

APPENDIX D
ENGINEERING REPORT

**SECTION-510
PLUM CREEK COMMUNITY PARK
CULVERT REMOVAL & STREAM
RESTORATION IN CONEWAGO
TOWNSHIP ADAMS COUNTY,
PENNSYLVANIA**



October 2023

Conewago township requested that USACE Baltimore District assist with the study and provide a design for the daylighting of Plum Creek due to the proposed removal of a grass runway strip and three deteriorated culverts that currently convey Plum Creek beneath the runway. The project is in Conewago Township, Adams County, PA. The scope of the project includes removal of the three culverts and construction of a natural channel.

The section of Plum Creek passing under the former Hanover Airport runway is located within the Plum Creek Community Park in Conewago Township, Adams County, Pennsylvania. Plum Creek at this location is a perennial, low order stream with a drainage area of 6.94 square miles and an average bed slope of 0.3%. The banks are about 4 to 7 feet high and vegetated with a variety of trees.

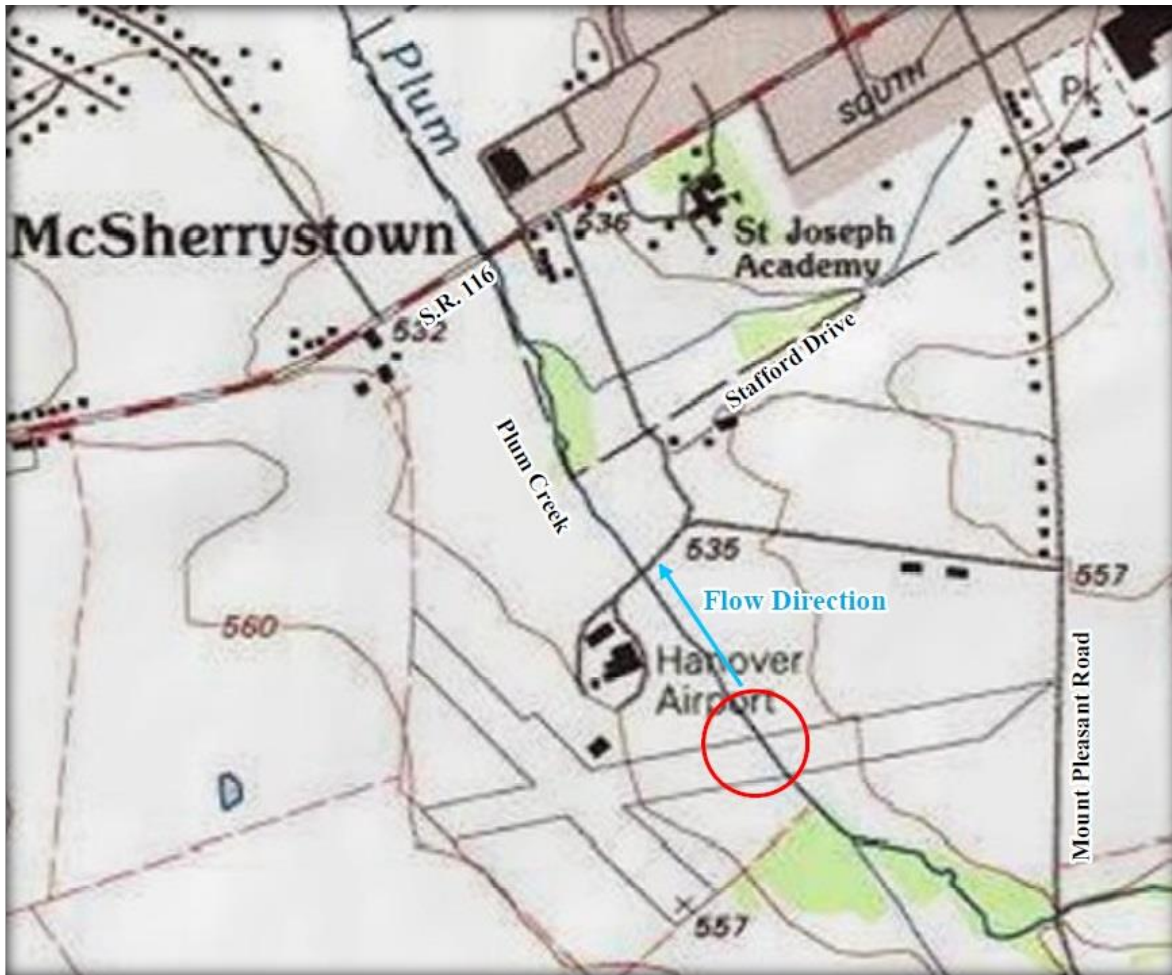


Figure 1, Vicinity Map

The two stream crossings (Mount Pleasant & S.R.116) upstream and downstream of the project site are two span bridges with one of their spans blocked by sediment depositions. Also, both crossing have a low under clearance of less than seven feet and no history of overtopping.



Figure 2, Stream Crossings

The proposed project would daylight Plum Creek by removing approximately 1,500 linear feet of defunct pipes that is failing structurally and causing erosion, flooding, and increased sediment transport within the park property. The project goals include:

- Reconnecting the stream to the floodplain
- Adding sinuosity
- Replacement of a sustainable traffic bridge over the stream at Airport Road,
- Planting native riparian vegetation (eco-system uplift)
- Educational opportunities
- Self-maintain system (eliminate/reduce maintenance)

Existing condition

The existing structures at the site are three (3) 63-inch diameter culverts ranging in length from 449 to 464 feet long extending beneath a grass runway strip. The culverts, which are decommissioned steel boilers with ends removed, are oriented parallel to the stream channel and skewed 25 degrees from perpendicular with respect to the runway. Overtime some open joints caused seepage that led to a sinkhole under the runway causing blockage and backwater. Figure 3 shows the lake effect during a major rainfall and partially twisted culverts causing blockage and erosion.



Figure 3, Left picture showing the lake effect from the blockage, right picture showing the sinkhole and tangled culverts causing the backwater.

Three similar culverts located approximately 700 feet downstream of the project area, convey Plum Creek beneath Airport Rd. Plum Creek passes beneath the S.R. 116 bridge approximately 2,400 feet downstream of the project area and beneath Mount Pleasant Rd. approximately 1,500 feet upstream of the project area. Plum Creek downstream of Mount Pleasant and the runway is in good condition with mature trees shading the stream.

Proposed Design

To create a self-maintained system that blends into a park settings natural environment led us to relocate the stream rather than fixing it in-place. This solution not only makes the permit requirement (working in dry) less challenging, it will also provide opportunity for environmental uplift, floodplain connectivity, improving conveyance and eliminating nuisance flooding within the park. Most of the existing stream will be converted to wetland (is discussed later in report) to provide additional functional habitat and ground water recharge.

Total of 1,700 feet of new stream will be created with proper geometry and a series of woody riffle grade controls (RGC) to maintain grade stability and improving potential aquatic habitat.

USACE has coordinated our efforts to smoothly blend in with the park masterplan to best serve the residents.

The USACE Baltimore district is proposing an 18'X10' box culvert at the Airport Road crossing. This box culvert will be depressed 2' below the proposed stream bed to eliminate any potential fish blockages and will provide a more natural stream bottom in the culvert. Another box culvert is required based on the park masterplan; the financial responsibilities are under discussion with the sponsor.

It should be noted that the HEC-RAS analysis will be performed in the next phase of the project. However, it is important to know that we do not anticipate any adverse impacts. The box culvert will be more efficient structure than the existing triple pipe culverts having less entrance, exit and friction losses. Also, the dimensions of box culvert will eliminate/reduce any sediment loading as has historically happened at the upstream (Mount Pleasant) and downstream (SR-116) stream crossings.

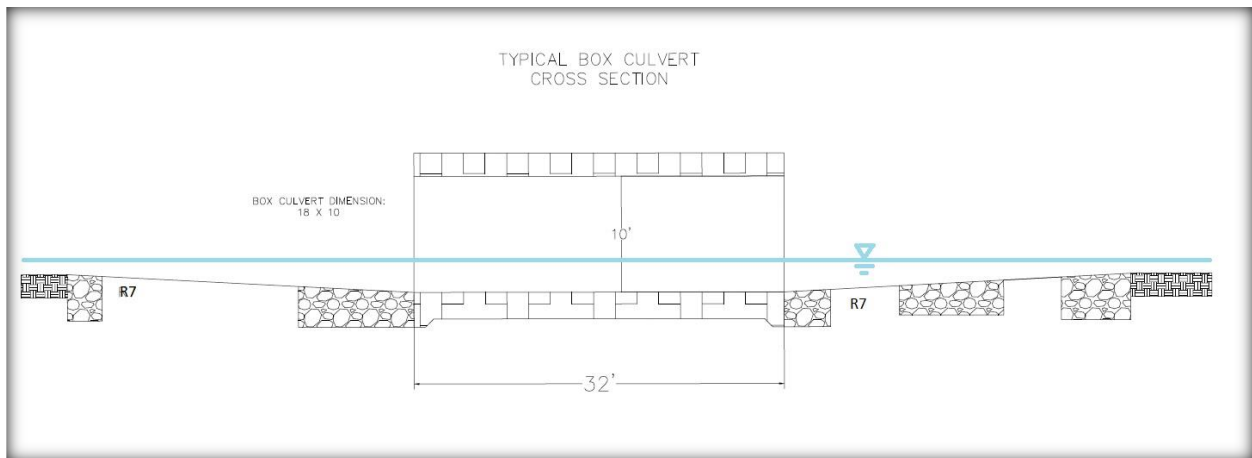


Figure 4, Box Culvert at low flow

The proposed streams cross-section was based of field visits (reference reach) and the inspection report on the upstream and downstream stream crossings. We designed a typical cross section that efficiently conveyed the flows in different hydrological events yet maintaining its geometry.

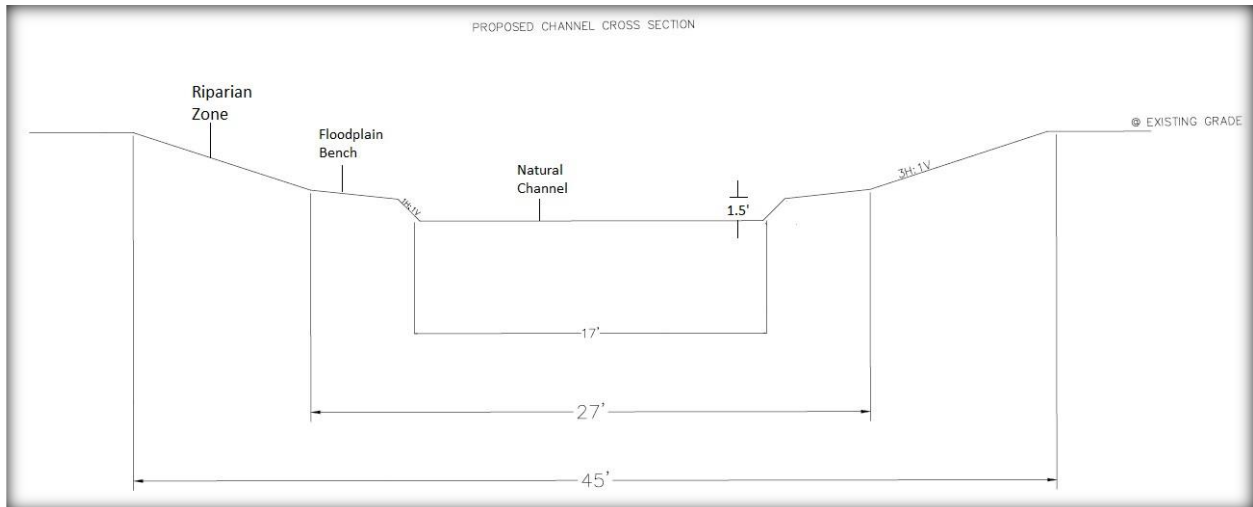


Figure 5, Proposed stream cross-section

A total of 10 RGC are proposed to provide grade control for stability and potential aquatic habitat uplift. These structures will create a self-maintained stream system, that with a combination of riparian buffer will create a system with diverse stream features and shade to enhance the functionality and aesthetics within the park.



Figure 6, Box Culvert at low flows

Starting upstream, the stream will be relocated to the left of the existing stream and the existing stream will be narrowed and elevated to feed the proposed wetland. A series of RGC with woody debris (some spanning the whole cross section, and some will also cover the main channel and floodplain benches) will be installed to provide stability which will uplift the aquatic habitat.

The proposed wetland will be about 350 feet long with 20 feet bottom width and 5:1 slope to top of existing grade. A mix of native wetland seeding, and plants will be applied to provide a functional uplift and educational opportunities. A rip-rap spillway will carry the wetland overflow to the rip-rap protection of box the culvert at station 6+25.



Figure 7, showing side channel and overflow channel, including a portion of relocated channel.

The existing Plum Creek between stations 7+00 to 13+75 will not be impacted since it is already stable with mature diverse trees shading this reach. Groundwater and surface flow will provide water sources for the wetland.

After removal of the three culverts under Airport Road a 36" HDPE will be installed to drain any overflows from the existing plum Creek into the proposed wetland cell on the downstream of Airport Road.