:

- ① The concrete exhibited cracking up to 1/8 inch wide with efflorescence along culvert walls and ceiling. Several small spalls with exposed reinforcing steel were observed throughout the barrel.
- ② Culvert floor consisted of bedrock and small boulders.
- ③ Undermining was observed along the bottom of the culvert wall measuring up to 1 foot vertically and 1.5 foot of horizontal penetration.
- ④ A light to moderate accumulation of timber debris was observed at the downstream opening.

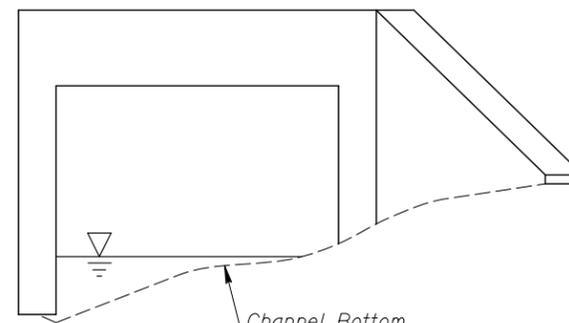
GENERAL NOTES:

1. The culvert was inspected underwater.
2. At the time of inspection on December 3, 2012, the waterline was located approximately 4.5 feet below the arch at the downstream opening. Since design plans or culvert elevation information were not available, a reference elevation of 100.0 was assumed. Based on the assumed reference the waterline elevation was 95.5.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.
4. Soundings were taken at the upstream and downstream openings of the substructure.



Channel Bottom  
on 12/3/12  
(BEDROCK)

DOWNSTREAM OPENING PROFILE  
(Looking Upstream)



Channel Bottom  
on 12/3/12  
(BEDROCK)

UPSTREAM OPENING PROFILE  
(Looking Downstream)

Legend

- 4.0 Sounding Depth from Waterline (12/3/12)
- ⌘ Timber Debris

**MINNESOTA  
DEPARTMENT OF TRANSPORTATION  
UNDERWATER BRIDGE INSPECTION**

STRUCTURE NO. L8500  
OVER KEENE CREEK  
CITY OF DULUTH

INSPECTION AND SOUNDING PLAN  
UPSTREAM AND DOWNSTREAM OPENING PROFILES



Drawn By: BJR  
Checked By: BRL  
Code: 7423L8500



Date: DEC. 2012  
Scale: NTS  
Figure No.: 1



MINNESOTA DEPARTMENT OF TRANSPORTATION  
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. L8500  
 INSPECTORS WSB & Associates and Collins Engineers, Inc.  
 ON-SITE TEAM LEADER Barritt Lovelace P.E.  
 WATERWAY CROSSED Keene Creek

INSPECTION DATE December 3, 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	CULVERT*	FOOTINGS	DISPLACEMENT	OTHER	OVERALL SUBSTRUCTURE CONDITION CODE*	SCOUR	EMBANKMENT EROSION	EMBANKMENT PROTECTION	OTHER (DRIFT/DEBRIS)	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
	Culvert	3.8'	N	4	N	7	N	4	5	N	N	6	5	5	N	N	N	N	N

\*UNDERWATER PORTION ONLY

REMARKS: Overall, the concrete of the culvert exhibited widespread up to 1/8 inch wide cracking with efflorescence and numerous small spalls with exposed reinforcing steel. Several areas of undermining were observed along the culvert walls with undermining cavity measuring up to 1.5 feet deep.

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.