UNDERWATER BRIDGE INSPECTION REPORT

BRIDGE NO. GUE-70-2192

STRUCTURE NO. 3002071

I-70 OVER

HIGHWAY DITCH

GUERNSEY COUNTY, OH

DISTRICT 5

August 2018

Prepared for:

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

STATE OF OHIO
JOSHUA M. JOHNSON
E-76141
REGISTERED PROFESSIONAL ENGINEER

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 5 Underwater Bridge Inspections - 2018

Purpose of Project: To perform a detailed visual and tactile underwater investigation of bridges for District 5 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 – William Gwaltney, E.I.T. – Collins Engineers, Inc.

Inspection Date(s): August 21, 2018

Water Visibility:	1 ft	***Water Velocity:***	<1 ft/s
Water Temperature:	75 °F	***Weather:***	Clear – 80 °F
Waterline Elevation:	84.8 ft	***Type of Boat:***	N/A
Coordinates:	40.0479898°N, 81.3494146°W		
Access Location:	East and West banks		
Dive Mode:	Surface Supplied Air		
Waterline Reference:	7.5 ft below the top of invert at the outlet		
Maximum Depth at SSU:	3.5 ft – Centerline mid-point of the barrel		
Shoreline Conditions:	The north and south shorelines consisted of mildly to moderately vegetated mild slopes with minor erosion.		

Summary of Findings:

- **Culvert:**
  - The channel bottom material consisted of soft silt and clay with up to 24 in. probe rod penetration.
  - The submerged portions of the culvert exhibited light surface corrosion with up to 1/32 in. section loss.
  - The joints and connection hardware exhibited moderate corrosion with up to 1/16 in. section loss.

Summary of Recommendations:

- Monitor steel section loss.

Underwater Inspection Coding:

NBI Ratings:

Item	Description	Coding	Condition
61	Channel	7 – Good Condition	Minor Erosion
62	Culvert	6 – Satisfactory Condition	Light Surface Corrosion, Moderate Corrosion at Joints and Hardware
92B	UW Insp. Frequency	60 Months	
93B	Previous Insp. Date	08/21/18	
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
243	Culvert, Steel	LF	100	90	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 I-70 Culvert carrying Highway Ditch in Guernsey County, OH. Collins Engineers, Inc. (Collins) conducted the underwater investigation for District 5 of the Ohio Department of Transportation (ODOT) on August 21, 2018. 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 culvert fascias, upstream and downstream of the bridge, and around the submerged substructure units.
- Determine the condition of the shorelines in the vicinity of the structure.
- Obtain photographs of the culvert 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. 3002071 is 12 ft in diameter, carrying Highway Ditch under I-70 and is approximately 180 ft long. The culvert is constructed of one steel corrugated pipe. The roadway orientation perpendicular to the culvert is west to east. Existing design drawings were not available at the time of the inspection. Refer to Figure 1 in Exhibit 1 for a Location Map of the culvert. Refer to Photographs 1 and 2 in Exhibit 2 for overall views of the culvert.

1.3 Method of Investigation

A detailed field inspection was conducted to determine the physical condition of the submerged 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 an professional engineer-diver and team leader (Joshua Johnson, P.E.) and two engineer divers (Matthew Rogers, E.I.T. and Will Gwaltney, E.I.T.) conducted the underwater inspection. The inspection was conducted using surface supplied air diving equipment. During the inspection, the inspectors worked from shore and a note taker on 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. Soundings were collected at 10 feet intervals in-line with the walls, upstream and downstream, and the waterline was referenced to an assumed elevation on the culvert. A sounding plan was developed using the soundings and approximate location of the shorelines. Refer to Figure 2 for the sounding plan that shows 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 Structure No. 3002071 was located approximately 7.5 ft below the top of invert at the inlet of the culvert, which corresponds to an assumed waterline elevation of 92.5 ft. During the inspection, the waterway was flowing at approximately 1 ft per second. The culvert skew was consistent with the channel alignment and does not require attention at this time. The north and south shorelines consisted of mildly to moderately vegetated mild slopes with minor erosion. Refer to Photographs 3 through 6 in Exhibit 2 for views of the shorelines near the structure.

2.2 Substructure Conditions

2.2.1 Culvert

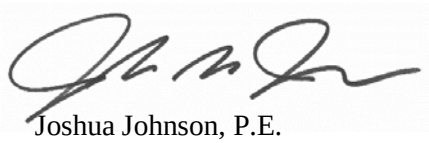
The channel bottom material around the culvert consisted of soft silt with approximately 24 in probe rod penetration. The submerged portions of the culvert exhibited light scaling up to 1/32 in deep and vertical joints exhibited moderate corrosion with up to 3/16 in section loss. Refer to Figure 4 in Exhibit 1 for detailed inspection notes. Refer to Photographs 9 through 10 in Exhibit 2 for views of the typical Steel condition at the waterline.

3.0 EVALUATION AND RECOMMENDATIONS

Overall, the inspected substructure units of Structure No. 3002071 were in good condition. A comparison of the soundings recorded during the previous inspection on September 19, 2013 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 culvert remains adequately embedded in the channel bottom.

It is recommended that the submerged substructure units of Structure No. 3002071 be next inspected underwater at an interval not to exceed 60 months, no later than August 22, 2023.

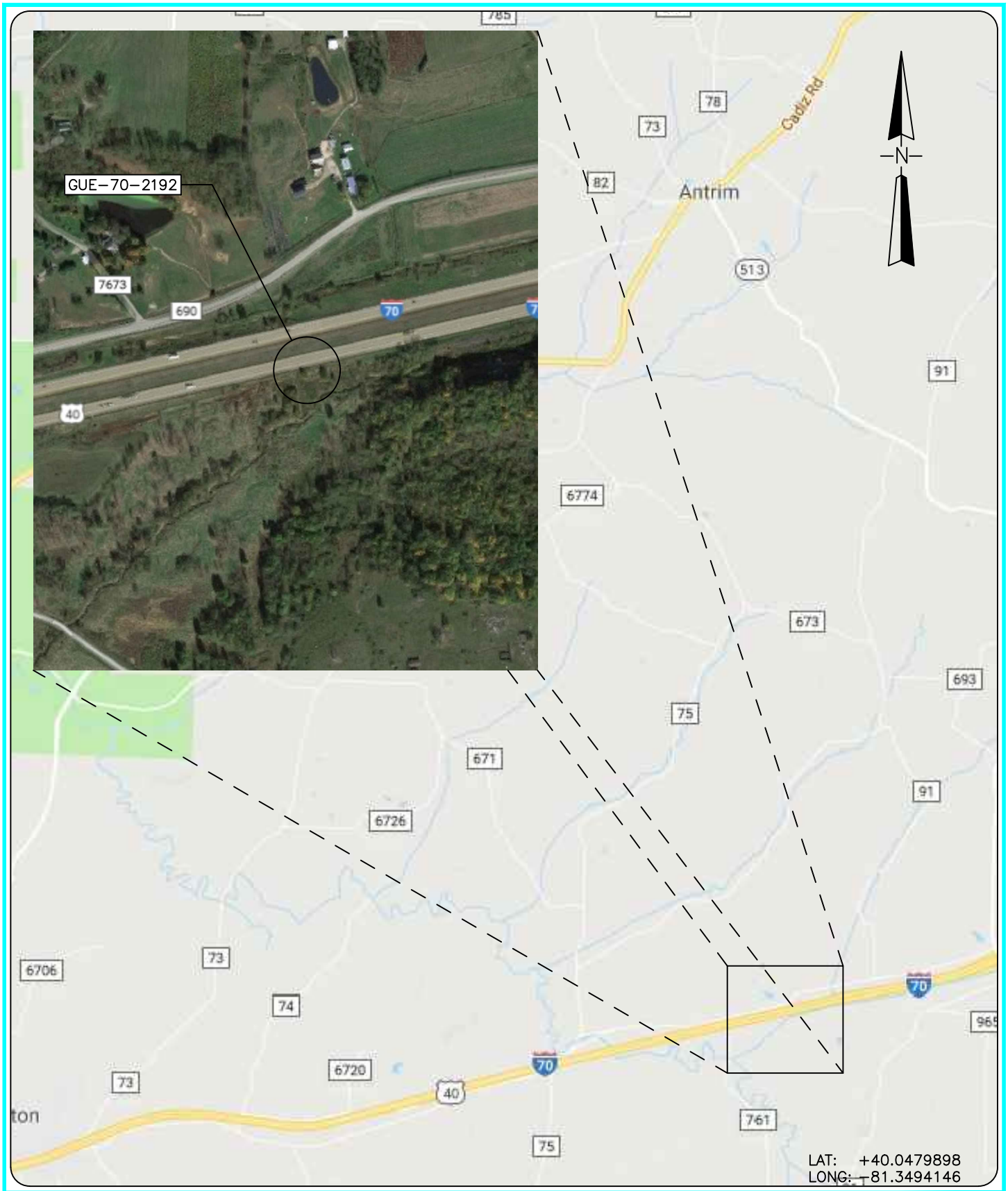
Respectfully Submitted,
COLLINS ENGINEERS, INC.



Joshua Johnson, P.E.
Project Manager/Team Leader

Originated by:
Matthew Rogers, 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 5
9600 Jacksontown Road
Jacksontown, OH 43030
Phone: 740-323-4400

I-70 OVER HIGHWAY DITCH
STRUCTURE NO. 3002071

LOCATION MAP

GUERNSEY COUNTY, OHIO

INSPECTED BY: MOR	CEI PROJECT: 55-10914.00
DRAWN BY: MOR	DATE: 21 AUG 2018
CHECKED BY: JMJ	SHEET NO: 1

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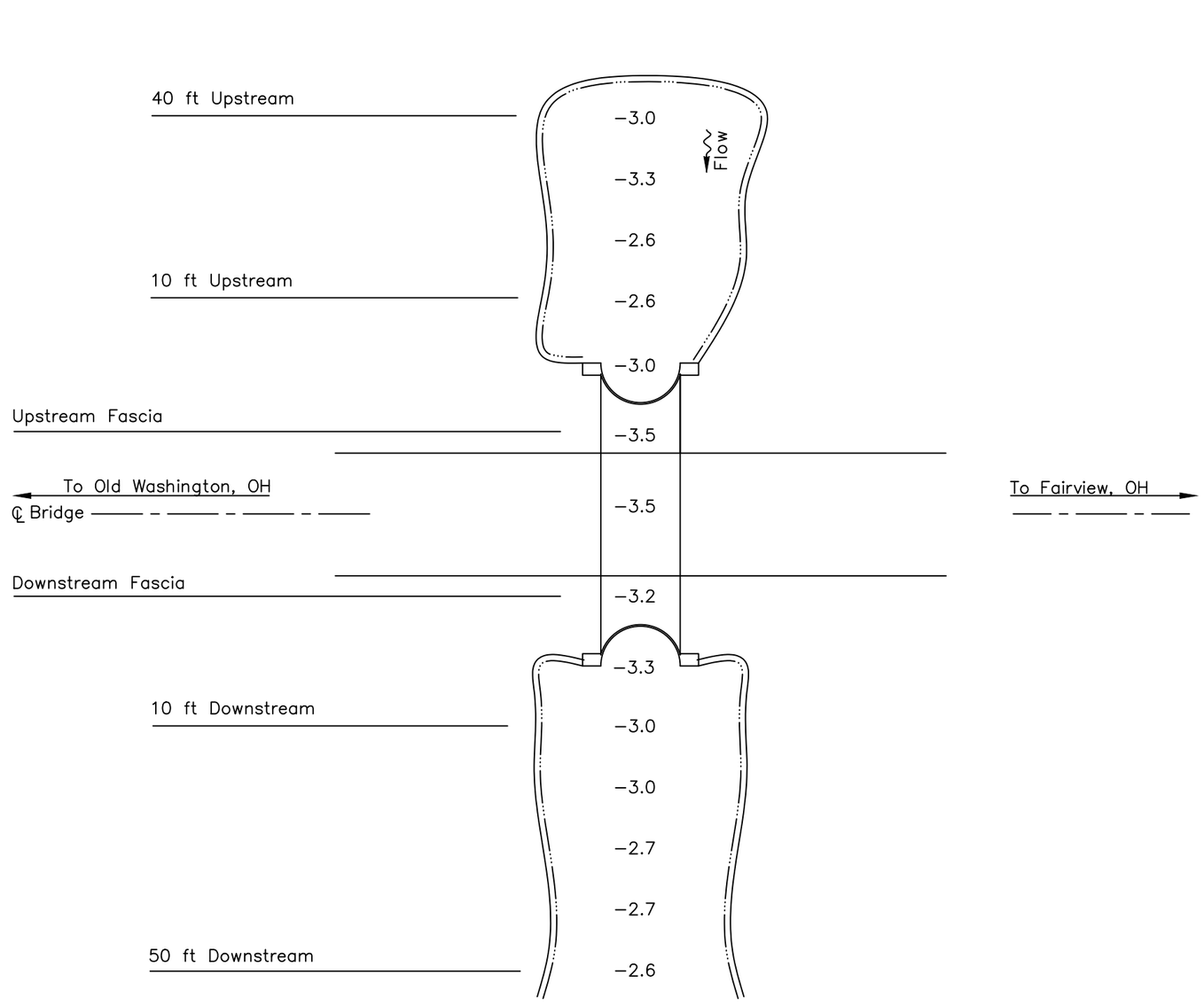


SOUNDING PLAN

GENERAL NOTES:

1. Culvert was inspected underwater. Substructure units are labeled according to ODOT Manual for Bridge Inspection (2014).
2. At the time of inspection on August 21, 2018, the waterline was located approximately 7.5 ft below Top of Pipe at upstream invert of culvert pipe (Assumed EL. +100.0 ft). This corresponds with a waterline elevation of +92.5 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

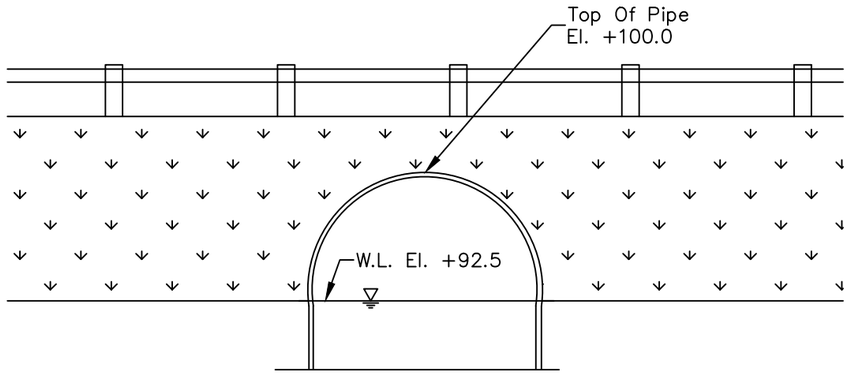
Ohio Department of Transportation, District 5
9600 Jacksontown Road
Jacksontown, OH 43030
Phone: 740-323-4400

I-70 OVER HIGHWAY DITCH
STRUCTURE NO. 3002071
SOUNDING PLAN
GUERNSEY COUNTY, OHIO

CEI PROJECT 55−10914.00
INSPECTED BY: MOR
DRAWN BY: MOR
CHECKED BY: JMJ
DATE: AUG 2018
SHEET NO: 2

EAST WALL

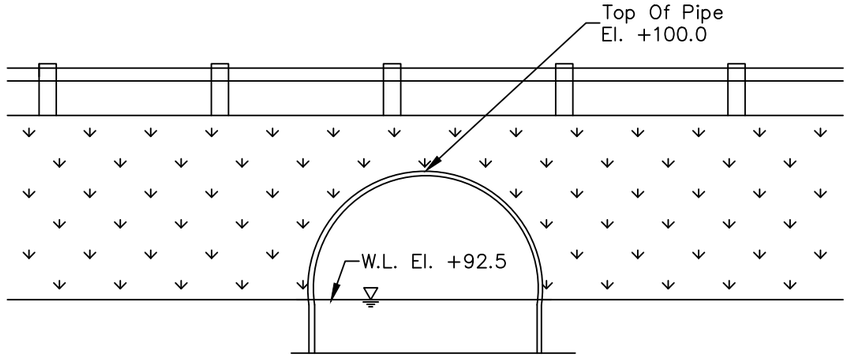
WEST WALL



UPSTREAM FASCIA CHANNEL CROSS SECTION (LOOKING DOWNSTREAM)

EAST WALL

WEST WALL



DOWNSTREAM FASCIA CHANNEL CROSS SECTION (LOOKING DOWNSTREAM)

Note:

Footing elevations unknown due to unavailable record drawings.

LEGEND

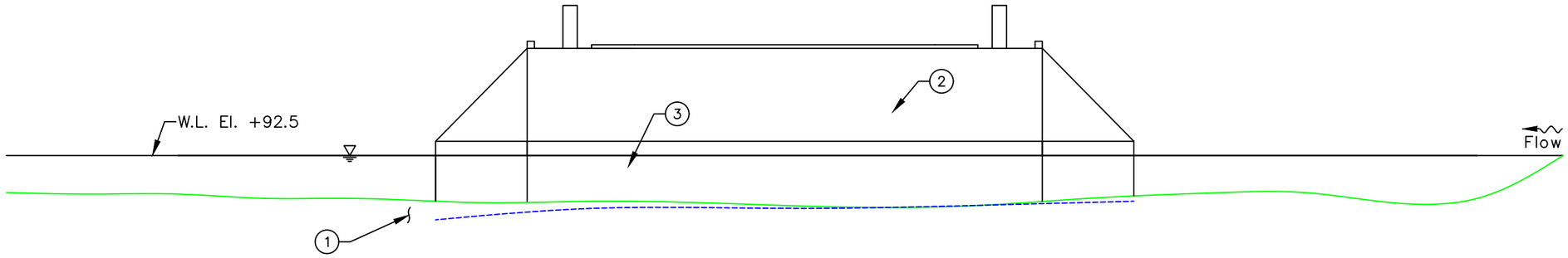
−2.7	Sounding Depth from Waterline (ft)
———	Approximate Channel Bottom – August 2018
	Timber Debris
	Water Surface

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

Ohio Department of Transportation, District 5
9600 Jacksontown Road
Jacksontown, OH 43030
Phone: 740-323-4400

I-70 OVER HIGHWAY DITCH
STRUCTURE NO. 3002071
CROSS SECTIONS
GUERNSEY COUNTY, OHIO

CEI PROJECT	55–10914.00
INSPECTED BY:	MOR
DRAWN BY:	MOR
CHECKED BY:	JMJ
DATE:	AUG 2018
SHEET NO:	3



STRUCTURE CENTERLINE
CHANNEL CROSS SECTION
(LOOKING WEST)

INSPECTION NOTES:

1. Channel bottom consisted of soft silt with up to 24 in of probe rod penetration.
2. Vertical joints experienced moderate corrosion with up to $\frac{3}{16}$ in of section loss.
3. Steel condition underwater consisted of light surface corrosion with up to $\frac{1}{32}$ in section loss.

LEGEND

———	Approximate Channel Bottom – August 2018
- - - - -	Approximate Channel Bottom – September 2013
– – – – –	Approximate Channel Bottom – (No Data)
	Timber Debris
	Water Surface
+450	Elevation (ft)

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Jacksontown, OH 43030
Phone: 740-323-4400

I-70 OVER HIGHWAY DITCH
STRUCTURE NO. 3002071
INSPECTION FINDINGS
GUERNSEY COUNTY, OHIO

CEI PROJECT
55–10914.00

INSPECTED BY:
MOR

DRAWN BY:
MOR

CHECKED BY:
JMJ

DATE:
AUG 2018

SHEET NO:
4

EXHIBIT 2 – INSPECTION PHOTOGRAPHS

Photograph No. 1: Overall View of Structure Outlet No. 3002071 Outlet, Looking North.

Photograph No. 2: Overall View of Structure Intlet No. 3002071 Outlet, Looking South.

Photograph No. 3: View of the Downstream Channel of the Structure, Looking South.

Photograph No. 4: View of the Upstream Channel of the Structure, Looking North.

Photograph No. 5: View of the West Embankment looking Downstream of the Structure, Looking Northwest.

Photograph No. 6: View of the East Embankment looking Downstream of the Structure, Looking Northeast.

Photograph No. 7: View of the West Embankment Looking Downstream of the Structure, Looking Southwest.

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

Photograph No. 9: View of the Typical Steel at the Waterline of the Structure, Looking West.

Photograph No. 10: View of the Typical Corrosion on the Vertical Joints of the Structure, Looking West.

EXHIBIT 3 – APPENDIX F

Appendix F

Underwater Inspection Procedure Checklist

Underwater Inspection Procedure

Acceptable written procedures are those that communicate from the previous underwater inspection and/or the public entity with inspection responsibility to the next field inspection team leader what is necessary to ensure a safe and successful inspection. Each bridge with elements requiring underwater diving inspection must have written inspection procedures specific to each bridge which address items unique to that bridge. The prior inspection report condition ratings and inspection comments, by themselves, do not suffice for the required procedures. It is valuable to review these items but they do not serve the same purpose as the inspection procedures. The inspection report records what an inspector actually did, what was looked at, and what was found. Procedures lay out what should be done, looked at, etc. Often consultant underwater reports will include a paragraph or section in the written report that communicates the underwater inspection procedures. This will often suffice as adequate inspection procedures and fulfill the intent of the FHWA requirement. The checklist herein is a framework, and may be completed for all underwater diving inspections when inspection procedures do not exist.

Bridge Identification

Agency with Inspection Responsibility ODOT DISTRICT 5

Dive Frequency if less than 60 months: _____months

SFN 3002071 Bridge Number GUE-70-2192

Superstructure:	Main Span Type	STEEL CORRUGATED PIPE
	Approach Span	STEEL CORRUGATED PIPE
Substructure:	Abutments	N/A
	Piers	N/A
	Foundations	N/A
Feature Intersected		HIGHWAY DITCH

Office and Field Assessment

Prior to the inspection, obtain and review copies of the previous underwater inspection reports, routine inspection reports 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.

Channel Conditions

_X_Waterway features

_X_Rapid stream flows,

_X_Significant debris accumulation

____Constricted waterway openings

____Soft or unstable streambeds

____Meandering channels

____Other which may promote scour and undermining of substructure elements

Water conditions which may affect the inspection

_X_Black water

_X_Rapid stream flows

____Near military facility

____Tribal fishing

____Water quality

____History of Log jams

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

____Highly corrosive water

____Unprotected steel members

____Timber piling with of teredos or limnoria

____Other

Risk Factor Comments:

_____

_____

Contacts

Divers shall notify ___ODOT D5 BRIDGE ENGINEER___

(*point of contact for immediate action such as closing the bridge due to findings*)

___14___ (*number*) days before the proposed underwater inspection date.

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			

Team

The field inspection team, at a minimum, should include

Team Leaders	Number
NBIS requirements (required)	1
Professional Engineer	
Successful completion of underwater bridge inspection course	X
OSHA qualified diver	X
Team Members	**Number**
Engineer-diver	2
Successful completion of comprehensive bridge inspection course	
Successful completion of underwater bridge inspection course	X
OSHA qualified diver	X
Other	**Number**
Surveyor	
Representative from the Entity with Inspection Responsibility	
Other:_____	

Site Information

Navigable waterway: Y / (N)

If Yes, waterway river point _____

Anticipated water visibility depth 0 ft

Anticipated Dive depth 4 ft

Anticipated current <1 ft

Scour Critical (item 113): 8

POA in place: Y/N

Scour Monitoring devices present: Y/(N)

The procedure for underwater elements that are not in water during an inspection:

_____

_____

_____

The underwater inspection consists of a visual and tactile examination of the accessible surfaces of the following items. Specify the elements to be inspected and the level of the underwater inspection (ex: Level 1, 100%, Level II at three elevations on 10% of piles and four locations at three elevations per substructure unit, Level III)

Item	Number of Units	Level of Inspection
Piers and Number of Columns	N/A	
Abutment	N/A	
Culvert	1	100% LEVEL I 10% LEVEL II
Scour Countermeasures	N/A	
Fenders or Dolphins	N/A	

Photographs, at a minimum, should be taken for typical conditions and at a minimum of _____2_____ per substructure unit. Video should be taken at a minimum _____N/A_____. 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.

Equipment and Field Logistics

The inspection should be conducted using:

____Chest waders

____Hip waders

_X__Diving equipment

____SCUBA

____SCUBA with communication

_X__Surface Supplied air with communication

The channel bottom should be sounded utilizing

____Digital fathometer

_X__Telescoping survey rod

____ acoustic imaging

During the inspection, the divers should work from

_X__Shore

____Boat

____Either

A note taker should work

_X__On shore / ____ In the boat

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

_____

_____

_____

The maximum depth of the channel is typically measured_3.5_ feet from _____

MIDSPAN OF CULVERT

_____

_____

Reference Datum_100 FT AT DOWNSTREAM TOP OF PIPE

Soundings should be recorded

_X__along the centerline

_X__along fascia, circle: US DS

____along the submerged substructure units

_X__culvert centerline and along both fascias

____ Grid pattern between substructure units

_X__Additional soundings recorded at:

Upstream: 50 FT FASCIA

_____

Downstream: 50 FT FASCIA

_____