
GANNETT FLEMING MEMORANDUM

Date: January 27, 2016

To: Radnor Township

From: Gannett Fleming

Re: Sawmill Road Arch Bridge Field View

A field view was performed on November 23, 2015 of the above-referenced arch bridge located just west of the intersection with Darby Paoli Road which carries Sawmill Road over Darby Creek in Radnor Township, Delaware County. The field view was performed to determine the need for the structure's repair, rehabilitation, or replacement. The field view was limited to observation of the above ground, visible and accessible elements. Elements below the water line or ground line were not assessed. Load ratings and structural plans of the existing bridge were not available at the time of field viewing.

Structure Description

The bridge carrying Sawmill Road over Darby Creek consists of a single span closed spandrel concrete arch with U-shaped stone masonry wing/retaining walls. The barrier atop the arch is vertical wall/faced concrete. The barriers on the approaches are a stone masonry vertical wall/face (an extension of the stone masonry wing/retaining wall) with a concrete cap and concrete end sections.

The 54'-0" long arch bridge carries two unmarked substandard lanes with a curb-to-curb distance of 18'-4". The 10" wide vertical wall barrier is 3'-0" high measured from the top of a 6" high by 5" wide steel armored concrete curb. The 3'-6" U-wall masonry barriers are 1'-6" wide topped with 1'-10" x 4" concrete caps.

Darby Creek flows north to south on a curved alignment through the bridge and occupies only eastern half of the span due to a sediment deposit that has accumulated along the western half of the span.



General View of Arch Bridge – Looking East



Downstream (South) Elevation

Structure Findings

The arch barrel is in good condition with no major defects, except a large spall is noticeable at the bottom of the southeast wingwall, and two small spalls and a few fine map cracks with efflorescence on the southern side of the arch barrel. The arch barriers are in fair condition with small spalls at various locations. All masonry U-shape wingwalls are in good condition.

There is severe bank erosion with exposed tree roots at southeast corner of the bridge.

Arch Barrel

No major defects excepted as noted.



Concrete Arch Barrel – Looking at West Abutment



Concrete Arch Barrel – Looking at East Abutment



Large Spall at Bottom of Southeast Wingwall



Surface Spall in South Fascia of Arch Barrel



Surface Spall in South Fascia of Arch Barrel



Small Spall in South Spandrel Wall and Fine Map Cracks with Efflorescence in South Fascia of Arch Barrel



View of Pavement – Cracks throughout



Spalls in Bridge Barrier



Spalls in Concrete Cap of Wingwall Barrier



Cracks in Wingwall Barrier



Bank Erosion with Exposed Tree Roots in Bank of Southeast Corner of the Bridge



Upstream Right Bank at West Abutment

Conclusions

The concrete arch bridge and stone masonry wingwalls are in good condition, except a few spalls as noted. The concrete barriers of the arch bridge and masonry stone barriers of the wingwalls are in good condition, except a few spalls and cracks at various locations.

There is a large sediment deposit under the arch blocking half the waterway channel. Water flows along the east abutment and causes severe bank erosion.

Safety Features



West Approach, Note Pedestrian Cross Walk was Previously Relocated Once



East Approach, Note Sign of Pedestrian Crossing

The lane widths of this roadway are substandard across the structure. Lane widths of 9' to 9'-4" are provided whereas the minimum allowable is 10' plus 1' offset to the bridge barrier for a total

lane width of 11'.

A pedestrian cross walk is located on the west approach between Skunk Hollow Park and Saw Mill Park. Pedestrians in the crosswalk do not have a clear view to the east over the structure.

Sight distance across the structure is also restrictive due to the vertical curve on the structure and a horizontal curve on the west approach to the bridge, there is no speed limit posting on either approach of the bridge. This creates a situation where pedestrian in the crosswalk and vehicles approaching the structure at the same time from opposite directions have difficulty seeing each other.

Positive protection for the blunt ends of the bridge barrier is not provided. Only hazard markers denote the location on each of the four approaches.

Environmental

Sawmill Road crosses Darby Creek which supports protected water uses for Cold Water and Migratory Fishes (CWF/MF) according Title 25, Chapter 93 of Pennsylvania State Code. The stream is trout-stocked but does not support a naturally reproducing trout population. Therefore, seasonal construction restrictions will be required and no instream work may occur between March 1 and June 15. A PNDI database search was conducted and the results indicated that a Pennsylvania rare plant, puttyroot, may occur at this location and may be impacted. Coordination with the Pennsylvania Department of Conservation and Natural Resources may be required in order to gain authorization to construct the project. The bridge is not eligible for listing on the National Register of Historic Places according to the Pennsylvania State Historic Preservation Office's Cultural Resources GIS website. Note, Darby-Paoli Road, located immediately northeast of the bridge, was assessed to determine its historical significance and the Pennsylvania SHPO indicated that there was insufficient evidence to determine if it is eligible for listing on the National Register of Historic Places.

It appears that rehabilitation of the bridge, including the addition of scour protection would require a PADEP General Permit #3 for Bank Rehabilitation, Bank Protection and Gravel Bar Removal. It is assumed that federal authorization for this activity can be authorized by PASPGP-4 that will be issued by PADEP.

If wetlands are present, and greater than 0.05 acres of impacts are expected, GP-3 does not apply and A Joint Chapter 105/Section 404 Permit may be required.

Geotechnical

No geotechnical investigation is necessary.

Recommendations

Based on field assessment and findings, it is recommended to rehabilitate the structure as follows:

- Repair spalls/cracks in fascia of arch ring.
- Remove trees and provide riprap protection at downstream left bank to prevent further bank erosion.
- Relocate the pedestrian crosswalk to the west, away from the structure, to the intersection with Earles Lane. The trails within the parks could be reconfigured with minimal earth disturbance to affect this change. This will allow vehicles to better observe pedestrians in the crosswalk and will allow pedestrians to see oncoming traffic from the bridge.
- Provide painted yield bars on the roadway at both bridge approaches with adjacent signing "YIELD TO ONCOMING TRAFFIC". This will allow vehicles on either approach to yield to a vehicle already on the structure.
- Provide guide rail or crash worthy end treatments on all four corners of the structure.

A conceptual construction cost estimate and estimate of engineering cost is provided for the recommended work.

Sawmill Road over Darby Creek Arch Rehabilitation

Construction Item Estimate:

	Unit	Qty	Unit \$	Item Cost
1 Sandbag Cofferdam	LS	1	\$1,000	\$1,000
2 Spall Repair in fascia of Arch Ring	SF	15	\$300	\$4,500
3 Riprap Protection at Downstream Left Bank	CY	20	\$150	\$3,000
4 Yield to oncoming traffic signage and striping	LS	1	\$2,000	\$2,000
5 Relocate ped crossing to Earles Ln intersection	LS	1	\$1,800	\$1,800
6 Protect blunt end of parapets	Each	4	\$2,200	\$8,800

Total Construction Cost: **\$21,100**

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+ 5% Mobilization

+ 20% Contingency

Construction Total: **\$27,000**

Engineering Fee: **\$28,100**

Total Project Cost: **\$55,100**