

Underwater Inspection Report for:

Highland Road Over the Cuyahoga River, Summit County, Ohio

(Prestressed Concrete Box Beams on Capped Pile Bents and Abutments)

Report Prepared Date: June 12, 2026

Personnel on site during inspection:

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1 EXECUTIVE SUMMARY

Bridge Data

NUMBER: SAG 111-0000

STRUCTURE OBSERVED: 2 Capped Pile Bents

ROUTE: Highland Road

STRUCTURE TYPE: Prestressed Concrete Box Beams on Capped Pile Bents

CROSSING: Cuyahoga River

WATERLINE ELEVATION: 8.9 feet below Bent

LOCATION: Summit County, Ohio

1 Cap at Pile 1

Inspection Data

INSPECTION DATE: May 18, 2026

TEAM LEADER: Trent E. Steffen, P.E.

INSPECTION TYPE: Routine Underwater

WATER CURRENT: 3 feet / second

WEATHER: Clear, 74 °F

MAX WATER DEPTH: 7.5 ft. at 200 ft. DS

UW VISIBILITY: 1.5 foot

DIVING OPERATION: SCUBA & Wading Piers

WATER TEMP: 66 °F

Summary of Findings

- All piles have been encased in corrugated black plastic pipes and the annular void filled with grout to an approximate elevation of 2.4 feet below the bent caps.
- The sections of the concrete slope protection at both abutments have cracking up to 1/8", scaling along the waterline, and vegetation growing in the joints.
- The forward abutment (east) slope protection has two areas with undermining below the slabs. At one of these locations, the slab is cracking.
- There are locations where the steel retaining bands securing the corrugated plastic pipe protection around the bent piles are missing or broken.

Recommendations

- Replace or repair the damaged and undermined concrete slabs on the east slope protection.
- Replace missing and broken steel retaining bands at corrugated plastic pipes.
- It is recommended that a routine underwater bridge inspection of the substructure elements be performed at a maximum interval of 60 months. Underwater inspections should also take place following any significant or potentially damaging event.



2 INTRODUCTION

This report details the results of a routine underwater inspection performed on May 18, 2026. The previous inspection was performed on April 5, 2021.

2.1 Description of Structure

Bridge SAG 111-0000 (SFN 7751001) carries two lanes of Highland Road over the Cuyahoga River in Summit County, Ohio. The bridge was built in 1967 and has an approximate overall length of the bridge of 155 feet. The structure is comprised of a 3-span prestressed concrete box beam superstructure, supported on capped pile abutments and capped pile bents. The bent piles (reinforced concrete cast-in-place piles) have been encased in corrugated galvanized metal and corrugated black plastic pipes, with the annular space filled with grout. The two abutments are well above the normal water level and were not part of this inspection. Only the two bents and the abutment slope protection fall within the normal river channel.

The numbering convention in this report increases from west to east and left (north) to right (south).

2.2 Inspection Procedure

Integrity Aquatic's 3-person dive team and one inspector from Palmer Engineering performed an underwater inspection in accordance with the National Bridge Inspection Standards (NBIS) requirements for inspection of in-service bridges and with relevant Occupational Safety and Health Administrations (OSHA) CFR 1910 Subpart T standards for commercial diving. Typically, the dive would be conducted using surface supplied heavy dive gear. However, with the given conditions (shallow water depths around the piers) SCUBA was more appropriate.

A Level 1 visual inspection was performed on all structural elements of the bridge from the mudline to 4-foot above the waterline (as directed in the Scope of Services). Where the diver's visibility was limited, tactile methods were used.

Soundings were taken throughout the structure at 10, 20, 30, 100 and 200 feet upstream and downstream using a surveyor's sounding rod. The hydrographic reference point is located at the bottom of the Bent 1 cap at Pile 1, which is the left (north) pile (see *Photo 14*). The water surface was measured to be 8.9 feet below the reference point during this inspection. The measurement taken during the 2021 underwater inspection was 9.5 feet.



Hazards Encountered:	None
Inspection Method:	SCUBA & Wading in a dry suit
Order of Inspection:	The diver inspected the bridge starting on Bent 2 followed by Bent 1.
Scour Checked By:	Soundings, probing and tactile methods.
Equipment Used:	SCUBA, Dry suit, sounding hammer and survey rod.
Elements Cleaned:	Minor algae growth. No significant cleaning required.

3 INSPECTION FINDINGS

3.1 Bent 1 (West Bent) and Rear Abutment Slope Protection

- All piles have been encased in corrugated black plastic pipes held in place with four hose clamps. The annular void has been filled with grout to an approximate elevation of 2.4 feet below the column caps. Above this plastic pipe, galvanized corrugated metal is visible (see *Photo 5*).
- The concrete slope protection at this abutment has some cracks up to 1/8", 1" deep scaling along the waterline, and some vegetation growing in the joints (see *Photo 7*). A portion of the slope protection near the left fascia (downstream side) was repaired in the fall of 2019 by Summit County Engineer Maintenance forces. The repaired portion was observed to be in good condition.
- There is a line of submerged rocks creating turbulence in the flow upstream of Bent 1 (see *Photo 8*).
- There is a missing hose clamp at the top of the Pile 1 encasement on Bent 1 (see *Photo 9*).

3.2 Bent 2 (East Bent) and Forward Abutment Slope Protection

- All piles have been encased in corrugated black plastic pipes held in place with four hose clamps. The annular void has been filled with grout to an approximate elevation of 2.4 feet below the column caps. Above this plastic pipe galvanized corrugated metal is visible (see *Photo 6*).
- There are three 2" diameter holes in the corrugated plastic pipe encasement on the upstream (right) face of Pile 6 (see *Photo 10*).
- There are two missing hose clamps at Pile 6 (see *Photo 11*).



- There is one missing hose clamp at Pile 1.
- The concrete slope protection at this abutment has numerous cracks up to 1/8", 1" deep scaling along the waterline, and some vegetation growing in the joints (see *Photo 12*).
- A 12' x 8' triangular area in the northeast corner bounded by a 1/8" crack, is hollow sounding when struck with a hammer (see *Photos 12 & 13 and Sounding Sheet* for location). Probing at the joint detected a 17-inch tall void under this section, due to undermining of the slab. The undermining has increased since the 2021 inspection (10" of undermining was measured in 2021).
- In the southeast corner of the slope protection under the bridge, there is an approximately 10' x 10' area that is hollow sounding when struck with a hammer, but no concrete deterioration was noted. (see *Sounding Sheet* for location).

3.3 Channel Condition

- Channel alignment both upstream and downstream of the bridge is good.
- The river bottom is composed mainly of sand, small river stone and gravel, with some fist-size stones.
- There is concrete slope protection along both abutments. The slope protection is functioning and in satisfactory condition. Deficiencies are noted in sections 3.1 and 3.2 of this report.



4 COMPARISON TO PREVIOUS REPORT

The lead underwater inspection diver for this inspection also participated in the 2011, 2016, 2019, and 2021 underwater inspections. Since the 2011 inspection, several significant repairs have been made. The failed drainage ditch slope protection on the southeast corner of the bridge has been replaced with large riprap stone. The piles have been encased in corrugated black plastic pipes filled with grout. The upstream and downstream concrete bent caps have been repaired. Finally, a small section of the failing northeast slope protection and a large section of the northwest slope protection were repaired.

On the east bank, material loss from under the slope protection continues. The depth of undermining of the cracked, triangular-shaped northeast corner has increased by 7" in depth since the 2021 inspection. The undermined area in the southeast corner remains unchanged from the 2021 inspection.

The river bottom topography around the bents is similar to that observed in the 2021 inspection. There are no signs of significant scour around the bents. The scour observed in the 2011 inspection was filled back in by the 2016 inspection and the streambed appears to currently be stable.



5 CONCLUSIONS AND RECOMMENDATIONS

Per the Ohio Department of Transportation Manual of Bridge Inspection and Inventory, the following component condition ratings should be assigned to the bridge:

- Item B.C.03 - Substructure Condition Rating – (6) Satisfactory
- Item B.C.09 - Channel Condition Rating – (7) Good
- Item B.C.10 - Channel Protection Condition Rating - (6) Satisfactory
- Item B.C.11 - Scour Condition Rating – (7) Good
- Item B.C. 15 – Underwater Inspection Condition - (6) Satisfactory

The condition rating of Item B.C.03 is based on the scope and findings of this inspection, and can be lowered if the condition of substructure components outside the scope of this inspection dictate.

Recommendations for repair and maintenance are as follows:

- Replace or repair the damaged and undermined concrete slabs on the Forward Abutment slope protection.
- Replace missing hose clamps at plastic pipe pile encasements.
- It is recommended that a routine underwater bridge inspection of the substructure elements be performed at a maximum interval of 60 months. Underwater inspections should also take place following any significant or potentially damaging event.



6 PHOTOS



Photo 1 – Facing northwest - South elevation of the bridge.



Photo 2 – Facing southeast - North elevation of the bridge.



Photo 3 – Facing north downstream.



Photo 4 – Facing south upstream.



Photo 5 – Facing east – Bent 1 west elevation.



Photo 6 – Facing west - Bent 2 east elevation.



Photo 7 – Cracking and scaling of Rear Abutment (west) slope protection.



Photo 8 – Submerged rocks creating flow turbulence upstream of Bent 1.



Photo 9 – Bent 1, Pile 1 – Missing hose clamp at top of plastic pipe encasement.



Photo 10 – Bent 2, Pile 6 – (3) 2" diameter holes in plastic pipe on upstream face of pile.



Photo 11 – Facing North - Bent 2, Pile 6. Missing top and bottom hose clamps on plastic pipe encasement.



Photo 12 – Forward Abutment (east) slope protection – typical cracking.

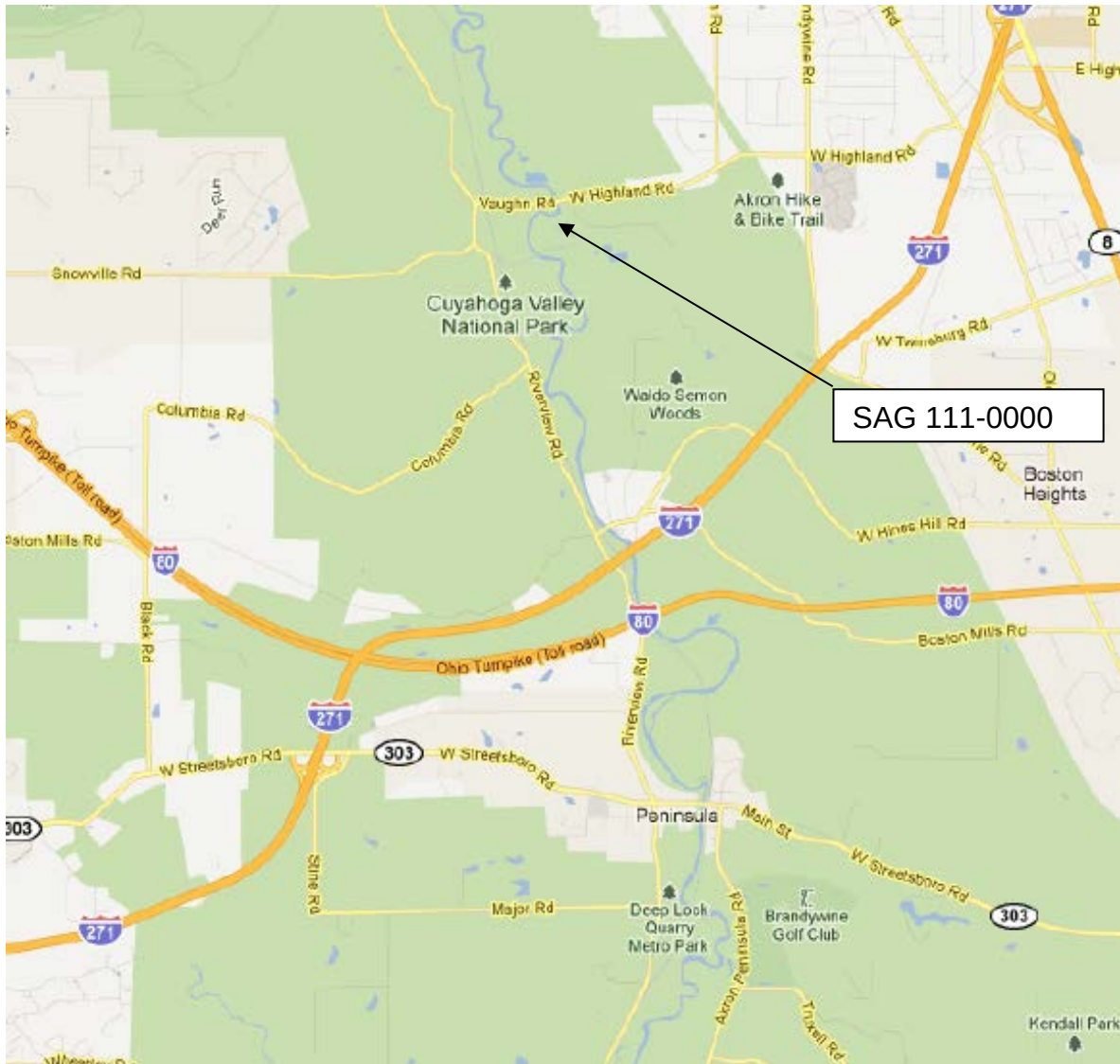


Photo 13 – Facing East – Void, cracking, and settlement of Forward Abutment slope protection (northeast corner).



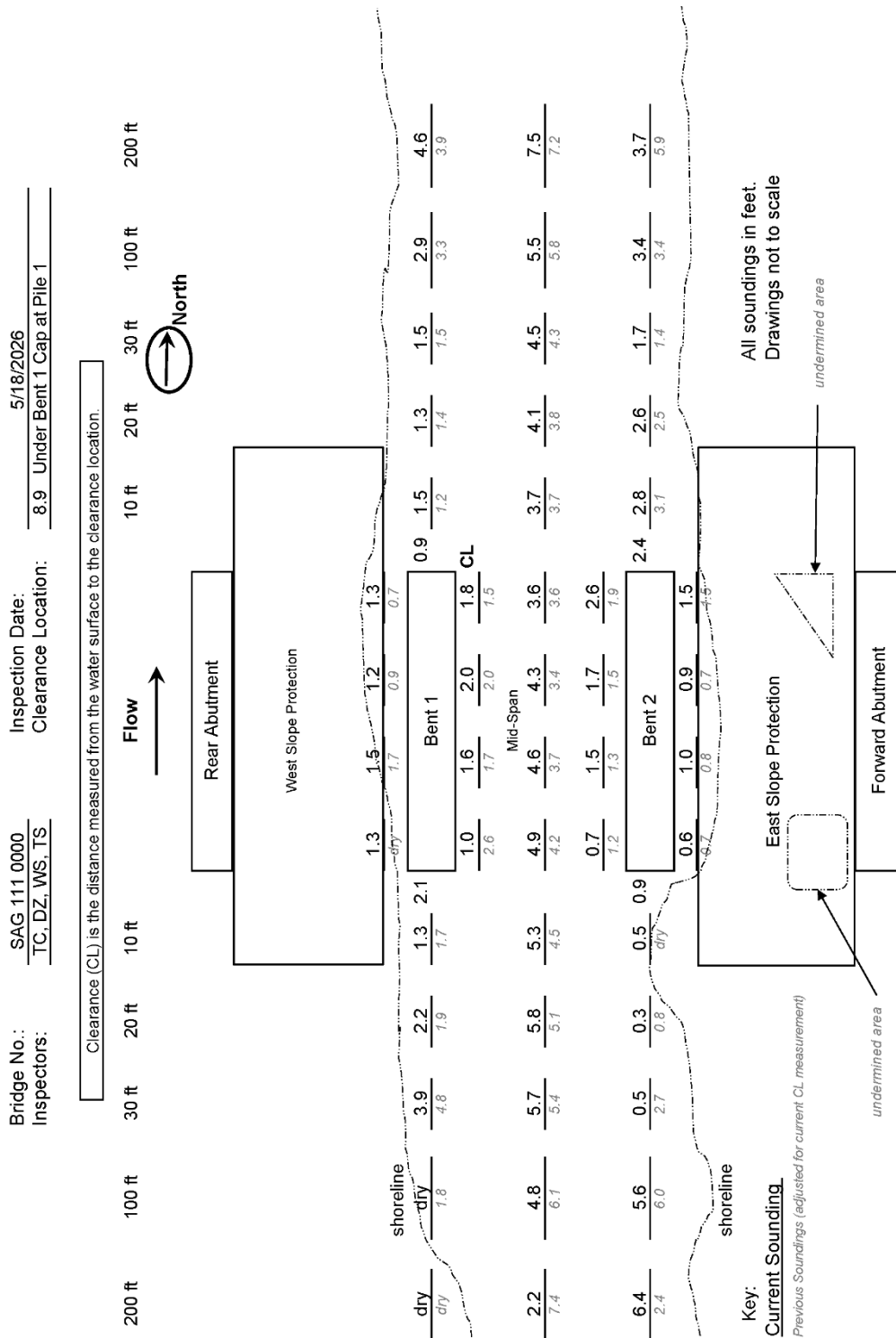
Photo 14 – Clearance level measurement - Bottom of Bent 1 cap at Pile 1.

7 LOCATION MAP



Google Maps

8 SOUNDINGS



9 CROSS CHANNEL PROFILE MEASUREMENTS

Date: 5/18/2026

Bridge ID: SAG-111-0000

Bridge Location: Highland Road over Cuyahoga River

Upstream Side

Measurements taken from Top of Railing. Top of railing to underside of beams was measured as 5.1 feet in Spans 1 & 3 and 6.1 feet in Span 2.

Msmt	Span	Horizontal distance from Rear (ft)	Object Measured	Vertical Msmt. (ft) 2019 *	Vertical Msmt. (ft) 2021	Vertical Msmt. (ft) 2026	Comments
1	1	0	Rear Abutment	5' 1"	5' 3"	5' 2"	
2	1	9	¼ point	9' 6"	8' 5"	8' 0"	
3	1	18	½ point	14' 2"	13' 5"	12' 3"	
4	1	27	¾ point	18' 9"	18' 2"	16' 4"	
5	1	31	EOW	18' 9"	19' 1"	18' 4"	29' in 2021
6		36	Pier 1	18' 10"	19' 9"	19' 7"	
7	2	55	¼ point	21' 7"	20' 11"	20' 3"	
8	2	74	½ point	22' 6"	23' 4"	24' 1"	
9	2	93	¾ point	21' 2"	21' 5"	22' 2"	
10		112	Pier 2	18' 8"	19' 6"	20' 3"	
11	3	121	EOW	17' 2"	19' 5"	18' 10"	115' in 2021
12	3	121	¼ point	17' 2"	18' 5"	18' 10"	
13	3	130	½ point	13' 5"	14' 3"	14' 5"	
14	3	139	¾ point	9' 1"	9' 11"	10' 5"	
15	3	148	Fwd. Abutment	5' 10"	6' 0"	6' 0"	

* Measurements obtained by Integrity Aquatic Inspectors on 6/28/2019.

