Passive System Rehabilitation of a High Flow Acidic Coal Mine Discharge

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Site Location
Maiden Passive Treatment System

Background

- Constructed 2006 to treat an abandoned acidic coal mine discharge
- Largest passive system in Dunkard Creek Watershed
- Treats 2 mine discharges

Reference: www.datashed.org
Maiden Passive Treatment System

Background

- High flow/loading discharge with no maintenance for almost 10 years due to refusal of landowner access from 2006 through 2015
- Land purchase by MEPCO, LLC in 2015
- Maintenance Aug-Nov 2016

Reference: www.datashed.org
## Raw Water Quality Data (Avg)

<table>
<thead>
<tr>
<th>Sample Point</th>
<th>Flow (gpm)</th>
<th>pH</th>
<th>Acidity (mg/L)</th>
<th>Fe (mg/L)</th>
<th>Mn (mg/L)</th>
<th>Al (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>117-6A</td>
<td>28.5</td>
<td>2.8</td>
<td>359</td>
<td>26</td>
<td>3.5</td>
<td>28</td>
</tr>
<tr>
<td>117-1</td>
<td>321</td>
<td>2.7</td>
<td>354</td>
<td>46</td>
<td>4.2</td>
<td>19</td>
</tr>
</tbody>
</table>

*Each discharge treated by separate set of components within the “system”*
Site Challenges

- Flooding of state route due to beaver activity at outlet of system
- HFLB clogged and overgrown with vegetation
- VFP1, VFP2B, & VFP3 siphons not functional
- VFP1, VFP2B, VFP3 stone clogged with Fe precipitates
- SP1/ Oxidation precipitation channel overflowing
- No flow to VFP2A (clogged inlet pipe)
- Underdrain pipes clogged in multiple components
Beaver Issues

- Left: Beaver dam at outlet of oxbow lake located at the system outlet
- Right: Flooding due to beaver dam on state road (August 2015)
Beaver Issues

- Installed dual 24" piping as "beaver proof" system outlet
HFLB Maintenance

- HFLB upgraded with infiltration trenches & inlet/outlet pools
VFP2B Siphon Repair

- Siphon trigger damaged by wildlife
VFP2B Siphon Repair
VFP2B Siphon Repair
VFP3 Siphon Repair

- Damaged siphon bell was retrofitted with improved bracing
VFP1 Siphon Replacement

- Solar powered mechanically actuated valve installed to drain VFP1 on set schedule
Media was clogged in VFP1 causing all raw water to short circuit pond
Iron precipitates had completely filled void space within the pond.
VFP1 Media Cleaning

- Excavator and 3" pump with 2" firehose attachment used to wash stone
VFP1 Underdrain Replacement

- Perforated 8” HDPE pipe with caps used to create more durable underdrain
VFP3 Media Clogged

- All flow bypassed treatment through emergency spillway
VFP3 Media Cleaning

- Limestone was cleaned and underdrain was repaired and kept in place
Channel Retrofit

- VFP2A & VFP2B “combined” with VFP2B as “high flow use only” component
System component offline for almost 10 years with no treatment
Media was “fluffed” to improve permeability
VFP2A outlet risers were adjusted due to variable site conditions and effluent quality goals.
VFP2A Stirred (Again)

- High quality treatment from media but less than expected flow prompted a second media stir
Media stirred, HDPE underdrain installed, infiltration trench installed
General Maintenance

Settling pond 8” bypass valve replacement and removal of E&S controls left in place from initial system construction
Post Maintenance Water Quality

<table>
<thead>
<tr>
<th>Sample Point</th>
<th>Flow (GPM)</th>
<th>pH (field)</th>
<th>Acidity (mg/L)</th>
<th>Alkalinity (mg/L)</th>
<th>Fe (mg/L)</th>
<th>Mn (mg/L)</th>
<th>Al (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>117-1 (Avg) n=32</td>
<td>321</td>
<td>2.88</td>
<td>354</td>
<td>NM</td>
<td>46</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Effluent (post rehab avg) n=6</td>
<td>327</td>
<td>5.2</td>
<td>54.9</td>
<td>36</td>
<td>1.3</td>
<td>1.6</td>
<td>5.6</td>
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</tbody>
</table>

*Note 3/5/2017 sampling was a flow of 689 gpm, pH 3.52, acidity 124 (over double system design flow) and is included in effluent average

*Data available at www.datashed.org
Project Accomplishments

- Cleaned 10,500 tons of limestone (VFP1, VFP2B, VFP3, HFLB)
- Installed 600 feet of HDPE underdrain pipe (VFP1 & VFP2B)
- Rehabilitated 1,300 CY of treatment media (VFP2A)
- Installed 150’-long channel to by-pass clogged culvert
- Installed flow-balancing channel between VFP2A & VFP2B
- Installed pipe outlet control on VFP2B
- Repaired VFP2B siphon mechanism that was damaged by wildlife
- Repaired VFP3 siphon worn by almost a decade of use
- Installed dual 24” piping as “beaver proof” system outlet
- Replaced 8” by-pass valve (SP1)
- Reconfigured HFLB to include inlet and outlet pools and infiltration trenches
- Installed solar powered valve actuator at VFP1
What Next?

- Plans to retrofit VFP2B as a mixed media component
- Continued stirring of limestone to maintain media permeability
- Install perforated riser pipe at HFLB outlet
Project Partners

- Foundation for Pennsylvania Watersheds
- Appalachian Stewardship Fund
- Western PA Coalition for Abandoned Mine Reclamation/PADEP
- SRI Operation & Maintenance Technical Assistance Grant (Growing Greener Funded)
- AMDRI
- MEPCO, LLC (property acquisition for site access + on-going water monitoring as part of AMDRI Dunkard Creek Watershed Management Plan)
- Stream Restoration Incorporated
- BioMost, Inc.
Questions?