UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 4801741 (LUC-24-2656)
US-24 OVER OTTAWA RIVER
LUCAS COUNTY, OH
DISTRICT 2

April 2020

10/9/2020

Prepared for:

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

Prepared by:

COLLINS ENGINEERS INC.

124 Venture Court, Suite 10

Lexington, Kentucky 40511

859.367.0097 • www.collinsengr.com

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EXECUTIVE SUMMARY

Project: ODOT District 2 Underwater Bridge Inspections - 2020

Purpose of Project: To perform a detailed visual and tactile underwater investigation of bridges for District 2 of the Ohio Department of Transportation.

Inspection Team: Team Leader – Joshua Johnson, P.E. – Collins Engineers, Inc.
Team Member – Matthew Rogers, E.I.T. – Collins Engineers, Inc.
Team Member – Nicholas Lane – Collins Engineers, Inc.

Inspection Date(s): April 21, 2020

Water Visibility:	0 ft	***Water Velocity:***	0 ft/s
Water Temperature:	50 °F	***Weather:***	Clear – 45 °F
Waterline Elevation:	572.1 ft	***Type of Boat:***	N/A
Coordinates:	41.687789°N, -83.555204°W		
Access Location:	Northeast Embankment at Structure		
Dive Mode:	Surface Supplied Air		
Waterline Reference:	10.9 ft below the top of the downstream nose of Pier 1.		
Maximum Depth at SSU:	7.3 ft – Downstream Quarter Point along the South Face of Pier 1		
Shoreline Conditions:	The north and south shorelines consisted of moderately-vegetated, well-protected, moderate slopes with no erosion.		

Summary of Findings:

- **Abutment 1:**
  - The channel bottom material consisted of sand, silt, and scattered riprap up to 18 in. diameter with up to 6 in. probe rod penetration.
  - The submerged portions of the pier were sound and smooth with no defects observed.
  - Typical spalling was observed around the weep hole drains measuring up to 24 in. diameter by 2 in deep with no exposed steel reinforcement.
- **Pier 1:**
  - The channel bottom material consisted of sand, silt, and scattered riprap up to 18 in. diameter with up to 6 in. probe rod penetration.
  - The submerged portions of the pier were sound and smooth with no defects observed.
- **Abutment 2:**
  - The channel bottom material consisted of sand, silt, and scattered riprap up to 18 in. diameter with up to 6 in. probe rod penetration.
  - The submerged portions of the pier were sound and smooth with no defects observed.
  - Typical spalling was observed around the weep hole drains measuring up to 24 in. diameter by 2 in deep with no exposed steel reinforcement.

Summary of Recommendations:

- Monitor concrete condition at the waterline.
- Monitor channel bottom to ensure footings remain properly embedded.

Underwater Inspection Coding:

NBI Ratings:

Item	Description	Coding	Condition
60	Substructure	7 – Good Condition	Spalls
61	Channel	7 – Good Condition	No Defects Observed
62	Culvert	N/A	
92B	UW Insp. Frequency	60 Months	
93B	Insp. Date	04 21 20	
113	Scour Critical Bridges	8 – Above Foundation Limits	Stable (Inspector Recommended)

AASHTO National Bridge Element (NBE) Ratings:

Element #	Description	Units	Total	Condition State			
				1	2	3	4
210	Reinforced Concrete Pier Wall	LF	180	170	10	0	0

Note: Ratings were developed using the FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges. The recommended ratings consider inspected elements located within the waterway and conditions existing below the water surface only. Additional consideration is necessary for the assignment of overall condition ratings for this bridge.

1.0 INTRODUCTION

1.1 Purpose and Scope

This report consists of the results of a detailed underwater investigation performed at the US-24 Bridge over Ottawa River in Lucas County, OH. Collins Engineers, Inc. (Collins) conducted the underwater investigation for District 2 of the Ohio Department of Transportation (ODOT) on April 21, 2020. The primary purpose of the investigation was as follows:

- Determine the condition of the substructure components located in the water at the time of the inspection from the waterline to the channel bottom.
- Obtain channel bottom depth measurements along the bridge fascias, upstream and downstream of the bridge, and around the submerged substructure units.
- Obtain channel profile cross sections at the upstream and downstream fascias.
- Determine the condition of the shorelines in the vicinity of the structure.
- Obtain photographs of the bridge and any significant defects.

In addition, a brief inspection was made of areas that could be submerged during periods of high water. The following report includes a description of the structure, the method of investigation, a description of existing conditions, an evaluation and recommendations based on the conditions, inspection figures, and photographs.

1.2 General Description of the Structure

Structure No. 4801741 (LUC-24-2656) spans 112.77 ft, carrying US-24 over Ottawa River and is approximately 65.0 ft wide. The bridge superstructure is constructed of two steel girder spans. The roadway orientation of the longitudinal axis of the bridge is south to north. The substructure units are labeled as Abutments 1 and 2 and Pier 1. Existing record drawings were available at the time of the inspection. Refer to Figure 1 in Exhibit 1 for a Location Map of the bridge. Refer to Photographs 1 and 2 in Exhibit 2 for overall views of the bridge.

1.3 Method of Investigation

A detailed field inspection was conducted to determine the physical condition of the submerged bridge substructure units from the waterline to the channel bottom. A brief visual examination of the substructure units above the waterline was also made.

A three-person team consisting of a professional engineer-diver and team leader (Joshua Johnson, P.E.) an engineer-diver (Matthew Rogers, E.I.T.) and a technician-diver (Nicholas Lane) conducted the underwater inspection. The inspection was conducted using surface supplied air diving equipment. During the inspection, the inspectors entered the water from the shore and a note taker on the shore recorded the inspection notes.

The underwater inspection consisted of a visual and tactile examination of the accessible surfaces of the substructure units from the waterline to the channel bottom with particular attention given to any observed areas of deterioration or apparent distress. Approximately 10 percent of the total area on the underwater surfaces of the substructure units was cleaned so that the condition could be more closely examined. Photographs were taken to document the general conditions and observed deficiencies. Underwater photographs could not be obtained due to poor water conditions. The type of channel bottom material, the presence or extent of scour, the presence or extent of riprap, the presence or extent of drift and debris, and the location of any foundation exposure or undermining were noted.

Channel bottom soundings were performed utilizing a telescoping survey rod, digital fathometer, and pneumofathometer. Soundings were collected at quarter points along the bridge centerline as well as at quarter points along the upstream and downstream fascias and 50 ft off each fascia. Additional soundings were collected adjacent to Pier 1 and at 10 feet intervals in-line with the pier, upstream and downstream, and the waterline was referenced to a known elevation on the bridge. A sounding plan was developed using the soundings and approximate location of the shorelines. Refer to Figures 2 through 5 in Exhibit 1 for the sounding plan and channel cross sections that show the channel limits and water depths around the structure.

2.0 EXISTING CONDITIONS

2.1 General Conditions

At the time of the inspection, the waterline of 4801741 (LUC-24-2656) was located approximately 10.9 ft below top of the downstream nose of Pier 1, which corresponds to a waterline elevation of 572.1 ft. During the inspection, the waterway was flowing at approximately 0 ft per second. The bridge pier skew was consistent with the channel alignment and does not require attention at this time. The north and south shorelines consisted of moderately-vegetated, well-protected, moderate slopes with no erosion. Refer to Photographs 3 through 8 in Exhibit 2 for views of the shorelines near the structure.

2.2 Substructure Conditions

2.2.1 Abutment 1

The channel bottom material consisted of sand, silt, and scattered riprap up to 18 in. diameter with up to 6 in. probe rod penetration. The submerged portions of the pier were sound and smooth with no defects observed. Typical spalling was observed around the weep hole drains measuring up to 24 in. diameter by 2 in deep with no exposed steel reinforcement. Refer to Figure 6 in Exhibit 1 for detailed inspection notes of Abutment 1. Refer to Photograph 7 in Exhibit 2 for views of Abutment 1.

2.2.2 Pier 1

The channel bottom material consisted of sand, silt, and scattered riprap up to 18 in. diameter with up to 6 in. probe rod penetration. The submerged portions of the pier were sound and smooth with no defects observed. Refer to Figure 7 in Exhibit 1 for detailed inspection notes of Pier 1. Refer to Photographs 9 and 10 in Exhibit 2 for views of Pier 1 and typical concrete condition at the waterline.

2.2.3 Abutment 2

The channel bottom material consisted of sand, silt, and scattered riprap up to 18 in. diameter with up to 6 in. probe rod penetration. The submerged portions of the pier were sound and smooth with no defects observed. Typical spalling was observed around the weep hole drains measuring up to 24 in. diameter by 2 in deep with no exposed steel reinforcement. Refer to Figure 8 in Exhibit 1 for detailed inspection notes of Abutment 2. Refer to Photograph 4 in Exhibit 2 for views of Abutment 2.

3.0 EVALUATION AND RECOMMENDATIONS

Overall, the inspected substructure units of Structure No. 4801741 (LUC-24-2656) were in good condition. A comparison of the soundings recorded during the previous inspection on November 10, 2015 and the soundings taken during this inspection revealed no significant change in the channel bottom profile in the vicinity of the structure. Although no channel deficiencies were observed, the channel bottom should continue to be monitored during future underwater inspections to verify that localized scour or overall channel degradation is not occurring and that the pier footings remain adequately embedded in the channel bottom.

The spalling observed on Abutments 1 and 2 are not a structural concern at this time given its size compared to the overall pier size, and as a result, no repairs are recommended. This area should be monitored during future inspections for increasing extent or severity of the scaling and exposure of reinforcing steel. If

the extent or severity of the scaling is observed to be increasing or reinforcing steel becomes exposed, it may be necessary to repair the area at that time.

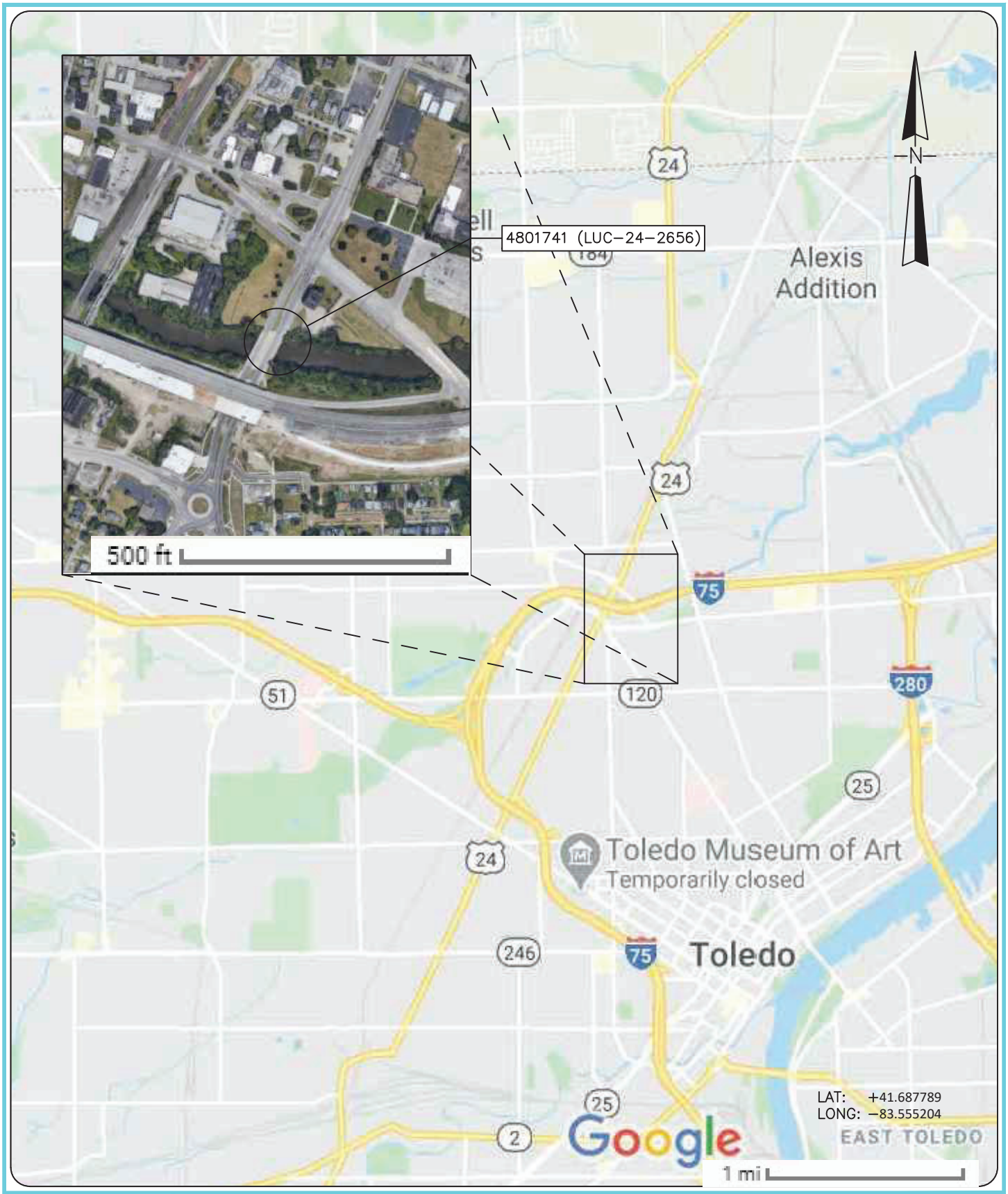
It is recommended that the submerged substructure units of Structure No. 4801741 (LUC-24-2656) be next inspected underwater at an interval not to exceed 60 months, no later than April 21, 2025.

Respectfully Submitted,
COLLINS ENGINEERS, INC.

Joshua Johnson, P.E.
Project Manager

Originated by:
Kevin Mitchell, E.I.T.

EXHIBIT 1 – FIGURES

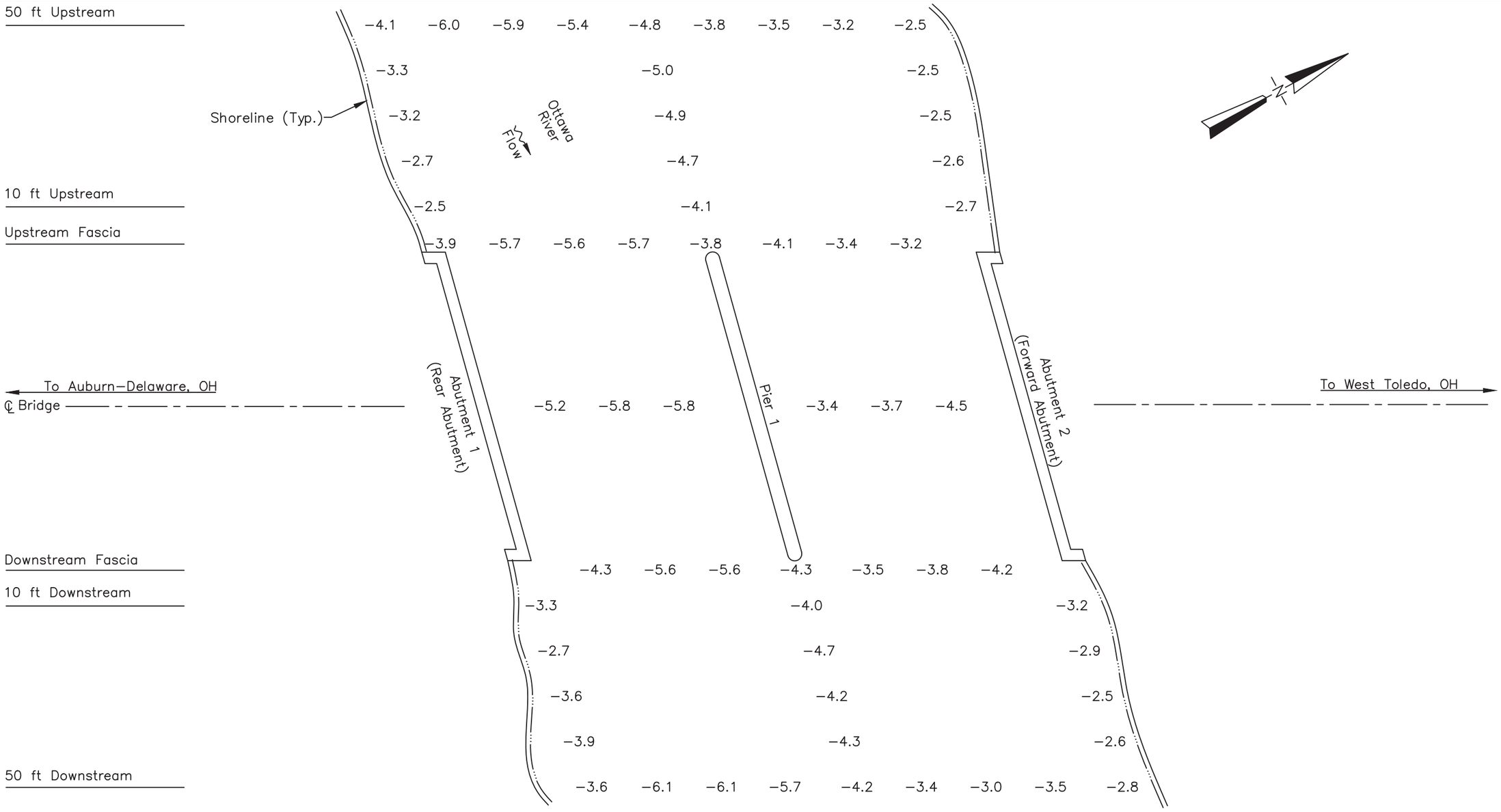


COLLINS ENGINEERS
124 Venture Court, Ste 10
Lexington, KY 40511
Phone: 859-367-0097
Fax: 859-367-0140

Ohio Department of Transportation, District 2
317 East Poe Rd.
Bowling Green, OH 45601
Phone: 419-353-8131

US-24 OVER OTTAWA RIVER
STRUCTURE NO. 4801741
(LUC-24-2656)
LOCATION MAP
LUCAS COUNTY, OHIO

INSPECTED BY: MOR	CEI PROJECT: 55-12239.00
DRAWN BY: BLV	DATE: 21 APR 2020
CHECKED BY: JMJ	SHEET NO: 1



SOUNDING PLAN

GENERAL NOTES:

1. Abutments 1 and 2 and Pier 1 were inspected underwater. Substructure units are labeled according to available record drawings.
2. At the time of inspection on April 21, 2020, the waterline was located approximately 10.9 ft below the top of the downstream nose of Pier 1 (EL. +583 ft). This corresponds with a waterline elevation of +572.1 ft.
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 the upstream and downstream fascias, at 10 ft intervals between the substructure units, and at 10 ft intervals in–line with the piers upstream and downstream up to 50 ft.

LEGEND

−2.7	Sounding Depth from Waterline (ft)
	Timber Debris

COLLINS ENGINEERS
124 Venture Court, Ste 10
Lexington, KY 40511
Phone: 859-367-0097
Fax: 859-367-0140

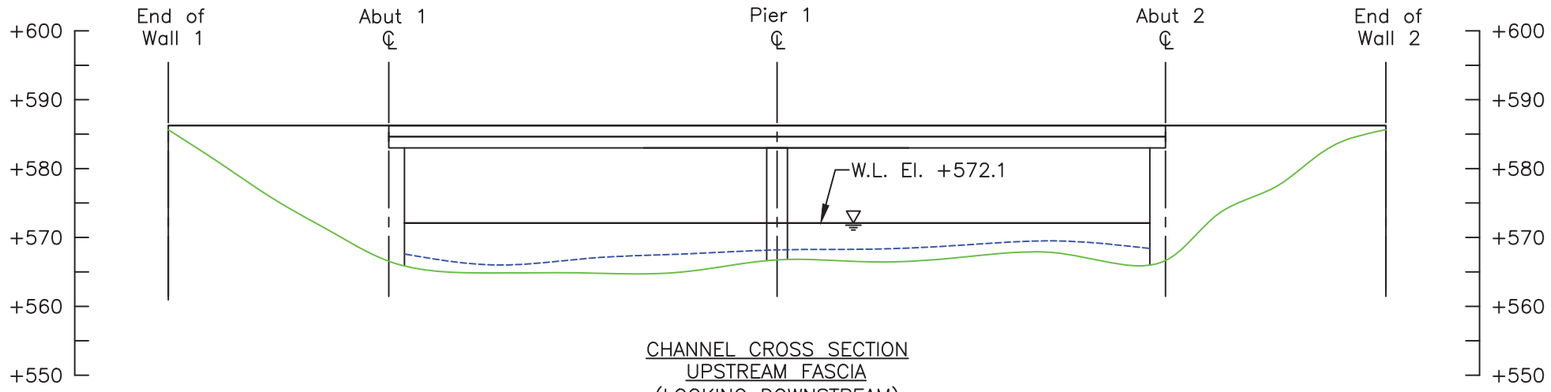
Ohio Department of Transportation, District 2
317 East Poe Rd.
Bowling Green, OH 45601
Phone: 419-353-8131

US-24 OVER OTTAWA RIVER
STRUCTURE NO. 4801741 (LUC-24-2656)
SOUNDING PLAN
LUCAS COUNTY, OHIO

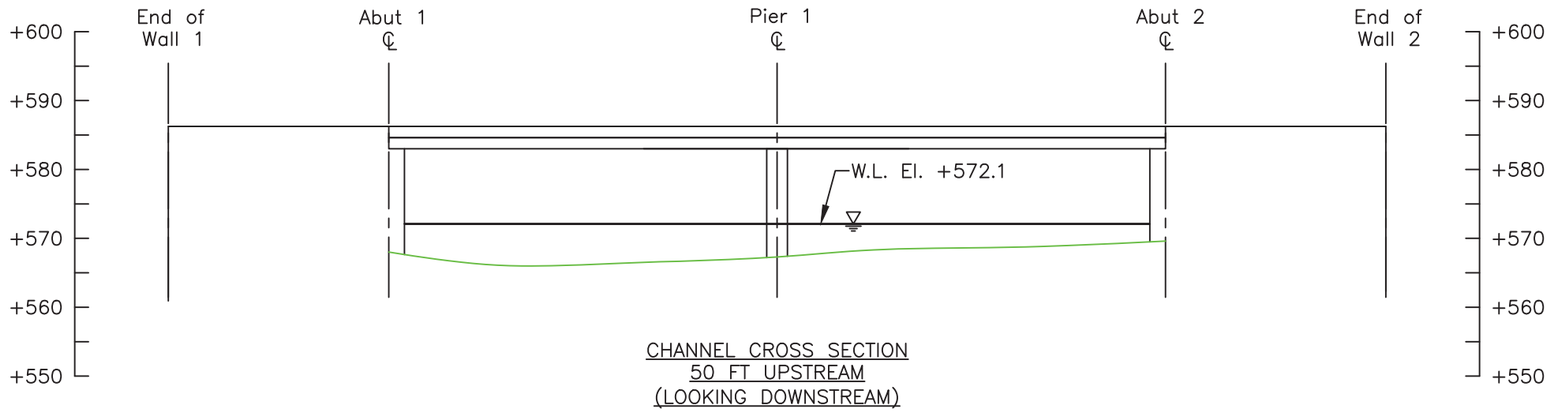
CEI PROJECT	55–12239.00
INSPECTED BY:	MOR
DRAWN BY:	BLV
CHECKED BY:	JMJ
DATE:	APR 2020
SHEET NO:	2

UPSTREAM FASCIA LOOKING DOWNSTREAM	
Location	Y(ft)*
EOW2	0.6
1/4	3.1
1/2	8.9
3/4	12.6
A2	19.6
1/4	18.7
1/2	19.0
3/4	19.8
P1	19.5
1/4	21.3
1/2	21.4
3/4	21.4
A1	19.7
1/4	15.6
1/2	11.1
3/4	5.8
EOW1	0.6

Profile taken from top of deck



CHANNEL CROSS SECTION
UPSTREAM FASCIA
(LOOKING DOWNSTREAM)



CHANNEL CROSS SECTION
50 FT UPSTREAM
(LOOKING DOWNSTREAM)

Note:

Footing elevations unknown due to unavailable design drawings.

LEGEND

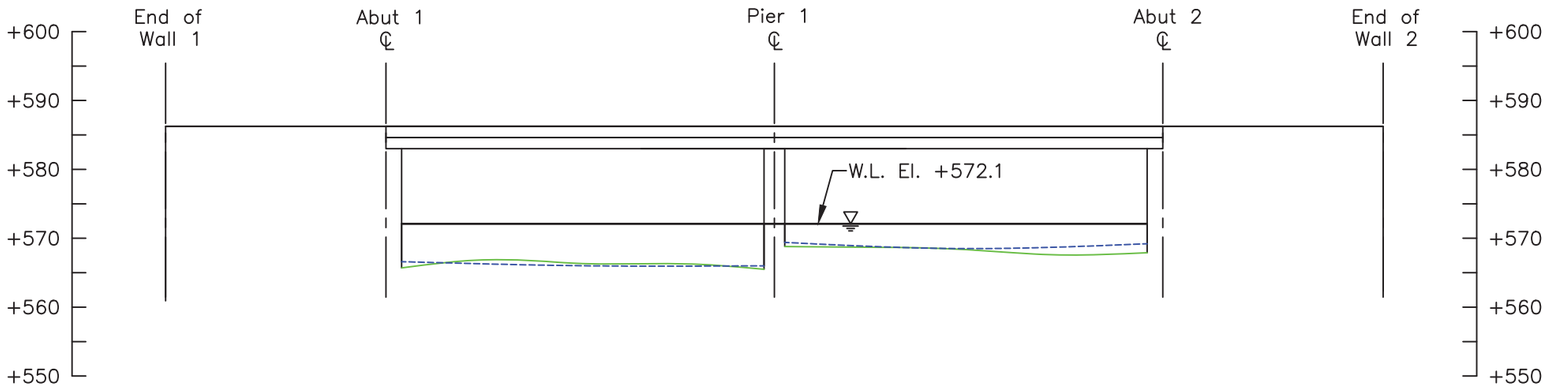
- Approximate Channel Bottom – April 2020
- Approximate Channel Bottom – Nov. 2015
- Approximate Channel Bottom – Nov. 2010 (No Data)
- Timber Debris
- Water Surface
- +450 Elevation (ft)

COLLINS ENGINEERS
124 Venture Court, Ste 10
Lexington, KY 40511
Phone: 859-367-0097
Fax: 859-367-0140

Ohio Department of Transportation, District 2
317 East Poe Rd.
Bowling Green, OH 45601
Phone: 419-353-8131

US-24 OVER OTTAWA RIVER
STRUCTURE NO. 4801741 (LUC-24-2656)
CROSS SECTIONS - UPSTREAM
LUCAS COUNTY, OHIO

CEI PROJECT 55–12239.00
INSPECTED BY: MOR
DRAWN BY: BLV
CHECKED BY: JMJ
DATE: APR 2020
SHEET NO: 3



CHANNEL CROSS SECTION
STRUCTURE CENTERLINE
(LOOKING DOWNSTREAM)

Note:

Footing elevations unknown due to unavailable design drawings.

LEGEND

- Approximate Channel Bottom – April 2020
- Approximate Channel Bottom – Nov. 2015
- Approximate Channel Bottom – Nov. 2010 (No Data)
- Timber Debris
- Water Surface
- +450 Elevation (ft)

COLLINS ENGINEERS
124 Venture Court, Ste 10
Lexington, KY 40511
Phone: 859-367-0097
Fax: 859-367-0140

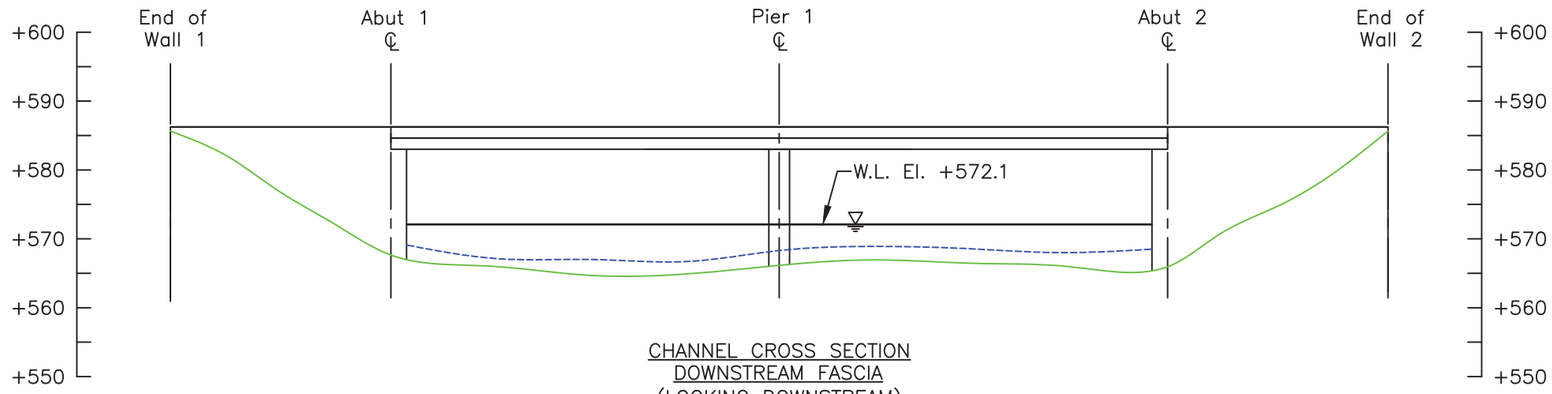
Ohio Department of Transportation, District 2
317 East Poe Rd.
Bowling Green, OH 45601
Phone: 419-353-8131

US-24 OVER OTTAWA RIVER
STRUCTURE NO. 4801741 (LUC-24-2656)
CROSS SECTIONS - CENTERLINE
LUCAS COUNTY, OHIO

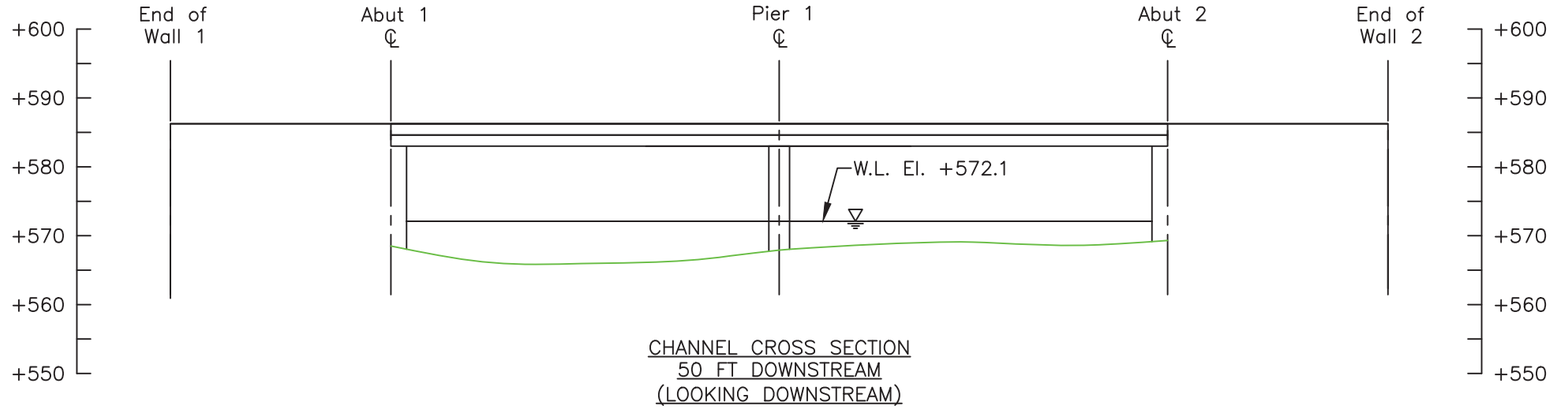
CEI PROJECT 55–12239.00
INSPECTED BY: MOR
DRAWN BY: BLV
CHECKED BY: JMJ
DATE: APR 2020
SHEET NO: 4

DOWNSTREAM FASCIA LOOKING DOWNSTREAM	
Location	Y(ft)*
EOW2	0.6
1/4	6.8
1/2	11.5
3/4	15.3
A2	20.3
1/4	20.3
1/2	19.8
3/4	19.3
P1	20.1
1/4	21.4
1/2	21.5
3/4	20.1
A1	18.6
1/4	14.2
1/2	9.5
3/4	4.1
EOW1	0.6

Profile taken from top of deck



CHANNEL CROSS SECTION
DOWNSTREAM FASCIA
(LOOKING DOWNSTREAM)



CHANNEL CROSS SECTION
50 FT DOWNSTREAM
(LOOKING DOWNSTREAM)

Note:

Footing elevations unknown due to unavailable design drawings.

LEGEND

- Approximate Channel Bottom – April 2020
- Approximate Channel Bottom – Nov. 2015
- Approximate Channel Bottom – Nov. 2010 (No Data)
- Timber Debris
- Water Surface
- +450 Elevation (ft)

COLLINS ENGINEERS
124 Venture Court, Ste 10
Lexington, KY 40511
Phone: 859-367-0097
Fax: 859-367-0140

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Bowling Green, OH 45601
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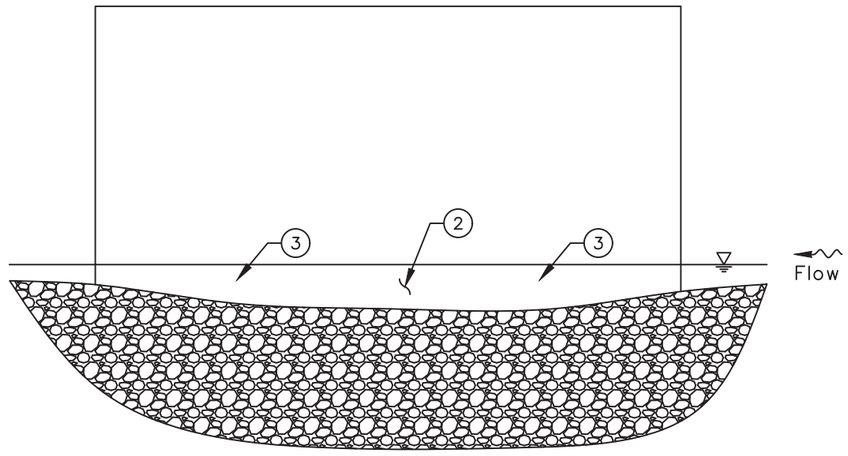
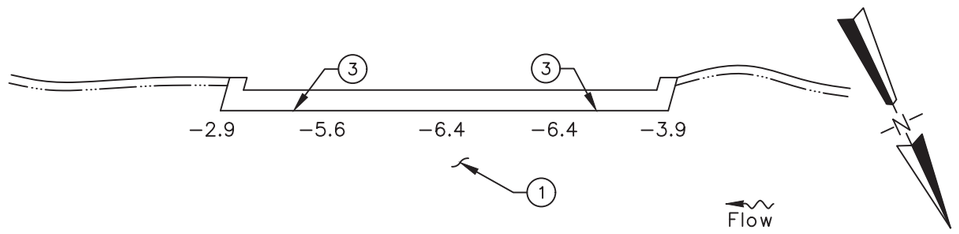
US-24 OVER OTTAWA RIVER
STRUCTURE NO. 4801741 (LUC-24-2656)
CROSS SECTIONS - DOWNSTREAM
LUCAS COUNTY, OHIO

CEI PROJECT	55–12239.00
INSPECTED BY:	MOR
DRAWN BY:	BLV
CHECKED BY:	JMJ
DATE:	APR 2020
SHEET NO:	5



NORTH ELEVATION
(LOOKING SOUTH)



PLAN

INSPECTION NOTES:

1. The channel bottom material consisted of sand, silt, and scattered riprap up to 18 in. diameter with up to 6 in. probe rod penetration.
2. The submerged portions of the pier were sound and smooth with no defects observed.
3. Typical spalling was observed around the weep hole drains measuring up to 24 in. diameter by 2 in. deep with no exposed steel reinforcement.

LEGEND

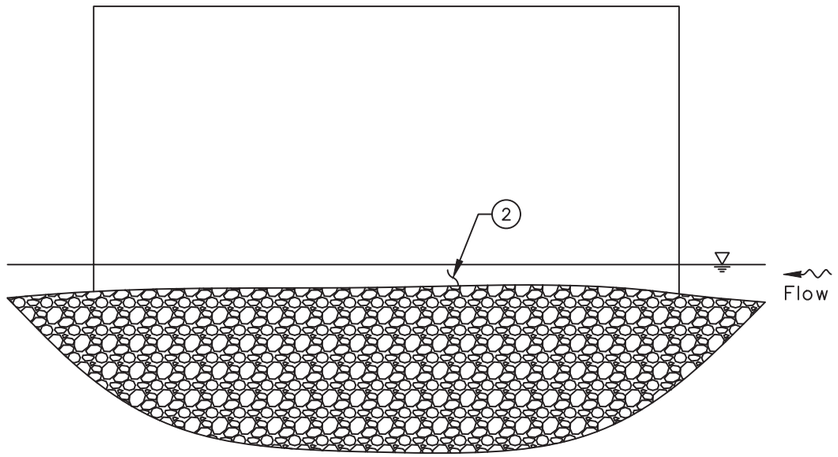
−2.7	Sounding Depth from Waterline (ft)
———	Approximate Channel Bottom – April 2020
	Timber Debris
	Water Surface

COLLINS ENGINEERS
124 Venture Court, Ste 10
Lexington, KY 40511
Phone: 859-367-0097
Fax: 859-367-0140

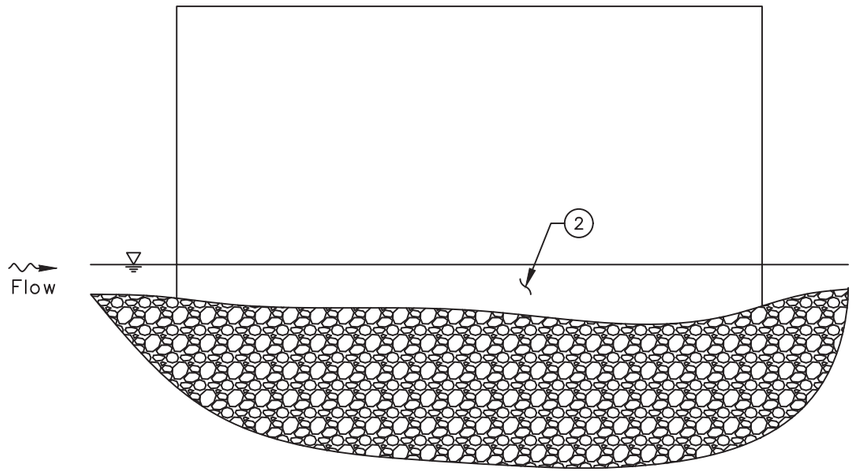
Ohio Department of Transportation, District 2
317 East Poe Rd.
Bowling Green, OH 45601
Phone: 419-353-8131

US-24 OVER OTTAWA RIVER
STRUCTURE NO. 4801741 (LUC-24-2656)
ABUTMENT 1
LUCAS COUNTY, OHIO

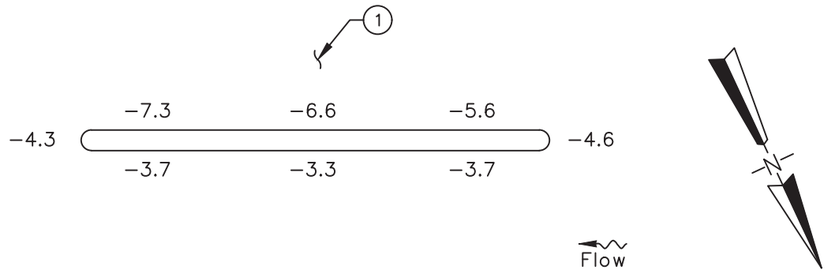
CEI PROJECT	55−12239.00
INSPECTED BY:	MOR
DRAWN BY:	BLV
CHECKED BY:	JMJ
DATE:	APR 2020
SHEET NO:	6



NORTH ELEVATION
(LOOKING SOUTH)



SOUTH ELEVATION
(LOOKING NORTH)



PLAN

INSPECTION NOTES:

(1) The channel bottom material consisted of sand, silt, and scattered riprap up to 18 in. diameter with up to 6 in. probe rod penetration.

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LEGEND

−2.7	Sounding Depth from Waterline (ft)
———	Approximate Channel Bottom – April 2020
	Timber Debris
———	Water Surface

COLLINS ENGINEERS
124 Venture Court, Ste 10
Lexington, KY 40511
Phone: 859-367-0097
Fax: 859-367-0140

Ohio Department of Transportation, District 2
317 East Poe Rd.
Bowling Green, OH 45601
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US-24 OVER OTTAWA RIVER
STRUCTURE NO. 4801741 (LUC-24-2656)
PIER 1
LUCAS COUNTY, OHIO

CEI PROJECT	55–12239.00
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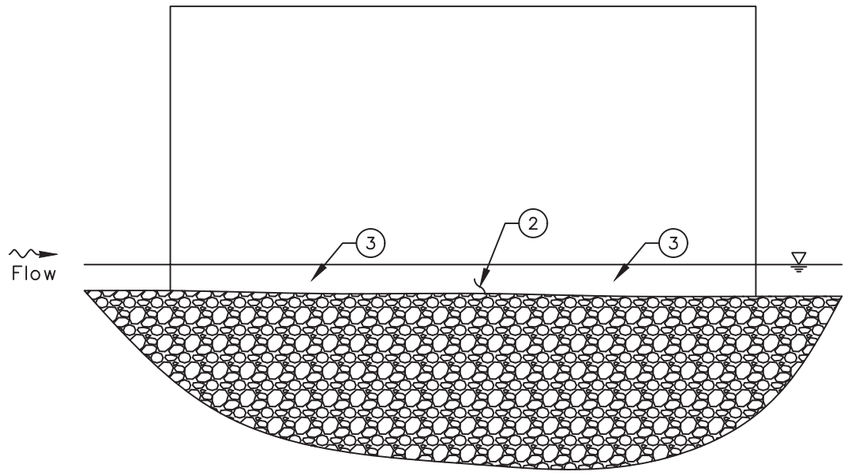
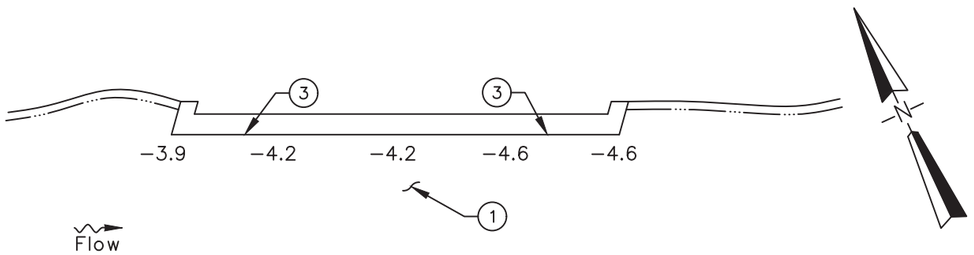
DATE:	APR 2020
SHEET NO:	7



SOUTH ELEVATION
(LOOKING NORTH)



PLAN

INSPECTION NOTES:

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	Timber Debris
	Water Surface

COLLINS ENGINEERS
124 Venture Court, Ste 10
Lexington, KY 40511
Phone: 859-367-0097
Fax: 859-367-0140

Ohio Department of Transportation, District 2
317 East Poe Rd.
Bowling Green, OH 45601
Phone: 419-353-8131

US-24 OVER OTTAWA RIVER
STRUCTURE NO. 4801741 (LUC-24-2656)
ABUTMENT 2
LUCAS COUNTY, OHIO

CEI PROJECT	55−12239.00
INSPECTED BY:	MOR
DRAWN BY:	BLV
CHECKED BY:	JMJ
DATE:	APR 2020
SHEET NO:	8

EXHIBIT 2 – INSPECTION PHOTOGRAPHS

Photograph No. 1: Overall View of Structure No. 4801741 (LUC-24-2656), Looking East.

Photograph No. 2: Overall View of Structure No. 4801741 (LUC-24-2656), Looking West.

Photograph No. 3: View of the North Embankment Upstream of the Structure, Looking North.

Photograph No. 4: View of the North Embankment at the Structure, Looking Northeast.

Photograph No. 5: View of the North Embankment Downstream of the Structure, Looking Northeast.

Photograph No. 6: View of the South Embankment Upstream of the Structure, Looking Southwest.

Photograph No. 7: View of the South Embankment at the Structure, Looking South.

Photograph No. 8: View of the South Embankment Downstream of the Structure, Looking Southeast.

Photograph No. 9: View of the North Face of Pier 1, Looking Southwest.

Photograph No. 10: View of the South Face of Pier 1, Looking Northeast.

Photograph No. 11: View of the Typical Concrete Condition at the Waterline on the Upstream nose of Pier 1, Looking Northeast.

EXHIBIT 3 – UNDERWATER DIVE INSPECTION PROCEDURE CHECKLIST

Underwater Dive Inspection Procedure Checklist

Acceptable written procedures communicate to the next dive team what is necessary to ensure a safe and successful inspection. Each bridge requiring underwater dive techniques must have a unique written inspection procedure. The prior inspection report does not suffice for the required procedures. It is valuable to review the last inspection notes, but they do not serve the same purpose as a stand-alone inspection procedure.

This document shall be completed for all underwater dive inspections. This document shall be reviewed prior to performing the field work and it shall be updated when necessary.

I. Bridge Identification

a. Agency with Inspection Responsibility: ODOT DISTRICT 2

Dive Frequency: 60 months

SFN: 4801741 Bridge Number (County-Route-SLM-SD): LUC-24-2656

Superstructure Type — Main Span Type: STEEL GIRDER

Approach Span: REINFORCED CONCRETE

Substructure Type — Abutment Type: REINFORCED CONCRETE

Pier Type: REINFORCED CONCRETE

Total Pier Count: 3

Total Pier Count in water: 3

Foundations: UNKNOWN

Feature Intersected — CEDAR CREEK

b. Photographs

Endview

Elevation

Underside

II. Office and Field Assessment

Prior to the inspection, obtain and review copies of the previous underwater inspection reports, routine inspection reports, scour and hydraulic information, and design plans in preparation of the inspection. Divers should pay particular attention given to any observed areas of deterioration, the channel conditions and factors that may accelerate material deterioration. Changes shall be noted in the inspection procedure. Site conditions should be reviewed prior to diving.

a. Channel Conditions

____Waterway features

____Rapid stream flows,

____Significant debris accumulation

____Constricted waterway openings

____Soft or unstable streambeds

____Meandering channels

____Other which may promote scour and undermining of substructure elements

____Navigable Waterway

____Flow Controls

b. Anticipated Water conditions which may affect the inspection

____Cold Water (Apprx. Temp____)

____Black water

____Rapid stream flows

____Near military facility

____Tribal fishing

____Water quality

____History of Log jams

c. Identify factors that may accelerate the deterioration of the bridge elements:

____Highly corrosive water

____Unprotected steel members

____Other

Risk Factor Narrative:

III. **Contacts Prior to Work**

District 2 Bridge Engineer: David Geckle, P.E.

Email: david.geckle@dot.ohio.gov – Phone: 419-373-4377

Point of contact for immediate action such as closing the bridge due to findings)

Contact Bridge Owner ____14_____ (number) days before the proposed underwater inspection.

Special contracting and scheduling procedures prior to inspection, include recommended lead time

Entity	Contact Name and Title	Contact Phone	Lead Time
Coast Guard			
Property Owner			
Access Equipment			
Lake or River draw-down			
Canal dry time			
Tree removal			
Other:			
Other:			

IV. **Dive Team Shall Include the Following:**

Dive Team Narrative:

The dive team consisted of one Team Leader (NBIS, P.E., ADCI) and two Team Members (NBIS, UW, ADCI).

Example: The Bridge shall be investigated using a three-member dive team: one supervisor to monitor rack box and take notes, one diver, and one tender/standby diver. There shall be one NBIS Team Leader onsite at all times.

V. Site Information

Navigable waterway:	Y / **N**	Anticipated current	__0___ ft
If Yes, waterway river point	_____	Scour Critical (item 113):	__8_____
Anticipated water visibility depth	__0___ ft	POA in place: Y/N	
Anticipated Dive depth	_7.3__ ft	Scour Monitoring devices present: Y/**N**	

Verify the Scope of Services when work is contracted for the procedure for underwater elements that are not in water during an inspection.

Site Information Narrative:

The underwater inspection consists of a visual and tactile examination of the accessible surfaces of the substructure items in water. Additional items should reference the scope of services in the contract. For reference the following items are in water:

Item	Number of Units	Level of Inspection (1, 2 or 3) with Commentary
Piers and Number of Columns	1	100% LEVEL I 10% LEVEL II
Abutment	2	100% LEVEL I 10% LEVEL II
Culvert		
Scour Countermeasures		
Fenders or Dolphins		

Photographs should be taken, if water clarity permits, for typical conditions, conditions that have changed since last inspection and significant or noteworthy deficiencies. The type of channel bottom material, the presence or extent of scour, the presence or extent of riprap, the presence or extent of drift and debris, and the location of any foundation exposure or undermining shall be quantified. Include depth, length, height and location of deficiencies.

VI. **Equipment and Field Logistics**

a. The inspection should be conducted using:

____Chest waders

____Hip waders

_X__Diving equipment

____SCUBA (Note that ADCI Consensus Standards require communication systems be employed for both SCUBA and Surface-Supplied (whether air or mixed-gas) dive modes)

____SCUBA with communication

_X__ Surface Supplied with communication

b. The channel bottom should be sounded utilizing

_X__ Digital fathometer

_X__ Telescoping survey rod

_X__ acoustic imaging

c. During the inspection, the divers should work from

_X__ Shore

_____ Boat

____Either

The note taker should work alongside the dive team.

d. Access to the waterway should be obtained from the shore (north bank, southwest quadrant, driveway 30 yards north etc.)

NORTHEAST EMBANKMENT AT STRUCTURE

_____

e. The maximum depth of the channel is typically measured_____ feet from

50FT. DOWNSTREAM BETWEEN ABUTMENT 1 AND PIER 1.

_____

Reference Datum_____

Soundings should be dictated by the scope of work. When not detailed in the scope they should be repeated from the previous soundings. If neither exist then they need to be taken in a grid pattern between substructure units 100' upstream and 100' downstream.

VII. Inspection Procedure History

Created: COLLINS ENGINEERS Date: 09/25/2020

Updated By: _____ Date: _____

Updated By: _____ Date: _____

Updated By: _____ Date: _____

Updated By: _____ Date: _____

Updated By: _____ Date: _____

VIII. Other Narrative Not Included In Previous Sections