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CIVIL & STRUCTURAL ENGINEERING

TOWNSHIP BRIDGES

MILFORD TOWNSHIP
SCHOCOPEE ROAD

&

MOON VALLEY/DEEP BROOK ROAD
MILFORD TOWNSHIP
PIKE COUNTY, PA

ENGINEER'S REPORT:
Preliminary Inspection & Evaluation
of Township Bridges
with Maintenance Recommendations

Revision 0
10/9/23

Client/Owner: Milford Township Board of Supervisors
560 Route 6 & 209
Milford, PA 18337

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1.0 Introduction

1.1 Purpose

In June 2023, John D. Fuller, P.E. (“Engineer”) was directed by the Board of Supervisors to inspect and evaluate the existing conditions and structural integrity of the three (3) bridges serviced and maintained by Milford Township. The Engineer was to determine if the existing bridges are “*structurally sound*” for continued and regular occupancy in the future. The Engineer was also asked to summarize future inspection and maintenance procedures including potential costs to repair, update or replace the bridge structures in the future

In preparation for this report, the Engineer performed site visits to investigate the bridge structures and to assess the deterioration of the structural components.

1.2 Scope of Engineer’s Report

This Engineer’s Report will accomplish the following:

- Identify & summarize the existing conditions of the bridges.
- Evaluate the existing conditions and provide an assessment on the status of each bridge.
- Provide bridge maintenance recommendations.

The inspections, assessments and recommendations are preliminary at this time. The report is intended to provide the Milford Township Board of Supervisors a basis to conduct planning and budgeting in the future.

2.0 Existing Condition

2.1 Bridge #1 - Moon Valley Road/Deep Brook Road (Vandermark Creek)

Bridge #1 is a single span structure that carries Deep Brook Road over Vandermark Creek at the intersection of Moon Valley Road. The superstructure consists of 4 precast box culverts that dimension 4’ in height by 16’ in width. The overall length and span of the bridge is approximately 16’. The width between the protective concrete barriers (30” x 8”) at the road surface is 26’ wide curb to curb.

On top of the precast concrete bridge deck is a bituminous wearing surface (asphalt). There is no load rating posted on the bridge at this time. At the entrance and exit of the creek bed through the box culvert are gabion stone baskets that retain the earth embankments. Other protection includes stone boulders of varying size.

Bridge #1 is in very good condition. Based on the visual inspection, it appears that the bridge was constructed within the recent past (20 to 30 years) and has minimal signs of wear.

The Appendix contains Photos, Sketches and Mapping to demonstrate the existing conditions, design, structure and location of the bridge.

2.2 Bridge #2 - Schocopee Road (Dimmick Meadow Brook)

Bridge #2 is a single span structure that carries Schocopee Road over Dimmick Meadow Brook. The superstructure/substructure consists of cast-in-place concrete abutments with a 12" minimum cast-in-place concrete deck. The bridge depth over the creek bed is approximately 5' in height. The overall length and span of the bridge is approximately 16'. The width between the protective concrete barriers (30" x 12") at the road surface is 17' wide curb to curb. The bridge abutments have a short return wall into the earthen embankments.

On top of the cast-in-place concrete bridge deck is a bituminous wearing surface (asphalt). There is no load rating posted on the bridge at this time. At the entrance and exit of the creek bed through the bridge are a mix of large stone and boulder to retain the earth embankments.

Bridge #2 is in satisfactory condition with some evidence of wear. Bridge #2 has a posted date (construction) of 1917 on the protective barrier at the road surface level. It appears that maintenance has been made to the bridge over time. Part of the footing on the abutment is exposed and may have been reinforced as part of the bridge maintenance in the past.

The Appendix contains Photos, Sketches and Mapping to demonstrate the existing conditions, design, structure and location of the bridge.

2.3 Bridge #3 - Schocopee Road (Pinchot Brook)

Bridge #3 is a single span structure that carries Schocopee Road over Pinchot Brook. The superstructure/substructure consists of cast-in-place concrete abutments with 4' long wing walls. The abutments support a 12" minimum cast-in-place concrete deck. The bridge depth over the creek bed is approximately 4' in height. The overall length and span of the bridge is approximately 10'. The width between the protective concrete barriers (30" x 12") at the road surface is 18' wide curb to curb. The wing walls are a distinctive feature of this bridge.

On top of the precast concrete bridge deck is a bituminous wearing surface (asphalt). There is no load rating posted on the bridge at this time. At the entrance and exit of the creek bed through the bridge are a mix of large stone and boulders that retain the earth embankments. Other protection includes stone boulders of varying size.

Bridge #3 is in fair condition with significant evidence of wear. Bridge #3 does not have a posted date of construction but it is estimated to have been built around the same time as Bridge #2. It appears that some maintenance of the bridge has been made in the past,

however, this bridge is in need of repair in the future. Part of the footing on the abutment is exposed and may have been reinforced as part of the bridge maintenance in the past.

The Appendix contains Photos, Sketches and Mapping to demonstrate the existing conditions, design, structure and location of the bridge.

3.0 Bridge Assessments

3.1 Bridge #1

The general assessment of Bridge #1 is as follows:

Visual Inspection

The general observations of this bridge during inspection include no evidence of concrete cracking and spalling. The superstructure/substructure system is showing no signs of failure. The field observations are shown in the photos and sketches attached in the appendix. Below is a brief summary of conditions for each feature.

Superstructure/Deck

The bituminous pavement has some minor cracking in the longitudinal direction. There is no evidence of deflection. The concrete deck is not cracking or spalling.

Substructure/Box Culvert

The precast box culvert shows minimal signs of wear. No cracking, spalling or delamination is present. The interior portion of the box culvert is in good condition. The only evidence of minimal wear is at the bottom of the box culvert wear the flow of water is continuous.

Assessment & Rating

Bridge #1 is in very good condition with a rating of 8. There are no problems noted. The bridge does not need any short term or longer term repair. The channel (creek bed) shall be monitored for scour and streambed protection. The bridge should have a regular inspection schedule to monitor wear over time.

3.2 Bridge #2

The general assessment of Bridge #2 is as follows:

Visual Inspection

The general observations of this bridge during inspection include some evidence of concrete cracking and definite spalling in a few locations. The superstructure/deck system is showing no signs of failure or fatigue. The field observations are shown in the photos and sketches attached in the appendix. Below is a brief summary of conditions for each feature.

Superstructure/Deck

The bituminous pavement has no evidence of cracking in the longitudinal or transverse direction. There is no evidence of deflection. The concrete deck, which was inspected from the underside, has minimal cracking but no evidence of spalling.

Substructure/Abutment

The abutments due show sign of wear. The abutments have some minor cracking with areas of significant spalling. There is no evidence of delamination, however, there is evidence of efflorescence which may lead to spalling in the future.

Assessment & Rating

Bridge #2 is in satisfactory condition with a rating of 6. A rating of 6 indicates that structural components have some minor areas of deterioration. The most significant area of deterioration is spalling of concrete on the bridge abutments. The bridge will require some long-term repair which will involve patching or coating the areas of spalling. The bottom of the abutments will also require additional stones and boulders to protect the abutments from erosion and scour at the footing base. The channel (creek bed) shall be monitored for streambed protection. The bridge should have a regular inspection schedule to monitor wear over time.

3.3 Bridge #3

The general assessment of Bridge #3 is as follows:

Visual Inspection

The general observations of this bridge during inspection include significant evidence of concrete cracking and spalling at the underside of the bridge deck. The superstructure/deck system is showing no signs of failure or fatigue; however, the spalling is a significant deterioration of the concrete deck. The field observations are shown in the photos and sketches attached in the appendix. Below is a brief summary of conditions for each feature.

Superstructure/Deck

The bituminous pavement has no evidence of cracking in the longitudinal or transverse direction. There is no evidence of deflection. The concrete deck, which was inspected from the underside, has significant spalling of concrete with exposure of corroding reinforcing steel.

Substructure/Abutment

The abutments show no sign of significant wear. The abutments have some minor cracking but no areas of significant spalling. It appears that some areas of spalling were corrected in the past. There is no evidence of delamination or efflorescence.

Assessment & Rating

Bridge #3 is in fair condition with a rating of 5. A rating of 5 indicates that structural components are sound but due have minor areas of section loss, spalling, cracking and scour. The most significant area of deterioration is spalling of the underside of the concrete deck.

The bridge will require short-term repair involving patching or coating the areas of spalling. The bottom of the abutments will also require additional stone to protect the abutments from erosion and scour at the footing base. The channel (creek bed) shall be monitored streambed protection. The bridge should have a regular inspection schedule to monitor wear over time.

The repair of the underside of the bridge deck may prove to be only temporary. The patching of the spalling areas will likely spall again after continued wear of the surface. The long-term repair will involve replacing the bridge deck with a new deck system.

4.0 Bridge Maintenance Recommendations

4.1 Specific Maintenance Requirements

As indicated in Section 3 above, the following specific maintenance conditions should be addressed:

Bridge #1 (Rating 8; Priority Code 5)

No short- or long-term maintenance repairs are required at this time. A bridge inspection procedure shall be put into place to monitor the performance of the bridge over time.

Bridge #2 (Rating 6, Priority Code 4)

A long-term repair of spalling conditions on the bridge abutments should be scheduled and budgeted as part of the maintenance of this bridge. Similar to Bridge #1, this bridge shall have regular inspections to monitor its performance.

Bridge #3 (Rating 5, Priority Code 3)

A short-term repair of spalling conditions on the underside of the bridge deck should be scheduled and budgeted as part of the maintenance of this bridge. Once the repair is made to this bridge, a regular inspection schedule shall be required to monitor the effectiveness of the repairs.

4.2 Inspections

The National Bridge Inspection Standards (NBIS) regulate the inspection of all publicly owned bridges greater than 20 feet in length on public roadways. Pennsylvania administers the federal National Bridge Inspection Standards, as they pertain to bridges within the commonwealth, through the use of its own Bridge Management System (BMS2).

Although bridges less than 20 feet in length are not required to be inspected by federal requirements, these bridges should be inspected using the same inspection criteria. Exclusion from the federal program does not release bridge owners (public or private) from safety and liability issues to the traveling public. All three bridges in Milford Township are less than 20 feet.

Bridge safety inspections should follow a minimum 24-month cycle. Routine inspections should be performed on a two-year cycle when bridges are deemed satisfactory or better. Bridges that have a rating of fair or poor should have interim inspections within the 24-month cycle. Bridges with significant deterioration or problem areas can have inspection frequencies less than the two-year cycle to monitor continued deterioration. Interim inspections may also be necessary if there is an expectation of accelerated deterioration.

A bridge safety inspection shall produce a report showing the condition of a bridge on the day it was inspected. These inspection reports shall contain narrative descriptions of the bridge components, photographs, and maintenance recommendations. Every bridge inspection report shall include detailed descriptions representing the inspectors' assessment of the various bridge components at the time of inspection. The inspection reports should note all observations relative to the need for corrective maintenance as well as preventive maintenance. These reports can, and should, be used to trigger preventive maintenance activities.

The condition codes used by the commonwealth in its BMS2 program are from FHWA's Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges. The BMS2 rating codes use a scale of 0 (failed condition) to 9 (excellent condition).

<u>Rating</u>	<u>Description</u>
9	Excellent Condition.
8	Very Good Condition – No problems noted.
7	Good Condition – Some minor problems.
6	Satisfactory Condition – Structural elements show some minor deterioration.
5	Fair Condition – All primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	Poor Condition – Advanced section loss, deterioration, spalling, or scour.
3	Serious Condition – Loss of section, deterioration, spalling, or scour may have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	Critical Condition – Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present, or scour may have removed substructure support. Unless closely monitored, it may be necessary to close the bridge until corrective action is taken.

- 1 “Imminent” Failure Condition – Major deterioration or section loss present in critical structural components of obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic, but corrective action may put it back in light service.
- 0 Failed Condition – Out of service; beyond corrective action

Prior to the implementation of a formal inspection procedure, a visual assessment survey may be conducted on each bridge to establish a basis. The visual assessment or survey is a precursor to a formal inspection that would include a hands-on inspection of each component of the bridge to gather information needed for an in-depth condition and load rating evaluation. The objectives of the visual survey are: (1) to gather as much information as possible without the ability to fully access the bridge superstructure; (2) to evaluate the condition and repair needs of the bridge; and (3) to better understand access issues, conditions, and to understand how these would influence a more formal inspection. The formal inspection can be used to identify additional needed repairs and better facilitate the ability to estimate associated repair costs.

4.3 Maintenance

Developing and maintaining a plan for completing bridge maintenance is a vital step to ensuring continued serviceability of bridges. Preventive maintenance is a primary deterrent to premature or continued deterioration of critical structural elements of bridges.

Once a regular inspection program is implemented, an effective bridge maintenance program can be established. The inspection will categorize the maintenance condition of the bridges with specific components or items that require repair or replacement. It is customary to assign a priority code. The priority codes range from 0 (Critical Priority) to 5 (Routine Non-structural).

- 0 – Critical Priority, prompt action required
- 1 – High Priority, as soon as work can be scheduled
- 2 – Priority, review work plan and adjust schedule as needed
- 3 – Add to Scheduled Work
- 4 – Routine Structural, can be delayed until funds are available
- 5 – Routine Nonstructural, can be delayed until programmed

For each maintenance item, the location of a recommended repair is noted as well as an estimate of the quantity needed and its priority code. The priority code indicates the maintenance tasks that should be performed immediately and those that may be planned in the future.

Those responsible for inspection will often send a “critical or high-priority deficiency” to municipal officials for maintenance items requiring immediate attention. Maintenance items coded a “0” or “1” should be considered critical or high-priority maintenance items requiring

immediate attention. Regardless of the priority code assigned to a bridge, the necessary repairs may be added to the municipality's bridge maintenance plan as the budget allows.

Bridge maintenance and repairs generally cost less the sooner they are done. Putting off maintenance and repairs will not only increase the cost of the maintenance item, but delayed maintenance on one bridge component can rapidly affect other parts of the bridge, further increasing costs.

4.4 Costs of Maintenance & Replacement of Bridges

Based on the results of the visual survey performed for this study, it is recommended that the short-term repairs for Bridge #3 identified above will be needed and should be budgeted.

Bridge #3 (Rating 5, Priority Code 3)

A short-term repair of spalling conditions on the underside of the bridge deck should be scheduled and budgeted as part of the maintenance of this bridge.

The nature of these repairs can only be fully determined by a formal inspection. The information obtained from a formal inspection would be sufficient for preparation of plans, specifications and estimates for the recommended repair work. Additional information would be needed on the magnitude and exact location of the deterioration that requires repair.

Based on the visual survey, it is estimated that the cost of bridge repair for short-term serviceability will be approximately \$35,000. This estimate includes a sizeable contingency that is typically set aside for unforeseen issues that arise during repair.

5.0 Limitations of Study

The professional opinions represented in this report are the objective evaluations of the Engineer based on the current Codes and Laws of Pennsylvania. This study is prepared for Milford Township and it is for their use and evaluation in their efforts to plan, budget and maintain the bridges going forward. The representations provided are not intended to be all encompassing at this time, but allow a basis to proceed with a future course actions including corrective measures

Respectfully submitted,



John D. Fuller, PE

6.0 Appendix

6.1 Bridge #1

- 6.1.1 Photos**
- 6.1.2 Sketches**
- 6.1.3 Street Map**
- 6.1.4 Aerial Map**

6.2 Bridge #2

- 6.2.1 Photos**
- 6.2.2 Sketches**
- 6.2.3 Street Map**
- 6.2.4 Aerial Map**

6.3 Bridge #3

- 6.3.1 Photos**
- 6.3.2 Sketches**
- 6.3.3 Street Map**
- 6.3.4 Aerial Map**

BRIDGE #1
VANDERMINE CREEK



Looking down Deep Brook Rd



Protective Barrier

6.0 Appendix - Photos



Upstream Side

6.0 Appendix - Photos



6.0 Appendix - Photos



6.0 Appendix - Photos



6.0 Appendix - Photos



6.0 Appendix - Photos

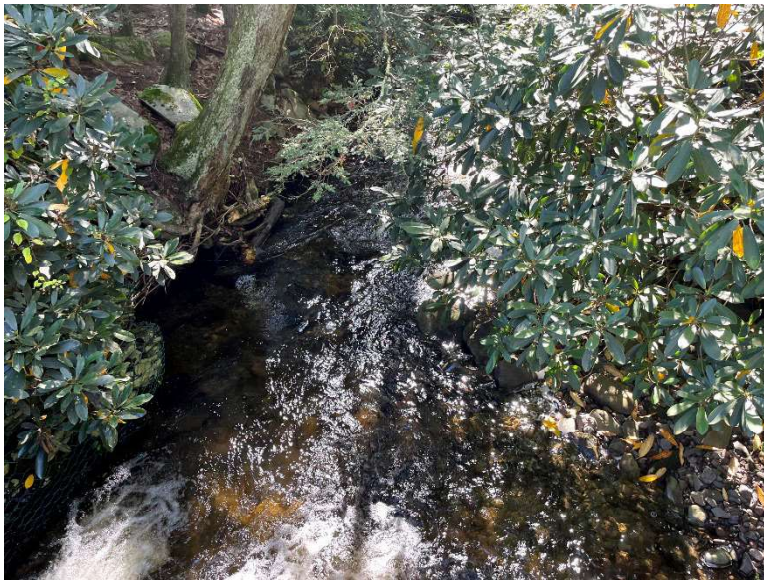


6.0 Appendix - Photos



Downstream Side

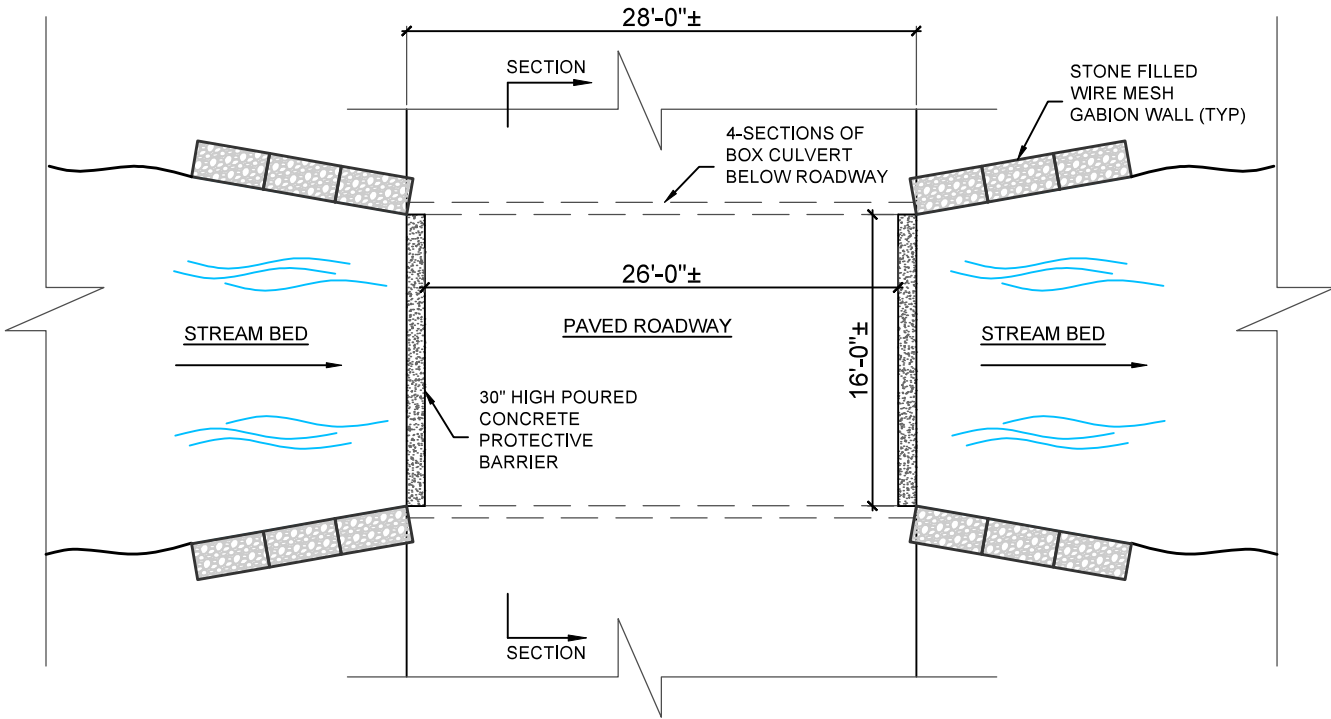
6.0 Appendix - Photos



Downstream Side

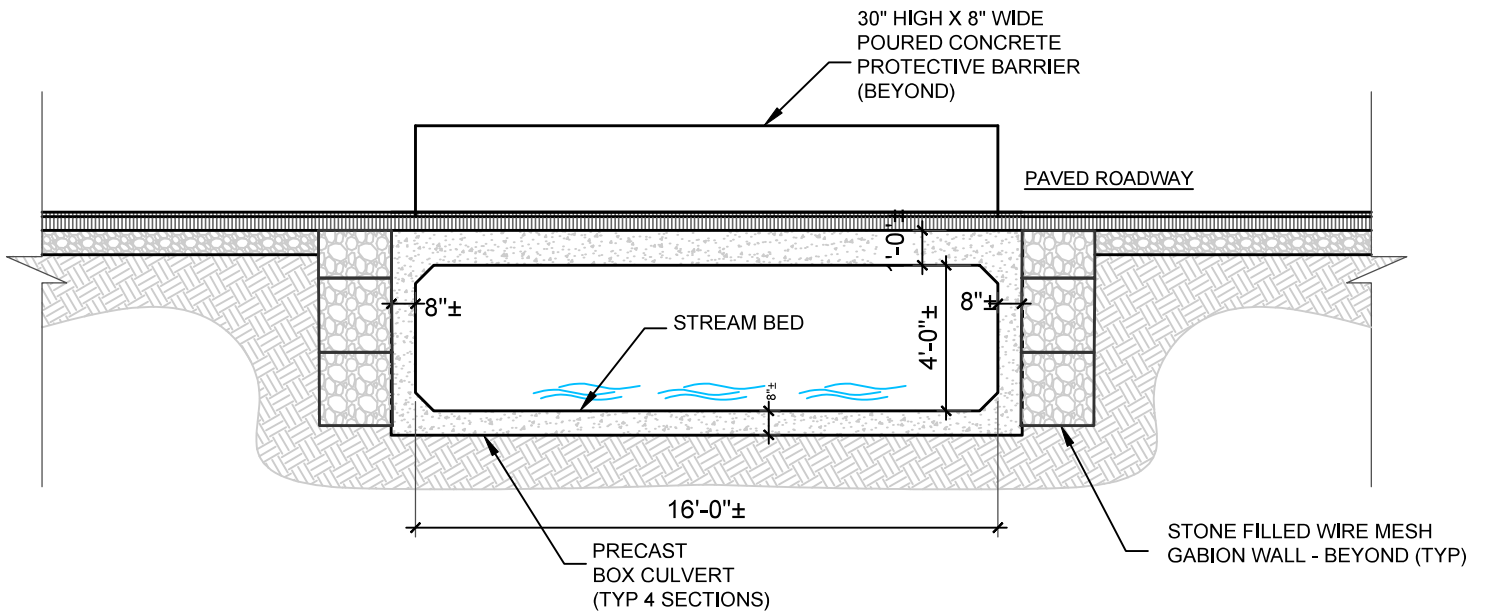
6.0 Appendix - Photos





BRIDGE #1 PLAN (VANDERMINE CREEK)

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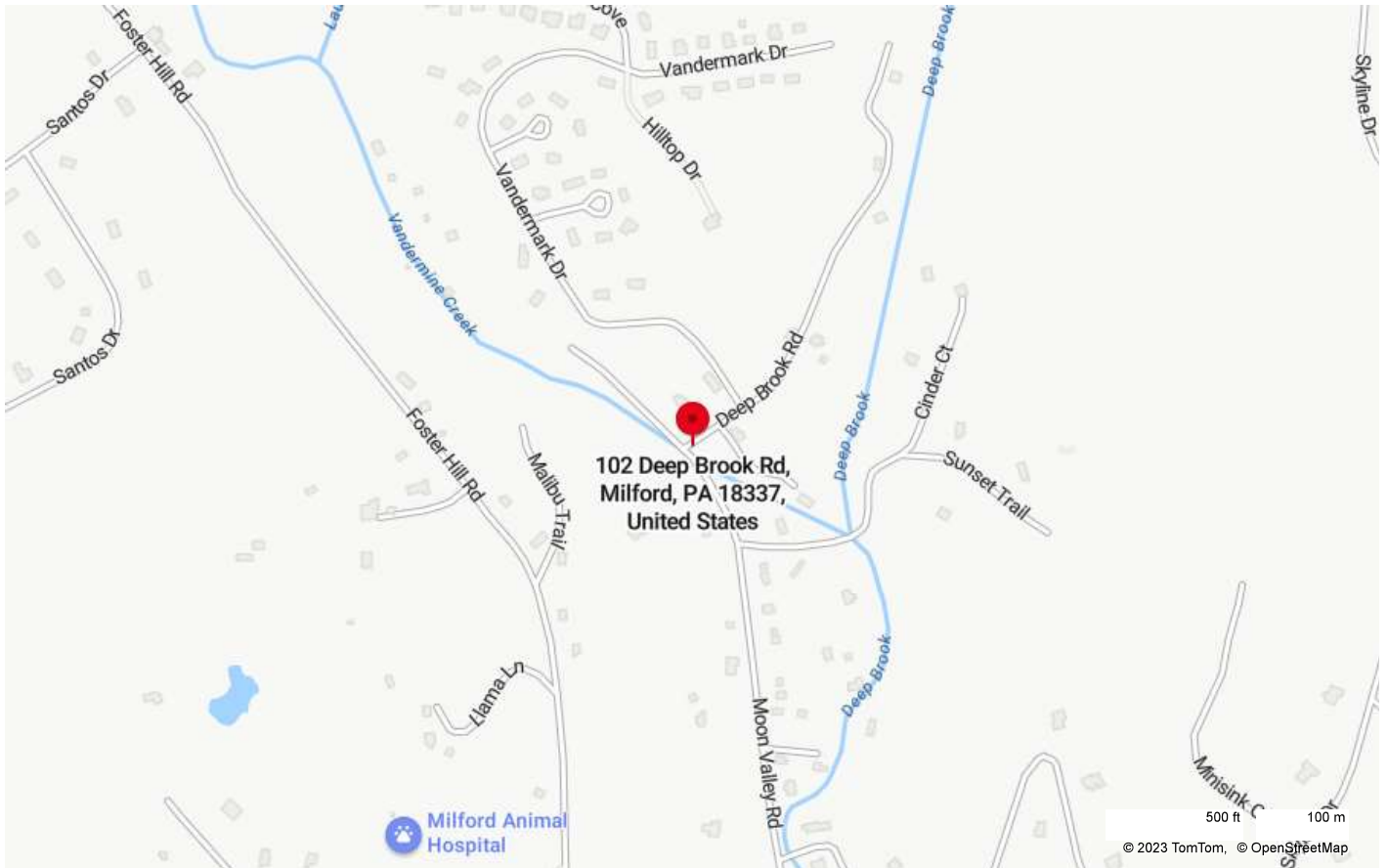


BRIDGE #1 SECTION

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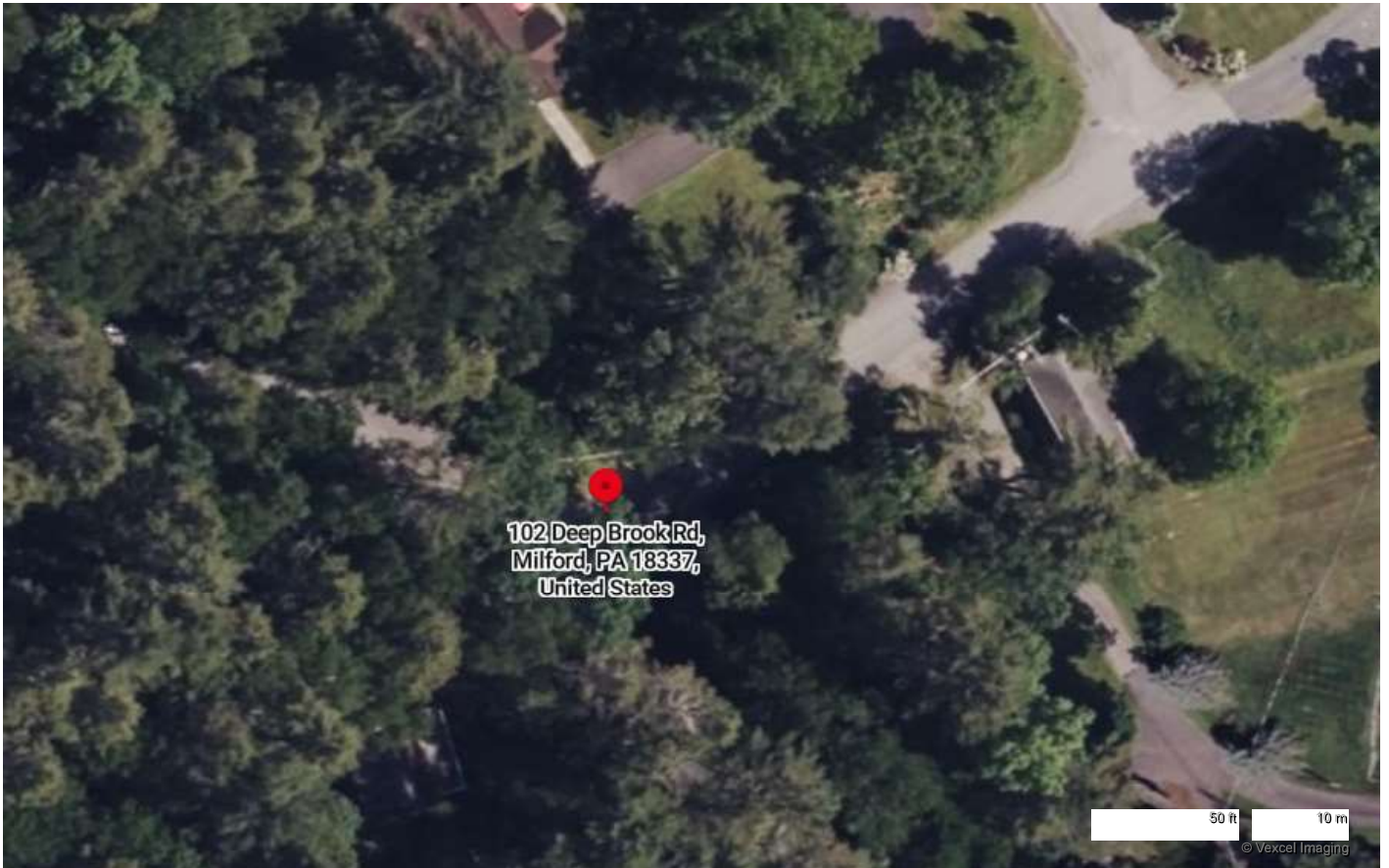
102 Deep Brook Rd, Milford, PA 18337, United States

Vandermine Creek Bridge, Deep Brook Rd.,
Milford, PA



102 Deep Brook Rd, Milford, PA 18337, United States

Vandermine Creek Bridge
Deep Brook Rd.
Milford, PA



BRIDGE #2
DIMMICK MEADOW BROOK BRIDGE



Protective Barrier

6.0 Appendix - Photos



Downstream Side

6.0 Appendix - Photos



Abutment – Area of Significant Spalling

6.0 Appendix - Photos



6.0 Appendix - Photos



Significant Spalling

6.0 Appendix - Photos



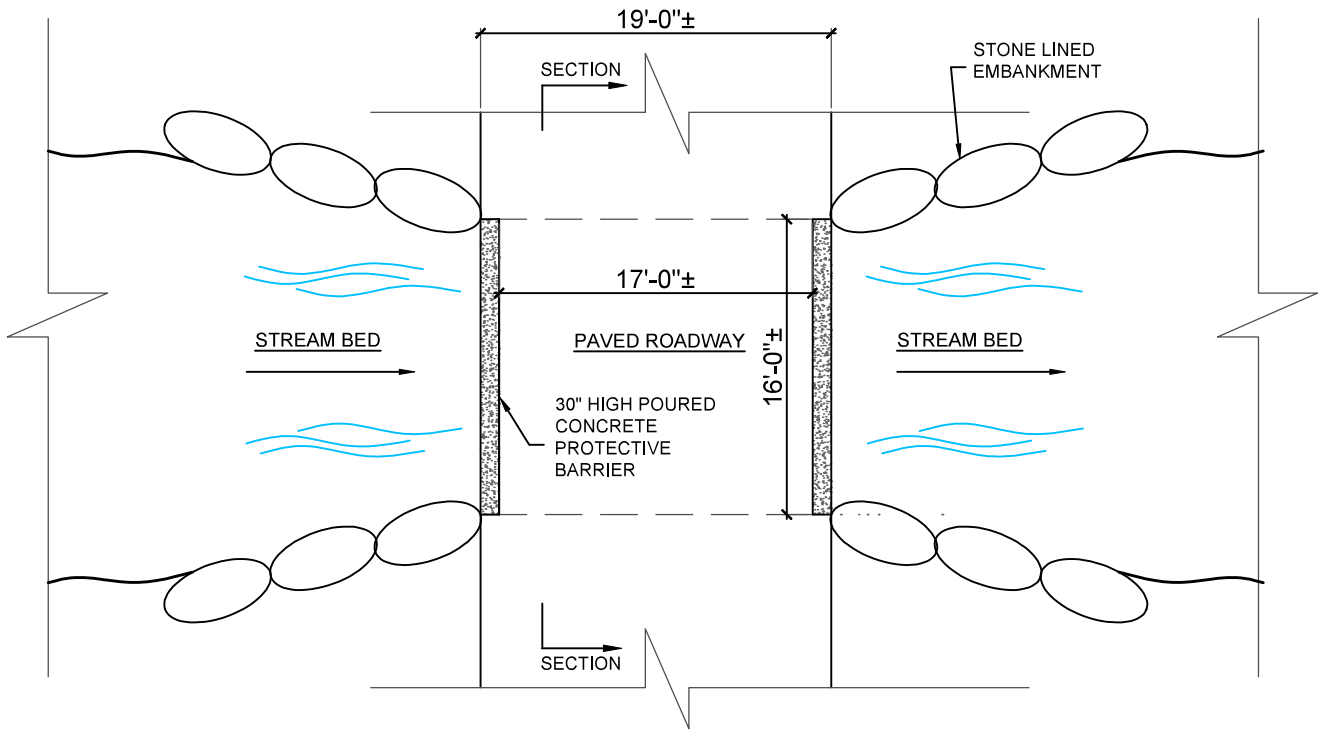
Underside of Deck in Good Condition

6.0 Appendix - Photos



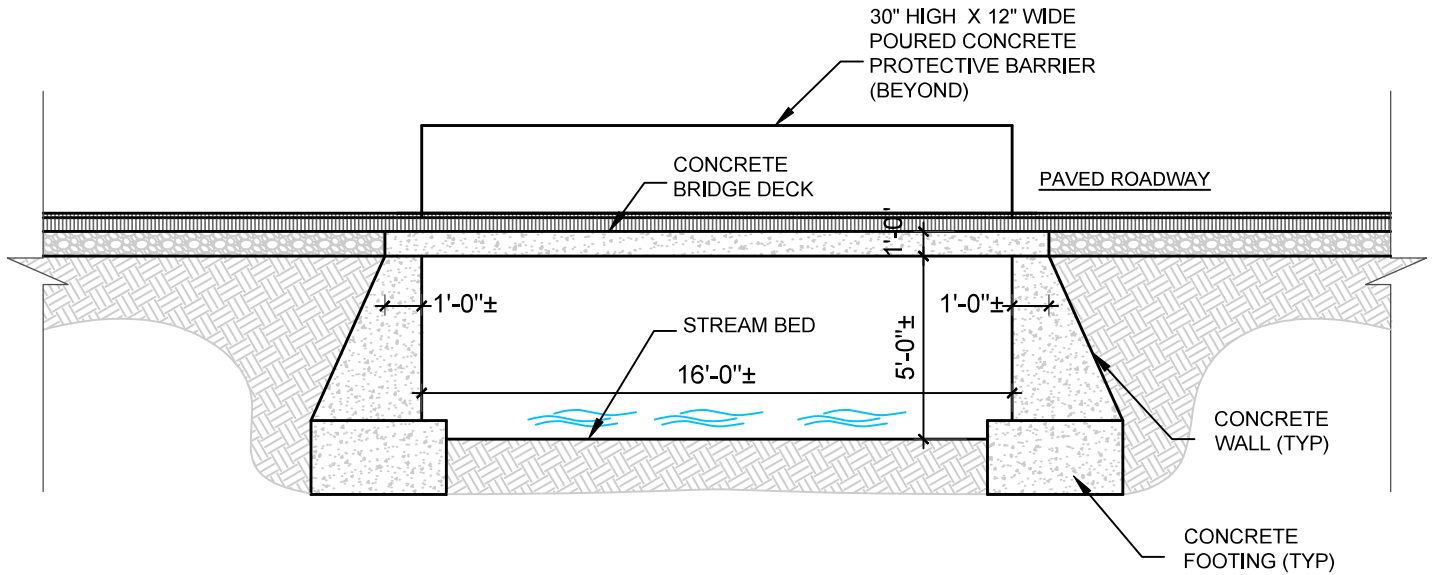
6.0 Appendix - Photos





BRIDGE #2 PLAN (DIMMICK MEADOW BROOK)

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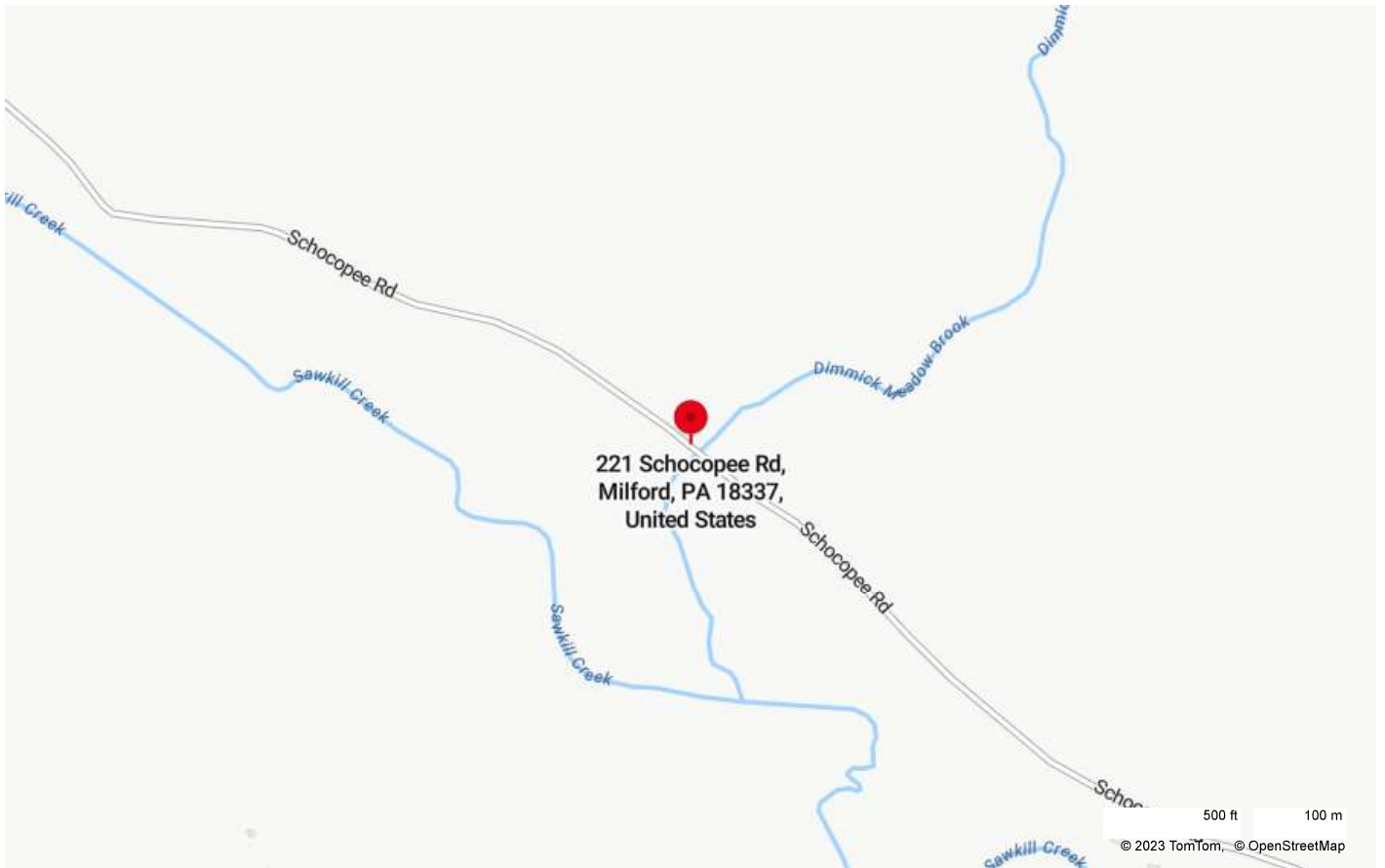


BRIDGE #2 SECTION

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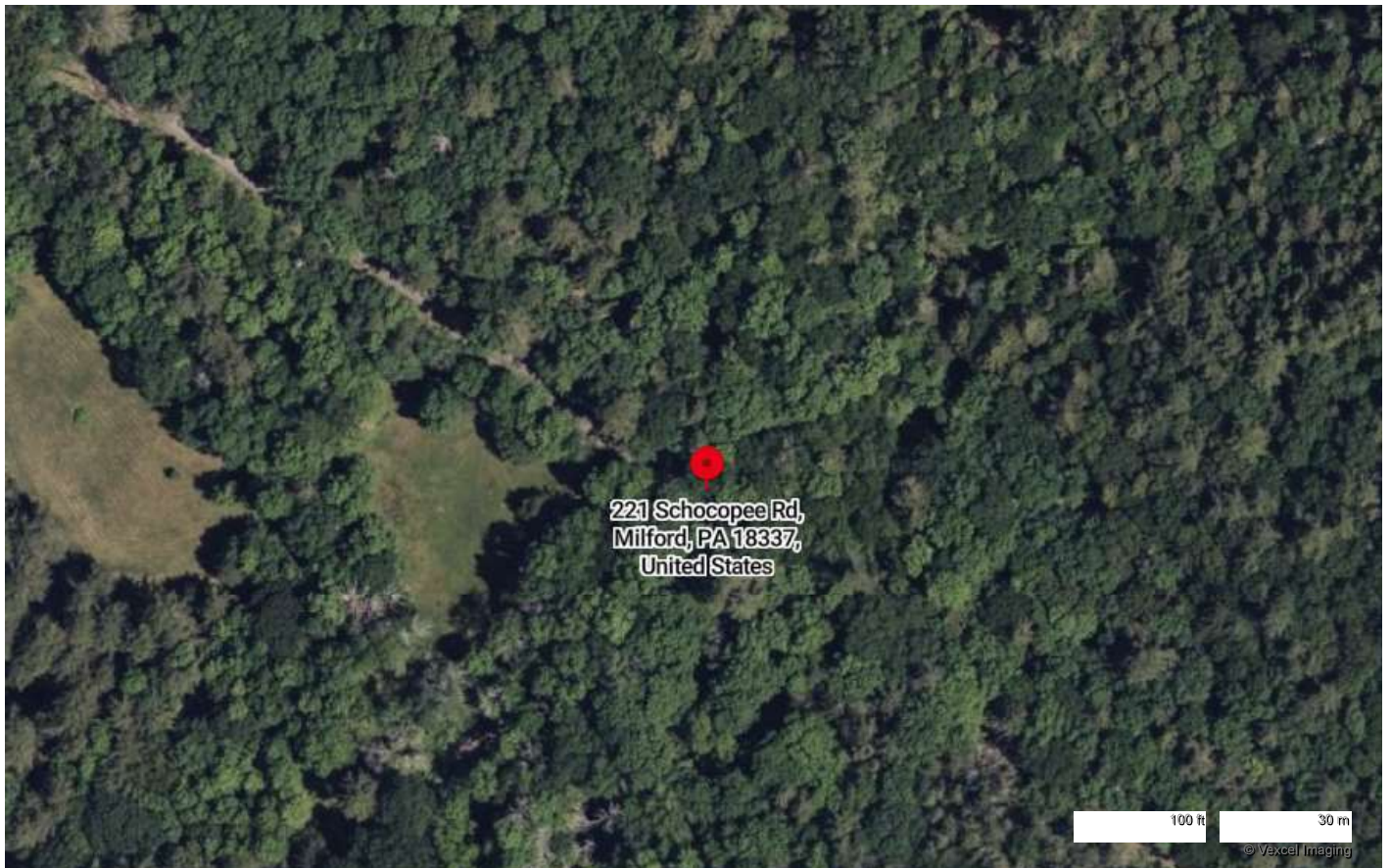
221 Schocopee Rd, Milford, PA 18337, United States

Dimmick Meadow Brook Bridge
Schocopee Rd
Milford, PA

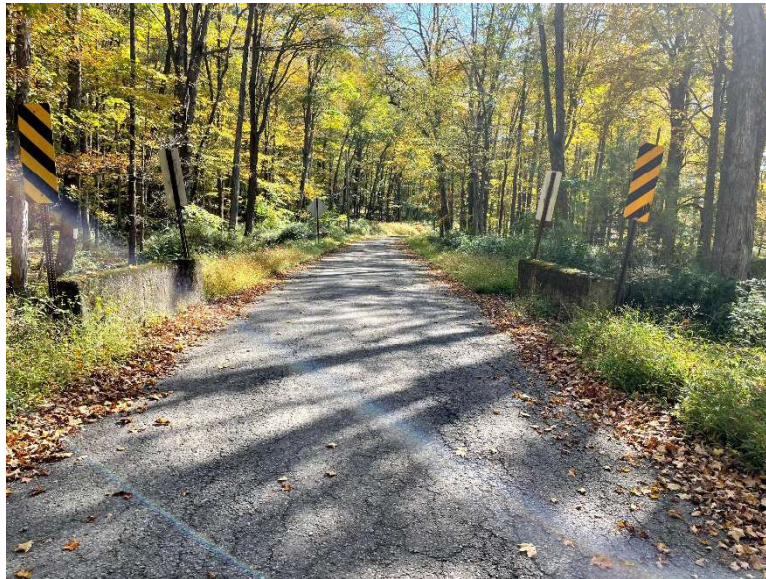


221 Schocopee Rd, Milford, PA 18337, United States

Dimmick Meadow Brook Bridge
Schocopee Rd.
Milford, PA

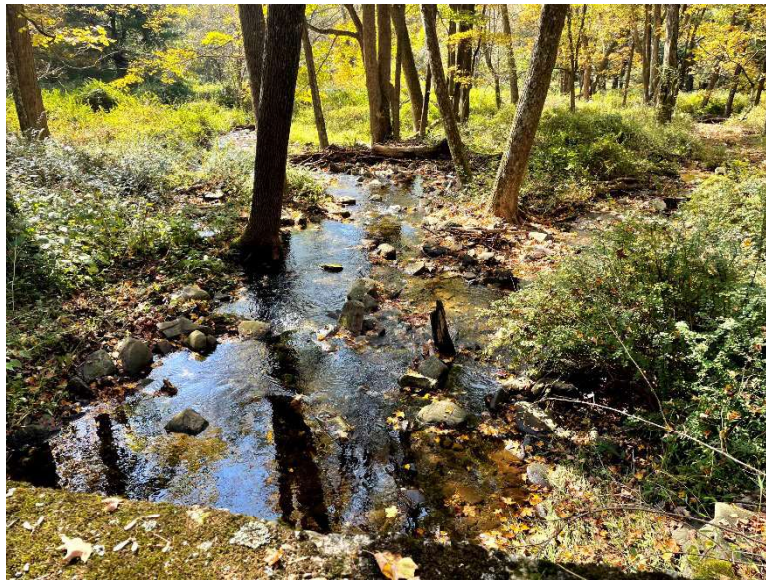


Bridge #3
PINCHOT BROOK BRIDGE



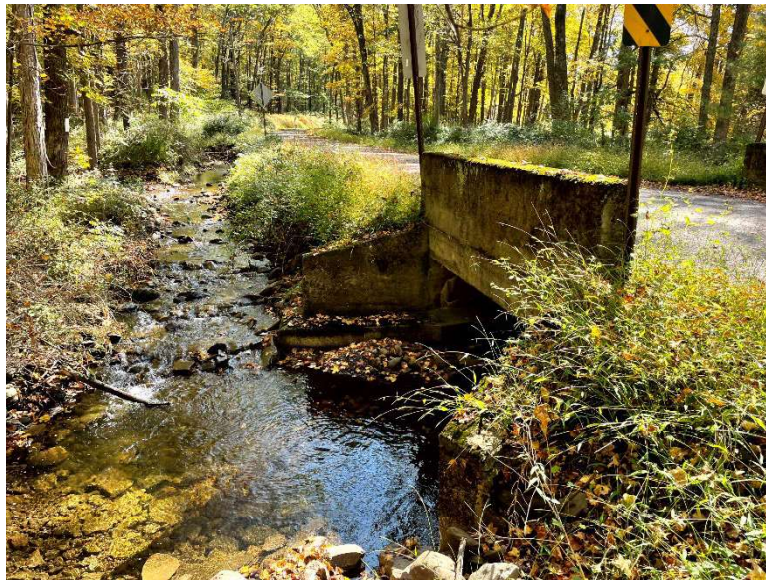
Protective Barrier

6.0 Appendix - Photos



Downstream

6.0 Appendix - Photos



Upstream

6.0 Appendix - Photos



Downstream w/ Wing Wall

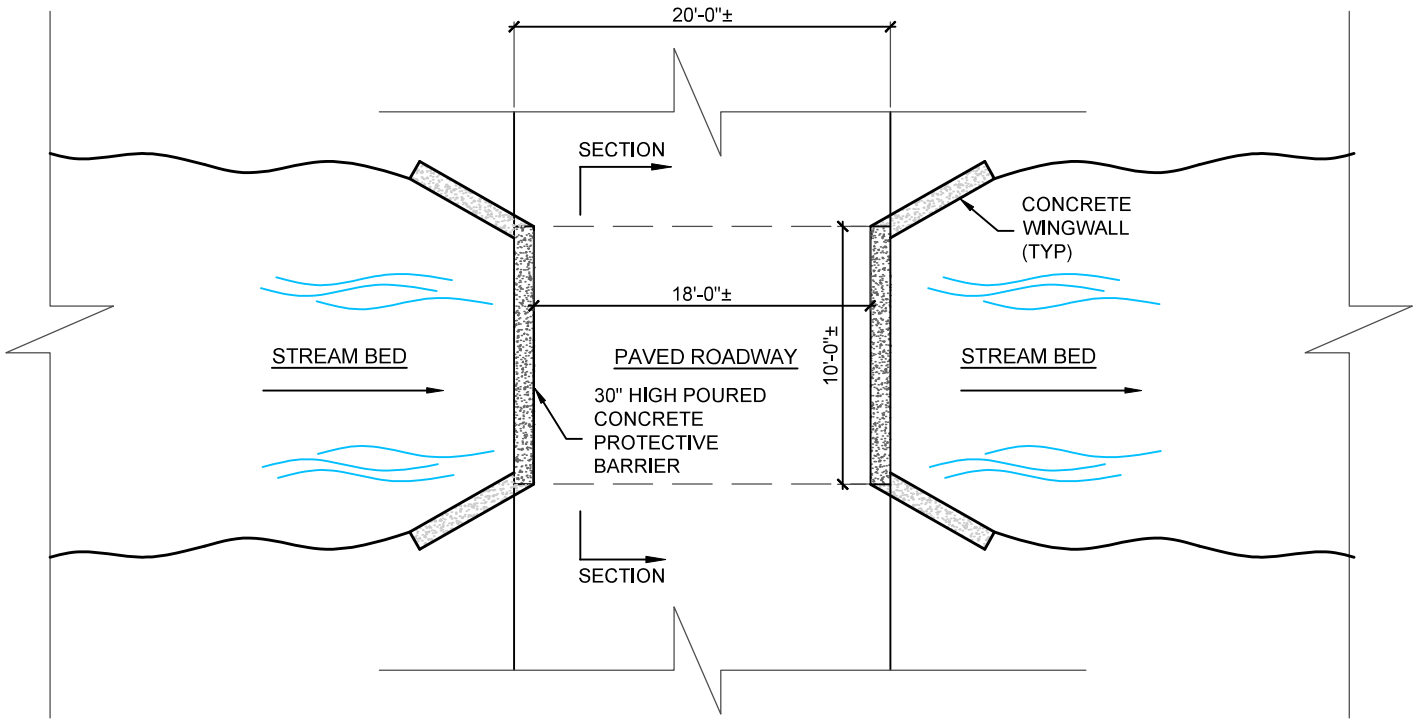
6.0 Appendix - Photos



6.0 Appendix - Photos

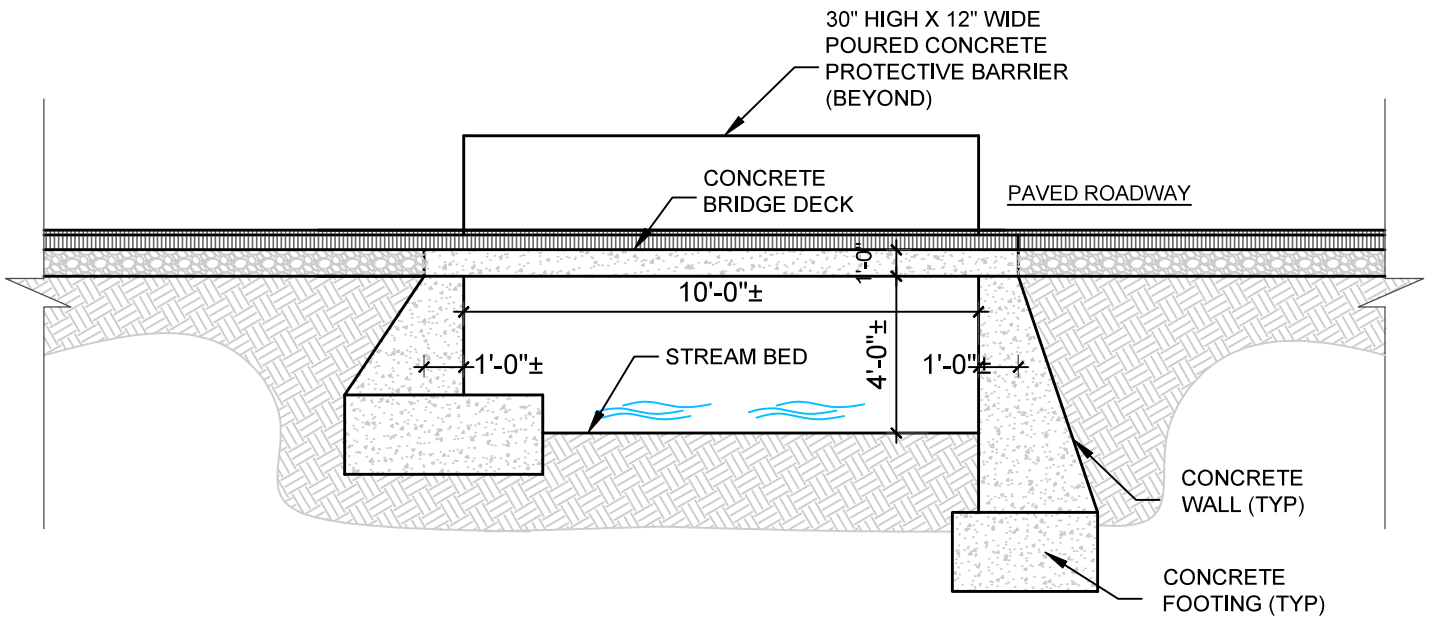


Underside of Deck – Significant Spalling in need of repair



BRIDGE #3 PLAN (PINCHOT BROOK)

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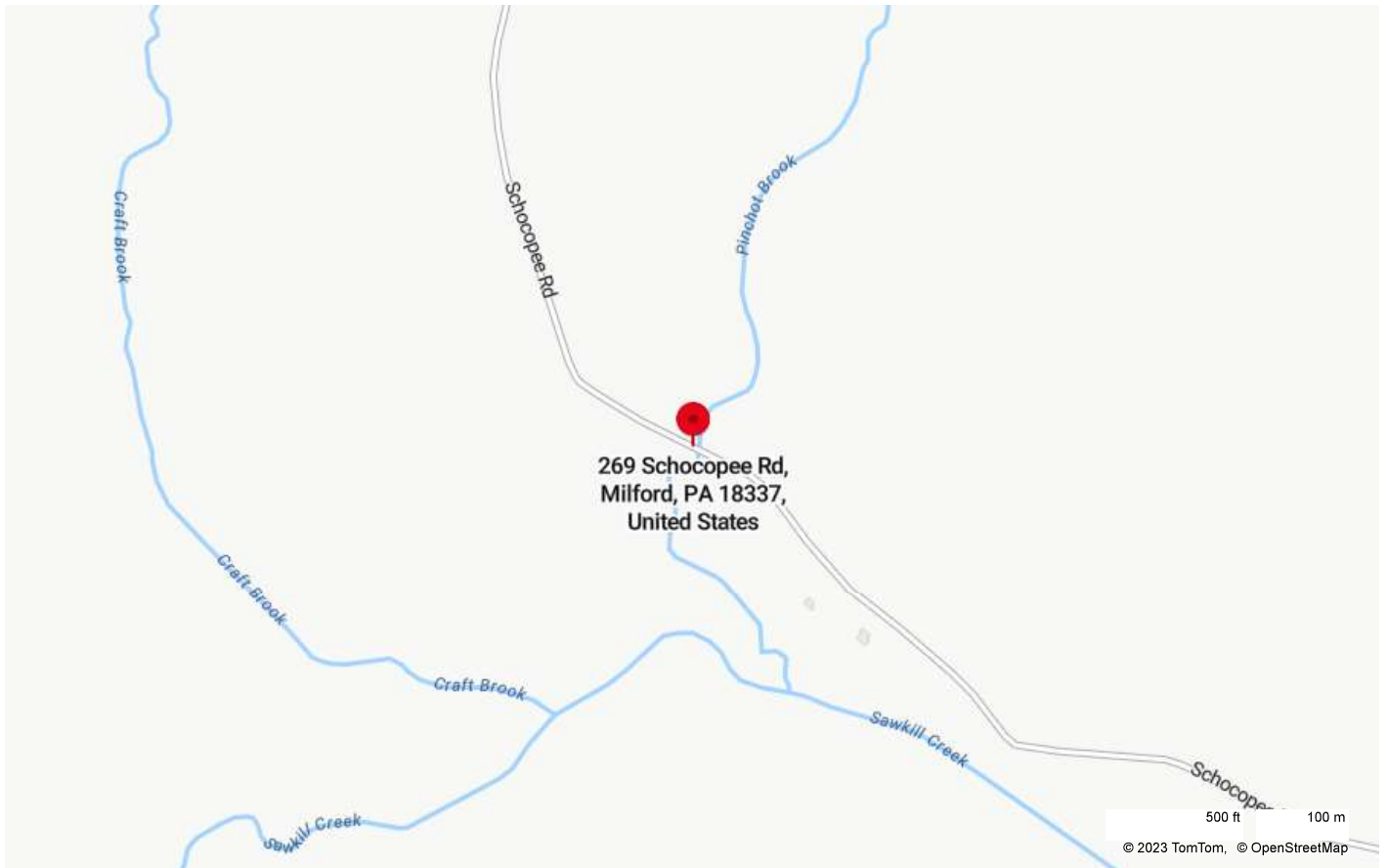


BRIDGE #3 SECTION (PINCHOT BROOK)

SCALE: N.T.S.

269 Schocopee Rd, Milford, PA 18337, United States

Pinchot Brook Bridge
Schocopee Rd.
Milford, PA



269 Schocopee Rd, Milford, PA 18337, United States

Pinchot Brook Bridge
Schocopee Rd.
Milford, PA

