Maiden Passive System Rehabilitation

Dunkard Township, Greene County, PA
39°44'55.6"N 79°57'50.6"W

Final Report

PA DEP Growing Greener Grant
(Grant Contract Number: C990002578)

US OSMRE WCAP Grant
(Project Number: S23AC00096-00)

December 2025

Project Sponsor:

STREAM RESTORATION INCORPORATED
A PA Non-Profit Organization 501(c)(3)
PO Box 837, Slippery Rock, PA 16057
724-279-5080 sri@streamrestorationinc.org
www.streamrestorationinc.org

Project Narrative

I. Overview

Dunkard Creek Watershed is a 235 square-mile area spanning nine townships in Greene County (Southwestern PA) and three districts in Monongalia County (Northwestern WV) and empties to the Monongahela River. The watershed has an extensive history of mining of both the Pittsburgh and the Sewickley coal seams. The Dunkard Creek Watershed Rivers Conservation Plan completed in 2000 and a Hydrologic Unit Plan completed by the Pennsylvania Department of Environmental Protection (PA DEP) in 2003 both cited acid mine drainage (AMD) from abandoned mines to be the number one problem and top priority in Dunkard Creek. Total Maximum Daily Loads (TMDLs) for Dunkard Creek were prepared by the PA DEP to address impairments due to metals from acid mine drainage (AMD) reported in the 1996 Pennsylvania Section 303(d) list of impaired waters. Stream data for the TMDL calculations collected from May 2003 to May 2004 suggested load reductions of iron and aluminum needed to be 179 lb and 93 lb per day, respectively, to improve the quality of Dunkard Creek. To address the impact by AMD, a vast public-private partnership between nonprofits, private industry, government entities, and the community worked together to construct the Maiden Mine (aka Mathews) passive treatment system (PTS) in Dunkard Township, Greene County in 2006. The original design and construction of Maiden PTS was funded by grants from the PA DEP Growing Greener, EPA Watershed Initiative, and the Foundation for Pennsylvania Watersheds as well as generous amounts of in-kind from all groups involved. The Maiden system treats two acid mine discharges, one being the largest in the Dunkard Creek Watershed, and was documented to have removed on average 120 lb of iron and 60 lb of aluminum per day during the first year of treatment after being placed online in 2006. This treatment accounted for approximately 67% of the iron and 65% of the aluminum that the TMDL calculations reported should be removed from Dunkard Creek. The original installation of the Maiden Mine PTS was a major success.

The Maiden PTS was originally installed on the private property of Herschel Mathews. One year after its completion, the landowner revoked all permissions to enter the property, which therefore prevented any monitoring or maintenance from occurring. In 2015, MEPCO, LLC purchased the property as part of their efforts in the watershed for the purpose of providing SRI access to operate, maintain, monitor, rehabilitate, and improve the Maiden Mine PTS. However, with nearly ten years without maintenance, the system was found to be in poor condition and had water bypassing the system. Funding was pulled together from WPCAMR's Quick Response Program, Foundation for PA Watersheds, Stream Restoration Incorporated's (SRI) O&M TAG Program, and the Appalachian Stewardship Fund to complete an initial phase of maintenance completed in 2016. Despite the improved treatment following the 2016 maintenance, Maiden PTS needed additional work to expand the system, clean the limestone, add additional treatment media, and convert the HFLB to a mixed media Jennings-style vertical flow pond.

Stream Restoration Incorporated (SRI) submitted a Pennsylvania Department of Environmental Protection (PA DEP) Growing Greener grant in 2019 to complete the remaining maintenance and rehabilitation work on the Maiden PTS with the purpose of continuing, and even improving, the treatment that was achieved through the original installation of the system. However, COVID-19 and other issues resulted in the fully executed contract not being received until 2021. Additional funding was obtained from the US Office of Surface Mine Reclamation and Enforcement (OSMRE) Watershed Cooperative Agreement Program (WCAP), the Foundation for Pennsylvania Watersheds, and Greylock Production, LLC. This funding was utilized for design, maintenance, and construction. Stream Restoration Incorporated acted as the fiscal agent and provided project management, outreach, and monitoring. BioMost, Inc. completed the design and construction oversight. Solid Rock Excavating Inc. was selected as the contractor who completed the maintenance and rehabilitation work. A brief overview of the background, problems, and rehabilitation of the system is provided in the following sections.

Original Treatment System Information & Problems Encountered:

The original Maiden PTS was designed to treat two acid mine drainage (AMD) discharges with the larger 117-1 discharge flowing from an underground mine entry, through a 1.5-foot H Flume along a channel into a 2,000 ton limestone-only, siphon-based, auto-flushing, vertical flow pond (VFP1), followed by a settling pond (SP1). A 1,200 ft oxidation precipitation channel (OPC), also known as a terraced iron formation (TIF), then conveyed the AMD to a Jennings-style (limestone and organic mixed media) vertical flow pond (VFP2A). VFP2A was designed with 1,150 tons limestone with 630 cubic yards of organic media mixture. A portion of the water was treated in VFP2A and discharged into another settling pond (SP2), while the overflow of VFP2A was directed to another 3,500-ton limestone-only auto-flushing vertical flow pond (VFP2B) before flowing into the second settling pond (SP2). SP2 then transitioned to a 0.75-acre wetland before finally discharging into a 4,000-ton horizontal flow limestone bed (HFLB). On the northern end of the system, the smaller 117-6A raw discharge was collected and directed into a 1,000-ton limestone-only, siphon-based, auto-flushing vertical flow pond (VFP3). VFP3 and the HFLB discharged into a large previously degraded wetland area that is bisected by the access road, before entering the unnamed tributary to Dunkard Creek (UNT1).

The raw untreated AMD discharges sampled between 2000 and 2019 prior to this project were characterized as high flow, acidic, high metal, severely degraded discharges with a maximum acid load of 3,640 lb/day (1.8 tons), with an average of 1,360 lb/day. Metals were high with a maximum of 481 lb/day iron and 192 lb/day aluminum, with the average being 147 lb/day iron and 71 lb/day aluminum. The system was originally designed to treat up to 300 gpm of mine drainage, and monitoring results demonstrated that the Maiden PTS provided meaningful and effective treatment for 1 year (Table 2, Appendix 2). After the first year of operation, the system could no longer be monitored due to the landowner issue.

After MEPCO, LLC purchased the property in 2015, SRI and BioMost conducted an assessment of the treatment system as part of SRI's O&M TAG Program. After almost 10 years of treating highly acidic and metal laden water with no maintenance, the system was found to be in poor condition. Issues included AMD bypassing the components, compaction of treatment media, vegetation colonizing treatment media in nearly all ponds, and siphons in all 3 auto-flushing VFPs were not functioning. Maintenance issues were beyond the scope of SRI's O&M TAG program, so additional funding was pulled together from WPCAMR's Quick Response Program, Foundation for PA Watersheds, O&M TAG, Appalachian Stewardship Fund, and donation of time and money from BioMost to restore the functionality of the existing components as feasible. The initial phase of maintenance was completed in 2016, with the following accomplished:

- Cleaned 10,500 tons of limestone (VFP1, VFP2B, VFP3, HFLB)
- Installed 600 feet of HDPE underdrain pipe (VFP1 and VFP2B)
- Rehabilitated 1,300 cubic yards of Jennings-style mixed treatment media (VFP2A)
- Installed 150’ long channel to bypass the clogged culvert
- Installed a flow-balancing channel between VFP2A & VFP2B
- Installed pipe outlet control on VFP2B
- Repaired VFP2B siphon mechanism that had been damaged by wildlife
- Repaired VFP3 siphon worn by almost a decade of use
- Installed dual 24” piping as beaver proof system outlet
- Replaced 8” bypass valve (SP1)
- Reconfigured HFLB to include inlet and outlet pools and infiltration trench
- Installed solar powered valve actuator to control flow in VFP1 (which was later stolen)

For a 3-year period after the 2016 maintenance, sampling results indicated the system performed at a level similar to the first year of operation. Notably, the system was measured to remove a maximum of 2,684 lb/day acidity (11/10/2017) which exceeds the “design” max acid load of 1,900 lb/day by 41%. On average, the Maiden system neutralized 533 lb/day acidity and removed 87 lb/day of metals following the 2016 maintenance (Table 2, Appendix 2). While the original system was designed to treat about 300 gpm, the average flow treated was about 360 gpm and at times exceeded 500 gpm. Despite the success achieved in the initial phase of maintenance at the Maiden Mine PTS, additional improvements were determined to be necessary to sustain successful treatment of the AMD.

Maiden Passive Treatment System Rehabilitation:

Rehabilitation and maintenance of the Maiden passive system began in October of 2024 and was completed in summer 2025. As previously mentioned, in general, the rehabilitated system’s treatment train was kept fairly similar to the original system (See attached as-built), except with most of the components improved upon through cleaning, addition of treatment media, or reconfiguration. The larger of the two raw discharges, 117-1, still flows from the underground mine entry, through a 1.5 ft H flume, to the limestone-only VFP1, which flushes into the first settling pond (SP1). The long moat following SP1 acts as a series of two long narrow ponds to convey the AMD from SP1 to either VFP2A or VFP2C, with VFP2C being the newly built Jennings-style VFP taking the place of the HFLB and which empties to the existing degraded wetland. VFP2A has a portion of its water overflowing to the limestone-only VFP2B. A portion of VFP2A’s water and all VFP2B’s water flow into SP2 that transitions into a 27,900 square foot constructed wetland, before discharging to the existing degraded wetland rather than first flowing into the HFLB. The smaller 117-6A discharge is still collected and conveyed into the siphon-based, limestone-only VFP3. VFP3, like VFP2C and WL, discharges to the 64,430 square foot degraded wetland that is bisected by the access road before emptying to an unnamed tributary to Dunkard Creek. System components and changes are described in more detail below.

Horizontal Flow Limestone Bed (HFLB)

The most significant large-scale change to the original system conducted during this rehabilitation project involved reconfiguring the existing Horizontal Flow Limestone Bed (HFLB) to the newly created Jennings-style mixed media vertical flow pond (VFP2C). The HFLB was originally designed for the purpose of manganese removal and as an additional alkalinity generator, however, since manganese concentrations were not excessive and there was more of a need to expand treatment for acidity, iron, and aluminum, a decision was made to repurpose this treatment component. As part of this process, approximately 2,700 tons of AASHTO #1 limestone within the HFLB was washed, recovered, and reused. Of the 2,700 tons of limestone recovered, 1,200 tons was reused in the treatment media mixture of the newly constructed VFP2C while 300 tons was added to VFP1, 1,000 tons was added to VF2B, and 200 tons added to VFP3. Additional details related to the vertical flow ponds are contained within their specific section.

Limestone-Only VFPs (VFP1, VFP2B, and VFP3):

The Maiden passive system has three limestone-only, siphon-based, auto-flushing vertical flow ponds (VFPs) which flush once the water elevation within the vault triggers the siphon to flush. The exception being VFP2B, which currently has its drain valve open slightly to allow 10-30 gpm of water to continually drain from the pond at all times via an 8' drainpipe to prevent the AMD from sitting idle for extended periods of time during low flow periods. Limestone was washed in all three of the limestone only VFPs (VFP1, VFP2B, and VFP3) during this rehab project. In addition, as identified in the above section, a portion of the AASHTO #1 limestone that was washed and recovered from the reconfigured HFLB was added to each of these VFPs. Following rehab, VFP1 has 2,300 tons, VFP2B has 4,500 tons, and VFP3 has 1,200 tons of limestone. During the rehab project, each siphon was inspected and repaired as needed to re-establish functionality. Both VFP1 and VFP2B have four 8-inch DR-17 HDPE perforated pipes that feed a concrete siphon vault housing a 12-inch siphon with a 48-inch draw down. VFP3 contains one 10-inch SDR35 PVC perforated pipe underdrain that feeds another concrete siphon vault housing a 6-inch siphon with 48-inch draw down. The contractor returned after major rehab work was completed to clean the underdrain pipes of each of the three limestone only VFPs utilizing a jetter.

Settling Ponds (SP1 and SP2):

The settling ponds SP1 and SP2 were not modified during rehabilitation, and no major maintenance was conducted. The ponds still function as originally designed to precipitate, settle and store metal solids. SP1 is approximately 7,700 square feet while SP2 is 6,700 square feet.

Moats (Moat A and Moat B):

The original passive system was designed in the early 2000's to have an Oxidation Precipitation Channel (OPC), also known as a Terraced Iron Formation (TIF) to promote the removal of iron at low pH while conveying the flow from the upper portion of the system to the lower. This was one of the first OPCs intentionally designed and built for low pH iron removal in a passive system and before our collective understanding of how the complex biogeochemical processes functioned, especially the importance of whether the iron was primarily ferrous (Fe^{+2}) or ferric (Fe^{+3}). As the OPC was not functioning as intended it was modified during this project to function as two long, narrow ponds (Moat A and Moat B) operating in series to provide increased storage capacity of solids flushed from VFP1 as well as to continue to convey water from SP1 to VFP2A, VFP2B, and VFP2C. This largely consisted of deepening the channel, especially towards the beginning near SP1 by about 4 feet, with little deepening occurring at the end of the moat. An 8-inch pipe was installed just upstream of the culvert at the end of Moat A that directs a portion of the flow from Moat A into the newly constructed VFP2C. A dry fit assembly is situated on the inlet end of the eight-inch pipe to reduce the inlet size to four inches in diameter to restrict the amount of flow that can enter VFP2C. The dry-fit then allows for the potential for the inlet to be adjusted to six or eight inches to allow more flow into VFP2C, if desired. Because the moats were designed as ponds, no rock channel lining was installed. Moat A is 6,400 square feet and Moat B is 7,900 square feet, with the total linear length of the two moats being approximately 1,200 feet long.

Jennings-Type Vertical Flow Ponds (VFP2A & VFP2C):

Jennings-Type Vertical Flow Ponds (JVFPs) utilize a by-volume treatment media mixture of limestone and organic material with the purpose of neutralizing acidity, generating alkalinity, and facilitating the precipitation of metals, particularly aluminum and iron. VFP2A was pre-existing. During this project sludge was scraped off the surface and additional limestone and woodchips were mixed into the treatment media. VFP2A now consists of mixture of about 725 tons of #57 limestone (reused), 425 tons of AASHTO #8 limestone (reused), 540 tons AASHTO #67 limestone (new), 400 cubic yards of woodchips (new), 315 cubic yards of woodchips (reused) and 315 cubic yards of spent mushroom compost (reused). The mixture sits on top of 300 tons of #57 limestone (reused) which primarily serves as an underdrain envelope but presumably provides additional treatment capacity. As previously mentioned above, the HFLB was reconfigured into a new Jennings-type VFP (VFP2C). VFP2C contains a mixture of 1,200 tons of AASHTO #1 limestone (reused from the HFLB), 225 tons of AASHTO #67 limestone (new), 390 cubic yards of hard woodchips, 165 cubic yards spent mushroom compost, and 360 cubic yards of hay. Each JVFP consists of four cells created by an underdrain system composed of perforated laterals connected to solid header pipes. Each underdrain cell discharges through an individual adjustable riser pipe, vertically connected to a riser with flexible rubber couplers. Each JVFP has three potential outlets: the primary outlet via riser pipes, secondary overflow emergency spillway, and a tertiary outlet via valved drainpipes.

Wetlands:

The 27,900 square-foot constructed aerobic wetland (WL) was built as part of the original passive system and receives water from Settling Pond 2 (SP2) via a level spreader. The wetland has two primary functions: 1) to re-aerate water that enters in a reduced state from the Jennings-type VFP, and 2) to provide a location for the precipitation and settling of metal solids. In the original system, the water then flowed from the wetland into the HFLB. As part of this project, a berm with an emergency spillway was built across the northern portion of the wetland to help create VFP2C and a new spillway was constructed in the northwestern corner to now direct the effluent of the constructed wetland into a pre-existing degraded "natural wetland" which is technically the receiving body of the passive system. This existing degraded wetland which contains other sources of untreated AMD now receives treated water from the Maiden passive system at three locations: the constructed wetland (WL), VFP2C, and VFP3. The natural degraded wetland ultimately flows through dual culverts to an unnamed tributary to Dunkard Creek (UNT1). While we do tend to use sample point 117-4 as a convenient "final effluent" point, in reality, not all water flowing from this "final component" has been treated. The untreated sources of AMD do impact the quality of the final effluent.

System Performance and Environmental Impact

Due to the short period of time between when construction ended and the project end date, as well as limited funding, the data provided in this report for post-rehab monitoring was only collected during one sampling round, which took place on August 26th, 2025. We recognize that this data was collected during the typical low-flow season following a period of low precipitation, so SRI intends to collect more data in the future to fully document how the system functions during both low and high flow conditions. For reference, historic water monitoring data of the Maiden system is included in this report, along with the post-rehab data collected in August 2025 for comparison (Appendix 2, Water Monitoring Data). A site schematic provided in Appendix 3 can be referenced to help match the location of sample points to the data, as can the as-built drawings and mapping available on Datashed. The water quality results have been uploaded onto Datashed (www.datashed.org) and are described in more detail below.

Maiden Mine Passive Treatment Performance – Post Construction

Post-construction monitoring of the Maiden passive system took place on 8/26/2025 (Table 3, Appendix 2), and the results demonstrated effective treatment of the acid mine drainage through considerable removal of iron, aluminum, and neutralization of most of the acidity of the raw discharges. Toward the northern side of the system at the top of the hillside, the larger of the two AMD discharges, 117-1, flows directly out of the Maiden #1 Mine entry and is effectively conveyed by a short channel into the limestone-only VFP1. Raw discharge 117-1 was found to have relatively high flow, though lower than average for being assessed during the dry season (96 gpm), and contained a field pH of 2.56, acidity of 290 mg/L, with high iron and aluminum concentrations (Table 3, Appendix 2). VFP1 successfully flushed to SP1 during the sampling event and then exited SP1 to Moat A. By the time the AMD reached the end of Moat A during the August 2025 sampling, the iron concentration decreased from a starting concentration of 35.5 mg/L to 21.2 mg/L. A portion of the water at the end of Moat A was diverted to the newly constructed Jennings-style vertical flow ponds (VFP2C) which then discharges to the degraded "natural" wetland. VFP2C was measured to raise the pH from less than 3.0 to 6.99, raise the alkalinity to 318 mg/L, and lower total iron and aluminum concentrations to ~0.1 mg/L (Table 3, Appendix 2).

The portion of flow from Moat A that was not conveyed to VFP2C continued into Moat B. At the end of Moat B, a portion of the water flowed through the treatment media of the second Jennings-style VFP (VFP2A), which treated ~28 gpm of the water by raising the pH to 6.71, raising the alkalinity to above 200 mg/L, and removing nearly all of the aluminum (to <0.1 mg/L) (Table 3, Appendix 2). AMD from Moat B that did not go through VFP2A flowed along the top of the VFP2A treatment media into the limestone-only VFP2B. While a portion of the flow was entering VFP2B and likely flowing through it, the sampler did not observe flow at the outlet and therefore, no sample was collected. Both VFP2A and VFP2B are designed to discharge into Settling Pond 2 (SP2) which then flows into a wetland. A sample was collected at the end of the wetland (WL). Treated water leaving WL discharges to the existing degraded "natural" wetland. Notably, water quality leaving WL was more degraded than expected, with outflow pH 3.9, no alkalinity, acidity 86 mg/L, iron 3.6 mg/L, and aluminum 10.5 mg/L (Table 3, Appendix 2). As VFP2A is neutralizing all of the acidity and providing excess alkalinity and less than 0.1 mg/L of aluminum, the poor water quality at WL is likely due to a lack of full treatment of the water that is flowing through VFP2B. This could be due to multiple factors, including short-circuiting caused by the partially open valve and deserves further investigation in 2026. There may be a need to convert VFP2B to a Jennings-style VFP.

On the very northern side of the system and closest to the unnamed tributary, the smaller of the two raw discharges, 117-6A emanates from the hillside where it is captured before entering the unnamed tributary and then piped to the limestone-only VFP3. In August 2025, 117-6A flow was estimated to be around 20 gpm with field pH of 2.65, high acidity of 380 mg/L, and high iron and aluminum concentrations above 20 mg/L (Table 3, Appendix 2). Due to site conditions, this discharge is only partially treated by the small siphon-based limestone-only vertical flow pond VFP3 before it flushes directly into the existing degraded wetland. VFP3 was not observed to be flushing during the time of the August 2025 visit, therefore the sampler was unable to collect a sample of the effluent during this round of sampling and not included in Table 3.

The "final effluent" sample point, labelled 117-4, is not a "true" system effluent point as it is situated "downstream" from all of the actual passive system effluent points (WL, VFP2C, and VFP3) that discharge into and mix with the water in the pre-existing AMD degraded "natural" wetland which then discharges through dual 24" HDPE culverts beneath a secondary access road into a channel that then flows into the unnamed tributary to Dunkard Creek. However, at the same time, it is likely the only reasonable sample point to evaluate the system as a whole. Unfortunately, the other sources of untreated AMD along with the partially treated AMD from VFP3 do impact the water quality at 117-4. However, compared to historic data, 117-4 is greatly improved. Prior to construction of the original passive system in 2006, water quality at 117-4 was characterized (Table 2, Appendix 2) as being acidic with 3.5 pH and 380 mg/L acidity and high average metal concentrations of metals 48 mg/L Fe, 23 mg/L Al, and 5 mg/L Mn. During the August 2025 sampling, water at 117-4 was found to have significantly decreased iron and aluminum concentrations at 0.6 mg/L and 1.4 mg/L, respectively, however, was not net-alkaline with a 5.75 lab pH and acidity of 12 mg/L (Table 3, Appendix 2). Interestingly, the field pH was measured at 7.5 with 10 mg/L alkalinity. The difference between field and lab is likely due to on-going chemical reactions taking place within the sample bottle and may be indicative of the various sources of water continuing to react after mixing.

A singular stream sample point (Dunkard DN) was collected downstream of the unnamed tributary's confluence with Dunkard Creek at Bobtown Road in August 2025 and compared to limited available historic data provided in Table 5 of Appendix 2. The Dunkard Creek TMDL provided stream data from 2003-2004, which was collected prior to construction of the original passive system and before other major watershed efforts were conducted. The Fisheries Survey of the Lower Portion of Dunkard Creek report completed by Kirk Environmental LLP in 2019 for MEPCO LLC provided data from 2012-2019. Monitoring conducted at Dunkard DN during all three periods of time indicated that pH and alkalinity of the stream was good. Acidity measurements of the TMDL and Fishery Survey are potentially questionable and likely either did not utilize a true Hot Acidity method or did not properly report the data as directed in Standard Methods. No field alkalinity data was provided other than our singular sample. Lab alkalinity does indicate an increase from pre-restoration to post. Iron, manganese and aluminum concentrations do show an improvement (75%, 30%, and 60% reduction respectively) from pre-restoration to after the rehabilitation project was completed, although additional stream sampling would be needed for further documentation. In August 2025, the water was excellent quality with pH above 7, alkalinity close to 100 mg/L, and metal (T. Fe, T. Mn, and T. Al) concentrations all at or below 0.2 mg/L. This suggests that the small amount of acidity and very minimal concentrations of metals leaving the Maiden system did not negatively impact quality of Dunkard Creek and in fact flows into a good quality stretch, suggesting the importance of the Maiden PTS and its location.

Maiden Mine Passive Treatment Performance – Historical Data/Assessments

Historical monitoring data of the Maiden Mine PTS is summarized and averaged in Table 1 and further broken down by timer periods in Table 2 (Appendix 2). The raw discharges were monitored and characterized prior to construction of the system in 2006, with the main raw discharge (117-1) being assessed starting in 2000, and the smaller (117-6A) assessed beginning in 2005. Because the original landowner revoked all access to the property approximately one year following construction, monitoring occurred ~bi-monthly following construction for one year and then did not begin again until after SRI and partners regained access in 2017.

Average pre-rehab monitoring data characterized the main discharge (117-1) as 360 gpm, with a pH below 3.0, iron concentration ~40 mg/L, aluminum ~16 mg/L, and acidity above 300 mg/L. The smaller discharge (117-6A) had similar water quality but much lower flow of 35 gpm on average (Table 1, Appendix 2). The historic data showed decreased iron concentrations from the main raw to the effluent of SP1, suggesting that VFP1 and SP1 functioned to neutralize about 1/3 of the acidity and decreased a large portion of the iron at the start of the system, validating the need to keep those two components in the rehabbed system. Results collected between 2006 and 2023 also indicated that very minimal amounts of iron were removed at low pH in the original oxidation-precipitation channel (OPC), which led to the decision to reconfigure the OPC into two long moats that would function as two long settling ponds that convey the water to other sections of the system. VFP2A contributed the greatest amount of alkalinity out of all components measured between 2006 and 2023, by contributing on average 141 mg/L alkalinity and neutralizing acidity from above 180 mg/L to -140 mg/L, while raising the pH to ~6.8 (Table 1, Appendix 2). While water quality of the WL was variable, the water entering the horizontal-flow limestone bed (HFLB) was often still acidic with high concentration of metals which prevented removal of manganese from occurring as well as plugging of the HFLB. The effluent of the HFLB on average had a pH 5.7 and acidity of 15.7 mg/L with decreased, but still elevated concentration of metals. These factors led to the decision to replace the HFLB with a second

Jennings-style vertical flow pond (VFP2C) through this rehabilitation project. Due to the unpredictability of the timing of the siphon-based flushing in the limestone only vertical flow ponds, VFP2B and VFP3 have rarely been sampled. Historic pre-rehab data indicated that on average, the system outflow, 117-4, was not net-alkaline, although a large portion of the acidity was neutralized and iron and aluminum removed the acidity on average (Table 1, Appendix 2).

Due to the long period of time where the Maiden Mine PTS could no longer be accessed for monitoring or maintenance purposes, the historic pre-rehab data was split up further in Table 2 (Appendix 2) to show average water quality one year after construction compared to after regaining access in 2017. Though the metal concentrations do not vary considerably in the system effluent between monitoring periods, it is clear that less of the acidity was neutralized during the period after regaining access. For the 2006/2007 period, an average of 1,140 lb/day acidity was neutralized (208 tons per year) in the Maiden system, while only 533 lb/day acidity was neutralized (97 tons per year) during the 2017 to 2023 period. Furthermore, the Maiden system effluent field pH was 5.43 on average during the 2006/2007 period, while the effluent pH was much lower after regaining access and found to be at an average of 3.97 (Table 2, Appendix 2). This was not a surprise as no maintenance had occurred at the system for a decade after access had been revoked, further adding to the need for this rehabilitation project.

Maiden Mine Passive Treatment Performance – Load Reductions

Load reduction calculations were performed using available flow and water quality data and provided in Table 4, Appendix 2. Data from the post-rehab monitoring conducted August 2025 suggests incredibly successful remediation of the AMD at the Maiden Mine system following rehabilitation. During this monitoring event, a calculated 409 lb/day of acidity was neutralized, and 46 lb/day iron and 26 lb/day aluminum were removed through treatment in the system. This equates to approximately 96% of the acidity being neutralized, 98% of the iron being removed, and 93% of the aluminum being removed from the two raw discharges during the August 2025 sampling event. Extrapolating upon these load reduction rates, approximately 149,346 lb of acidity would be neutralized with 16,632 lb of iron and 9,322 lb of aluminum being removed in the system per year (Table 4, Appendix 2). It is acknowledged that SRI conducted this monitoring event during a dry, low-flow season due to the timing of the end date of the construction, so it is likely that the load reductions will be greater during high flow with the percentages removed/neutralized potentially being lower due to increased flow and stress on the system. Furthermore, it is understood that due to the nature of the auto-flushing siphon-based VFPs, which have pulses of flow and unpredictable flush cycles, the collection of flow and water quality data is further complicated, so it must be noted that these load reduction calculations are estimates using all the available data that could be collected.

In comparison, the historical water quality data of the Maiden Mine PTS suggests that on average 255,208 lb of acidity were neutralized per year, with 36,975 lb of iron and 9, 271 lb of aluminum removed per year prior to rehabilitation. While this pre-rehab dataset suggests that greater load reductions were removed, likely due to much of the data being collected during higher flow periods in Winter/Spring, the percentages removed were much lower at 51.4 % of acidity being neutralized with 68.7% of the iron and 35.8% of the aluminum being removed (Table 4, Appendix 2). Therefore, we predict that greater loads of acidity and metals will be reduced with increased treatment efficiency post-rehabilitation, though further monitoring is needed to confirm.

III. Operation & Maintenance Plan

BioMost, Inc., developed an updated O&M plan for the Maiden Mine passive treatment system as part of this rehabilitation project. The plan is provided in Appendix 3 of this report. The O&M plan explains site location and access, information on system components, how to perform operation and maintenance on specific system components, system monitoring requirements, and an anticipated O&M schedule. The plan has also been uploaded to www.datashed.org for future reference.

IV. Growing Greener Report Questions

a. What was the project supposed to accomplish?

The primary objective of this project was to rehabilitate the Maiden Mine passive treatment system in order to sustain and ideally improve treatment of the two abandoned mine discharges which would then result in maintaining previously achieved pollutant load reductions and water quality improvements of Dunkard Creek and the unnamed tributary. The goal was to conduct this rehabilitation/maintenance project by utilizing the existing pond structures and existing treatment media as much as possible rather than conducting a full system rebuild. The system was to treat 350 gpm on average and up to 500 gpm. SRI was to administer the grant, provide project management, coordinate the effort with project partners, act as the fiscal agent, and conduct water monitoring as feasible. BioMost, Inc. was to provide all technical services related to the grant such as data analysis, design, permitting, construction oversight, etc.

Major project work proposed included:

- Cleaning and repurposing the limestone from the existing 4,000-ton Horizontal Flow Limestone Bed (HFLB) within the treatment system.
- Reconfigure the HFLB as a Jennings-style mixed media Vertical Flow Pond.
- Clean the limestone within VFP1, VFP2B, and VFP3 and add additional limestone from the HFLB as feasible.
- Replace the stolen solar panels of VFP1 and improve mounting posts for theft deterrence.
- Convert existing OPC into a water conveyance "Moat" and install an intake to convey part of the flow to the new JVFP built within the footprint of the HFLB.
- Supplement the treatment media of VFP2A by adding additional mixed media.

As part of the project deliverables, as-built drawings and an updated O&M plan were to be provided. Additional details regarding pre-existing conditions, plans, and actual implementation are provided within the overview section.

b. What you actually did and how it differs from your plan?

Certain components of the Maiden Mine passive system were successfully redesigned and/or rehabilitated. In general, everything that was proposed in the 2019 grant application and identified above were successfully completed through this project, despite some minor differences. For example, in the grant application, it was proposed to reconfigure the HFLB as a Jennings-style mixed media Vertical Flow Pond (VFP2C) utilizing 1,600 tons of cleaned repurposed AASHTO #1 limestone, 480 cubic yards woodchips, 480 cubic yards hay, and 240 cubic yards of mushroom compost. Instead, the actual reconfiguration of the HFLB into VFP2C resulted in 1,200 tons of cleaned repurposed AASHTO #1 limestone, with 225 tons of new AASHTO #67 limestone, 390 cubic yards woodchips, 360 cubic yards of hay, and 165 cubic yards of compost. Even with the slightly decreased amount of treatment media in VFP2C as compared to what was proposed, VFP2C is still designed to treat 200 gpm, which is much greater than would be needed for the vast majority of the time, particularly considering VFP2C receives less than half of the system's flow. Similarly, rehab on the other Jennings-style vertical flow pond, VFP2A, also resulted in minor specification differences, except with VFP2A ending up with a slightly greater tonnage of treatment media than proposed. The original application proposed supplementing the treatment media of VFP2A by adding additional mixed media consisting of 540 tons of AASHTO #57, 200 cubic yards of mushroom compost, and 200 cubic yards of woodchips. Instead, what was supplemented (in addition to the repurposed/reused 1,150 tons of limestone) in VFP2A was 540 tons of AASHTO #67, 315 cubic yards of mushroom compost, and 315 cubic yards of woodchips. One difference from the proposal was that we did not replace the solar panels at VFP1 due to continued concerns about theft. Instead, we decided to repair the original siphon system. Additional details are contained in the overview section of this report.

c. What were your successes and reasons for your success?

The Maiden Mine PTS was successfully rehabilitated and maintained. Based on data collected in August 2025, the Maiden Mine system is estimated to neutralize nearly 150,000 pounds of acidity and prevent at least 25,000 pounds of metals from entering Dunkard Creek each year.

Success of the project is due to the collective efforts and contributions of all project partners involved and MEPCO LLC's involvement and support to help SRI regain access to the property. The project would not have been possible without the funding provided by the PA DEP Growing Greener program, OSMRE's WCAP program, and the Foundation for PA Watersheds as well as funding provided by Greylock Production, LLC. The professional expertise provided as well as the donated services and reduced fees of our various project partners, especially BioMost, Inc., was invaluable. The primary construction contractor Solid Rock Excavating Inc. provided efficient, quality services and were easy to work with.

d. What problems were encountered and how did you deal with them?

A few problems were encountered. The primary issue was work delays and inflation that occurred due to the COVID-19 pandemic which began shortly after the grant was submitted in 2019. The PA DEP was not able to provide a fully executed contract until April 2021. SRI then had to obtain the required matching funds from OSM, which was not awarded until August of 2023. This caused work delays and increased the cost of the project, especially related to materials and labor for construction such as limestone, compost, pipe, valves, and fuel. We overcame this issue by obtaining a grant extension and additional funding. After the main maintenance was over, we found some issues with the underdrain and siphons not working properly. We had the crew return to the site to jetter the underdrain which seemed to resolve the issue. While it has not yet caused a problem, there is concern about the algal growth in the system. BioMost attempted to apply an algaecide but did not have much success.

e. How your work contributed to solution of original problems?

This project provided for the rehabilitation and maintenance of the Maiden Mine passive system thereby continuing to provide treatment and watershed restoration improvements that were accomplished through its original construction. Further details are provided in the overview section above.

f. What else needs to be done?

The project itself is complete. Further monitoring should be done to better understand how the system is functioning post-rehabilitation, particularly during the high flow season. The only post-rehab monitoring at Maiden PTS to date was completed in August 2025, which was collected following a period of low precipitation and low flow. Future monitoring will continue as feasible including field measurements as well as water samples collected for analysis of AMD parameters by a certified laboratory. This data will be uploaded to Datashed. We will likely experiment with different fitting sizes of the inlet pipe assembly at VFP2C to increase flow to that component and to see what changes can be made at VFP2B to improve treatment. If water quality improvements are not to our satisfaction, there may be a need to convert a couple of the siphon-based, limestone only vertical flow ponds such as VFP2B and VFP3 to Jennings-type or layered-type vertical flow ponds, which would require additional funding. There will be a need to keep an eye on the algae growing within the system, although not much can probably be done as it appears to emanate at the mine entry.

g. What are the plans for disseminating the project results?

Project information including water monitoring data, as-built drawings, and final report information will be posted online to Datashed (www.datashed.org) for free public access. Project information, updates, and successes will be shared through social media posts. In addition, the project will likely be discussed and/or presented at public events, tours, and conferences such as the annual Pennsylvania Abandoned Mine Reclamation and American Society of Reclamation Sciences.

h. How well did spending align with the budget request?

Costs associated with this project, especially construction, were higher than the original budget that was submitted in the 2019 grant application. This was largely due to massive inflation that occurred during and following the COVID-19 pandemic that began in 2020. Additional funding obtained by the Foundation for Pennsylvania Watersheds, Greylock Production, LLC as well as in-kind contributions allowed the project to still be completed as proposed.

Appendix 1

Photographs



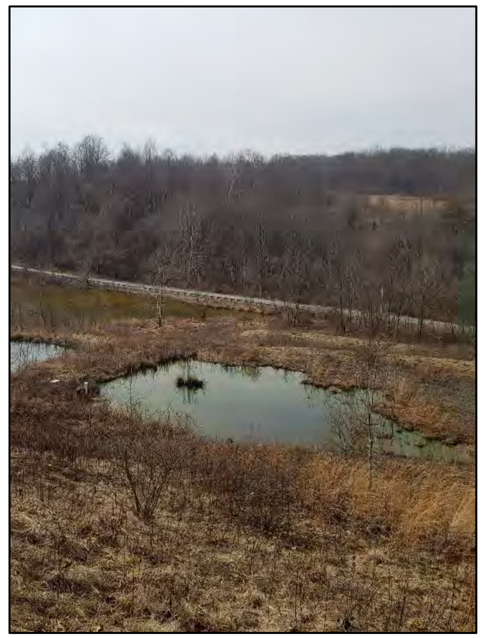

All Above: Main raw discharge (117-1) flowing out of the abandoned Maiden #1 Mine.

Top Left: Raw, severely degraded discharge (117-1) flowing out of mine and through H-Flume.

Top Right: Close-up of algae growth at the mine entrance.

Bottom Left: Discharge 117-1 flowing out of mine and overtopping flume prompting reconfiguration of the flume (taken prior to other photos above). The algae growth intensified during Spring.

Bottom Right: Close-up of H-Flume, which was fixed and made functional during the design phase of the project prior to rehabilitation to allow proper flow measurements to document before/after rehabilitation impacts.



All Above: Limestone-only VFP1 photos photographed prior to rehabilitation.

Top: Zoomed-out view of VFP1 half-inundated with water and containing algae growth.

Bottom Left: Close-up of what was left of the solar flushing device.

Bottom Right: View of VFP1 taken on top of the hill to show elevation relative to road and end wetlands.

All Above: Photos of SP1 prior to rehabilitation. SP1 receives water from discharge 117-1 that has been treated in the first component, the limestone-only VFP1.

Top Left: Pre-rehab photo of SP1 from its inlet end. Water discharges through the small channel on the opposite end which formed the OPC.

Top Right: Zoomed-out photo taken towards the top of the hill that shows SP1 water flowing into the start of the OPC (on right) with the "natural" degraded wetland in the background.

Bottom: SP1 during Spring prior to rehab with algae growth.

All Above: Oxidation-precipitation channel (OPC) at the Maiden Mine PTS prior to rehabilitaiton, which functioned to convey water from SP1 to VFPs on the other side of the system. The OPC's purpose was also to remove low pH iron, which was documented to not be significant.

Top Left: Approximate mid-way of OPC hugging along a steep hillside.

Top Right: Tail-end of the OPC before flowing into VFP2B and VFP2A.

Bottom: Close-up of algae growth and iron solids in the shallow OPC.

Top: Southern-most end of the system prior to rehabilitation showing VFP2A with water cap in the foreground and WL and horizontal flow limestone bed (HFLB) in the background.

Bottom: WL (background) followed by the HFLB (foreground) plugged by metal precipitates prior to rehabilitation.

All Above: Horizontal flow limestone bed (HFLB) prior to rehabilitation clogged with metal solids. Due to on-going maintenance issues, lack of full treatment, and manganese concentrations being of minor concern, a decision was made to replace the HFLB with a second Jennings-style vertical flow pond to focus on acidity neutralization, alkalinity generation and Fe/Al removal.

All Above: Degraded pre-existing "natural" wetland which recieves flow from Maiden passive system components before emptying to the unnamed tributary of Dunkard Creek. Iron precipitates were visible and no vegetation was present in the wetlands

All Above: Photos taken during construction phase of the rehab project during winter 2024.

Top: View of access road and construction materials.

Bottom: Reconfiguration of the oxidation precipitation channel (OPC) into two moats.

All Above: Cleaning of Limestone in VFP1 with view of the siphon vault and remains of the solar flushing system. The siphon was repaired during this rehabilitation project.

All Above: Limestone within the Horizontal Flow Limestone Bed limestone being cleaned for reuse.

Top Photos: Piles of cleaned limestone from the HFLB to be repurposed in the reconstructed Jennings style vertical flow pond.

Bottom Left: Reconfiguration of the HFLB to VFP2C.

Bottom Right: Mixing of treatment media before placement into VFP2C.

All above: Taken shortly after main construction phase of rehab finished in March 2025.

Top Left: VFP1 with cleaned/replaced stone.

Top Right: Siphon vault of VFP1 before new lid was installed.

Bottom: SP1 following rehab with high suspended iron solids following a flush.

All Above: Moats (reconfigured from the original OPC) flowing in a series following rehab.

Top Left: Moat A conveying AMD toward the VFPs.

Top Right: End of Moat A where a portion of flow continues into Moat B while the other portion is directed to VFP2C via an intake pipe.

Bottom: Close-up of the intake pipe to VFP2C. The intake is constructed with a dry-fit assembly that allows the possibility of changing size of pipe fittings to control amount of flow to VFP2C.

All Above: Photos of rehabilitated VFP2A and VFP2B.

Top: Limestone-only VFP2B after cleaning and additional limestone.

Middle: Jennings-style VFP2A with newly placed media (limestone, woodchips, compost) in March 2025.

Bottom: VFP2A after being placed online for several months taken in August 2025.

Top: Reconfigured constructed wetland with new effluent spillway that discharges to "natural" wetland. Photo taken from newly constructed berm to create VFP2C.

Bottom Left: SP2 after rehab in March 2025. The dark spot shows where VFP2B enters SP2. SP2 then transitions into the constructed wetland (shown where cattails begin growing) before exiting to the degraded existing wetland.

Bottom Right: Looking towards inflow of VFP2C, which receives flow from Moat A. VFP2C was constructed within the footprint of HFLB. A new berm on the right side of the photo was constructed to separate VFP2C from WL.

Top: Close-up of VFP2C treatment media taken in March 2025 after being placed online.

Middle: Photo of VFP2C taken in March 2025, which took the place of the HFL.B

Bottom: Photo of rehabilitated limestone-only VFP3 after limestone cleaning and addition of repurposed limestone from HFLB. VFP3 provides partial treatment of the smaller raw discharge 117-6A.

Top Left: Outflow of VFP2C to the existing degraded wetland south of the access road in March 2025.

Top Right: Existing degraded natural wetland after rehab, photographed March 2025.

Bottom Left: Existing degraded wetland south of the access road taken later in August 2025, with wetland vegetation growth improving filtration without channelized flow paths.

Bottom Right: Degraded natural wetland before emptying to the unnamed tributary, photographed in August 2025.

Appendix 2

Water Monitoring Data

Table 1: Average water quality data of the Maiden passive system prior to rehab (2007 – 2023)

Sample Point	Point Description	Flow (gpm)	pH - Field	pH - Lab	Sp. Cond	Alk - Field	Alk - Lab	Acidity	T. Fe	T. Mn	T. Al	SO_4	TSS	Acidity Loading	T. Fe Loading	T. Mn Loading	T. Al Loading	Alk Loading
117-1	Raw AMD issues from the Maiden #1 underground coal mine; monitored beginning in 2000	360	2.74	2.96	2,312	0	0	315.8	38.77	3.53	16.14	1,454	5	1,233.4	141.7	12.6	63.3	0
SP1	Effluent of Settling Pond 1	Not Meas.	3.46	3.17	2,228	0	0	184.7	21.25	3.53	13.91	1,323	19	-	-	-	-	-
OPC Mid	Sampled approximately midway of the oxidation & precipitation channel at the access road	Not Meas.	3.58	3.22	2,235	0	0	171.4	19.04	3.70	14.19	1,388	16	-	-	-	-	-
OPC	Effluent of the oxidation & precipitation channel	459	3.42	3.20	2,170	0	0	187.8	18.18	3.24	12.88	1,312	16	1,383.2	92.5	8.74	47.3	0
VFP2A	Effluent of the Jennings-style VFP following the OPC, named VFP2A	51	6.76	6.96	2,181	141	151	-139.8	2.53	4.12	0.12	1,254	10	-57.6	0.9	1.6	0.1	67
VFP2B	Effluent of the limestone-only VFP following the OPC and VFP2A, named VFP2B	Not Meas.	3.61	3.27	2,059	0	0	130.0	13.04	2.61	8.25	1,162	66	-	-	-	-	-
SP2/ WL	Effluent of the second settling pond, which transitioned into an aerobic wetland	459	4.87	4.74	2,072	34	30	59.5	3.76	2.60	6.30	1,245	14	967.1	25.1	5.1	25.3	-
HFLB	Effluent of horizontal flow limestone bed (which has since been reconfigured)	342	5.74	5.53	2,048	37	35	15.7	1.60	2.01	3.20	1,268	9	175.0	11.6	10.4	17.5	166
117-6A	Smaller of the 2 raw AMD discharges; emanates at northern hillside near the unnamed trib	35	2.84	2.80	2,260	0	0	337.3	22.62	3.07	24.52	1,260	8	126.3	5.7	1.0	7.7	0
VFP3	Effluent of the limestone-only VFP that treats 117-6A, named VFP3	Not Meas.	-	3.12	1,862	-	0	172.1	11.24	1.83	15.68	909	30	-	-	-	-	-
117-4	Final effluent point of the Maiden PTS; collected at final weir where effluents from VFP3 and HFLB mix	545	4.35	4.61	1,762	27	18	74	5.57	1.51	5.52	1,062	12	660.5	46.1	10.4	45.6	50

Units for specific conductivity are in µmhos/cm; and all units for alkalinity, acidity, metals, sulfate, and total suspended solids (TSS) are in mg/L. Units for loading are in lb/day. It should be noted that a portion of past historical water monitoring data wrongly reported hot acidity as a '0' rather than the negative number. It should also be noted that fewer flow measurements were taken for points "OPC" and "SP2/WL", causing these points' flow averages to be higher than the raw.

Table 2: Historic water quality of AMD sources and effluent at Maiden PTS (pre- and post-construction)

Sample Point	Point Description	Flow (gpm)	pH - Field	pH - Lab	Sp. Cond	Alk - Field	Alk - Lab	Acidity	T. Fe	T. Mn	T. Al	SO_4	TSS	Acidity Loading	T. Fe Loading	T. Mn Loading	T. Al Loading	Alk Loading
117-1	Main raw discharge collected 2003 - 2006 prior to construction	282	2.83	2.93	2,652	0	0	402.5	57.63	5.04	22.85	1,830	6	1,184.3	170.0	15.5	68.1	0
117-6A	Smaller of the 2 raw; collected 2005 -2006 prior to construction	29	2.89	2.89	2,298	0	0	357.2	21.68	3.63	27.52	1,524	2	122.3	7.4	1.2	9.4	0
117-4	117-1 and other sources at channel to unnamed trib prior to construction 2000-2006; location of current effluent point	299	3.47	2.94	2,602	0	0	379.0	47.85	4.77	22.94	1,617	8	1,132.6	144.7	14.2	69.1	0
117-1	Main raw discharge collected monthly for **1 year** after construction beginning in 2007	389	2.84	2.77	2,459	0	0	319.6	39.07	3.91	17.98	1,498	7	1,208.6	151.2	14.3	73.1	0
117-6A	Smaller of the 2 raw discharges; collected monthly for **1 year** after construction beginning in 2007	29	2.82	2.72	2,395	0	0	360.5	28.20	3.43	27.88	1,299	11	113.9	6.9	1.2	9.0	0
117-4	Final effluent point of the Maiden; collected monthly for **1 year** after construction beginning in 2007	316	5.43	4.98	2,017	25	18	30.4	8.07	2.53	5.28	1,307	30	68.3	32.2	7.8	13.7	113.9
117-1	Main raw discharge collected 2017 to 2023 after regaining access to property	468	2.67	3.10	2,124	0	0	241.5	22.90	2.06	10.64	1,139	3	1,327.0	131.5	11.2	58.5	0
117-6A	Smaller of the 2 raw discharges; collected 2017 to 2023	48	2.85	2.92	1,805	0	0	248.8	7.12	1.22	10.36	788	5	150.8	3.3	0.6	5.0	0
117-4	Final effluent point of the Maiden PTS; collected 2017 to 2023	609	3.97	4.35	1,749	0	15.19	89.7	4.62	1.52	5.99	1,016	5	793.6	49.7	11.7	52.6	35.4

Units for specific conductivity are in µmhos/cm; and all units for alkalinity, acidity, metals, sulfate, and total suspended solids (TSS) are in mg/L. Units for loading are in lb/day. It should be noted that a portion of past historical water monitoring data wrongly reported hot acidity as a '0' rather than the negative number. Monitoring of these sample points occurred monthly for one year after original system construction and occurred again nearly 10 years later after access to the property was once again granted (collected 2017 to 2023).

Table 3: Water quality data of the Maiden system after rehabilitation (August 2025)

Sample Point	Point Description	Flow (gpm)	pH - Field	pH - Lab	Sp. Cond	Alk - Field	Alk - Lab	Acidity	T. Fe	T. Mn	T. Al	SO_4	TSS	D.O. - Field	Temp (°C) - Field	Acidity Loading	T. Fe Loading	T. Mn Loading	T. Al Loading	Alk Load
117-1	Raw AMD issues from the Maiden #1 underground coal mine	96 (Flume Meas.)	2.56	2.84	2,450	0	<10	290	35.50	2.91	17.6	1,320	<5	9.06	12.7	334.6	41.0	3.4	20.3	0
VFP1	Effluent of auto-flushing VFP1; caught during a flush	Not Meas.	3.05	3.14	2,300	0	<10	180	18.70	2.37	14.5	1,300	10	9.54	15.4	-	-	-	-	-
SP1	Effluent of Settling Pond 1	Not Meas.	2.95	3.07	2,310	0	<10	200	21.80	2.86	17.1	1,290	6	6.46	17.2	-	-	-	-	-
Moat A	Approximate middle of the moat; from outflow pipe where it enters VFP2C	96 (assumed)	2.91	3.06	2,300	0	<10	210	21.20	2.90	17.1	1,310	5	9.71	24.9	242.3	24.5	3.3	19.7	0
Moat B	Sampled at the end of Moat B; end of the series of 2 moats	Not Meas.	2.93	3.04	2,320	0	<10	200	15.30	2.78	16.3	1,270	<5	9.71	24.9	-	-	-	-	-
VFP2A	Effluent of the first Jennings-style VFP following Moat A, named VFP2A	27.6	6.71	7.16	2,230	248	208	-181	18.90	7.22	<0.1	1,190	20	4.14	20.9	-60.0	6.3	2.4	0.1	82.3
WL	Effluent of the aerobic wetland that follows SP2	55 (assumed)	3.91	3.69	2,140	0	<10	86	3.61	3.61	10.5	1,290	6	8.93	22.3	56.8	2.4	2.4	6.9	0
VFP2C	Effluent of the second JVFP; what the previous HFLB was reconfigured into	44.1	6.99	7.22	2,260	318	290	-257	0.11	3.60	<0.1	1,080	<5	0.52	21.8	-136.2	0.1	1.9	0.1	186.5
117-6A	Smaller of the 2 raw AMD discharges; issues from Maiden #1 coal mine on the northern hillside near the unnamed trib	20 (est.)	2.65	2.76	2,470	0	<10	380	22.50	2.97	29.9	1,220	<5	3.83	15.2	91.3	5.4	0.7	7.2	0
117-4	Final effluent of the Maiden PTS; collected downstream of secondary access road	116 (assumed)	7.5	5.75	2,090	10	<10	12	0.57	3.36	1.4	1,220	6	8.37	26.7	16.7	0.8	4.7	2.0	13.9

Units for specific conductivity are in µmhos/cm; and all units for alkalinity, acidity, metals, sulfate, and total suspended solids (TSS) are in mg/L. Units for loading are in lbs/day. The only auto-flushing limestone-only VFP that was flushing during the time of the visit was VFP1. Due to the nature of the auto-flushing VFPs and other sources of AMD in the "natural" pre-existing wetland, many of the flow "measurements" are assumed or estimated, which in turn provide only rough estimates of load.

Table 4: Load reduction information for Maiden Passive Treatment System before (red; collected 2007 - 2023) and after (blue; collected 2025) rehabilitation

	Acidity Neutralized	T. Fe Load Reduction	T. Mn Load Reduction	T. Al Load Reduction	Alkalinity Load to Stream
Removed (lb/year)	255,208	36,975	1,168	9,271	18,250
% Removed	51.4 %	68.7 %	23.5 %	35.8 %	-
Removed (lb/year)	149,346	16,632	0	9,322	7,665
% Removed	96.1 %	98.3 %	0 %	92.9 %	-

Table 5: Water quality data of Dunkard Creek up and downstream of Maiden Mine PTS before construction (pink), after construction (red), and after rehabilitation (blue)

Sample Point	Point Description	Flow (gpm)	pH - Field	pH - Lab	Sp. Cond	Alk - Field	Alk - Lab	Acidity	T. Fe	T. Mn	T. Al	SO_4	TSS
Dunkard-UP	Data from Dunkard Creek TMDL; point taken upstream of discharges ~0.5 miles upstream of tributary confluence; taken prior to Maiden PTS 2003-2004; labeled DUNK05 in report	110,586	-	7.63	-	-	94.70	0.00	0.65	0.13	0.46	-	-
Dunkard-DN	Data from Dunkard Creek TMDL; point taken downstream of discharge south of Bobtown Rd; taken prior to Maiden PTS 2003-2004; labeled DUNK03 in report	112,778	-	7.42	-	-	80.58	0.00	0.63	0.25	0.51	-	-
Dunkard – UP	Data from 2018 Fishery Survey by Kirk Environmentl, LLP; point taken at same upstream location as DUNK05 above; collected after Maiden PTS 2012-2019; labeled DC-4 in report	36,991 (meas. during Fall)	7.7	7.84	1,497	-	131	10	0.30	0.10	0.30	568	6
Dunkard - DN	Data from 2018 Fishery Survey by Kirk Environmentl, LLP; point taken at same downstream location as DUNK03 above; after Maiden PTS 2012-2019; labeled DC-BP in report	24,513 (meas. during Fall)	7.7	7.74	1,941	-	115	6	0.30	0.10	0.30	790	4
Dunkard - DN	Downstream point sampled during August 2025 post-rehab monitoring; sampled at nearly the same location as DC-BP and DUNK03 shown above but closer to Bobtown Road	Not Meas.	7.01	7.91	1,770	102	98	-79	0.16	0.17	0.20	876	<5

Units for specific conductivity are in µmhos/cm; and all units for alkalinity, acidity, metals, sulfate, and total suspended solids (TSS) are in mg/L. It should be noted that a portion of past historical water monitoring data wrongly reported hot acidity as a '0" rather than the negative number or perhaps did not perform hot acidity.

Appendix 3

O&M Plan and Schematic

Maiden Passive System Rehabilitation Treatment System

Dunkard Township, Greene County, Pennsylvania

Operation & Maintenance Plan

May 2025

Prepared by:

BioMost, Inc.
Mining & Reclamation Services
434 Spring Street Ext., Mars, PA 16046
www.biomost.com

Prepared for:

Stream Restoration Incorporated
PO Box 837, Slippery Rock, PA 16057
www.streamrestorationinc.org

Operation & Maintenance Plan Update

(See 2007 O&M Plan for More Information)

Section 1 – Project Information

Project Name	**Maiden Passive System Rehabilitation**
Location	(39.7483°, -79.9659°)
Site Access	Taylortown Rd, Dilliner, PA
Hydrologic Order	Unnamed Tributary → Dunkard Creek → Monongahela River
Landowner	Mepco, LLC
Project Designer	BioMost, Inc., Mars, PA, www.biomost.com
Project Contractor	Solid Rock Excavating, Inc.

Design Summary	
Max Hydraulic Design Flow	1,500 GPM
Max Treatment Design Flow	600 GPM
Average Design Flow	360 GPM

Raw Loading Rates		
Treatment Load	**Max**	**Average**
Acid Load	2,000 lb/day	1200 lb/day
Iron Load	500 lb/day	180 lb/day
Aluminum Load	200 lb/day	80 lb/day
Design Life: 15-25 Years		

Section 2 – Overview

The Maiden Passive Treatment System (PTS) in Dunkard Township, Greene County, was installed in 2006 to treat two abandoned mine discharges, including one of the most acidic sources in the Dunkard Creek Watershed. Funded by PA DEP and EPA grants, the initial project was a public-private partnership involving nonprofits, government agencies, private companies, and local citizens. However, a year after completion, the landowner revoked access, preventing maintenance. Efforts to regain access failed until 2015 when MEPCO, LLC purchased the property to restore system functionality. After nearly a decade without maintenance, the system was in poor condition. Initial repairs in 2016 improved water quality, but further upgrades were needed to expand treatment capacity.

Section 3 – System Components

3.1 – Previous Treatment System

The larger 117-1 discharge flows from an underground mine entry, through a 1.5-ft H-Flume, along a channel into 2000 ton limestone-only vertical flow pond (VFP1) then a settling pond (SP1). An oxidation-precipitation channel (OPC – a/k/a Terraced Iron Formation or TIF) then conveys this effluent to a limestone and organic media mixed vertical flow pond (VFP2A) through a channel. This pond overflows into another 3500 T limestone-only vertical flow pond (VFP2B) before flowing into another settling pond (SP2), then a 0.75 acre wetland (WL), before finally discharging into a 4000 ton horizontal flow limestone bed (HFLB). The second smaller system collects the discharge VFP3 Sump (measure flow at inlet to VFP3) via a PVC pipe that drains to a 1000 ton limestone only vertical flow pond 3 (VFP3). All the VFPs discharge to a large, previously degraded wetland area that is bisected by the access road.

3.2 – Upgraded Limestone-Only Vertical Flow Ponds (VFP1, VFP2B, VFP3)

3.2.A – Description and Purpose

VFP1 and VFP2B contain about 2200 and 4500 tons of AASHTO #1-sized limestone respectively. The underdrains in VFP1 and VFP2B consist of four 8-inch DR-17 HDPE perforated pipes that feed a concrete siphon vault housing a 12-inch siphon with a 48-inch draw down by Fluid Dynamic Siphons, Inc. (model number 1248). These siphons outlet to SP1 and SP2 respectively. VFP3 contains approximately 1200 tons of PADOT #3 limestone with one 10-inch SDR35 PVC perforated pipe underdrain that feeds another concrete siphon vault housing a 6-inch siphon with 48-inch draw down (model number 648). VFP3 outlets to the large, common wetland.

3.2.B – Maintenance

Each of the three limestone-only vertical flow ponds, VFP1, VFP2B, and VFP3 should be inspected during each monitoring event. It is recommended that they are inspected at least quarterly. Upon arrival on site, measure down to the water level in each vault, and return at least one hour later to check the water level. If the VFPs are not actively flushing the water levels should be noted to be rising. The only exception is VPF2B which should be sent to allow about 10-30 gallons per minute (gpm) of water to continually drain out of the pond at all times via the 8" drain pipe. This is so that water is not retained for extended periods of time, especially during dry or low-flow periods. If the VFP2B drain valve needs to be opened, measure the height of the valve stem before opening and re-set the valve as needed.

If fill and flush cycles are found be less than about four hours, or if water is flowing on top of the limestone and into the top of the siphon vault, the limestone should be cleaned. The drain valve should be opened to drain the pond. It is recommended to use leave about two to three feet of water in the pond, agitate the limestone to remove solids, and use other water to flush the solids from limestone. Continue to flush the solids through the siphon vaults and into the downstream component (either settling pond or wetland). Expose all the pipes and ensure that they are clean both inside and out prior to replacing the limestone. The pipes can be temporarily removed for cleaning. Place the pipes in the approximately original position and no higher than the minimum water elevation shown on the As-Built Plan. Replace the limestone and level within about one-half foot. In order to avoid short circuiting in VFP1 and VFP2B, inlet channels should be dug into the top four to five feet of stone and extended along at least two sides of the VFPs to direct water into the ponds as far away from the siphon vaults as possible.

3.3 – Settling Ponds (SP1 & SP2)

3.3.A – Description and Purpose
Settling ponds are designed to settle and store the metal precipitates from the upstream VFP. Settling Pond 1 (SP1) has a bypass pipe that allows the pond to be drained into the final wetland.

3.3.B - Maintenance
Check effluent channels for sediment or debris that could block flow or cause water to bypass the channels. Over time, solids swill accumulate in SP1 and SP2, reducing retention time during flushes from the siphons in VFP1 and VFP2B. When ponds can no longer retain precipitates effectively, remove and dewater the sludge. Dispose of sludge according to applicable laws and regulations.

3.4 – Moat

3.4.A – Description and Purpose
The OPC (a/k/a TIF) was modified to function as a series of two long, narrow ponds (Moat A and Moat B) to convey water from SP1 to VFP2A, VFP2B, and VFP2C. There is an eight-inch pipe just upstream of the culvert at the end of Moat A that directs flow into VFP2C. An assembly of pipe fittings are dry fit (not glued) on the inlet end of the eight inch pipe to reduce the inlet size to four inches to restrict the amount of flow that can enter VFP2C. The initial design flow for VFP2C is about 160 gpm using the four-inch inlet. The flow to VFP2C can be increased to 360 gpm with a six-inch inlet or 640 gpm with an eight-inch inlet. Alternatively, a cap could be installed with a custom-sized inlet if desired. Since the Moats are designed as ponds, no channel lining (i.e., rock) was installed.

3.2.B – Maintenance
Remove solids and vegetation as needed to maintain a free-flowing condition in both Moat segments. Ensure that the culvert between Moat A and Moat B is unobstructed.

3.5 – Jennings-Type Vertical Flow Pond (VFP2A & VFP2C)

3.5.A – Purpose and Description
The JVFPs utilize a by-volume media mixture consisting of limestone and organic material as specified on the updated as-built drawing. This blend neutralizes acidity, generates alkalinity, and facilitates the precipitation of metals, particularly aluminum and iron. Each Jennings-type VFP includes a multi-cell underdrain system composed of perforated laterals and header pipes.

Each underdrain cell discharges through adjustable riser pipes, vertically connected to an adjustable riser with flexible rubber couplers. Operators can manipulate riser heights to adjust water levels or direct flow through selected treatment zones. Each JVFP includes three potential outlets: the primary outlet via riser pipes, secondary overflow emergency spillways, and a tertiary outlet at the drainpipe. VFP2A has a total of three drainpipes connected to each of the underdrain cells that outlet to SP2 while VFP2C utilized an existing 12-inch drain pipe that is connected to the header pipe of cell four of the underdrain.

3.5.B – Treatment Process and Odor Management
The treatment media's biological activity produces both alkalinity and hydrogen sulfide gas. During startup or early operation, and under conditions of low temperature or high flow, nuisance odors may

emerge. Operators can mitigate these odors by restricting flow to a single cell and rotating usage monthly during colder months. Alternatively, all underdrain cells can be active if flow rates remain low enough to control hydrogen sulfide production.

During warmer weather or periods of lower influent flow, further reduction of flow may be necessary. To assist in this, operators can install flow-reduction assemblies using dry-fit bushings and one-inch PVC ball valves at the four-inch riser elbows. This allows fine-tuned flow control without cell rotation. If odors persist, further restrict or temporarily halt flow, forcing ponded water to discharge via the emergency spillways. This partially treated water will mix with fully treated effluent in the downstream component. Over time, typically several years, odor issues diminish as the media matures. A persistent mild odor near outlet pipes signals proper system function, but operators should adjust treatment as needed to meet performance targets and minimize odor.

<u>3.5.C – Treatment Media Maintenance</u>
Over time, the treatment media may compact and accumulate metals both on top and/or within the media, reducing permeability to a point where water no longer passes through effectively. This condition can cause the pond water level to rise and overflow via the emergency spillway, thereby significantly diminishing treatment effectiveness. VFP2A should be able to pass at least 100 gpm, while VFP2C should be able to pass at least 200 gpm. When the riser pipes are set at their lowest elevation and total flow is less than stated, maintenance should be conducted. Removing accumulated solids on top of the media and/or stirring the treatment media typically restores permeability. To facilitate maintenance and maintain continuous operation, the JVFP units are installed in parallel, allowing one unit to remain online while the other undergoes servicing. The maintenance procedure is outlined below:

1. Divert flow from the JVFP scheduled for maintenance.
2. Open the drain valve(s) to fully dewater the selected JVFP.
3. Allow the treatment media to dry—typically one week or more, depending on weather conditions—to enable access by a mini excavator or other low-ground-pressure equipment.
4. If solids have accumulated on top of the media to a depth that can be effectively removed, excavate the solids as feasible and remove before subsequent steps.
5. Stir the full depth of media until loose and uncompacted, stopping at the underdrain stone. Avoid and repair any damage to underdrain piping. Close the drain valves and allow the pond to refill.
6. Reopen the drain valves to flush the stirred JVFP and remove fine materials from the piping system.
7. Close the drain valves once more, allow the pond to refill, and adjust the outlet risers to the normal operating elevation as needed.

<u>3.5.D – Media or Underdrain Replacement</u>

If stirring fails to restore flow, replace the treatment media and, if needed, underdrain stone and piping:

1. Divert flow from the targeted JVFP.
2. Fully dewater and allow the media to dry.
3. Remove spent media and underdrain components as necessary.
4. Transport and dispose of old media appropriately, then revegetate disposal areas.

5. Install new stone, piping, and mixed treatment media per the original specifications or updated design mixture.
6. Before replacement, reassess system performance needs and water quality trends.

3.6 – Wetlands

3.6.A – Purpose and Description
The treatment wetlands receive water from each of the VFPs and SP2. Over time, as organic matter, vegetation, and metal precipitates build up, the substrate will build up and the water level will gradually rise. The wetland has two primary functions:

1. Re-aerate water that enters in a reduced state from the Jennings-type VFPs.
2. Provide surface area for iron to oxidize and precipitate.

Treated water exits the wetland through dual culverts to an unnamed tributary to Dunkard Creek.

3.6.B – Maintenance
As the wetlands fill with accumulated material, cleanout is required when the buildup is within about one foot of the lowest berm elevation. Remove excess substrate and accumulated material and dispose of in an approved location, following all applicable regulations.

Section 4 – Monitoring

The design of the passive treatment system is focused on neutralizing the acidity of the raw water and removing iron and aluminum found in the raw water. The treatment system is expected to consistently remove up to the maximum design acid, iron, and aluminum loads while generating excess alkalinity as indicated by negative acidity reported on laboratory analysis. It is expected that the system will produce effluent with a pH of at least six when operating within design flow parameters. If flows or pollutant loads exceed the design parameters, effluent with a pH below six and/or positive acidity can be expected. This may occur for short periods during high flow conditions, however, based on observations of other passive systems, the effluent quality should improve once the pollutant load and/or flow return to the design range. If average or maximum conditions are exceeded on a frequent basis, increased maintenance and decreased system life should be expected.

To ensure that the system is functioning as designed, the influent and effluent acid loads will need to be calculated using the total flow rate measured at the flume located just downstream of the 117-1 discharge and the collection pipe to VFP3 (for VFP3 Sump). Laboratory-determined acidity values using the hot-peroxide method will also be needed to accurately quantify the system performance. Calculating acid load removal is explained in Equations 1 through 3 below. Note the wetlands are not designed to provide alkalinity to the system. To assess the overall function of the system, the total influent acid load as calculated from the two influent points (H-flume and VFP3 collection) should be used with the system effluent load. The effluent acidity is measured at the single outlet point (117-4) and the effluent load is calculated using the combined influent flow rates.

Equation 1: Influent Acid Load
Instructions: Collect sample at H-Flume and VFP3 Collection Pipe and measure flow at both locations

Flow (gpm) X Acid Concentration (mg/L $CaCO_3$) X 0.01202 (conversion factor) = Acid Load lb/day

Add the acid loads from each influent point to obtain the total acid influent load.

Equation 2: Effluent Acid Load
Instructions: Collect sample at the single outlet (117-4).
Combined Influent Flow (gpm) X Acid Concentration (mg/L $CaCO_3$) X 0.01202 (conversion factor) = Acid Load lb/day

Equation 3: Acid Load Removed
Combined Influent Acid Load (lb/d) minus Effluent Acid Load = Acid Load Removed
When the effluent acidity is negative, subtracting a negative acid load from the positive influent acid load will result in a total acid load removed greater than the total influent acid load.

To calculate the metal load removed, follow the above equations, substituting the metal concentration (mg/L) for acidity concentrations (mg/L $CaCO_3$). As manganese only contributes less than one percent of the total acid load, the system was not designed to remove this metal, and no appreciable manganese removal is expected. However, manganese removal may still be observed.

Section 5 – O&M Schedule

Monthly (Frequency may be reduced based on system performance)

- Measure and record flow at H-flume.
- Measure flow at VFP3 inlet (for VFP3 Sump) (open 4” drain valve as needed to lower water elevation)
- Inspect siphons in VFP1, VFP2B and VFP3 for evidence of uniform filling and flushing
    - Check each siphon at least twice during each site visit, with an hour between inspections
- Visual inspection of all components, channels, ditches, etc.
- Check pH at system effluent, 117-4
    - pH should always be >6.0
- Upload all monitoring data to www.datashed.org

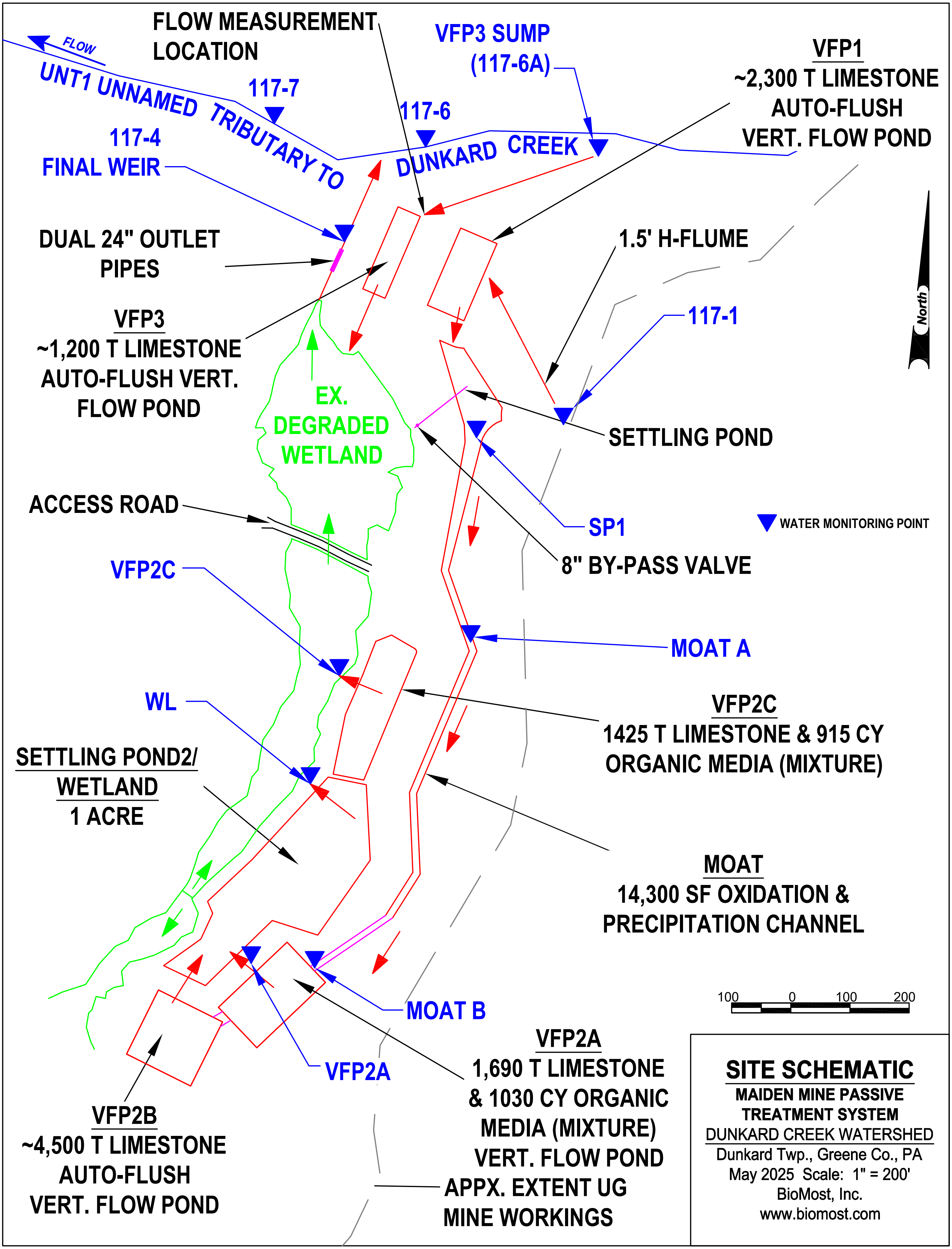
Annually

- During typical high-flow (February – May) collect samples for laboratory analysis at:
    - Discharge point 117-1, VFP3 inlet, Moat A (at the culvert near the VFP2C inlet pipe), VFP2A (composite of 3 pipes), VFP2C (composite of 4 pipes), and the system effluent 117-4 (See Attachment 1: Schematic)
        - Minimum parameters to include per sample point: pH, conductivity, acidity, alkalinity, iron, aluminum, manganese
            - At system effluent, iron should be <3.0 mg/L
        - Measure flow at H-Flume, VFP2C inlet pipe, VFP2A, and VFP2C outlet pipes
            - Flow can be measured by taking the sum of each individual riser pipe outlet and combining for each respective JVFP total
        - Upload all monitoring data to www.datashed.org

- Open the drain valves for all VFPs to evacuate solids and, in the case of VFP2A and VFP2C, trapped gases

As Needed

- Remove unwanted vegetation from spillways, channels, pipes, etc.
- Remove woody vegetation from embankments.
- Maintain of ditches, level spreaders, etc. as described herein.
- Replace or stir treatment limestone or mixed media as described herein.


FLOW
UNT1 UNNAMED TRIBUTARY TO DUNKARD CREEK
FLOW MEASUREMENT LOCATION
VFP3 SUMP (117-6A)
VFP1
~2,300 T LIMESTONE
AUTO-FLUSH
VERT. FLOW POND
117-7
117-6
117-4
FINAL WEIR
DUAL 24" OUTLET PIPES
1.5' H-FLUME
VFP3
~1,200 T LIMESTONE
AUTO-FLUSH VERT.
FLOW POND
117-1
North
EX. DEGRADED WETLAND
SETTLING POND
ACCESS ROAD
SP1
WATER MONITORING POINT
8" BY-PASS VALVE
VFP2C
MOAT A
VFP2C
1425 T LIMESTONE & 915 CY
ORGANIC MEDIA (MIXTURE)
WL
SETTLING POND2/
WETLAND
1 ACRE
MOAT
14,300 SF OXIDATION &
PRECIPITATION CHANNEL
MOAT B
100 0 100 200
VFP2A
VFP2A
1,690 T LIMESTONE
& 1030 CY ORGANIC
MEDIA (MIXTURE)
VERT. FLOW POND
VFP2B
~4,500 T LIMESTONE
AUTO-FLUSH
VERT. FLOW POND
APPX. EXTENT UG
MINE WORKINGS
SITE SCHEMATIC
MAIDEN MINE PASSIVE
TREATMENT SYSTEM
DUNKARD CREEK WATERSHED
Dunkard Twp., Greene Co., PA
May 2025 Scale: 1" = 200'
BioMost, Inc.
www.biomost.com

Appendix 4

As-Built Plan

GENERAL NOTES

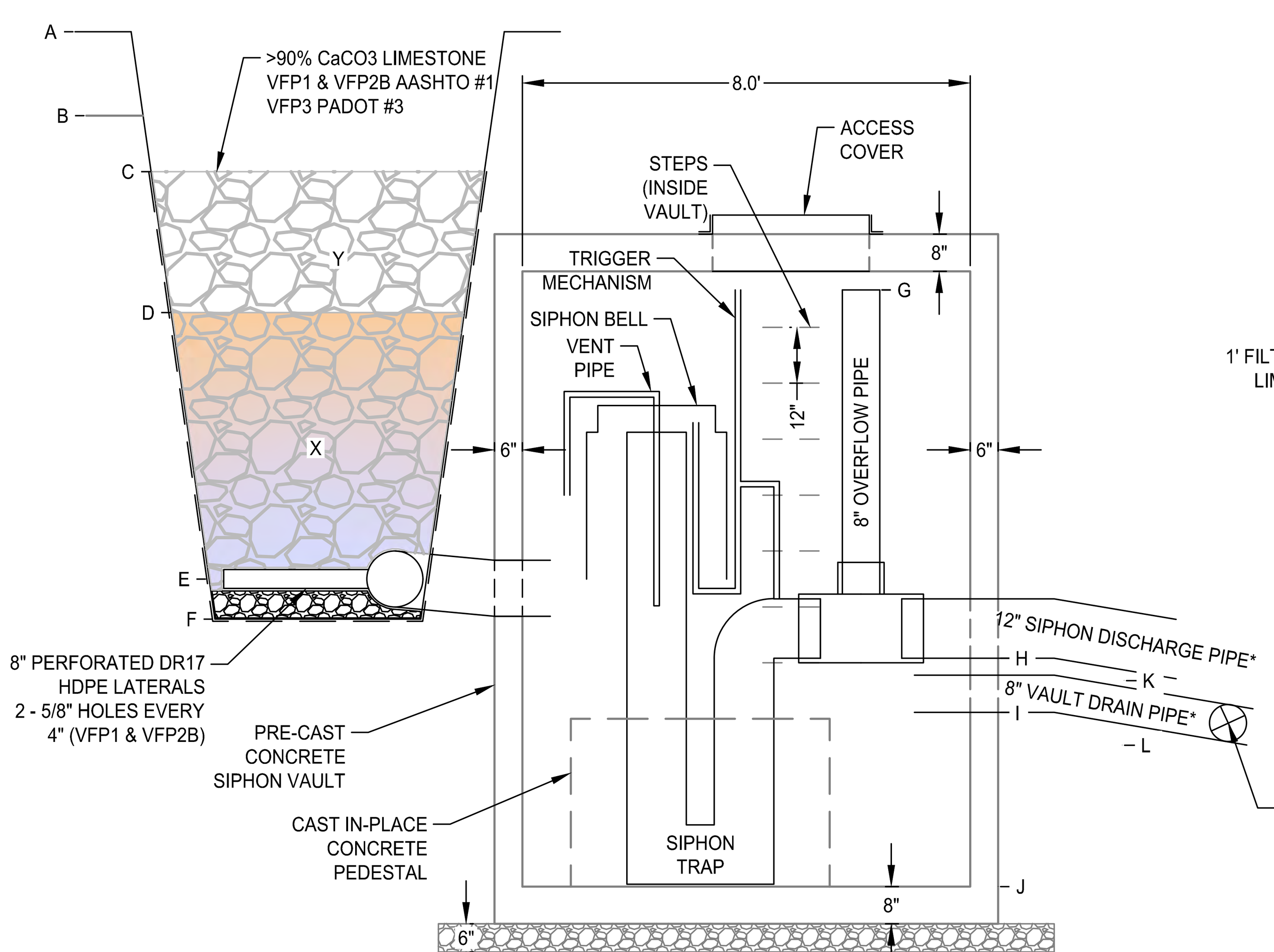
1. Base map contours derived from a bare-earth digital elevation model constructed from LiDAR data (QL2) collected in Fall 2019/Spring 2020 by US Geologic Survey [PA State Plane - South (US Survey Foot) NAD83, Vertical datum - NAVD88)]. Select topographic and cultural features from 2018 Pennsylvania Emergency Management Agency (PEMA) 0.5-foot orthoimagery obtained from www.pasda.psu.edu.
2. All dimensions are in feet unless otherwise noted. All slope designations are H:V.
3. Contours are 1' interval.
4. This is an updated plan to document work completed in 2025 and is intended to be a supplement to the "Matthew's Restoration Area, Passive Treatment System Operation and Maintenance Plan, December 2007."

VFP DATA TABLE

ELEVATION	MARK	VFP1	VFP2B	VFP3
TOP OF POND	A	899.0	890.1	881.9
EMERGENCY SPILLWAY	B	898.5	888.5	879.8
TOP OF LIMESTONE	C	897.0	884.8	878.1
MAX. WATER ELEVATION (APPX.)	D	896.8	882.9	878.3
MIN. WATER ELEVATION (APPX.)	E	891.8	877.9	874.6
POND BOTTOM	F	891.0	877.5	873.0
8" OVERFLOW* CREST IN VAULT	G	897.2	883.3	878.5
INV. 12" DISCHARGE* AT VAULT	H	890.5	876.8	872.3
INV. 8" DRAIN* AT VAULT	I	889.6	875.8	869.5
BOTTOM INSIDE VAULT	J	886.5	872.6	869.5
INV. 12" DISCHARGE AT OUTLET	K	887.4	874.2	870.1
INV. 8" DRAIN AT OUTLET	L	887.6	874.6	870.3
"ACTIVE" TREATMENT LIMESTONE	X	1,100 T	2,700 T	1000 T
"STORAGE" TREATMENT LIMESTONE	Y	1,200 T	1,800 T	200 T

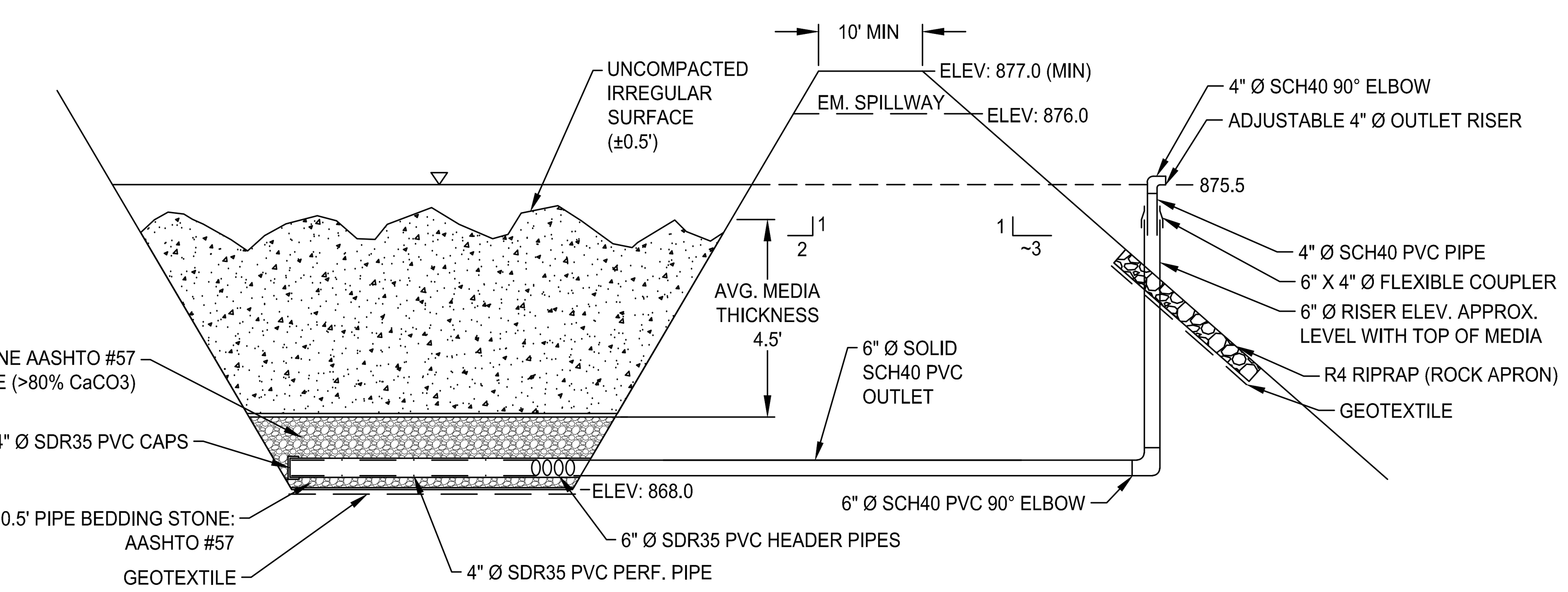
* VFP3: 6" OVERFLOW; 8" DISCHARGE (FROM 6" SIPHON); 4" DRAIN

NOTE:
1. Typical dimensions shown for VFP1 and VFP2B vault with Fluid Dynamic Siphons, Inc. model 1248 siphon; VFP3 uses model 648 siphon with smaller vault – VFP3 siphon does not have a trigger mechanism.
2. VFP1, VFP2B, and VFP3 siphon bells are mounted to wall- or floor-mounted brackets (not shown for clarity).



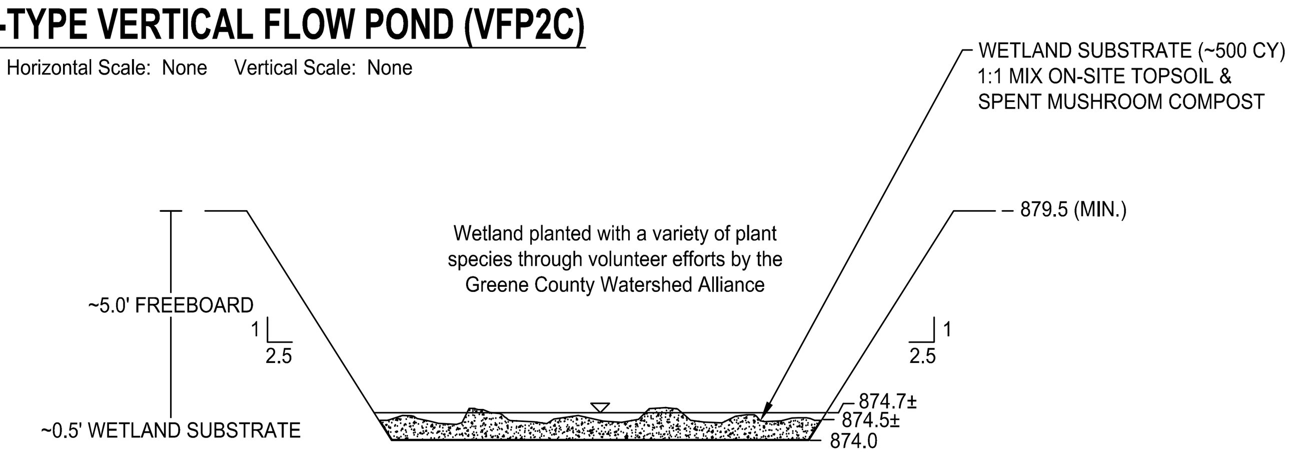
VERTICAL FLOW POND AND SIPHON VAULT FOR VFP1, VFP2B & VFP3

Horizontal Scale: None Vertical Scale: None



JENNINGS-TYPE VERTICAL FLOW POND (VFP2C)

Horizontal Scale: None Vertical Scale: None

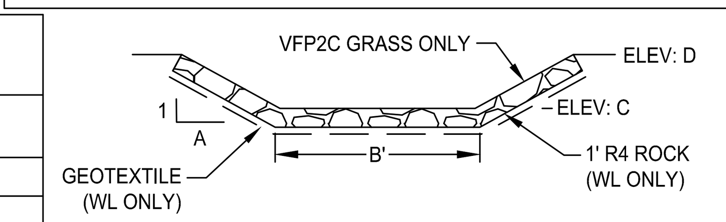


EX. AEROBIC WETLAND (WL)

Horizontal Scale: None Vertical Scale: None

SPILLWAY DETAILS

	WETLAND	VFP2C
A	5	2
B	20	15
C	875.5	876.0
D	880.0 ±	877.0

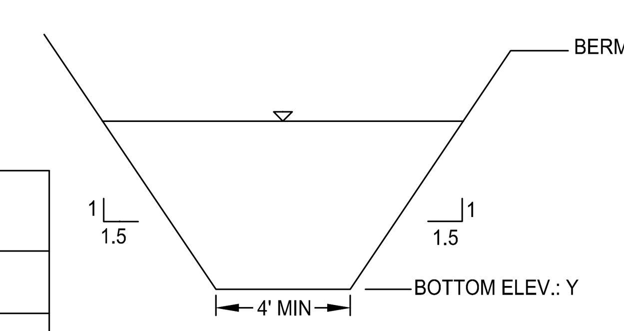


SPILLWAY (TYP.)

Horizontal Scale: None Vertical Scale: None

MOAT ELEVATIONS

	MOAT A	MOAT B
X	891 (MIN)	890 (MIN)
Y	884 (MAX)	883 (MAX)



MOAT (TYP.)

Horizontal Scale: None Vertical Scale: None

BioMost, Inc.
434 Spring Street Ext.
Mars, PA 16046
www.biomost.com

CLIENT:
STREAM RESTORATION INCORPORATED
SLIPPERY ROCK, PA
(724) 279-5080
www.streamrestorationinc.org

NO.	BY	DATE	DESCRIPTION
1	TPD	Jan 2026	Updated VFP2A Reused Media Quantities

REVISIONS

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER CODY A. NEELY PE085089

SIGNATURE / DATE
SUBMITTED BY:
PROJECT DESIGNER - BioMost, Inc.

DATE: JUNE 2025
LATITUDE: 39.7483
LONGITUDE: -79.9659
SCALE: 60' 30' 0 60' UNLESS OTHERWISE NOTED
DRAWN BY: DMC
CHECKED BY: DAG
ACAD FILE NAME: 1176 AB (2025).dwg

ALL EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED BY THE CONTRACTOR AT THE SITE AS APPLICABLE

MAIDEN PASSIVE SYSTEM REHABILITATION

DUNKARD TOWNSHIP GREENE COUNTY

AS-BUILT PLAN UPDATE & DETAILS

DRAWING NUMBER: 1 of 1