

2016 UNDERWATER BRIDGE INSPECTION REPORT



BRIDGE # 93280 CR 119 over E BR RAT ROOT RIVER

DISTRICT: District 1 COUNTY: Koochiching CITY/TOWNSHIP: T - 69 R - 23
STATE: Minnesota

Date of Inspection: 06/03/2016

Equipment Used:

Owner: County Highway Agency

Inspected By: Stromberg, Dan

Report Written By: Dan Stromberg

Report Reviewed By:

Final Report Date:



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UNDERWATER INSPECTION

REPORT SUMMARY

The substructure units inspected below water at Bridge No. 93280, the East and West Abutments and Piers 1 and 2, were found to generally be in satisfactory condition with only minor checking of the timber piles around the waterline. Above water, the checking on the timber piles increased in size, and reduced pile cap bearing was observed for the piles at the West Abutment. The condition of the diagonal bracing at Piers 1 and 2 has slightly worsened since the previous inspection with additional full depth splits at the connection points and a portion of full member section loss. The channel bottom appeared stable with no significant scour or appreciable changes since the previous inspection.

INSPECTION FINDINGS

(A) The channel bottom material at the West Abutment consisted of soft, silty, sandy clay allowing 6 inches to 1 foot of probe rod penetration. (B) The channel bottom material around Piers 1 and 2 and the East Abutment consisted of 6 inch to 12 inch diameter riprap with silty sand infill. (C) The east diagonal brace at Pier 1 was broken between Piles 1 and 2 and between Piles 2 and 3 the diagonal brace was cracked with up to 50% section loss. (D) Curved steel ice-breaker plates from just below the pile caps down to approximately 1 foot below the waterline were attached to the south face of Pile 6 at Piers 1 and 2. (E) The east diagonal brace at Pier 2 exhibited a full depth split up to 2 inches wide from Pile 1 to Pile 3, located 2 inches to 6 inches from the top face and goes through the connection at Pile 1 rendering it ineffective. (F) The west diagonal brace of Pier 2 contained a split at Pile 6 that is 1.5 feet long, 1 inch wide and runs through the connection rendering it ineffective. (G) The pile cap of the West Abutment was slightly rotated back with 75 percent typical bearing on the piles. (H) A row of abandoned cut off piles 2 feet above the channel bottom was present between Pier 2 and the East Abutment. (I) A large vertical split approximately 2 feet high by 1/4 inch wide, allowing 3 inches of penetration was located at the top of Pile 1 of the East Abutment. (J) Light accumulation of timber debris at Piles 2 through 6 of Pier 2, with up to 6 inch diameter pieces, typically extending from the channel bottom to the waterline. (K) Escaping fill was observed at 1 inch gap in horizontal planking of the West Abutment, 4 feet above waterline, with 3 inches maximum penetration. (L) Escaping fill was observed at 1 inch gap in horizontal planking of the West Abutment, 3 feet above waterline, with 3 inches maximum penetration.

RECOMMENDATIONS

(A) The diagonal timber cross braces that are split and/or deteriorated through the fasteners at Piers 1 and 2 should be replaced during routine maintenance. (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 #: 93280
Feature Intersected: E BR RAT ROOT RIVER
Facility Carried: CR 119
District: District 1
County: 036 - Koochiching
Bridge Description:

The superstructure is a three span, timber stringer/deck bridge. The superstructure is supported by two timber pile abutments and two timber pile piers. The piers are numbered 1 and 2 from west to east.

2. INSPECTION DATA

Professional Engineer/Team Leader: Daniel G. Stromberg
Inspection Diver: Daniel G. Stromberg
Date of Underwater Inspection: 06/03/2016
Weather Conditions: Sunny, 61°F
Underwater Visibility (feet): 1.0 foot
Waterway Velocity (ft/sec): Negligible

3. SUBSTRUCTURE INSPECTION DATA

Substructure(s) Inspected: East and West Abutments, and Piers 1 and 2.

General Shape:

The piers and abutments consist of six timber piles with a square timber pile cap. The piers have timber cross bracing attached to the piles. The embankments are contained behind the abutments by timber lagging and adjacent timber pile and lagging wingwalls. Each abutment has 10 piles total (6 at abutment wall and 2 at each wingwall).

Maximum Water Depth at Substructure(s) Inspected (feet): 9.9 feet

4. WATERLINE DATUM

Water Level Reference: The top of the pile cap at the north end of Pier 1.
Waterline Elevation (feet): 94.2 feet
Description: The waterline was approximately 5.8 feet below the reference.

5. NBIS CODING INFORMATION

(Minnesota specific codes are used for 92B and 113)

Item 60: Substructure: Code: 6
Item 61: Channel and Channel Protection: Code: 7
Item 62: Culvert: Code:
Item 92B: Underwater Inspection: Code: Y 48 06/2016

Item 113: Scour Critical Bridge:

Code: K

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
216	Timber Abutment	96	LF	96			
228	Timber Piling	32	EA		32		
856	Secondary Members - Substructure	1	EA			1	
885	Scour	1	EA	1			

UNDERWATER INSPECTION

INSPECTION PROCEDURES

The routine underwater inspection of Bridge 93280 (C.R. 119 over East Branch of the Rat Root River) was completed on June 3, 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 (SSA and/or SCUBA) in accordance with OSHA regulations. Channel bottom profiles were taken along the upstream and downstream faces of the bridge and around the periphery of substructure units to determine the presence, location and area of scour. The bridge elements inspected consisted of two timber piers and the two timber abutments. According to the bridge inventory, Piers 1 and 2 and both abutments are founded on timber piles. 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 BRIDGE INSPECTION REPORT

08/17/2016

Inspector: CO Bridge

BRIDGE 93280 CR 119 OVER E BR RAT ROOT RIVER

County: Koochiching	Location: 1.5 MI NE OF JCT TH 53	Length: 78.0 ft.
City:	Route: 07 - CNTY 119 Ref. Pt.: 002+00.690	Deck Width: 25.9 ft.
Township: 36090 - T - 69 R - 23	Control Section:	Rdwy. Area/ Pct. Unsnd: 1905 sq. ft. / %
Section: 2 Township: 069N Range: 23W Maint. Area:		Paint Area/ Pct. Unsnd: sq. ft. / %
Span Type: 7 - Wood or Timber 1 - Slab	Local Agency Bridge Nbr.:	Culvert: N/A
List:		Postings: 30 40 40

NBI Deck: 7 Super: 7 Sub: 6 Chan: 7 Culv: N
 Open, Posted, Closed: P - Posted for Load
 MN Scour Code: K - LIMITED RISK

Appraisal Ratings - Approach: 4 Waterway: 8 Unofficial Structurally Deficient N
 Required Bridge Signs - Load Posting: 2 - Vehicle & Semi (Type R12-5) Traffic: 0 - Not Required Unofficial Functionally Obsolete N
 Horizontal: 1 - Object Markers Vertical: N - Not Applicable Unofficial Sufficiency Rating 88.9

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	
31	Timber Deck	Underwater	08/03/2016	2020 SF	2020	0	0	0	
		Migrated Values		2020 SF	2020	0	0	0	
	Notes: [2016] Migrator assumed CS1.								
510	- Wearing Surfaces	Underwater	08/03/2016	1905 SF	1867	0	38	0	
		Migrated Values		1905 SF	1867	0	38	0	
	Notes: 2013 - Aging. 2012 - Change code to reflect gravel surface on deck. 2010 - 1/2" gravel 2008 - Only 1" gravel. Previously - Probably 3" gravel on deck.								
54	Timber Slab	Underwater	08/03/2016	2020 SF	2020	0	0	0	
		Migrated Values		2020 SF	2020	0	0	0	
	Notes: [2016] Migrator assumed CS1.								
510	- Wearing Surfaces	Underwater	08/03/2016	1905 SF	1867	0	38	0	
		Migrated Values		1905 SF	1867	0	38	0	
	Notes: 2013 - Aging. 1/2" - 1" GRAVEL ON DECK OVER ASPHALT								
156	Timber Floor Beam	Underwater	08/03/2016	26 LF	26	0	0	0	
		Migrated Values		26 LF	26	0	0	0	
	Notes: [2016] Migrator assumed the presence of one timber floorbeam in CS1.								
216	Timber Abutment	Underwater	08/03/2016	96 LF	96	0	0	0	
		Migrated Values		96 LF	96	0	0	0	
	Notes: [2016] Migrator added 40 LF to abutment quantity to account for wingwalls (CS1:40 CS2:0 CS3:0 CS4:0). 2012 - 1/8" split in E abut cap. Previous - Water - 18" to 30" deep at W Abut & 18" deep at East Abut. Visible for inspection as only 1" of water. Wingwall notes:								
228	Timber Pile	Underwater	08/03/2016	24 EA	22	2	0	0	
		Migrated Values		24 EA	22	2	0	0	
	Notes: 2015 - W. Abut - 2 minor splits. Water is 18" to 40" deep. Some delam at water line. 2012 - East sway brace on east pier needs replacement. NE abut pile has minor split. SE Abut. pile 3/4" split. W Abut. 1 piling delamination. E pier 2 minor splits. W pier splitting 3/4" split and 1 minor split. 2009 - Replace east sway brace. S Pile of South Pier - 1/2". Middle pile of N Pier - minor split. N. Abut - 2 minor splits. 2008 - steel plate on s piers. Should replace 2 sway braces on E Pier. 2007 - North abut & north pier - 1 minor split pile. 2006 - 1 sway brace on both east and west pier is split. E piling on south pier is delaminating. Previous - Split for 8' on sway brace - e pier. Better replace both. Water 3' deep @ e pier. 2 SWAY BRACES ON E PIER HAVE SPLITS ON END. Sway braces on east and west need repair. Minor split in NE column. Minor split in SW Abut pile. 3/8" split in center pile west pier and 1/4" split in south center pile in east pier.								

BRIDGE 93280 CR 119 OVER E BR RAT ROOT RIVER

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
235	Timber Pier Cap	Underwater	08/03/2016	112 LF	105	7	0	0
		Migrated Values		112 LF	105	7	0	0
<p>Notes: 2013 - NE and SE filler cap 100% rotten. E pier cap: minor split on N end. S end has 1/2" split. W pier cap: minor splits on both ends. W Abut: N end has 1 minor split and S end has 2 minor splits. 2012 - Minor split in SW & NW cap. 2010 - Split in cap at SW & NE and north end of west pier. . NE - top of cap has mold & major rot. Cap has minor split. SE - cap is gone for 18" 2008 - N end of N Pier - minor split. 2007 - east end of n abut is split. 2006 - E end of south pier is deformed and e end of next south pier is deformed and has a 3' split at the bottom. Cap on 1st north pier has bad split on west end and minor split on east end. South abut cap tipped backwards slightly. Previous - SE FILLER BLOCK OVER CAP IS ROTTEN. SW Corner of Cap split in two.</p>								
330	Metal Bridge Railing	Underwater	08/03/2016	157 LF	157	0	0	0
		Migrated Values		157 LF	157	0	0	0
<p>Notes: [2016] Migrator assumed metal rail/timber post combination type rail. 2010 - minor splits in south rail posts. 2009 - Some split rail posts, but generally minor.</p>								
	515 - Steel Protective Coating	Underwater	08/03/2016	999 SF	999	0	0	0
		Migrated Values		999 SF	999	0	0	0
<p>Notes: [2016] Migrator assumed CS1 and a quantity of 999 SF.</p>								
332	Timber Bridge Railing	Underwater	08/03/2016	26 LF	26	0	0	0
		Migrated Values		26 LF	26	0	0	0
<p>Notes: [2016] Migrator assumed metal rail/timber post combination type rail. Post spacing assumed to be 5LF, each post 1LF. 2010 - minor splits in south rail posts. 2009 - Some split rail posts, but generally minor.</p>								
800	Critical Deficiencies or Safety Hazards	Underwater	08/03/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
<p>Notes: NO CRITICAL FINDINGS OBSERVED DURING THE LAST INSPECTION.</p>								
885	Scour	Underwater	08/03/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
<p>Notes: K - Limited risk. Monitoring required.</p>								
890	Load Posting or Vertical Clearance Signing	Underwater	08/03/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
<p>Notes: [2016] Structure requires a vertical clearance sign or load posting sign.</p>								
891	Other Bridge Signing	Underwater	08/03/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
<p>Notes: 2013 - 30-40-40. NE del bent. Many bullet holes in 3 of them. Signs shot up.</p>								
892	Slopes & Slope Protection	Underwater	08/03/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
<p>Notes: 18' to 36' riprap east side.</p>								
894	Deck & Approach Drainage	Underwater	08/03/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
<p>Notes: Use this element to rate the condition, function, and adequacy of the drainage system.</p>								
895	Sidewalk, Curb, & Median	Underwater	08/03/2016	1 EA	0	1	0	0
		Migrated Values		1 EA	0	1	0	0
<p>Notes: 2010 - 1/3 of curb is missing at NW corner. 2008 - 8" X 8" curb. 2007 - Drying out. 2006 & before - SCRAPED BY SNOWPLOW AT 2 LOCATIONS.</p>								
900	Protected Species	Underwater	08/03/2016	1 EA	1	0	0	0
		Migrated Values		1 EA	1	0	0	0
<p>Notes: Use this element to track the presence of protected species living on this structure.</p>								

BRIDGE 93280 CR 119 OVER E BR RAT ROOT RIVER

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
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General Notes: 06/03/2016 Underwater Inspection - Collins Engineers
 2015 - D. Grindall, Erickson Engineering. Inspect again in Winter. Major erosion in SW ditch.
 2014 - Inspected by D. Grindall Erickson Engineering. Inspect again in December. Water over 4' deep at west abutment.
 2013 - Inspected by D. Grindall Erickson Engineering. Inspected underneath in December. Water over 4' deep West Abutment. 12/17/13 Substructure inspection.
 2012 - DG & WH. Posted 30-40-40. Water - 3' deep at W abut. 2010 - 36" riprap on east side. no riprap exposed on west side. Water is 1' below normal. Substructure re-inspected on 12/9/11 by DG & WH.

2009 DG. Inspected also on 12/14/09. 6.5' from low timber to water on W Abut & 5' on E Abut. High banks on west side. Appears to be at least a 50' runover area east of bridge. Lot of storage capacity to the east. Water is 60" to low timber at east end. West app is almost as wide as bridge deck. East app - 18' gravel & 1' grass shldr. 2008 - DG. Water - 30" at west abut. Mud bottom. Inspected again on 1/5/09. 5' to water 2007 - DG. Inspected again on 12/19/2007. Underwater inspection on 8/26/07. 2006 - Inspected by 8/16/06 and on 12/11/06 by DG. 12/21/05 - substructure inspected by DG. 9/21/05 - Inspect substructure units again in winter. Inspector DG. Debris in west span. Water deep in west span. PONTIS inspection comments - 5" to water on east end. DG PONTIS inspection comments - Minor debris at SW corner. Inspector - DG *6" TO WATER. E PIER CAP - MINOR CRACK. NE WING PILE - 1 MINOR SPLIT. NE ABUT PILE - 1 MINOR SPLIT. 1 BROKEN SWAY BRACE. NW CURB BURNT. RIPRAP ON SLOPES. DELINEATORS BADLY SHOT UP.

1991 COMMENTS - VERT ABUT. LOW TIMBER HIGHER THAN SAG PT TO THE EAST. 18" AVE. RIPRAP - E ABUT. W PIER - S SIDE - 1 SPLIT PILE. W ABUT - RIPRAP CAN'T BE SEEN.

1/93 COMMENTS - MISSINGS - 2 RAIL BOLTS & NUTS. SE PILE - 1/2" SPLIT.

12/93 COMMENTS - DEL IS SHOT UP. W SWAY BRACE IS BROKE. SE END BLOCK IS ROTTING. E SWAY BRACES SPLIT.

1/95 COMMENTS - W SWAY BRACE STILL BROKE. E SWAY BRACE HAS BAD SPLIT. MISSING 1 RAILPOST BOLT & NUT.

1/96 COMMENTS - 1 SPLIT RAILPOST. 2 SWAY BRACES ARE MISSING PIECES OF WOODS.

12/96 COMMENTS - 1 - 12" RAILPOST BOLT MISSING.

12/97: 6.5" TO WATER. 2 - 12" BOLTS STILL MISSING. SE CORNER OF 12X12 OVER CAP ROTTED.

1/99 7.5" TO WATER. ALL NUTS ON THIS YEAR

1/24/00 - SUBSTRUCTURE INSPECTED. 6.5" TO WATER ON W END.

01/2001 - NO CHANGE. 6" TO WATER AT W END.

. Substructure inspected further on 12/30/04 by DG.

58. Deck NBI:

36A. Brdg Railings NBI:

36B. Transitions NBI:

36C. Appr Guardrail NBI:

36D. Appr Guardrail Terminal NBI:

59. Superstructure NBI:

60. Substructure NBI: Diagonal bracing has worsened with full depth splits at connections points and an area of full member section loss.

61. Channel NBI:

62. Culvert NBI:

71. Waterway Adeq NBI:

72. Appr Roadway Alignment NBI:

Inventory Notes:

ELEM NBR	ELEMENT NAME	REPORT TYPE	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
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Inspector's Signature

Reviewer's Signature

Pictures



Photo 1 - Upstream Fascia, Looking Northeast



Photo 2 - Downstream Fascia, Looking Southeast

Pictures



Photo 3 - West Abutment, Looking Southwest



Photo 4 - Pier 1, Looking Northwest

Pictures



Photo 5 - Broken Cross Brace between Piles 1 & 2 of Pier 1, Looking Southwest

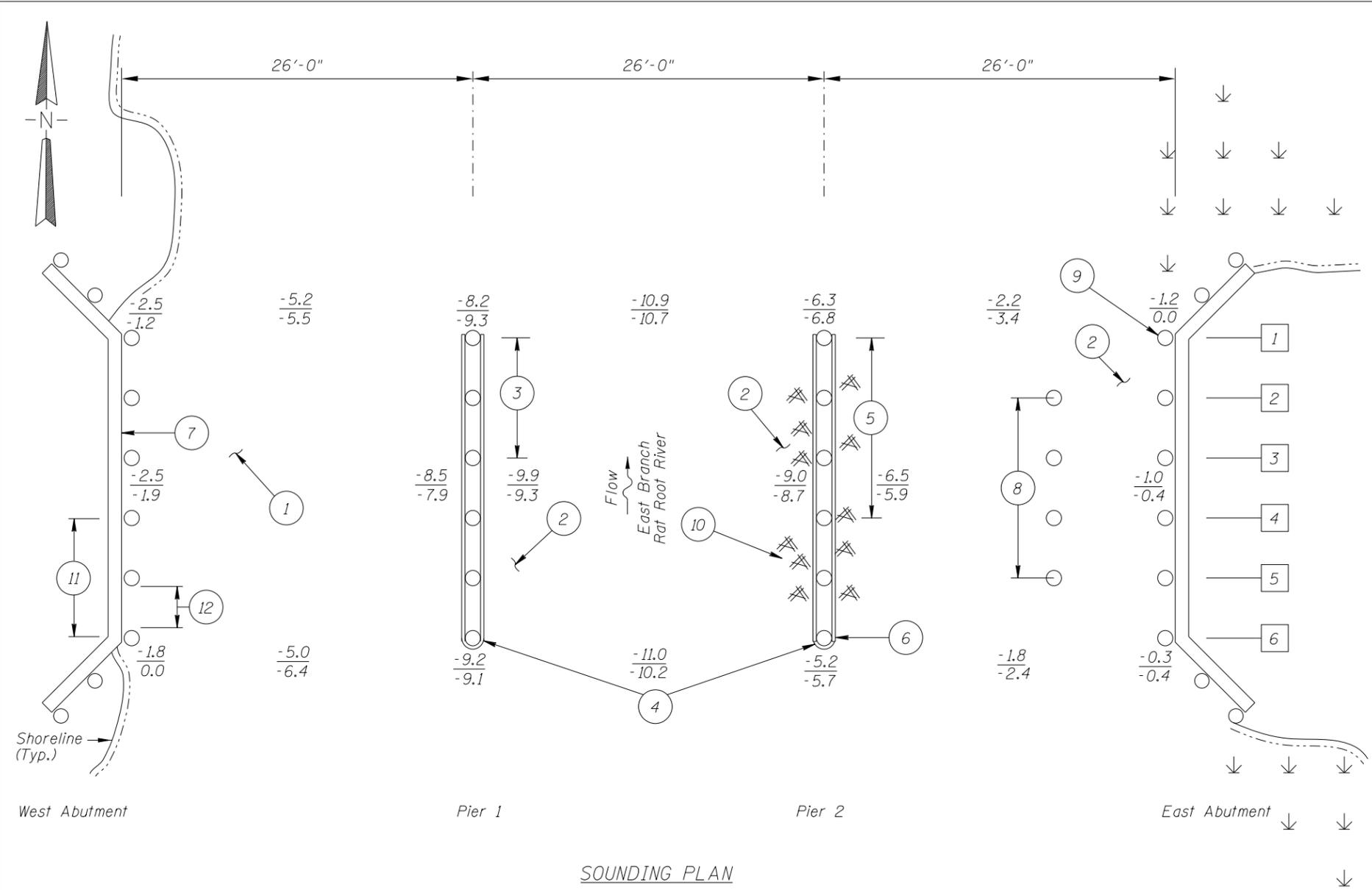


Photo 6 - Pier 2, Looking Northeast

Pictures

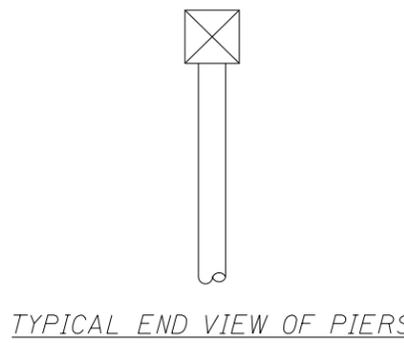


Photo 7 - East Abutment, Looking Southeast



- INSPECTION NOTES:**
- 1 The channel bottom material at the West Abutment consisted of soft, silty, sandy clay allowing 6 inches to 1 foot of probe rod penetration.
 - 2 The channel bottom material around Piers 1 and 2 and the East Abutment consisted of 6 inch to 12 inch diameter riprap with silty sand infill.
 - 3 The east diagonal brace at Pier 1 was broken between Piles 1 & 2 and between Piles 2 & 3 the diagonal brace was cracked with up to 50% section loss.
 - 4 Curved steel ice-breaker plates from just below the pile caps down to approximately 1 foot below the waterline were attached to the south face of Pile 6 at Piers 1 and 2.
 - 5 The east diagonal brace at Pier 2 exhibited a full depth split up to 2 inches wide from Pile 1 to Pile 3, located 2 inches to 6 inches from the top face and goes through the connection at Pile 1 rendering it ineffective.
 - 6 The west diagonal brace of Pier 2 contained a split at Pile 6 that is 1.5 feet long, 1 inch wide and runs through the connection rendering it ineffective.
 - 7 The pile cap of the West Abutment was slightly rotated back with 75 percent typical bearing on the piles.
 - 8 A row of abandoned cut off piles 2 feet above the channel bottom was present between Pier 2 and the East Abutment.
 - 9 A large vertical split approximately 2 feet high by 1/4 inch wide, allowing 3 inches of penetration was located at the top of Pile 1 of the East Abutment.
 - 10 Light accumulation of timber debris at Piles 2 through 6 of Pier 2, with up to 6 inch diameter pieces, typically extending from the channel bottom to the waterline.
 - 11 Escaping fill was observed at 1 inch gap in horizontal planking of the West Abutment, 4 feet above waterline, with 3 inches maximum penetration.
 - 12 Escaping fill was observed at 1 inch gap in horizontal planking of the West Abutment, 3 feet above waterline, with 3 inches maximum penetration.

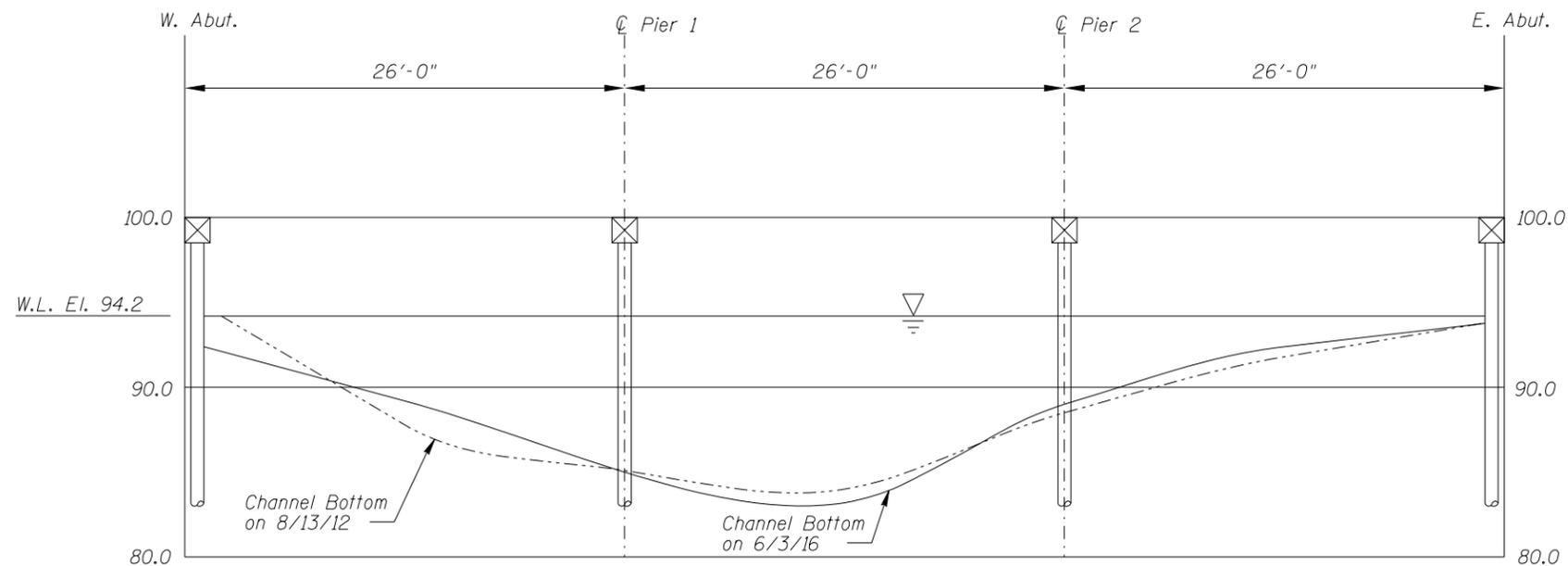
SOUNDING PLAN



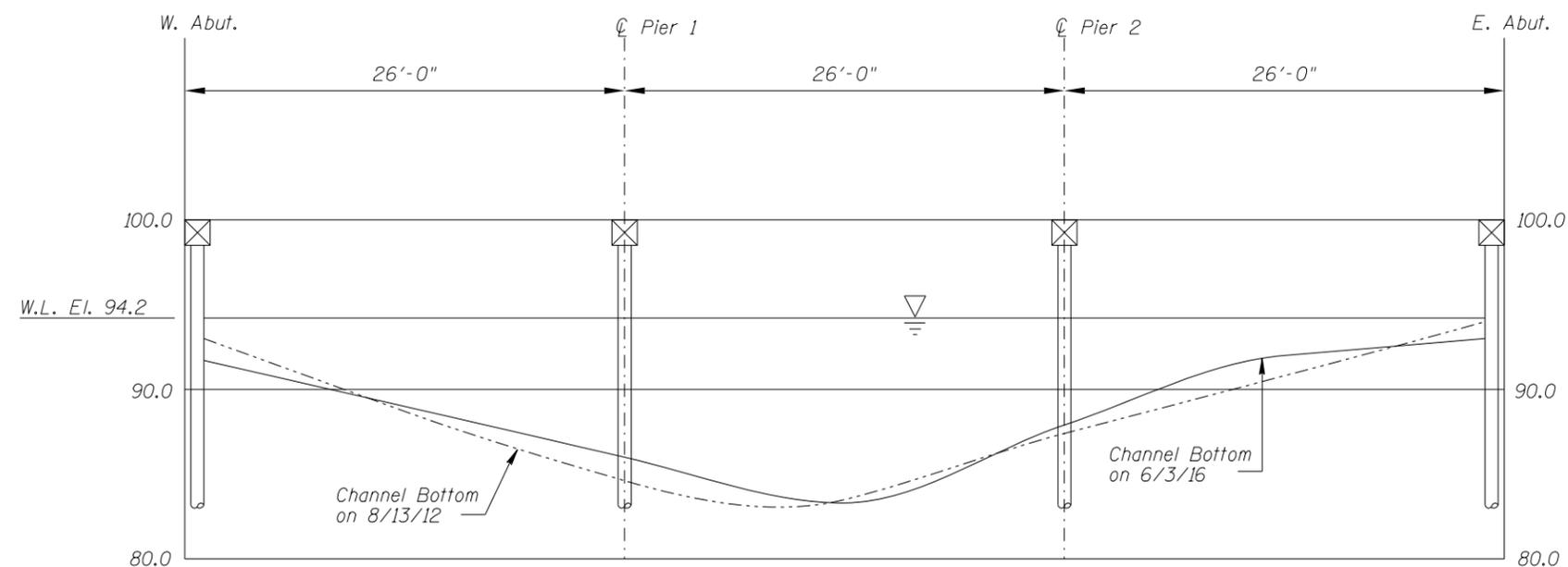
- GENERAL NOTES:**
1. Piers 1 and 2, and the East and West Abutments were inspected below water.
 2. At the time of inspection on June 3, 2016, the waterline was located approximately 5.8 feet below the top of pier cap at the north end of Pier 1. Since insufficient bridge elevation information was available a reference elevation of 100.0 was assumed. Based on the assumed reference the waterline elevation was 94.2.
 3. Soundings indicate the water depth at the time of inspection and are measured in feet.
 4. Soundings were taken parallel to the bridge at mid point intervals between the substructure units.
 5. Piles exhibited random checking from the top of the pile to the channel bottom with up to 1/4 inch maximum checking and at times piles sounded slightly hollow with some softening of the exterior surface and minor delaminating and splintering between 1 foot above and below the waterline.

- Legend**
- 8.2 Sounding Depth (6/3/16)
 - 9.3 Sounding Depth (8/13/12)
 - Timber Pile
 - 6 Pile Designation Number
 - Timber Debris
 - ↓ Grassy Vegetation
- Note:**
All soundings based on 2016 waterline location.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 93280 OVER THE EAST BRANCH OF THE RAT ROOT RIVER DISTRICT I, KOOCHICHING COUNTY		
INSPECTION AND SOUNDING PLAN		
DRAWN BY: ELN	COLLINS ENGINEERS <small>133 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	DATE: JUNE 3, 2016
CHECKED BY: DGS		SCALE: NTS
CODE: 968793280		FIGURE NO.: 1



UPSTREAM FASCIA PROFILE
Vertical Scale: 1"=10'-0"



DOWNSTREAM FASCIA PROFILE
Vertical Scale: 1"=10'-0"

Note:
Refer to Figure 1 for General Notes.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION		
STRUCTURE NO. 93280 OVER THE EAST BRANCH OF THE RAT ROOT RIVER DISTRICT I, KOOSKICHING COUNTY UPSTREAM AND DOWNSTREAM FASCIA PROFILES		
DRAWN BY: ELN	COLLINS ENGINEERS <small>133 North Wacker Drive Suite 900 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com</small>	DATE: JUNE 3, 2016
CHECKED BY: DGS		SCALE: NTS (U.O.N.)
CODE: 968793280		FIGURE NO.: 2