

2016 UNDERWATER BRIDGE INSPECTION REPORT



BRIDGE # 7780 CSAH 133 over DITCH

DISTRICT: District 1

COUNTY: St. Louis

CITY/TOWNSHIP: NORTHLAND

STATE: Minnesota

Date of Inspection: 09/13/2016

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 below water at Structure No. 7780, Box 1 and Box 2 of the culvert, were found to be in fair to poor condition below water with minor defects of structural significance. The concrete of the walls, haunches and ceiling exhibited moderate to heavy scaling with a maximum penetration of 3/4 inch. A moderate accumulation of timber debris was observed obstructing the upstream opening of Box 1. The culvert had a layer of silty sand throughout the length of both boxes. Overall the structure condition has not significantly changed since the previous underwater inspection.

INSPECTION FINDINGS

(A) The culvert floor was typically covered in a layer of silty sand allowing a maximum probe rod penetration of 4 inches. Within Box 1 the culvert floor was at times exposed/clean of any infill material.

(B) The channel bottom material upstream and downstream of the culvert apron consisted of silty sand allowing a maximum probe rod penetration of 8 inches.

(C) The concrete of the culvert walls and haunches exhibited moderate to heavy scaling with a typical penetration of 1/2 inch and a maximum penetration of 3/4 inch.

(D) The concrete of the culvert ceiling exhibited light scaling with a maximum penetration of 1/4 inch and random areas of poor concrete consolidation with a maximum penetration of 1 inch.

(E) A moderate timber debris accumulation of 4 inch diameter and smaller branches was observed slightly obstructing the flow within Box 1. The debris extended from the channel bottom to 1 foot above the waterline.

(F) The concrete of the center wall extension at the upstream and downstream ends of the culvert exhibited heavy scaling with a maximum penetration of 2 inches.

(G) A 12 foot wide by 8 inch high area of concrete section loss was observed at the upstream headwall with up to 1.5 inches of penetration and exposed reinforcing steel exhibiting approximately 30 percent loss of section.

(H) The apron toe was locally detected at the upstream opening with no measurable vertical exposure.

RECOMMENDATIONS

(A) Remove the timber debris accumulation in Box 1 before it becomes more detrimental. If the debris accumulation increases in size or density or the flow through the culvert increases, it may become more imperative to remove the debris to reduce excessive lateral loads on the culvert, limit further debris accumulation, and reduce the likelihood of channel bottom degradation resulting from obstructed flow.

(B) The inspection of the submerged substructure units can most likely be accomplished in the future without using a dive team. To perform the underwater inspection, a properly equipped qualified inspector will have to enter the water during a period of low flow. As channel bottom contours and depths of flow can change quickly, it is recommended that lead line soundings of water depth be taken along the upstream and downstream fascias to determine whether wading is possible prior to beginning the inspection. If conditions are unsafe for inspection by wading, then an underwater inspection with the use of a dive team will be required.

(C) 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 #: 7780
Feature Intersected: DITCH
Facility Carried: CSAH 133
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: 09/13/2016
Weather Conditions: Cloudy, 60°F
Underwater Visibility (feet): 2.0 feet
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 12 feet wide by 6 feet high and 42 feet long.

Maximum Water Depth at Substructure(s) Inspected (feet): 2.5 feet

4. WATERLINE DATUM

Water Level Reference: The top of the culvert headwall at the upstream end of Box 1.
Waterline Elevation (feet): 94.1 feet
Description: The waterline was located approximately 5.9 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: 4
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	85	LF			85	
870	Culvert End Treatment	2	EA			2	
885	Scour	1	EA	1			

UNDERWATER INSPECTION

INSPECTION PROCEDURES

The routine underwater inspection of Bridge 7780 (CSAH 133 over Ditch) was completed on September 13, 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 element inspected was Box 1 and Box 2 of the reinforced concrete 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: 7780

CSAH 133 over DITCH

Date: 11/17/2016

+ GENERAL +	+ ROADWAY +	+ INSPECTION +
Agency Br. No. 187 Crew District 01 Maint. Area County 069 - St. Louis City Township 69053 - NORTHLAND Desc. Loc. 3.6 MI W OF JCT TH53 Sect., Twp., Range 18 - 053N - 17W Latitude 47 ° 4' 10.69 " Longitude 92 ° 32' 53.86 " 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 0 - NO PLAN Date Opened to Traffic On - Off System 1 - ON Legislative District 05B Potential ABC 2 - N/A	Bridge Match ID (TIS) 0 Roadway O/U Key Route On Structure Route Sys 04 - CSAH Number 133 Roadway Name or Description CSAH 133 Level of Service 1 - MAINLINE Roadway Type 2 - 2-way traffic Control Section (TH Only) Reference Point 024+00.640 Detour Length 10.0 mi. Lanes ON 2 UNDER 0 ADT 619 YEAR 2008 HCA DT ADTT % Functional Class 07 - Rural - Major Collector	Userkey 109 Structurally Deficient Y Functionally Obsolete N Sufficiency Rating 65.0 Routine Inspection Date 05/18/2016 Routine Inspection Frequency 12 Inspector Name Janulis, Lukas Status A - Open
		+ NBI CONDITION RATINGS +
		Deck N Unsound Deck % Superstructure N Substructure N Channel 6 Culvert 4
	+ RDWY DIMENSIONS +	+ NBI APPRAISAL RATINGS +
	If Divided NB-EB SB-WB Roadway Width 30.00 ft. ft. Vertical Clearance ft. ft. Max. Vert. Clear. ft. ft. Horizontal Clear. ft. ft. Lateral Clearance ft. ft. Appr. Surface Width 30.0 ft. Bridge Roadway Width 0.0 ft. Median Width On Bridge ft.	Structure Evaluation 4 Deck Geometry N Underclearances N Waterway Adequacy 9 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 W126D Barrel Length 42 Cantilever ID Number of Spans MAIN: 2 APPR: 0 TOTAL: Main Span Length 12.5 ft. Structure Length 26.4 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 1.50 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. +
		Y/N Freq Date Frac. Critical Underwater 60 09/13/2016 Pinned Asbly. Spec. Feat.
	+ PAINT +	+ WATERWAY +
	Year Painted Unsound Paint % Painted Area sq. ft. Primer Type Finish Type	Drainage Area (sq. mi.) Waterway Opening (sf.) 144 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 +
	Posted Load 0 - Not Required Traffic 0 - Not Required Horizontal 1 - Object Markers Vertical N - Not Applicable	Design Load 0 - Other/Unknown 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

12/27/2016

Inspector: CO Bridge

BRIDGE 7780 CSAH 133 OVER DITCH

County: St. Louis	Location: 3.6 MI W OF JCT TH53	Length: 26.4 ft.
City:	Route: 04 - CSAH 133 Ref. Pt.: 024+00.640	Deck Width: 0.0 ft.
Township: 69053 - NORTHLAND	Control Section:	Rdwy. Area/ Pct. Unsnd: sq. ft. / %
Section: 18 Township: 053N Range: 17W Maint. Area:		Paint Area/ Pct. Unsnd: sq. ft. / %
Span Type: 1 - Concrete 19 - Culvert (includes frame culverts)	Local Agency Bridge Nbr.: 187	Culvert: W126D
List:		Postings:
NBI Deck: N Super: N Sub: N Chan: 6 Culv: 4		
	Open, Posted, Closed: A - Open	
	MN Scour Code: E - CULVERT	

Appraisal Ratings - Approach: 8 Waterway: 9		Unofficial Structurally Deficient Y
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 65.0

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	11/17/2016	85 LF	0	0	85	0
		Routine	05/18/2016	85 LF	0	0	85	0
Notes: [2016-2015] No noticeable exposed reinforcement along scaled areas. Small areas of honeycombing with water staining at south end of barrel 2 top. Small area of exposed rebar top of barrel 2 north end with section loss. [2014] Culvert has extensive scaling with some lose of aggregate. Concrete scaled surface from top of barrels down. [2013] No change. CONC. FINISH WORN OFF. Rebar starting to show.								
800	Critical Deficiencies or Safety Hazards	Underwater	11/17/2016	1 EA	1	0	0	0
		Routine	05/18/2016	1 EA	1	0	0	0
Notes: [2016-2013] No critical deficiencies or safety hazards during this inspection.								
870	Culvert End Treatment	Underwater	11/17/2016	2 EA	0	0	2	0
		Routine	05/18/2016	2 EA	0	0	2	0
Notes: [2016] 3' of corroding rebar exposed on end of north center wing with section loss. [2015-2013] No change. Concrete loss. Slight spall on S wings. South headwall deteriorating, rebar exposed.								
871	Roadway Over Culvert	Underwater	11/17/2016	1 EA	1	0	0	0
		Routine	05/18/2016	1 EA	1	0	0	0
Notes: [2016] Roadway was chip sealed in summer of 2015. [2015-2014] No signs of settlement or undermining. [2013] Cracks in bituminous have been crack sealed. Bituminous.								
885	Scour	Underwater	11/17/2016	1 EA	1	0	0	0
891	Other Bridge Signing	Underwater	11/17/2016	1 EA	0	0	1	0
		Routine	05/18/2016	1 EA	0	0	1	0
Notes: [2016] All culvert markers have been removed. [2015-2013] All signs present with no deterioration. 4 Culvert markers and 4 guardrail markers.								

BRIDGE 7780 CSAH 133 OVER DITCH

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	11/17/2016	1 EA	0	1	0	0
		Routine	05/18/2016	1 EA	0	1	0	0
Notes: [2016-2015] Minor erosion or settlement behind NW wing. [2014] Minor erosion at center of south headwall. [2013] Slopes are protected by vegetation. No change. South eroding over culvert.								
893	Guardrail	Underwater	11/17/2016	1 EA	0	1	0	0
		Routine	05/18/2016	1 EA	0	1	0	0
Notes: [2016] Minor impact damage along NE guardrail causing flexbeam to flatten. [2015-2014] No corrosion or impact damage. [2013] No change. Flex Beam w/ ET 2000 ends.								
894	Deck & Approach Drainage	Underwater	11/17/2016	1 EA	1	0	0	0
		Routine	05/18/2016	1 EA	1	0	0	0
Notes: [2016-2014] No notable ponding or drainage-related slope erosion. [2013] Shoulders well graded.								
900	Protected Species	Underwater	11/17/2016	1 EA	1	0	0	0
		Routine	05/18/2016	1 EA	1	0	0	0
Notes: [2016] No evidence of protected species present.								

General Notes: SLC District 5
Inspected by: [2016] CG, RL, ES : [2015] CG, RN : [2014] BH, CG.
[2014] Debris at inlet of barrel 1.

58. Deck NBI:

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

36B. Transitions NBI: No rail attached to culvert.

36C. Appr Guardrail NBI: Flex beam with wood posts

36D. Appr Guardrail Terminal NBI: ET 2000 end terminals.

59. Superstructure NBI:

60. Substructure NBI:

61. Channel NBI: [2016] Sediment buildup at outlet of barrel 1 restricting flow when water is low.
[2015] Debris and sediment buildup in both barrels. Possible old beaver dam in barrel one. 1' to 1.5' of sediment buildup in barrel 2.
[2014] Minor bank erosion but no sign of stream movement.

62. Culvert NBI: [2016-2013] Culvert has extensive scaling with some lose of aggregate. Concrete scaled surface from top of barrels down.

71. Waterway Adeq NBI: [2016-2015] Remote chance of overtopping. Bridge did not overtop during flooding of 2012 which was greater than a 500 year event.

72. Appr Roadway Alignment NBI: [2016-2014] No sight distance problems or speed reduction required.

Inventory Notes:

Inspector's Signature

Reviewer's Signature

Pictures



Photo 1 - Upstream Opening, Looking Northeast



Photo 2 - Downstream Opening, Looking South

Pictures



Photo 3 - Interior of Box 1, Looking South

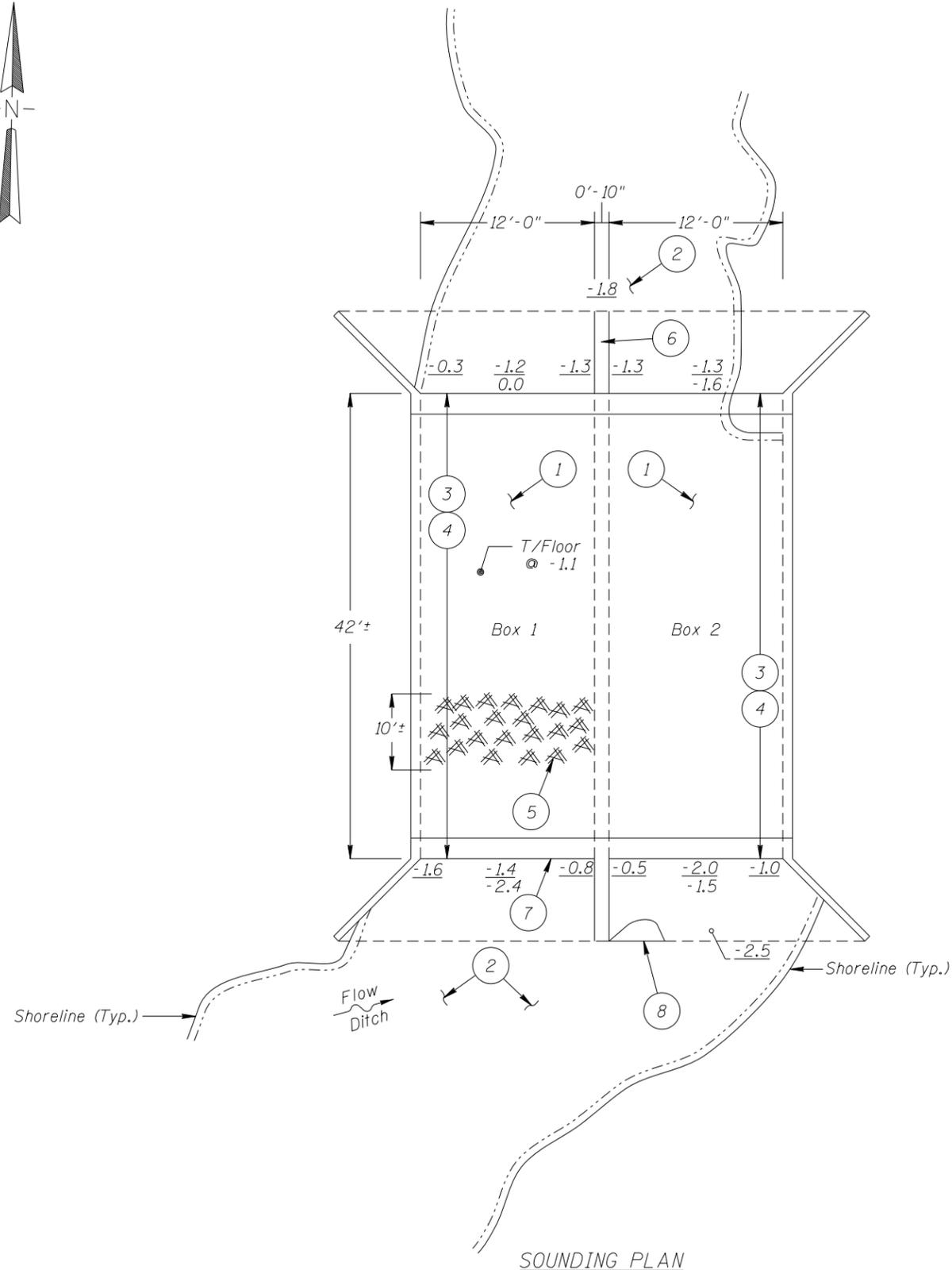
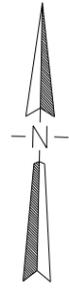


Photo 4 - Interior of Box 2, Looking South

Pictures



Photo 5 - Downstream Center Wall Condition, Looking Southwest



SOUNDING PLAN

GENERAL NOTES:

1. Box 1 and Box 2 of the culvert were inspected underwater.
2. At the time of inspection, on September 13, 2016, the waterline was located approximately 5.9 feet below the top of the culvert headwall at the upstream end of Box 1. Since insufficient elevation information was available, an elevation of 100.0 was assumed. This corresponds to a waterline elevation of 94.1.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.

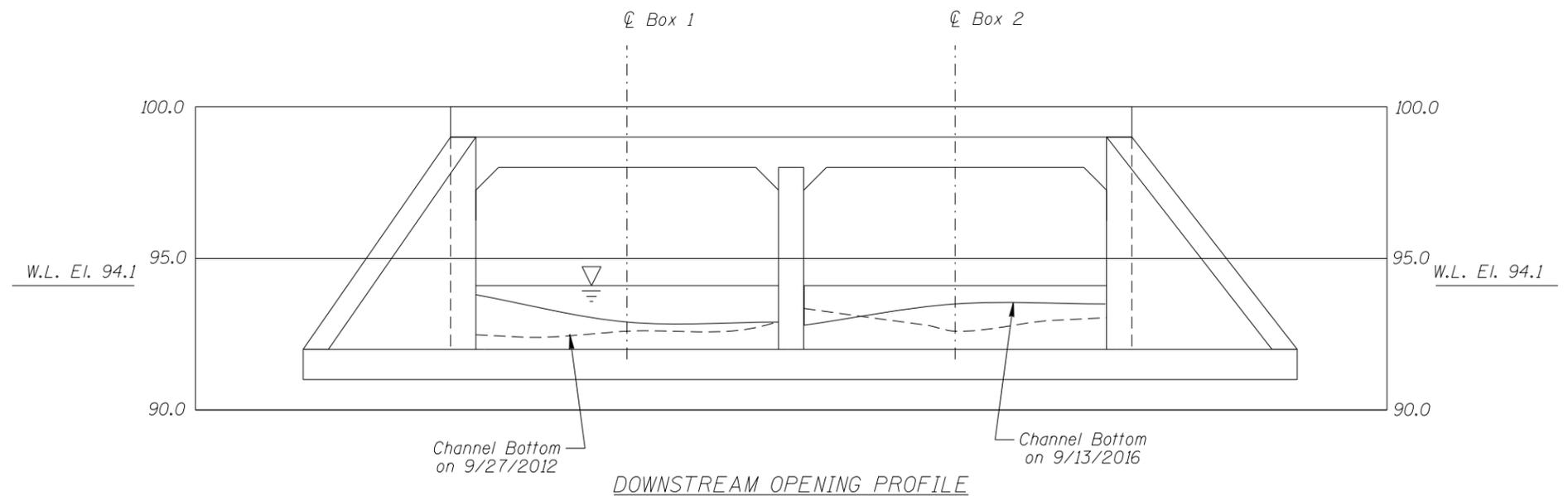
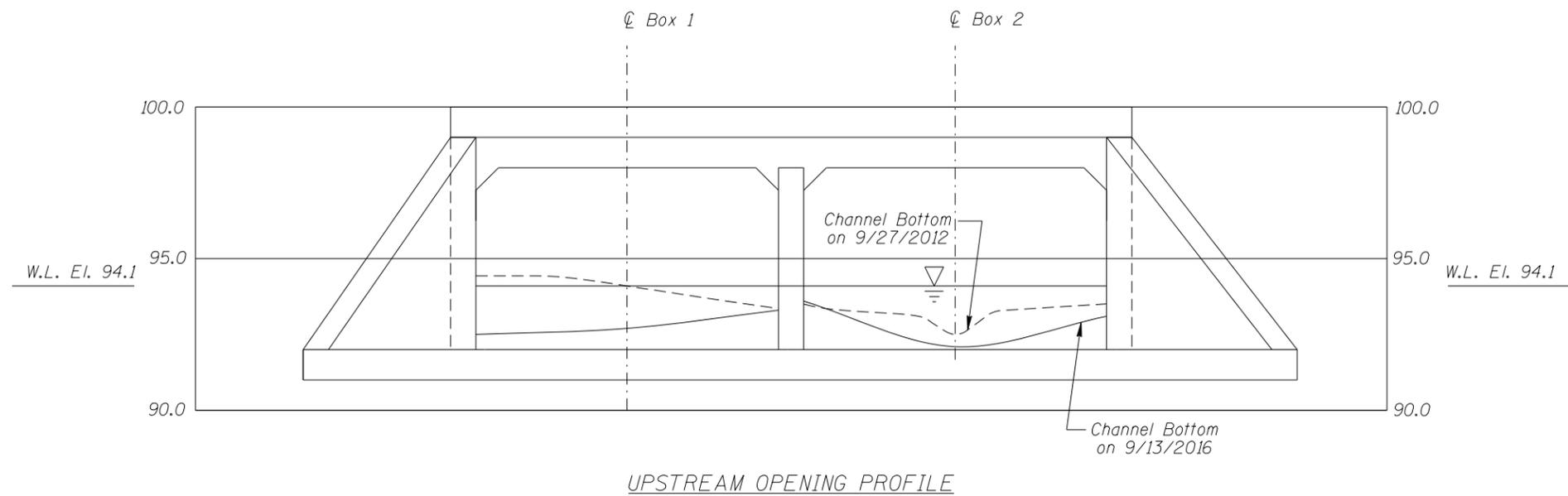
INSPECTION NOTES:

- ① The culvert floor was typically covered in a layer of silty sand allowing a maximum probe rod penetration of 4 inches. Within Box 1 the culvert floor was at times exposed/clean of any infill material.
- ② The channel bottom material upstream and downstream of the culvert apron consisted of silty sand allowing a maximum probe rod penetration of 8 inches.
- ③ The concrete of the culvert walls and haunches exhibited moderate to heavy scaling with a typical penetration of 1/2 inch and a maximum penetration of 3/4 inch.
- ④ The concrete of the culvert ceiling exhibited light scaling with a maximum penetration of 1/4 inch and random areas of poor concrete consolidation with a maximum penetration of 1 inch.
- ⑤ A moderate timber debris accumulation of 4 inch diameter and smaller branches was observed slightly obstructing the flow within Box 1. The debris extended from the channel bottom to 1 foot above the waterline.
- ⑥ The concrete of the center wall extension at the upstream and downstream ends of the culvert exhibited heavy scaling with a maximum penetration of 2 inches.
- ⑦ A 12 foot wide by 8 inch high area of concrete section loss was observed at the upstream headwall with up to 1.5 inches of penetration and exposed reinforcing steel exhibiting approximately 30 percent loss of section.
- ⑧ Apron toe was locally detected at the upstream opening with no measurable vertical exposure.

Legend

- 3.0 Sounding Depth (9/16/2016)
- 2.5 Sounding Depth (9/27/2012)
- ⑤ Inspection Note Number
- ⌘ Timber Debris

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 7780 CSAH 133 OVER A DITCH DISTRICT 1, ST. LOUIS COUNTY		
INSPECTION AND SOUNDING PLAN		
DRAWN BY: RT	COLLINS ENGINEERS	DATE: SEPT 13, 2016
CHECKED BY: LJ		SCALE: 1"=10'
CODE: 96877780		FIGURE NO.: 1



Note: _____
 Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 7780 CSAH 133 OVER A DITCH DISTRICT 1, ST. LOUIS COUNTY UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
DRAWN BY: RT	COLLINS ENGINEERS	DATE: SEPT 13, 2016
CHECKED BY: LJ	133 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com	SCALE: 1"=5'
CODE: 96877780		FIGURE NO.: 2