

UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. BEL-148-2666
SR 148 OVER CAPTINA CREEK
BELMONT COUNTY, OH
DISTRICT 11

August 2017

STATE OF OHIO
JOSHUA M. JOHNSON
E-76141
1/11/18
REGISTERED PROFESSIONAL ENGINEER

STATE OF OHIO DEPARTMENT OF TRANSPORTATION

Prepared by:

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EXECUTIVE SUMMARY

Project: ODOT District 11 Underwater Bridge Inspections - 2017

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

Inspection Team: Team Leader – Kurt Lingo, E.I.T. – Collins Engineers, Inc.
Team Member – Matthew Rogers, E.I.T. – Collins Engineers, Inc.
Team Member – John Strub – Collins Engineers, Inc.

Inspection Date(s): August 3, 2017

Water Visibility:	<1 ft	***Water Velocity:***	<1 ft/s
Water Temperature:	82 °F	***Weather:***	Sunny – 85 °F
Waterline Elevation:	621.7 ft	***Type of Boat:***	23 ft Carolina Skiff
Coordinates:	39.860452°N, 80.803509°W		
Access Location:	Public Boat Ramp to the west on the northern shore. Located on Railroad Ave.		
Dive Mode:	Surface Supplied Air		
Waterline Reference:	19.2 ft below the top of concrete barrier at the upstream end of Pier 2.		
Maximum Depth at SSU:	12.0 ft – South face and downstream Nose of Pier 2.		
Shoreline Conditions:	The north and south shorelines consisted of moderately vegetated mild slopes with minor erosion and a few trees leaning toward the channel.		

Summary of Findings:

- **Abutment 1:**
  - Light scaling up to 1/16 inch deep was observed on all submerged portions of the abutment.
  - Grout bags were observed along the north face of the abutment extending from the channel bottom to 2 feet above the waterline.
- **Pier 2:**
  - The submerged portions of the pier exhibited light algae growth with zebra mussels and the concrete was typically smooth and south with no defects.
  - Light timber debris accumulation consisting of logs up to 4 inches diameter was observed from the midpoint of the south face and around the upstream nose to the upstream quarter-point along the north face, extending from the channel bottom to the waterline.
- **Pier 3:**
  - The submerged portions of the pier exhibited light scaling up to 1/16 inch deep and light marine growth with occasional zebra mussels.
  - Moderate timber debris accumulation consisting of logs up to 2 feet diameter was observed at the upstream nose extending from the channel bottom to approximately 6 feet below the waterline.

Summary of Recommendations:

- Monitor timber debris accumulation at Pier 2 and 3.
- Monitor scaling on Abutment 1 and Pier 3.

Underwater Inspection Coding:

NBI Ratings:

Item	Description	Coding	Condition
60	Substructure	7– Satisfactory Condition	Light Concrete Scaling
61	Channel	7– Good Condition	Timber Debris Accumulation
62	Culvert	N/A	
92B	UW Insp. Frequency	60 Months	
93B	Insp. Date	08 03 17	
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	48	48	0	0	0
215	Reinforced Concrete Abutment	LF	24	24	0	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 SR 148 Bridge over Captina Creek in Belmont County, OH. Collins Engineers, Inc. (Collins) conducted the underwater investigation for the Ohio Department of Transportation (ODOT) on August 3, 2017. 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. BEL-148-2666 spans 239.2 ft, carrying SR 148 over Captina Creek and is approximately 30.0 ft wide. The bridge superstructure is constructed of three steel multi-beam spans. Although the structure orientation is actually Southwest-Northeast, all directions in the report and figures correspond to a South-North structure orientation. The substructure units are labeled as Abutment 1, Piers 2 and 3, and Abutment 4 from south to north. Existing design drawings were available at the time of the inspection and were used to determine water surface elevation and foundation elevations. 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 (Kurt Lingo, E.I.T.) and two engineer divers (Matthew Rogers, E.I.T. and John Strub, E.I.T.) conducted the underwater inspection. The inspection was conducted using surface supplied air diving equipment. During the inspection, the inspectors worked from a boat and a note taker in the boat 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 digital fathometer and pneumofathometer. Soundings were collected at quarter points along the bridge centerline as well as 10 feet and 50 feet upstream and downstream of the bridge, parallel with its fascias. Additional soundings were collected adjacent to Abutment 1 and Piers 2 and 3 and at 10 feet intervals in-line with the piers, 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 BEL-148-2666 was located approximately 19.7 ft below the top of the concrete barrier at the upstream end of Pier 2, which corresponds to a waterline elevation of 621.7 ft based on the existing design drawings available. During the inspection, the waterway was flowing at less than 1 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 mild slopes with minor erosion and several trees leaning toward the channel. Refer to Photographs 3 through 6 in Exhibit 2 for views of the shorelines near the structure.

2.2 Substructure Conditions

2.2.1 Abutment 1

The channel bottom material around Abutment 1 consisted of soft silt, mud, and clay with up to 2 feet of probe rod penetration. Light scaling up to 1/16 inch deep was observed on all submerged portions of the abutment. Grout bags were observed along the north face of the abutment extending from the channel bottom to 2 feet above the waterline. Refer to Figure 6 in Exhibit 1 for detailed inspection notes of Abutment 1. Refer to Photograph 7 in Exhibit 2 for a view of Abutment 1.

2.2.2 Pier 2

The channel bottom material around Pier 2 consisted of soft silt, mud, and clay with up to 2 feet of probe rod penetration. The submerged portions of the pier exhibited light algae growth with zebra mussels and the concrete was typically smooth and south with no defects. Light timber debris accumulation consisting of logs up to 4 inches diameter was observed from the midpoint of the south face and around the upstream nose to the upstream quarter-point along the north face, extending from the channel bottom to the waterline. Refer to Figure 7 in Exhibit 1 for detailed inspection notes of Pier 2. Refer to Photographs 8 and 9 in Exhibit 2 for views of Pier 2.

2.2.3 Pier 3

The channel bottom material around Pier 3 consisted of soft silt, mud, and clay with up to 2 feet of probe rod penetration. The submerged portions of the pier exhibited light scaling up to 1/16 inch deep and light marine growth with occasional zebra mussels. Moderate timber debris accumulation consisting of logs up to 2 feet diameter was observed at the upstream nose extending from the channel bottom to approximately 6 feet below the waterline. Refer to Figure 8 in Exhibit 1 for detailed inspection notes of Pier 3. Refer to Photographs 10 through 12 in Exhibit 2 for views of Pier 3 and the typical concrete condition at the waterline.

3.0 EVALUATION AND RECOMMENDATIONS

Overall, the inspected substructure units of Structure No. BEL-148-2666 were in satisfactory condition. A comparison of the soundings recorded during the previous inspection on September 19, 2012 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 timber debris accumulation at Piers 2 and 3 did not significantly affect the channel flow, and as a result, does not require removal at this time. If the debris accumulation increases in size or density, it may be necessary to remove the debris to reduce excessive lateral loads on the pier, limit further debris accumulation, and reduce the likelihood of channel bottom degradation resulting from obstructed flow.

The scaling observed on Abutment 1 and Pier 3 is not a structural concern at this time given its size compared to the overall pier size, and as a result, no repairs are recommended. These areas 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.

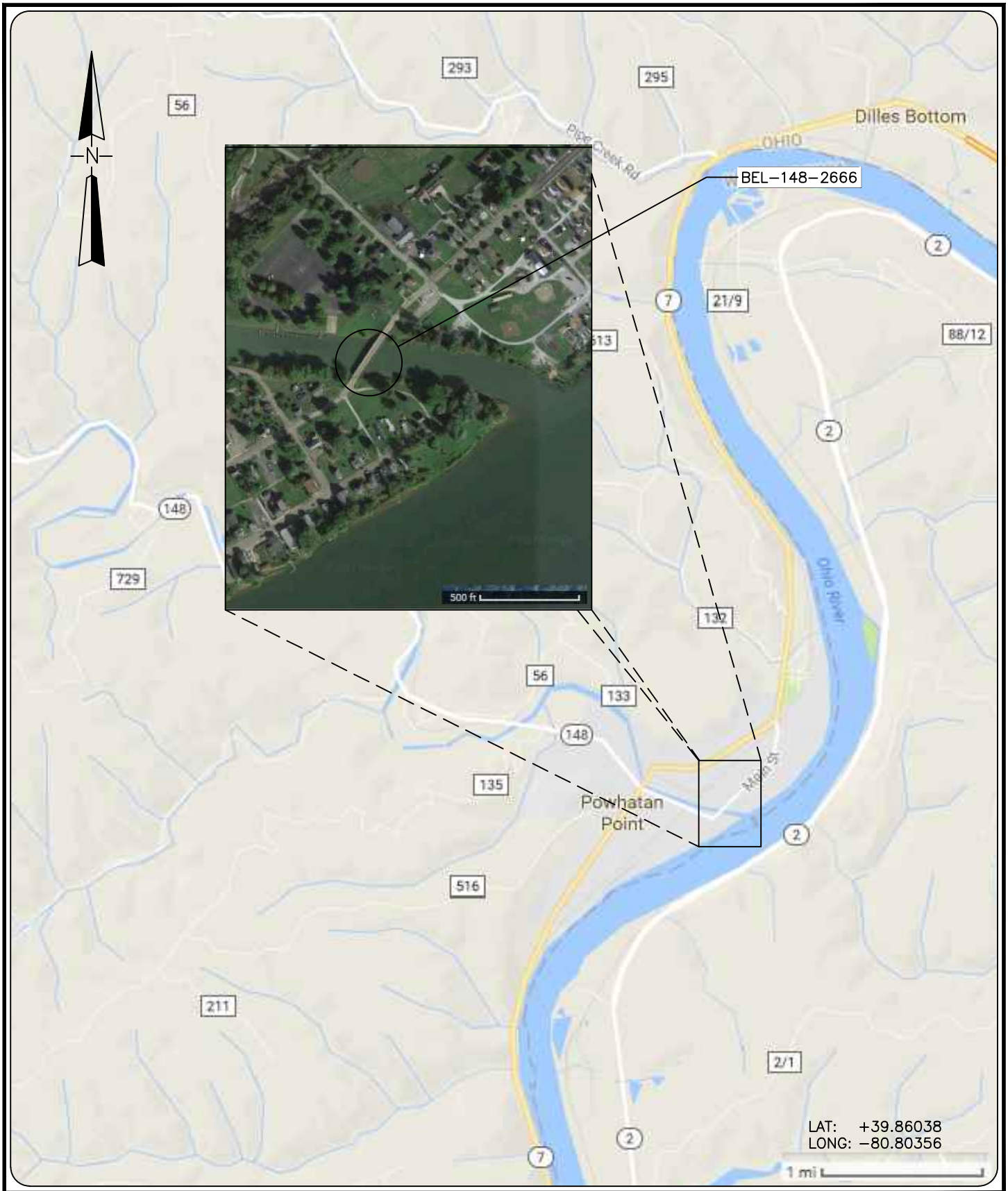
It is recommended that the submerged substructure units of Structure No. BEL-148-2666 be next inspected underwater at an interval not to exceed 60 months, no later than August 3, 2022.

Respectfully Submitted,
COLLINS ENGINEERS, INC.

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

Originated by:
Jacob P. Green

EXHIBIT 1 – FIGURES



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SR 148 OVER CAPTINA CREEK
STRUCTURE NO. BEL-148-2666
LOCATION MAP
BELMONT COUNTY, OHIO

INSPECTED BY: MOR	CEI PROJECT: 55-10356.00
DRAWN BY: KMM	DATE: AUG 2017
CHECKED BY: JMJ	SHEET NO: 1

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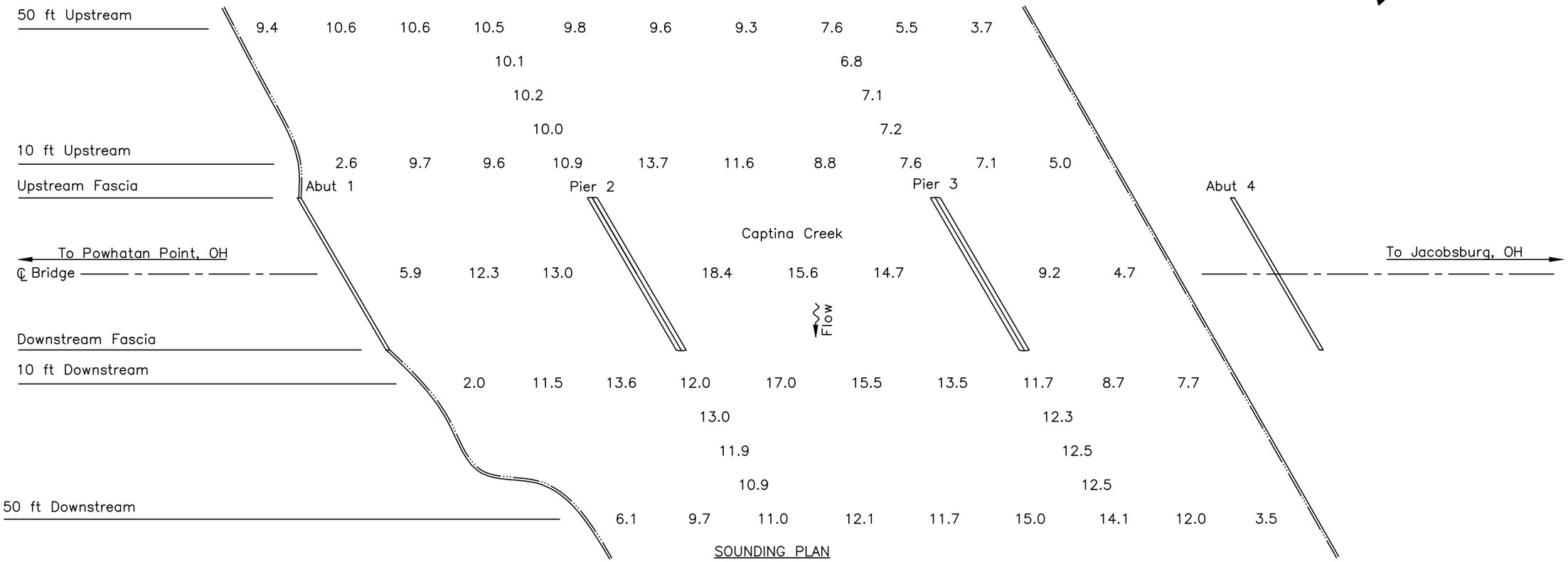

SOUNDING PLAN

-00.0

GENERAL NOTES:

1. Abut. 1 and Piers 2 & 3 were inspected underwater. Substructure units are labeled according to available record drawings.
2. At the time of inspection on August 3, 2017, the waterline was located approximately 19.7 ft below the top of the concrete barrier at the upstream end of Pier 2. This corresponds with a waterline elevation of 621.7 ft.
3. Soundings indicate the water depth at the time of inspection and are measured in feet.
4. Soundings were collected at quarter points along the bridge as well as 10 feet and 50 feet upstream and downstream of the bridge, parallel with its fascias. Additional soundings were collected adjacent to Abutment 1 and Piers 2 and 3 and at 10 feet intervals in-line with the piers, upstream and downstream.

LEGEND

-2.7	Sounding Depth from Waterline (ft)
	Timber Debris

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SR 148 OVER CAPTINA CREEK
STRUCTURE NO. BEL-148-2666
SOUNDING PLAN
BELMONT COUNTY, OHIO

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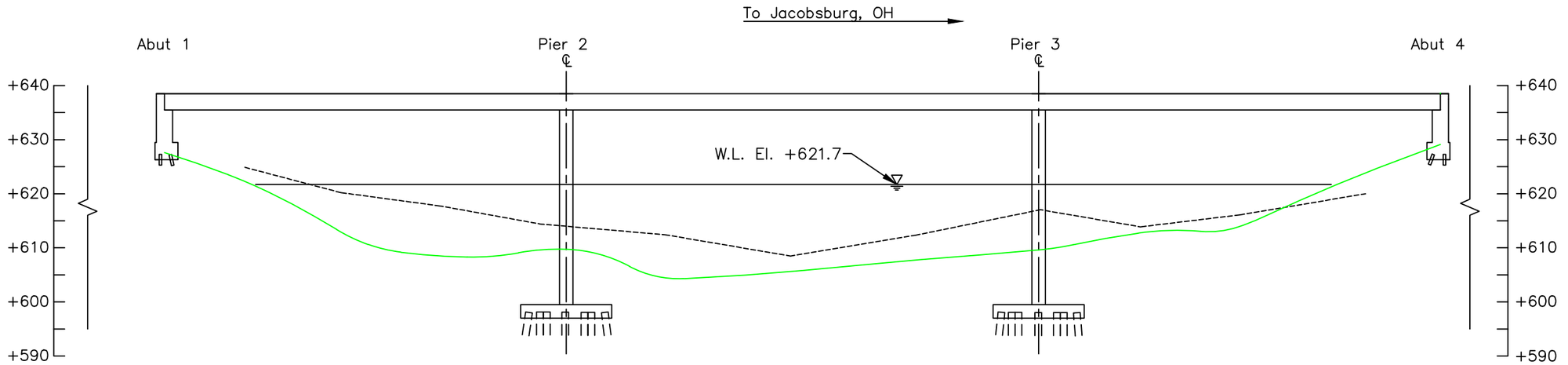

UPSTREAM FASCIA CROSS SECTION (LOOKING UPSTREAM)

Upstream Looking Upstream		
Location	X	Y
A1	0.0	10.9
1/4	18.4	16.3
1/2	36.8	16.4
3/4	55.1	16.6
P2	73.5	16.8
1/4	96.1	17.2
1/2	118.8	17.2
3/4	141.4	17.2
P3	164.0	17.2
1/4	181.6	17.1
1/2	199.3	17.0
3/4	216.9	16.8
A4	234.5	9.4

Note:

Footing elevations unknown due to unavailable record drawings.

LEGEND

- Approximate Channel Bottom – August 2017
- Approximate Channel Bottom – September 2012
- Approximate Channel Bottom – [No Data]
- Timber Debris
- Water Surface
- +450 Elevation (ft)

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SR 148 OVER CAPTINA CREEK
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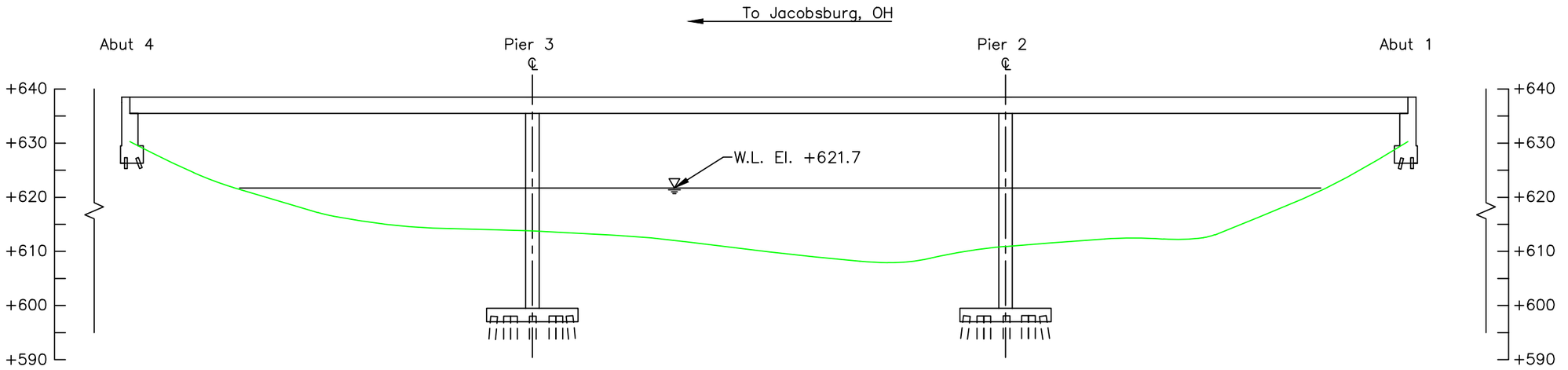

STRUCTURE CENTERLINE
CHANNEL CROSS SECTION
(LOOKING DOWNSTREAM)

Note:

Footing elevations unknown due to unavailable record drawings.

LEGEND

- Approximate Channel Bottom – August 2017
- Approximate Channel Bottom – [No Data]
- Approximate Channel Bottom – [No Data]
- Timber Debris
- Water Surface
- +450 Elevation (ft)

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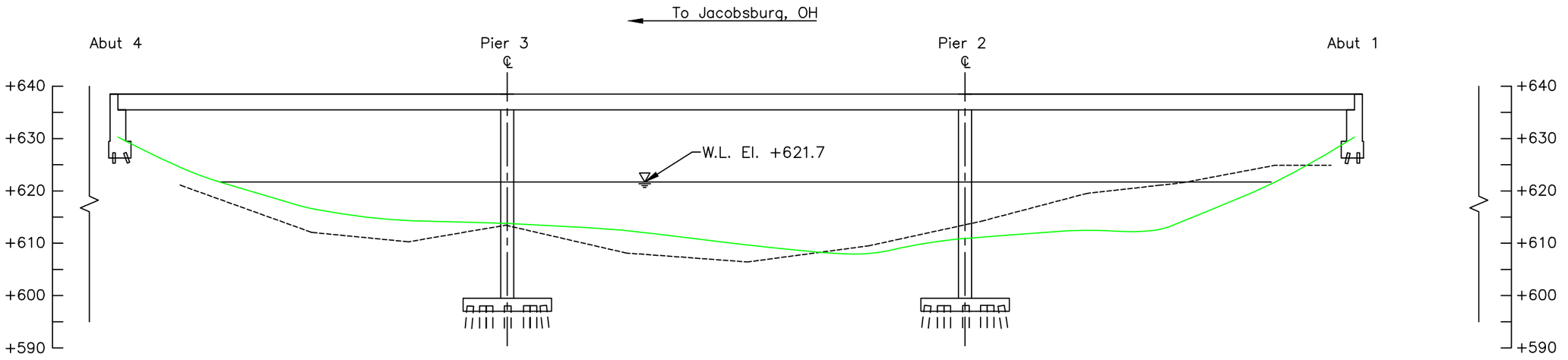

DOWNSTREAM FASCIA CROSS SECTION (LOOKING DOWNSTREAM)

Downstream Looking Downstream		
Location	X	Y
A4	0.0	8.2
3/4	18.4	16.7
1/2	36.8	17.0
1/4	55.1	17.1
P3	73.5	17.1
3/4	96.1	17.2
1/2	118.8	17.0
1/4	141.4	16.9
P2	164.0	16.7
3/4	181.6	16.6
1/2	199.3	16.3
1/4	216.9	16.2
A1	234.5	8.2

Note:

Footing elevations unknown due to unavailable record drawings.

LEGEND

- Approximate Channel Bottom – August 2017
- Approximate Channel Bottom – September 2012
- Approximate Channel Bottom – [No Data]
- Timber Debris
- Water Surface
- +450 Elevation (ft)

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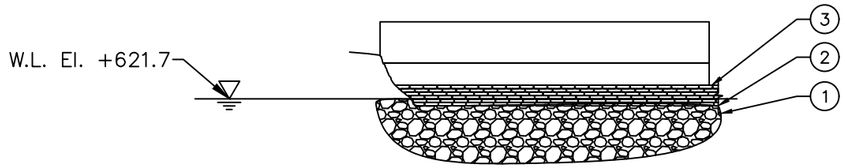
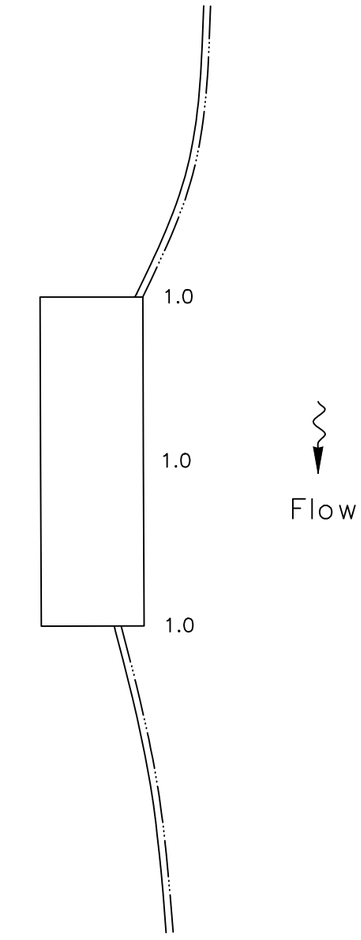


SOUTH ELEVATION– ABUTMENT 1



PLAN – ABUTMENT 1

INSPECTION NOTES:

1. The channel bottom material consisted of soft silt, mud and clay with up to 2 ft probe rod penetration.
2. Light scaling up to 1/16 in. deep was observed on all submerged portions of the abutment.
3. Grout bags were observed extending from the channel bottom to 2t above the waterline.

LEGEND

–2.7	Sounding Depth from Waterline (ft)
———	Approximate Channel Bottom – July 2015
	Timber Debris
	Water Surface

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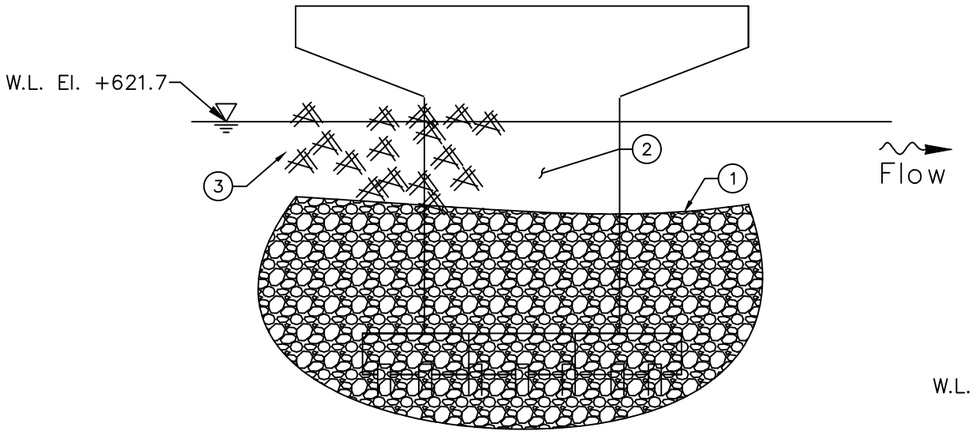
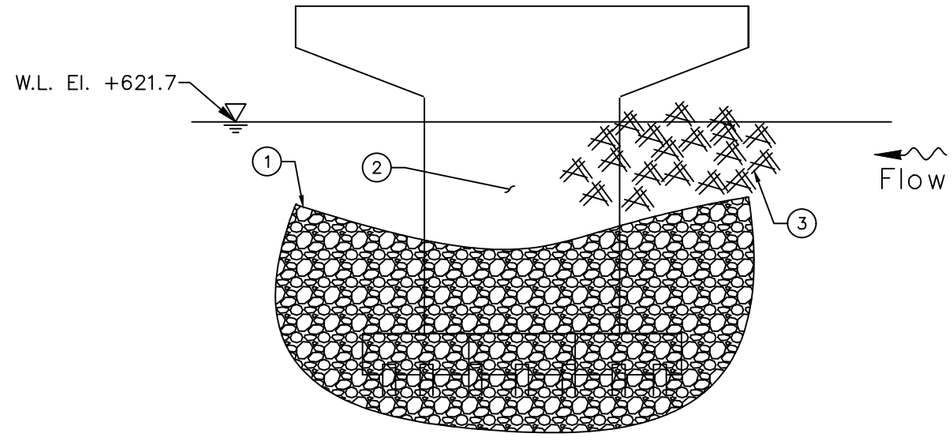
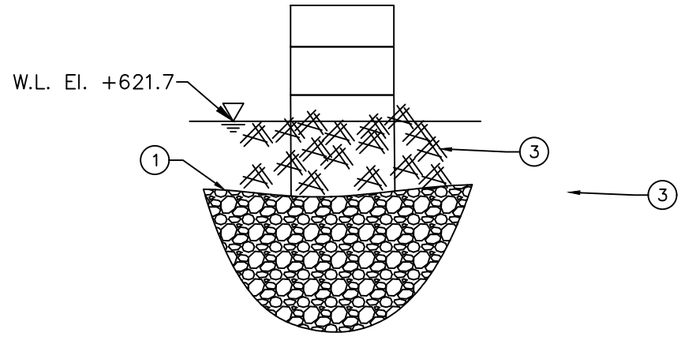


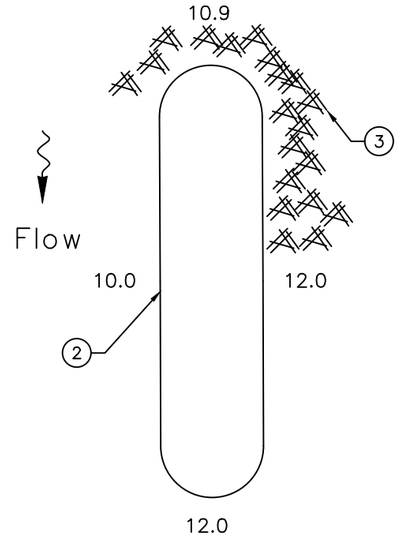
SOUTH ELEVATION – PIER 2



NORTH ELEVATION – PIER 2



UPSTREAM ELEVATION – PIER 2



PLAN – PIER 2

INSPECTION NOTES:

(1) The channel bottom material consisted of soft silt, mud and clay with up to 2 ft probe rod penetration.

(2) The submerged portions of the pier exhibited light algae growth with zebra mussels and the concrete was typically smooth and sound with no defects noted.

(3) Light timber debris up to 4 in. diameter was observed extending from the channel bottom to the waterline from the midpoint of the south face around the upstream nose to the upstream quarter–point along the north face.

LEGEND

–2.7	Sounding Depth from Waterline (ft)
———	Approximate Channel Bottom – July 2015
	Timber Debris
	Water Surface

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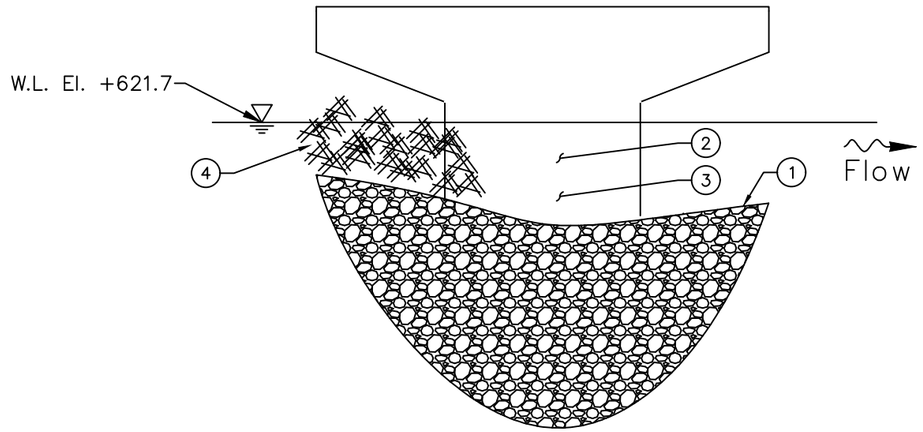
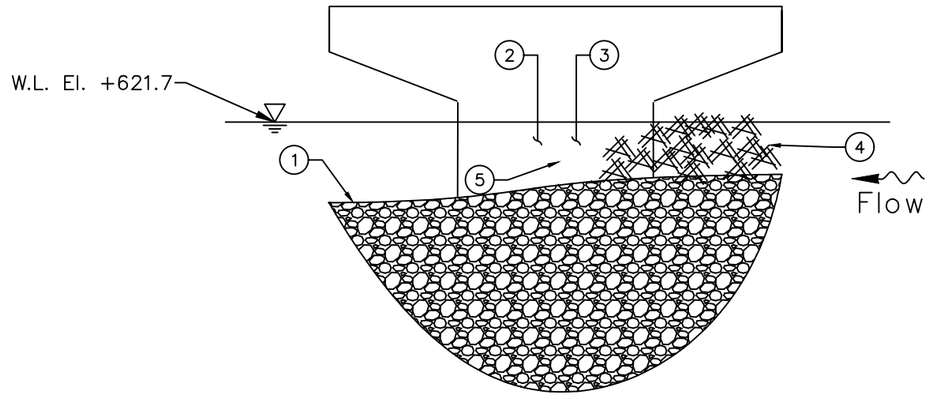
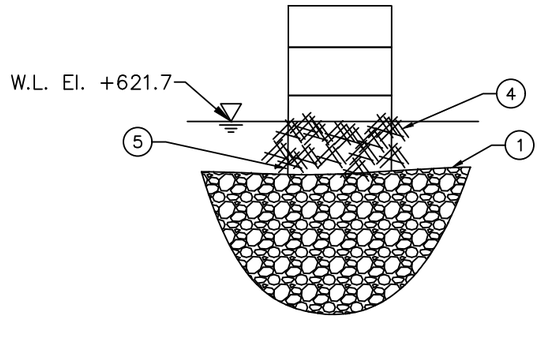


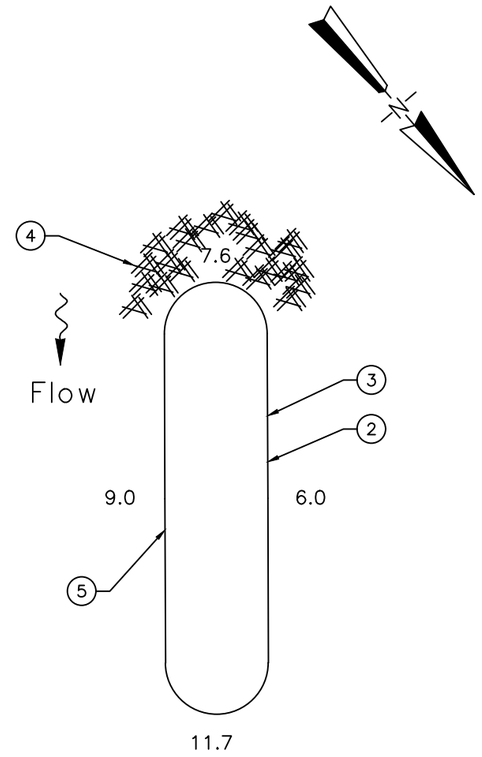
SOUTH ELEVATION – PIER 3



NORTH ELEVATION – PIER 3



UPSTREAM ELEVATION – PIER 3



PLAN – PIER 3

INSPECTION NOTES:

1. The channel bottom material consisted of soft silt, mud and clay with up to 2 ft probe rod penetration..
2. The submerged portions of the pier exhibited light algae growth with zebra mussels observed.
3. Light scaling up to 1/16 in. deep was observed extending from the channel bottom to the waterline at upstream nose.
4. Moderate timber debris up to 2 ft diameter was observed at the upstream nose extending from channel bottom to 6 ft below the waterline.
5. A steel H–Pile was observed protruding 4 in. out from the pier wall at the midpoint of the pier approximately 5 ft below the waterline.

LEGEND

–2.7	Sounding Depth from Waterline (ft)
———	Approximate Channel Bottom – July 2015
	Timber Debris
	Water Surface

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SR 148 OVER CAPTINA CREEK
STRUCTURE NO. BEL-148-2666
PIER 3
BELMONT COUNTY, OHIO

CEI PROJECT 55–10356.00
INSPECTED BY: MOR
DRAWN BY: KMM
CHECKED BY: JMJ
DATE: AUG 2017
SHEET NO: 8

EXHIBIT 2 – INSPECTION PHOTOGRAPHS



Photograph No. 1: Overall View of Structure No. BEL-148-2666, Looking West.



Photograph No. 2: Overall View of Structure No. BEL-148-2666, Looking East.



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



Photograph No. 4: View of the Southeast Embankment Downstream of the Structure, Looking Southwest.



Photograph No. 5: View of the Northwest Embankment Upstream of the Structure, Looking Northeast.



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



Photograph No. 7: View of Abutment 1, Looking Southwest.



Photograph No. 8: View of Pier 2, Looking Southeast.



Photograph No. 9: View of Pier 2, Looking Northwest.



Photograph No. 10: View of Pier 3, Looking Southeast.



Photograph No. 11: View of Pier 3, Looking North.



Photograph No. 12: View of the Typical Concrete Condition at the Waterline on the North Face of Pier 3, Looking South.



Photograph No. 13: View of Abutment 4, Looking Northeast.