Whiskey #9 Passive Treatment System

Operation and Maintenance Plan

Prepared for Blackleggs Watershed Association, September 2015

Operation and Maintenance Overview

Passive treatment systems, like any infrastructure, require maintenance in order to function properly. The proposed Whisky Run #9 passive treatment system will function primarily as a settling basin, and as such, will have very minor operation and maintenance requirements. The design of the system minimizes the use of pipes reducing maintenance. The primary maintenance requirement for this system is anticipated to be vegetation management. Flow channels can become obstructed with vegetation requiring periodic cleanout. Though the design attempts to minimize plant growth in flow paths by providing wide channels lined with geotextile and aggregate, vegetation removal by excavation may be required every 3-5 years. The responsibility of operation and maintenance of the system will be the role of BCWA volunteers, and will include the routine inspection of the system, water sampling, and vegetation management. Anticipated maintenance includes site inspection, channel clearing, and general repairs of the system. The system has the capacity to retain metals and generate net alkaline effluent well beyond 10 years.

Routine Operation and Maintenance

The primary goal of routine Operation and Maintenance (O&M) efforts is to maintain flow through the installed system. The important aspects of the system's hydraulics include the following features.

- Collection of the water in the mine entry and transport to Cell 2 in a 15 inch diameter pipeline.
- The water level control box (AgriDrain) that sets an upper limit on water allowed into the system.
- The limestone check dams in each cell (Cells 2, 3 and 4) to distribute flow across the width of the cell.
- The three rock line channels to transport water between cells and to the final discharge.

Monthly inspections are recommended. The inspection should include a walk through the system with attention to the system's general operation and potential problem areas. The inspector should be able to correct easy problems such as channel and rock check dam blockage (AMD sludge, leaves and sticks). Water levels in each cell should be checked at maintained at about a 6 inch depth. This should be able to be accomplished by checking the beginning of each channel for blockage and removing the blockage.

Several minor maintenance items should be done every year. The water level control box at the end of the system may accumulate dirt, iron and other debris. Once a year, the box

should be cleaned out. All stoplogs should be removed, wiped cleaned, the O-ring on each board greased and replaced. The stoplogs are removed with a tool that is stored onsite. Also, at this time, boards should be added to the water level control box to insure that the bypass is clear and operating properly.

Major Maintenance

Unexpected Major Maintenance

Major maintenance involves non-routine efforts that cannot be accomplished by the site inspector. Examples would be the removal of trees that have fallen into the ponds or wetland, removal of beaver dams and removal of excessive vegetation in the wetland. Major maintenance efforts that correct one-time problems (all the above) may be funded through the Western PA Coalition for Abandoned Mine Reclamation Quick Response Emergency Repair program.

Major Maintenance: Metal Solids

The ponds will accumulate iron and aluminum solids extremely slowly due to the very low concentrations of these metals (~1-2 mg/L). Iron and aluminum solids should not cause a problem for at least 10 years. Sediment washed in by heavy rains is much more likely to cause a problem and should be monitored. Manganese is present in concentrations of about 10 mg/L. Manganese removal will occur on contacted rock surfaces in the limestone check dams and limestone in the channels. These areas should be monitored and cleaned when necessary (i.e., water has problems flowing).

System Replacement

The system does contain limestone in the check dams and channels. These should not require replacement (or additions to) for at least 10 years. As long as the system hydraulics and the storage capacities of the ponds and wetland are maintained, there should be no need to replace the treatment system.

System Monitoring

It is suggested that the performance of the system be measured by sampling the influent and effluent every other month for the first year of operation and once per quarter (every three months) in subsequent years. The sampling points are:

- system influent collected from the end of the pipe entering Cell 2
- system effluent collected at the end of the final effluent channel

Flow may be measured in the water level control box from the depth of water over the top board. In practice, it is easier to measure the depth from the top edge of the box down to the water. After the system is turned on, measurements should be made from the top of the box down to the top board. Measurement to the water surface behind the board

(upstream side) can then be made to estimate flow. Distance to the top board minus the distance to the water level will equal the height of the water over the board. Table 4 shows flows for water heights.

The water quality parameters that should be analyzed for include pH, total alkalinity, net acidity, iron, aluminum, manganese, sulfate, conductivity, and total suspended solids. Metals (Fe, Mn and Al) are typically measured on a sample preserved in the field with nitric acid. The remaining parameters are measured on a sample collected without preservation. If the samples cannot be acidified in the field, then they should be delivered to the laboratory as soon as possible (same day) for acidification at the lab. (Local labs routinely provide pre-acidified bottles for collection of the acid samples.) During sampling, care should be taken to avoid disturbing and mobilizing soil or iron solids in the sampling area. Visual assessments should be made on water that is collected in a clear plastic container. Always record a visual assessment of the final effluent, even when samples are collected for laboratory analysis.

Attachments to the O&M Plan

- As-built schematic dated September 8, 2015 showing O&M points
- Inspection and monitoring form
- Flow rate chart

Flows rate estimates for water at the Water Level Control Box.
Weir width used 18-3/8 inches without end contractions.

Depth over weir, inches	Flow, gpm
0.5	19
1.0	55
1.5	101
2.0	156
2.5	218
3.0	286
3.5	360
4.0	440
4.5	526
5.0	615
5.5	710
6.0	809
6.5	912
7.0	1020
7.5	1131
8.0	1246
8.5	1364
9.0	1486
9.5	1612
10.0	1741
10.5	1873
11.0	2008
11.5	2147
12.0	2288

Date _____ Inspector _____

Current Weather _____

Recent Weather (past week) _____

Item	Comments (additional comments on back of sheet)
Gate (closed and locked?)	
Access roads in site (good condition?)	
Parking Area (good condition?)	
Surface at mine entry (any water not being collected?)	
Any water flowing through bypass pipe?	
Water flowing freely through AgriDrain Box?	
Water flowing freely from end of pipe into Cell 2?	
Cell 2 rock dam passing water?	
Cell 2 depth 3 – 6 inches throughout?	
Channel from Cell 2 to Cell 3 free of debris?	
Cell 3 rock dam passing water?	
Cell 3 depth 3 - 6 inches throughout?	
Channel from Cell 3 to Cell 4 free of debris?	
Cell 4 rock dam passing water?	
Cell 4 depth 3 - 6 inches throughout?	
Channel from Cell 4 to effluent free of debris?	
All wetland cells (2, 3, 4), flow irregularities?	
All wetland cells (2, 3, 4), plant vigor?	
All wetland cells (2, 3, 4), muskrat or beaver damage?	
All wetland cells (2, 3, 4), other problems?	
Final discharge area, irregularities?	
Trees or debris that needs to be cleared?	
Other Observations	

Flow Rate: Water height behind top stoplog = _____ inches (measure to ¼ inch)

Water Sample information

Point	pH	Temp	Acid bottle No.	Raw bottle No.	Sample appearance*
Influent (at end of pipe into first wetland)					
Effluent (at end of final discharge channel – at bottom of slope)					
Other					
Other					

* clear; turbid with iron (orange); turbid with mud (brown); turbid with aluminum (white); other (describe)

ADD MISCELLANEOUS OBSERVATIONS TO BACK OF SHEET