







UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. SFN 7900334
(TUS-36-1205)
SR-36 OVER TUSCARAWAS RIVER
TUSCARAWAS COUNTY, OH
DISTRICT 11

July 2022

Prepared for:

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

STATE OF OHIO
MATTHEW ROGERS
PE.87504
REGISTERED PROFESSIONAL ENGINEER

Prepared by:

COLLINS ENGINEERS INC.

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EXECUTIVE SUMMARY

Project: ODOT Underwater Bridge Inspections - 2022

Purpose of Project: To perform a detailed visual and tactile underwater investigation of bridges for District 11 the Ohio Department of Transportation.

Inspection Team: Team Leader – Matthew Rogers, P.E. – Collins Engineers, Inc.
Team Member – Kevin Mitchell, E.I.T – Collins Engineers, Inc.
Team Member – Joshua Davis, E.I.T. – Collins Engineers, Inc.

Inspection Date(s): July 27, 2022

Water Visibility:	3 ft	***Water Velocity:***	1 ft/s
Water Temperature:	70 °F	***Weather:***	Cloudy – 70 °F
Waterline Elevation:	73.3 ft	***Type of Boat:***	10 ft kayak
High-water Elevation:	82.0 ft		
Coordinates:	40.36136°N, 81.44501°W		
Access Location:	Southwest Shore		
Dive Mode:	Wading		

Waterline Reference: 24.4 ft below the Top of Deck at the downstream nose of Bent 3.
Maximum Depth at SSU: 6.1 ft – Upstream Nose of Bent 4
Shoreline Conditions: The east and west shorelines consisted of moderate vegetation with minor erosion.

Summary of Findings:

- **Bent 3:**
  - The steel drilled shaft encasements exhibited surface corrosion on up to 100% of the surface area with pitting up to 1/16 in. deep.
- **Bent 4:**
  - The steel drilled shaft encasements exhibited surface corrosion on up to 100% of the surface area with pitting up to 1/16 in. deep.

Summary of Recommendations:

- Monitor channel bottom configuration at Bents 3 and 4.
- Monitor embankment erosion.
- Monitor encasement corrosion on Bents 3 and 4.

Underwater Inspection Coding:

NBI Ratings:

Item	Description	Coding	Condition
B.C.03	Substructure (Overall)	7– Good Condition	Light Corrosion on Encasements
B.C.09	Channel Cond. Rating	7– Good Condition	Minor Erosion
B.C.10	Channel Protection Cond.	N – Not Applicable	
B.C.11	Scour Cond. Rating	7– Good Condition	
B.C.15	Underwater Cond. Rating	7– Good Condition	
B.IE.03	Insp. Date	July 27, 2022	
B.IE.05	UW Insp. Interval	60 Months	

AASHTO National Bridge Element (NBE) Ratings:

Element #	Description	Units	Total	Condition State			
				1	2	3	4
205	Reinforced Concrete Column	EA	8	8	0	0	0

Note: Ratings were developed using the FHWA Specifications for the National Bridge Inventory. 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 SR-36 Bridge over Tuscarawas River in Tuscarawas County, OH. Collins Engineers, Inc. (Collins) conducted the underwater investigation for the Ohio Department of Transportation (ODOT) on July 27, 2022. 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.
- 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. SFN 7900334 spans 528 ft carrying SR 36 over Tuscarawas River and is approximately 35.0 ft wide. The bridge superstructure is constructed of five steel girder spans. The roadway orientation of the longitudinal axis of the bridge is west to east. The substructure units are labeled as Bents 3 and 4. 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 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 an engineer-diver and team leader (Matthew Rogers, P.E.) and two engineer divers (Kevin Mitchell, E.I.T. and Joshua Davis, E.I.T.) conducted the underwater inspection. The inspection was conducted through wading. During the inspection, the inspectors worked from a kayak 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. Soundings were collected at quarter-points along the bridge centerline, upstream and downstream fascias, and 50 feet upstream and downstream of the bridge, parallel with its fascias. Additional soundings were collected adjacent to Bents 3 and 4 and at 10 feet intervals in-line with the piers, upstream and downstream up to 50 ft, 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 SFN 7900334 was located approximately 24.4 ft below the top of deck at the downstream nose of Bent 3, which corresponds to an assumed waterline elevation of 75.6 ft. During the inspection, the waterway was flowing at approximately 1 ft per second. The approximate high-water elevation was observed to be 79.6 ft. The approximate high-water elevation was observed to be 82.0 ft.

The bridge pier skew was consistent with the channel alignment and does not require attention at this time. The east and west shorelines were moderately vegetated mild slopes with minor erosion. Refer to Photographs 3 through 10 in Exhibit 2 for views of the shorelines near the structure.

2.2 Substructure Conditions

2.2.1 Bent 3

The channel bottom material consisted of silt and sand with up to 2 in. probe rod penetration. The steel drilled shaft encasements exhibited surface corrosion on up to 100% of the surface area with pitting up to 1/16 in. deep. A deposit of timber debris up to 24 in. diameter was noted along the downstream east face of the bent. Refer to Figure 6 in Exhibit 1 for detailed inspection notes of Bent 3. Refer to Photographs 11 through 13 in Exhibit 2 for views of Bent 3.

2.2.2 Bent 4

The channel bottom material consisted of silt and sand with up to 2 in. probe rod penetration. The steel drilled shaft encasements exhibited surface corrosion on up to 100% of the surface area with pitting up to 1/16 in. deep. Refer to Figure 7 in Exhibit 1 for detailed inspection notes of Bent 4. Refer to Photographs 14 through 16 in Exhibit 2 for views of Bent 4 and typical steel encasement condition at the waterline.

2.2.3 Channel Bottom and Scour Assessment

At the time of the inspection, the Tuscarawas River was experiencing normal flow and the channel bottom appeared stable for the type of material. The channel bottom was primarily silt and sand surrounding the substructure units. No additional scour, undermining, or scour countermeasures were observed.

3.0 EVALUATION AND RECOMMENDATIONS

Overall, the submerged substructure units of Structure No. SFN 7900334 were in good condition below water. Since no design or as-built plans were available for the bridge, the amount of embedment of the footings in the channel bottom is unknown. As a result, the channel bottom configuration should continue to be monitored during future underwater inspections to verify that localized scour or overall channel degradation is not occurring and that the bent footings remain adequately embedded in the channel bottom. Design or as-built drawings for the bridge should be obtained and reviewed, if possible, prior to the next underwater inspection to determine the exact construction of the piers and their foundations.

It is recommended that the submerged substructure units of Structure No. SFN 7900334 be next inspected underwater at an interval not to exceed 60 months, no later than July 27, 2027.

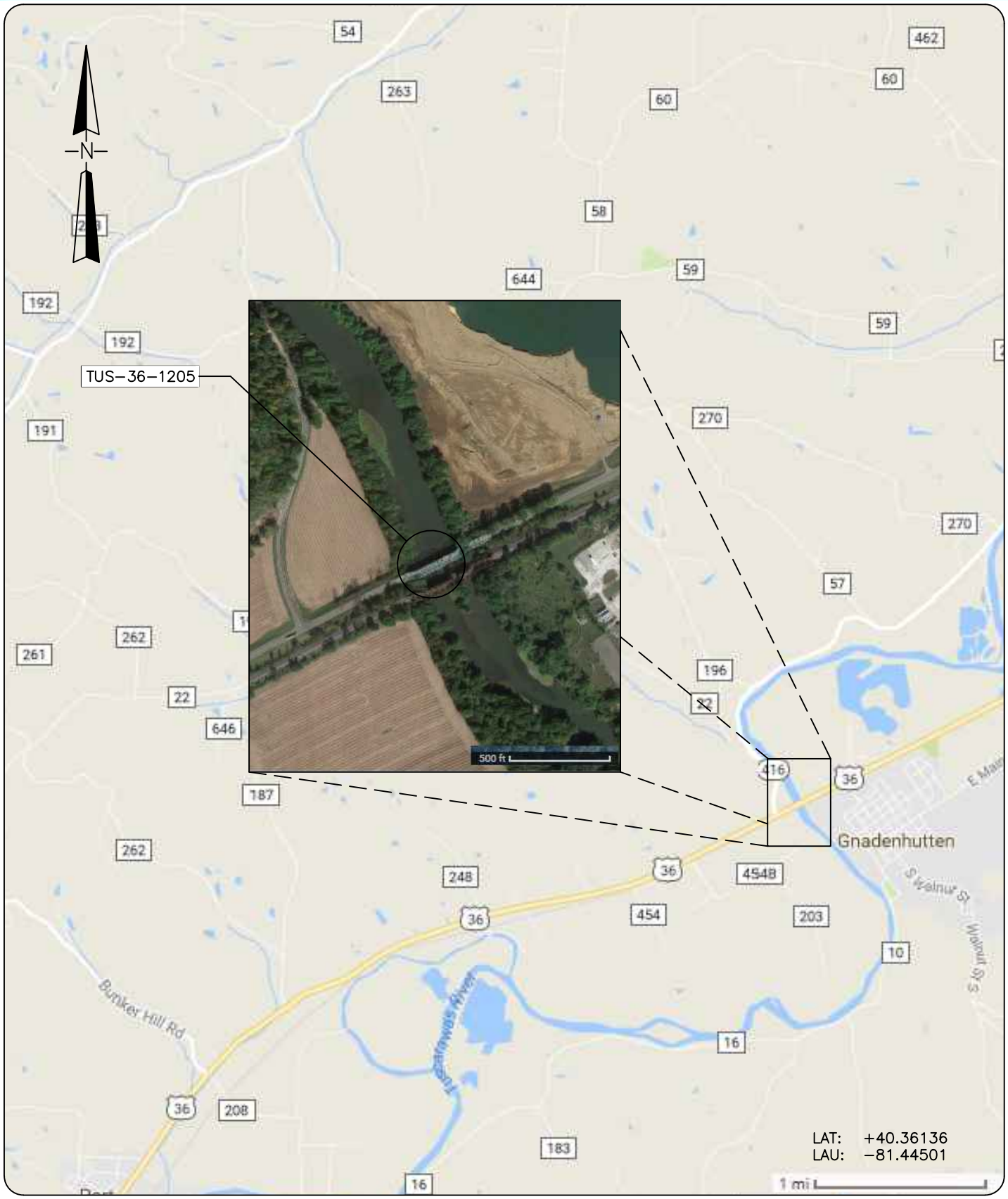
Respectfully Submitted,
COLLINS ENGINEERS, INC.

Matthew Rogers

Matthew Rogers, P.E.
Project Manager/Team Leader

Originated by:
Nicholas Lane

EXHIBIT 1 – FIGURES



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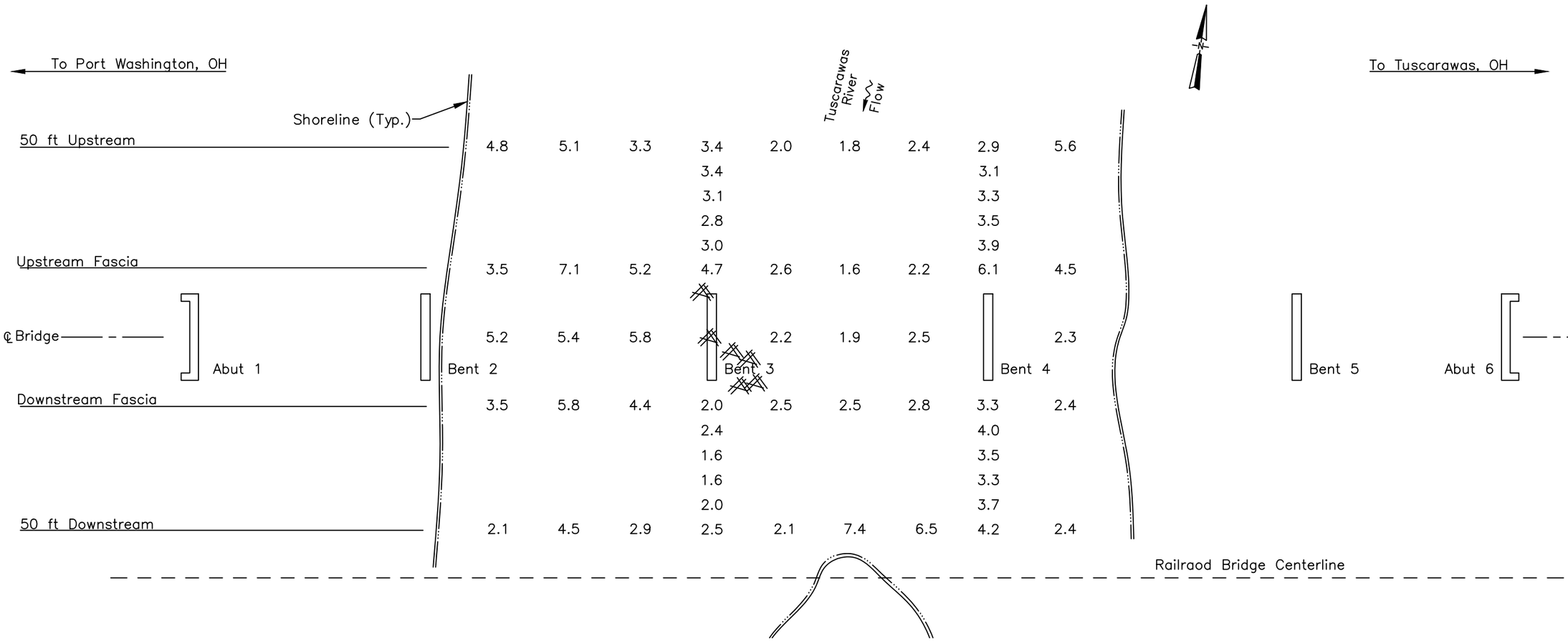
SR-36 OVER TUSCARAWAS RIVER
STRUCTURE NO. SFN 7900334

LOCATION MAP

TUSCARAWAS COUNTY, OHIO

INSPECTED BY: JTD	CEI PROJECT: 55–13380.01
DRAWN BY: NML	DATE: 27 JUL 2022
CHECKED BY: MOR	SHEET NO: 1

Y:\PROJECTS\55 - KENTUCKY\55-13380.01 - ODOT D11 UW BRIDGE INSP (2022)\ENGINEERING\BRIDGES\SFN 7900334 (TUS-36-12.05 N)\DRAWINGS\SFN 7900334 DRAWINGS.DWG10/11/2022 12:13:16 PM



SOUNDING PLAN

GENERAL NOTES:

1. Bents 3 and 4 were inspected underwater. Substructure units are labeled according to available record drawings.
2. At the time of inspection on July 27, 2022, the waterline was located approximately 24.4 ft below Top of Deck at downstream nose of Bent 2 (Assumed EL. +100.0 ft). This corresponds with a waterline elevation of +75.6 ft.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.
4. Soundings were taken at quarter–point intervals along the bridge centerline and upstream and downstream fascias and parallel to the bridge 50 ft from the upstream and downstream fascias and at 10 ft intervals in–line with the piers upstream and downstream up to 50 ft.
5. A railroad bridge oriented parallel to the structure was 60 ft downstream from the downstream fascia of the bridge.

LEGEND

2.7 Sounding Depth from Waterline (ft)

Timber Debris

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SR-36 OVER TUSCARAWAS RIVER
STRUCTURE NO. SFN 7900334
SOUNDING PLAN
TUSCARAWAS COUNTY, OHIO

CEI PROJECT	55–13380.01
INSPECTED BY:	JTD
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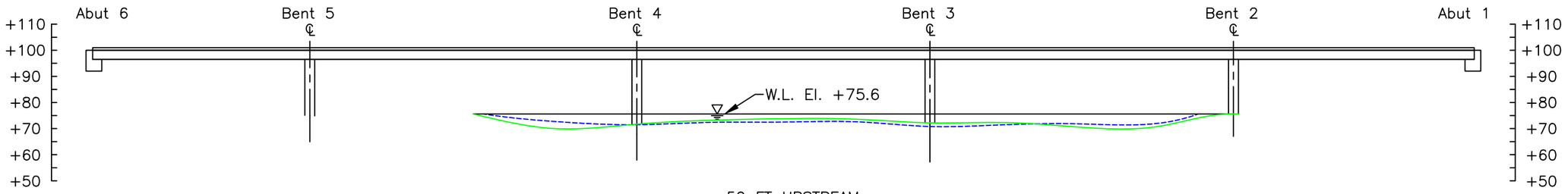
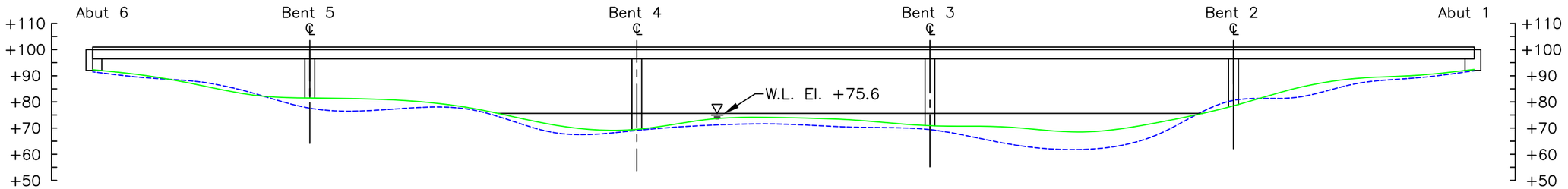
DATE:	JUL 2022
SHEET NO:	2



50 FT UPSTREAM
CHANNEL CROSS SECTION
(LOOKING DOWNSTREAM)



UPSTREAM FASCIA
CHANNEL CROSS SECTION
(LOOKING DOWNSTREAM)

Upstream Elevations (Looking Downstream)	
Location	Height (ft)
A6	7.7
1/4	10.0
1/2	13.7
3/4	17.5
B5	18.5
1/4	19.2
1/2	22.5
3/4	28.9
B4	30.5
1/4	26.6
1/2	26.0
3/4	27.0
B3	29.1
1/4	29.6
1/2	31.5
3/4	27.9
B2	21.5
1/4	15.0
1/2	11.1
3/4	9.9
A1	7.6

Note:

Footing elevations unknown due to unavailable record drawings.

LEGEND

- Approximate Channel Bottom – July 2022
- Approximate Channel Bottom – July 2017
- Approximate Channel Bottom – July 2012 (No Data)
- Timber Debris
- Water Surface
- +450 Elevation (ft)

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SR-36 OVER TUSCARAWAS RIVER
STRUCTURE NO. SFN 7900334
CROSS SECTIONS
TUSCARAWAS COUNTY, OHIO

CEI PROJECT 55-13380.01
INSPECTED BY: JTD
DRAWN BY: NML
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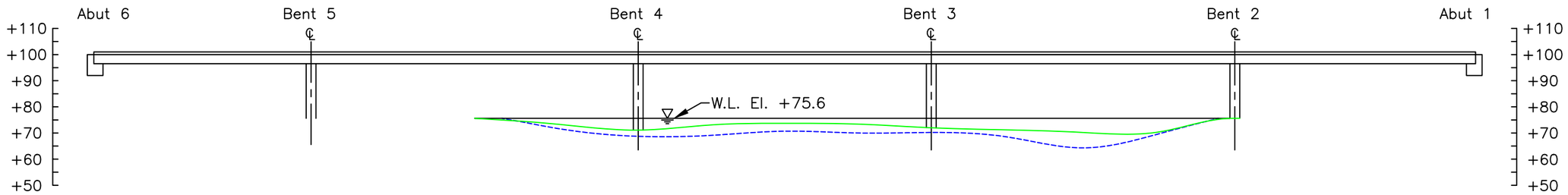
DATE: JUL 2022
SHEET NO: 3



STRUCTURE CENTERLINE
CHANNEL CROSS SECTION
(LOOKING DOWNSTREAM)

Note:

Footing elevations unknown due to unavailable record drawings.

LEGEND

———	Approximate Channel Bottom – July 2022
- - - - - - - - -	Approximate Channel Bottom – July 2017
– – – – –	Approximate Channel Bottom – July 2012 (No Data)
	Timber Debris
	Water Surface
+450	Elevation (ft)

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SR-36 OVER TUSCARAWAS RIVER
STRUCTURE NO. SFN 7900334
CROSS SECTIONS
TUSCARAWAS COUNTY, OHIO

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INSPECTED BY:	JTD
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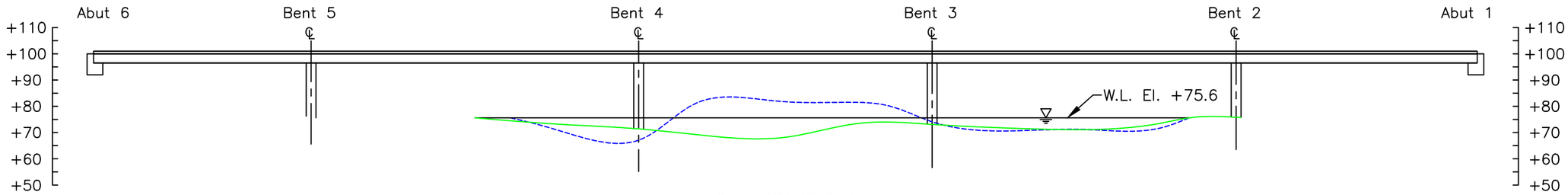
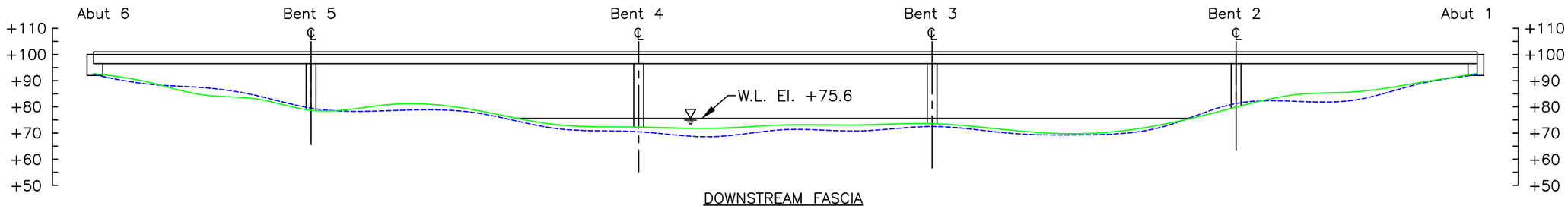
CHECKED BY:	MOR
DATE:	JUL 2022
SHEET NO:	4



50 FT DOWNSTREAM
CHANNEL CROSS SECTION
(LOOKING DOWNSTREAM)



DOWNSTREAM FASCIA
CHANNEL CROSS SECTION
(LOOKING DOWNSTREAM)

Downstream Elevations (Looking Downstream)	
Location	Height (ft)
A6	7.3
1/4	10.5
1/2	15.4
3/4	17.0
B5	17.8
1/4	19.0
1/2	21.2
3/4	26.8
B4	27.7
1/4	27.2
1/2	26.9
3/4	26.9
B3	26.4
1/4	28.8
1/2	30.2
3/4	27.9
B2	20.1
1/4	15.3
1/2	14.2
3/4	10.9
A1	7.3

Note:

Footing elevations unknown due to unavailable record drawings.

LEGEND

- Approximate Channel Bottom – July 2022
- Approximate Channel Bottom – July 2017
- Approximate Channel Bottom – July 2012 (No Data)
- Timber Debris
- Water Surface
- +450 Elevation (ft)

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SR-36 OVER TUSCARAWAS RIVER
STRUCTURE NO. SFN 7900334
CROSS SECTIONS
TUSCARAWAS COUNTY, OHIO

CEI PROJECT 55–13380.01
INSPECTED BY: JTD
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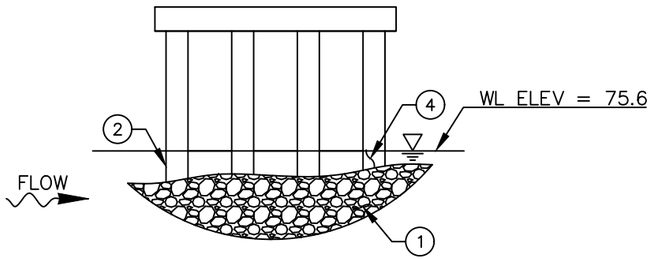
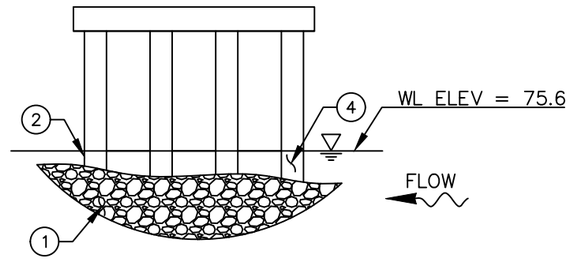
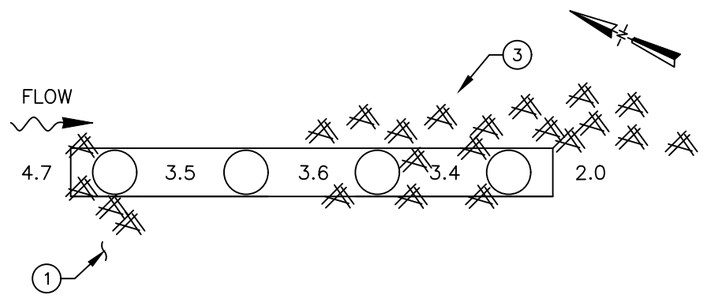
DATE: JUL 2022
SHEET NO: 5



WEST ELEVATION
(LOOKING EAST)



EAST ELEVATION
(LOOKING WEST)



INSPECTION NOTES:

1. The channel bottom material consisted silt and sand with up to 2 in. probe rod penetration.
2. The drilled shaft encasements exhibited surface corrosion on up to 100% of the surface area with pitting up to 1/16 in. deep
3. A deposit of timber debris up to 24 in. diameter was noted along the downstream east face of the bent.
4. Typical light marine growth algae and silt up to 1/8 in. deep was observed on the submerged portions of the pier.

LEGEND

2.7	Sounding Depth from Waterline (ft)
———	Approximate Channel Bottom – July 2022
	Timber Debris
	Water Surface

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SR-36 OVER TUSCARAWAS RIVER
STRUCTURE NO. SFN 7900334
BENT 3
TUSCARAWAS COUNTY, OHIO

CEI PROJECT
55–13380.01

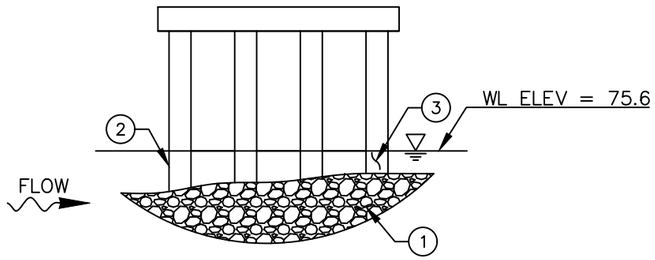
INSPECTED BY:
JTD

DRAWN BY:
NML

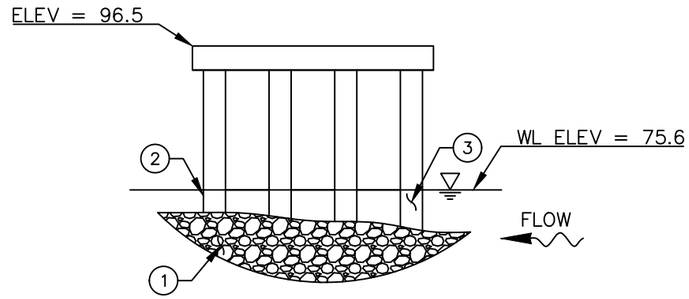
CHECKED BY:
MOR

DATE:
JUL 2022

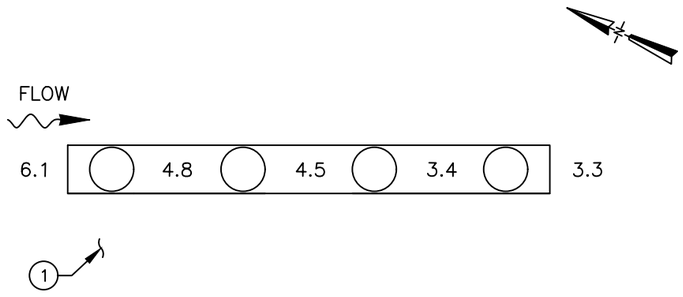
SHEET NO:
6



WEST ELEVATION
(LOOKING EAST)



EAST ELEVATION
(LOOKING WEST)



INSPECTION NOTES:

1. The channel bottom material consisted silt and sand with up to 2 in. probe rod penetration.
2. The drilled shaft encasements exhibited surface corrosion on up to 100% of the surface area with pitting up to 1/16 in. deep
3. Typical light marine growth algae and silt up to 1/8 in. deep was observed on the submerged portions of the pier.

LEGEND

2.7	Sounding Depth from Waterline (ft)
———	Approximate Channel Bottom – July 2022
	Timber Debris
	Water Surface

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SR-36 OVER TUSCARAWAS RIVER
STRUCTURE NO. SFN 7900334
BENT 4
TUSCARAWAS COUNTY, OHIO

CEI PROJECT
55–13380.01

INSPECTED BY:
JTD

DRAWN BY:
NML

CHECKED BY:
MOR

DATE:
JUL 2022

SHEET NO:
7

EXHIBIT 2 – INSPECTION PHOTOGRAPHS



Photograph No. 1: Overall View of Upstream Fascia of Structure No. SFN 7900334, Looking Southeast.



Photograph No. 2: Overall View of the Downstream Fascia of Structure No. SFN 7900334, Looking Northeast.



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



Photograph No. 4: View of the Eastern Embankment at Structure, Looking East.



Photograph No. 5: View of the Eastern Embankment Downstream of Structure, Looking Southeast.



Photograph No. 6: View of the Western Embankment Downstream of Structure, Looking Southwest.



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



Photograph No. 8: View of the Western Embankment Upstream of the Structure, Looking West.



Photograph No. 9: View of the Upstream Channel, Looking North.



Photograph No. 10: View of the Downstream Channel, Looking South.



Photograph No. 11: Overall View of Bent 3 West Face, Looking East.



Photograph No. 12: Overall View of Bent 3 East Face, Looking Southwest.



Photograph No. 13: View of Timber Debris at Bent 3, Looking West.



Photograph No. 14: Overall View of Bent 4 West Face, Looking East.



Photograph No. 15: Overall View of Bent 4 East Face, Looking Southwest.



Photograph No. 16: View of Typical Steel Encasement at Waterline, Bent 4 Column 3, Looking South.

EXHIBIT 3 – DIVE 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 11

Dive Frequency: 60 months

SFN: 7900334 Bridge Number (County-Route-SLM-SD): TUS-36-12.05 N

Superstructure Type	Main Span Type:	Steel Multi-Beam
	Approach Span:	Steel Multi-Beam
Substructure Type	Abutment Type:	Reinforced Concrete
	Pier Type:	Steel Encased Concrete Pile Bents
	Total Pier Count:	4
	Total Pier Count in water: 2	
	Foundations:	Steel Encased Concrete Piles
Feature Intersected	Tuscarawas River	

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,

_X__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**

Dr. Waseem Khalifa, Ph. D., P.E.

District Bridge Engineer

2201 Reiser Avenue SE

New Philadelphia, OH 44663

(330) 308-7873

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	N/A	N/A	N/A
Property Owner	N/A	N/A	N/A
Access Equipment	N/A	N/A	N/A
Lake or River draw-down	N/A	N/A	N/A
Canal dry time	N/A	N/A	N/A
Tree removal	N/A	N/A	N/A
Other:	N/A	N/A	N/A
Other:	N/A	N/A	N/A

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

Dive Team Narrative:

The structure shall be investigated using a three-member dive team: one dive supervisor to monitor communications and air supply while taking notes, one diver, and one tender/standby diver. There shall be one NBIS Team Leader onsite at all times.

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	1 ft/s
If Yes, waterway river point	_____	Scour Critical (item 113):	5
Anticipated water visibility depth	3 ft	POA in place:	Y/N
Anticipated Dive depth	6.1 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	2	100% Level 1 10% Level 2
Abutment		
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

____Digital fathometer

__X_Telescoping survey rod

____ 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.)

Southwest shore at the structure

e. The maximum depth of the channel is typically measured:

At the upstream nose of Bent 4

Reference Datum 24.4 Feet below the top of the parapet at the downstream nose of Bent 3

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, Inc. Date: 07/27/2022

Updated By: _____ Date: _____

Updated By: _____ Date: _____

Updated By: _____ Date: _____

Updated By: _____ Date: _____

Updated By: _____ Date: _____

VIII. Other Narrative Not Included In Previous Sections