

## 1) Background of Organization

### Description of our watershed

The Pittsburgh Botanic Garden is transforming a 460-acre brownfield site at the southern end of Settlers Cabin County Park within Allegheny County into a world-class, comprehensive Botanic Garden. On 140 acres of the site, the Botanic Garden is engaged in an innovative reclamation project whereby the coal in the abandoned mines will be exposed and removed. While that work proceeds to the south of the site, garden progress is focused on the northern end of the site. Initial Garden development is concentrated on the Woodland Gardens, an area that was deep mined but never strip mined. By the end of 2012, over 15 acres of the Appalachian Plateau Woodlands was cleared of invasive plant species, over 600 native trees and over 1,000 native shrubs and herbaceous perennials were planted. A solar powered irrigation system was built to care for the new plants. We now have three miles of trails built throughout the woodland area. The Sprout Tree Nursery with its own solar powered irrigation system, continues to service the Garden.

At the edge of the Appalachian Plateau Woodlands where the Asian Woodlands begins is the area where there is an acid mine drainage seep.

The acid mine drainage in the Woodland Gardens flows into an existing pond – which is lifeless – and then discharges to a stream that eventually flows into Pinkerton Run, which flows to Robinson Run and then to Chartiers Creek. The AMD produced is generally severe, with pH less than 4 and high concentrations of aluminum. Chartiers Creek is also seriously impacted by abandoned mine drainage. The AMD severely degrades the quality of the stream through the precipitation of unsightly metal solids. The stream then flows through an existing wetland area that the PBG would like to restore and develop as an exhibit. Before making this investment, the AMD must be remediated.



The Chartiers Creek Rivers Conservation Plan identifies AMD as a major water quality problem, but no specific remediation recommendations are made. There are several watershed associations in the Chartiers Creek watershed that are making progress on AMD remediation and stream quality restoration. However, there is not currently an active group in the Robinson Run watershed. AMD remediation by the PBG is the first non-profit restoration activity in the watershed.

This project was selected because it is in the middle of the area we are developing first. It is important to address so as to make the site more conducive to plant and animal health, clean the pond and stream and allow a wetland garden to thrive. Addressing this issue highlights the problem of AMD and its resolution to students and the greater community. We have had several classes at the site for interested visitors to learn about the AMD issue and its resolution. Continuing education is planned.

The impact of the PBG Acid Mine Drainage & Education Initiative includes restoring the pond and increasing the pH of a portion of the stream from 3 to 7, removing metal sludge currently precipitating into the stream, reducing acidity and aluminum levels, restoring 2700 feet of stream that currently has no aquatic life and eliminating a large and only known source of AMD in the Woodland area of Botanic Garden.

The goal was to develop a plan to fix the AMD problem, enhance the area, turn it into an asset and an integral part of the new botanic garden where students and visitors can see the role of passive technologies in water clean-up. We anticipate that the project will remove 10,000 pounds of acidity per year as well as 1,000 pounds of aluminum per year.

As reported last year, Eagle Scout Brandon Growark built and installed monitoring stations (flumes and weirs) at key locations and initiated a monitoring program that provided flow measurements and water chemistry analyses. Based on that data, a plan to treat the AMD passively was recently developed.

Funds provided by the FPW supported the characterization of the AMD woodland discharge and the flow and chemical analysis. FPW funding also contributed to the conceptual treatment design and the construction of the drainable limestone bed which is now all but complete. The second step of the PBG Acid Mine Drainage & Education Initiative dealt with the construction of a drainable limestone bed to receive the acid mine drainage and treat it before it enters the woodland pond.

Project partners for this phase of the project include Hedin Environmental, Allegheny County Conservation District, Colcom Foundation, an anonymous foundation, Growing Greener, Auberle, and Carmeuse Lime & Stone (which is donating \$11,250 of crushed limestone).



The DLB is a 4.5 ft thick bed of limestone aggregate and does not contain any organic matter. The bed is completely flooded during routine operation, but there is no need for standing water on top of the stone. Aluminum solids accumulate in the limestone aggregate. The deleterious effect of the solids is mitigated by rapidly draining the bed empty every week. The

draining process removes some of the Al solids and maintains the bed's porosity. The water drained contains white aluminum solids that will precipitate within a couple of hours in a pond. The weekly draining is accomplished by opening a gate valve that can be done manually or mechanically.

The DLB was recommended for several reasons.

1. The system does not involve deep potentially hazardous standing water.
2. The effluent does not have any objectionable odors.
3. The system's footprint is smaller than a VFP.

The system constructed is a bed of limestone with pipes that are largely hidden from view within the aggregate. The PBG needed the treatment system to be as compact as possible so that its construction and installation would cause as little damage to existing Woodlands forest as possible. The tank and limestone contents will be incorporated into the landscape and will actually become part of the trail system so that visitors will walk on top of the treatment system.



The DLB system is not quite complete. The concrete work is done but the 450 tons of limestone aggregate has not been delivered due to the weather. The bed is 4.5 ft deep and approximately 20 ft. by 100 ft. The sizing is based on the highly conservative assumption of 15 gpm flow and acidity removal. This conservative design was utilized so that its effectiveness will be assured and so that cleaning of the limestone should only be necessary every 10 years.

The treatment system's routine effluent is expected to have pH 7 with 80 mg/L alkalinity and less than 1 mg/L Al, Fe, and Mn. When the system is drained empty, the drained discharge will be alkaline with 50-100 mg/L particulate Al. The performance will be monitored by PBG by measuring the flow and pH of the routine effluent initially on a weekly basis and, as confidence in the system grows, on a monthly basis. Hedin Environmental will measure alkalinity on a regular basis and samples will be collected for analysis of AMD parameters initially on a monthly basis and, as confidence in the system grows, on a quarterly or semi-annual basis.

The drainage effluent will be sampled several times in the first six months of operation and analyzed



for total and dissolved metals. The visual condition of the pond after a drainage event will be monitored by PBG to determine if the solids introduced result in unacceptable aesthetic condition. If the solids discolor the pond unacceptably, a plan to reroute the drainage water around the pond will be implemented.

The DLB treatment tank is expected to be complete by spring, 2013. Future work includes pond cleanout and clearing, restoration of the original pond size, the installation of an agridrain and spillway and clean-up. We anticipate working with the OSM on the next phase.