Oven Run B

Township/City: Shade Township
County: Somerset
Latitude/Longitude: 40° 6' 50.0004" N 78° 54' 47.9988" W
Receiving Stream: Oven Run
Watershed: Stonycreek River

The Oven Run B passive treatment system was constructed by the PA Department of Environmental Protection in 1999 to treat mine drainage emanating from three sealed deep mine entries. The system was designed by Gwin, Dobson and Foreman, Inc., with modifications by BAMR. The treatment system consists of a collection pond → SAPS→ Settling Pond → SAPS→ Settling Pond. According to a Passive Treatment System Evaluation report prepared by the PA DEP in May of 2008, the system was designed based on an average flow of 350 gpm, but capable of handling a maximum flow of 1,100 gpm. In October 2001, a flow distribution pipe was installed on top of SAP1. In October 2001, iron sludge and compost was removed from SAP1 and SAP2 and new compost was added.

A site visit was conducted on October 17, 2013. Water samples were collected and field testing, including pH, DO, temperature, ORP, alkalinity, and flow, was conducted as possible. In addition, raw untreated water was collected from sample point ORBI to perform a bucket test. During the inspection, the flow rate through the system was approximately 200 gpm. No water was flowing through the underdrain of SAP1. Instead, the water was flowing over the emergency spillway indicating either a portion of the undrain is plugged or the treatment media itself has become impermeable, most likely due to low pH iron precipitation. Water was flowing through SAP2; however, water emanating from the primary outlet pipe was of poor quality indicating that there is probably significant short-circuiting within the pond. Interestingly water flowing out of what appears to be a flush pipe was of significantly better quality water.

An initial short-lived dye test of SAP2 was conducted to see if short-circuiting could be easily observed. Due to time constraints and the size of the pond, the dye test could only be observed for a short period of time. During the approximately 1.5 hours, no dye was observed in the effluent pipe. Observations of the dye plume on the surface of the pond indicated that the flow was moving towards the western 1/2 of the pond and not flowing through the eastern ½ of the pond. This may be due to the location of the flushing pipe, which is also located on the same side of the pond. In addition, water from the final settling pond (Pond 3) was flowing out of both the emergency spillway and the effluent pipe indicating that the pipe may be partially plugged with low pH iron and/or debris or the valve is broken.

A bucket test utilizing just limestone was conducted on October 22, 2013 utilizing raw untreated water collected several days earlier to assess the possibility of converting SAP1 into an auto-flushing limestone only VFP. With just 4 hours of retention time, the pH had risen to 6.1 with 64 mg/L of alkalinity and after 6 hours the pH was 6.5 with 100 mg/L of alkalinity. The results were very encouraging, but also questionable. It is unusual for a limestone only bucket test to exceed 80 mg/L of alkalinity due to the limits of limestone dissolution in an open environment. Also, during the test a strange odor resembling hydrogen sulfide was noticed.

After the test was completed, the bucket and stone were examined and a dead mouse, nest, and stored food were discovered. The decaying organic matter would likely have caused an increase in alkalinity production. Unfortunately, there was not enough water left to conduct another test. While the results are inconclusive, based upon other sites, it is believed that an auto-flusher could be successfully used as the first stage of treatment.

Water Quality Data

A review of the available water quality data for the treatment system was conducted. The PA DEP has sampled the site on a quarterly basis through about 2010 after which point monitoring was conducted more sporadically. Individual sample dates and additional parameters are available on Datashed (www.datashed.org). The discharge can be described as very acidic with high concentrations of iron, aluminum and manganese. Based on available data, on average, the water quality of the effluent remains acidic with reduced, but still high concentrations of metals. The system appears to have treated the discharge well for the first year and a half after which the treatment suddenly and dramatically decreased. A closer evaluation of the SAP data indicates that SAP1 worked exceptionally well for only about 4 months and SAP2 for about 18 months before treatment decreased. Considering the amount of media present, the sudden decrease in treatment would tend to indicate short-circuiting to the underdrain.

Oven Run B Water Quality Data (Average Values)

Sample Point	Flow	Field pH	Lab pH	Alkalinity	Acidity	T. Fe	T. Mn	T. Al	SO_4
ORBI (Influent)	175	2.8	2.8	0	424	47.5	15.8	33.0	901
SAP1	174	3.7	3.5	11	234	36.7	15.8	23.1	994
Pond 2	186	3.4	3.2	11	240	21.0	15.5	23.2	986
SAP2	137	5.1	4.4	37	138	15.8	15.2	14.7	1003
ORBO (Effluent)	172	4.8	4.2	31	126	8.4	15.9	12.9	992

Flow in gpm, pH in standard units, Alkalinity and Hot Acidity in mg/L as $CaCO_3$, Iron (Fe), Manganese (Mn) and Aluminum (Al) as total metal concentrations in mg/L

Conclusions & Recommendations

The Oven Run B system quickly began to develop operational problems within a few months of construction with good treatment results ending within about 18 months. Over a dozen years later, the system is still providing treatment. On average the system has been neutralizing about 70% of the acid and removing about 80% of the iron and 60% of the aluminum, which considering the flow rate is still providing quite a significant improvement to the Oven Run watershed. As there is most likely significant treatment media still remaining within the system, the primary problems is likely to be related to short-circuiting and potentially plugged pipes and/or loss of treatment permeability. Underdrain cleanouts extending through the treatment media would be a potential cause of short-circuiting. There is also indication that significant amounts of low-pH iron is accumulating on top of the compost of SAP1 and potentially SAP2, which could be the cause of permeability problems. There may be the potential to install an

Oxidation Precipitation Channel to remove a portion of low-pH iron prior to entering SAP1. Ideally, if possible, the collection pond could be modified into a large limestone channel that would convey the flow to SAP1. Due to the large size of the SAPS ponds at the site and the high flow rate, there is greater risk and greater impact of short-circuiting. To address the issue, an Agri Drain Smart Drain or automatic flushing siphon system could be installed to replace the existing Agri Drain control structures for at least SAP1 and possibly SAP2, which would provide for batch treatment of the mine drainage and regular flushing of the media. Baffle curtains should probably be added to the settling basins if the Smart Drain or siphons are installed to help settle solids. There may be a need to remove the compost and clean the treatment media. The piping throughout the treatment system should be cleaned or possibly replaced. If an extensive rehabilitation is conducted, it may be possible to effectively divide SAP1 into two auto-flushing systems. One potential problem with utilizing the auto-flushing system that needs to be considered is whether there is enough capacity within the settling pond to handle the flushing event. It may be necessary to utilize less stone or perhaps turn part of SAP1 into a flush pond. A more thorough engineering evaluation should be conducted. SRI's O&M TAG program could be utilized to complete the evaluation. In addition, as this is a BAMR project, BioMost, Inc. is currently on BAMR's list of approved contractors to provide services in which design improvements could be completed.

Oven Run B Photos

At the Oven Run B system, AMD enters through three sealed deep mine entries (Top Left) which flows into a collection pond (Top Right). It may be possible to convert a portion of the collection pond into an OPC for low pH iron removal, which might be able to be extended along the eastern side of SAP1 (Bottom Left), but the length and width would likely be limited by a rock outcropping (Bottom Right).

SAP1 (Top Left) is a huge pond which is susceptible to short-circuiting, especially along cleanouts that extend through the treatment media. The permeability of the media is now so low (likely due to low pH iron) that the water discharges to Pond 2 through the emergency spillway instead of the outlet (Top Right). A dye test of SAP2 was attempted (Center Left) but not conclusive; however, it indicated that the water appeared to flow along western side (Center Right) where the flush header was located. Final effluent of the system is currently discharging mainly over the emergency spillway with some flow through the pipe, indicating the outlet pipe is partially plugged or valve is broken.