

## **Operation & Maintenance**

### **Routine System Operation**

When conducting routine inspections, note condition and stability of berms and overall site vegetation. Check for vandalism and illegal dumping.

### **Vertical Flow and Hybrid Flow Ponds**

Passive treatment system components of this type should be inspected on a monthly to quarterly basis. Occasionally, the water levels in the vertical/hybrid flow ponds may need to be adjusted and accumulated material removed from the spillways.

Periodically, the vertical/hybrid flow ponds will need to be flushed (15 minutes/flush pipe) to remove accumulated precipitates from within the pipes/treatment media. This will most likely occur during every other inspection event. Annually, a more thorough flushing, is recommended.

### **Settling Ponds/Wetlands and Forebays**

Inspections of these passive treatment system components should be conducted on a quarterly basis, or more frequently if completed in conjunction with other types of system components. These components will typically have a rock-lined spillway or pipe-type outlet structure. In either case, accumulated debris should be periodically removed to maintain the design water level. The overall health of the wetland portion of these components should also be monitored to ensure sustainable vegetative growth. This may require occasional re-plantings to maintain species diversity and, if desired, removal of dominant or invasive plants.

For all types of passive treatment components, the inspections will include observing the system to ensure proper water flow through each component and should also include field-testing for pH using a test kit or meter. The pH measurements will give an overall indication of system performance. These inspections should take about 1-3 hours per event and may require small hand tools and some light labor. If completed by volunteers, this would cost only the time/travel associated with this activity; however, a “high-end” estimate is provided based on PADEP OM&R labor cost for paid personnel.

***Estimated annual operation and maintenance time: 12 – 36 hours***

***Estimated annual operation and maintenance cost: \$0 - \$1440***

### **General System Maintenance**

Every few years, debris removal and minor reparations using small equipment (i.e., backhoe, skid-steer loader, etc.) may be necessary. These repairs will vary depending on weather, site conditions, and other factors. Based on similar projects, the project partners may be willing to donate these services for the first five years of operation and reduce overall costs to the MRWA.

***Estimated operation and maintenance time (every three years): 8 – 16 hours***

***Estimated annual average operation and maintenance cost: \$240 - \$1,040***

### **Replacement/Reconstruction**

The conceptual design life for the passive systems included in this report is 25 years. Based on the discharge characteristics over time, weather, and other factors, the system may need to be recharged with fresh treatment media and/or otherwise updated based on the current state of treatment technology at that time. The above noted costs do not take this into consideration.