

**Reitz #1 Passive Treatment System**  
**SRI O&M TAG Project # 9 Request #1**  
**OSM PTS ID: PA-191**

Requesting Organization: Shade Creek Watershed Association (in-kind partner)  
Receiving Stream: Laurel Run (Dark Shade Creek)  
Hydrologic Order: Laurel Run→Dark Shade Creek→Stony Creek River→  
Conemaugh River→Kiskiminetas River→Allegheny River→  
Ohio River  
Municipality/County: Shade Township, Somerset County  
Latitude/ Longitude: 40°07'04.0008"N / 78°48'11.0016" W  
Construction Year: 2004

In October 2011, SRI was contacted by Larry Hutchinson of Shade Creek Watershed Association regarding the Laurel Run Reitz #1 Passive Treatment System, where the Vertical Flow Pond (VFP) was not always performing as well as desired, especially during the winter months for the previous two years.

Cliff Denholm met with Larry on November 22, 2011 to investigate the site. The abandoned mine drainage is piped underneath the stream and flows into a layered-style VFP. The underdrain piping system collects the water from the VFP via 2 Agridrain boxes which then conveys the water via pipe to a settling pond followed by a Bioreactor. Reportedly the hydrogen sulfide smell from the Bioreactor was so strong that the local citizens complained. The Bioreactor is now essentially bypassed as the water only flows on the surface, transforming the pond into more of a settling pond or wetland. Logs that had been placed within the media of the Bioreactor were mostly floating on the surface.

During the site visit, the field pH measurement for the VFP effluent was 6.3 indicating that the VFP was working fairly well on that date. According to Larry, visual observations of the VFP effluent indicate that the flow rate does not vary significantly on a seasonal basis. A large portion of the compost covering the VFP was observed to have "migrated" to the far end of the VFP, which according to Larry was due to a large flow event and/or high winds that had occurred. This uneven distribution of compost could be expected to encourage the AMD to short-circuit through areas where the compost was thinner, which was also located near where the water first enters the VFP. A review of data available through *Datashed* and field data provided by Larry indicated that water quality through the system has been quite variable; however, there appeared to be a general trend of net-acidic water with higher iron concentrations over the last two years compared to the 2-3 year period immediately following system construction.

A plan was developed in October 2012 by the Shade Creek Watershed Association and Stream Restoration, Inc. to restore the Laurel Run Reitz #1 Passive Treatment System that resulted in multiple renovations and improvements. First, the VFP was drained and the compost material was re-distributed across the pond. Then the compost was mixed into the top layer of the limestone to help reduce short-circuiting. The VFP emergency spillway outlet height was lowered and a ramp was installed into the VFP to provide for easier access in the future. Logs that were floating ewere removed from within the settling pond and Bioreactor.

Access points were installed for future maintenance activities to the settling ponds. Water samples collected of the final effluent shortly after the maintenance was conducted indicated the system performance was significantly enhanced and produced net-alkaline water; however, total iron concentrations even though decreased by about 60% still remained elevated. The dissolved iron concentration is expected to be substantially lower as significant iron solids were observed in the effluent. The large amount of iron solids may have been due to the recent stirring event. In addition, the Shade Creek Watershed Association stated that the VFP was being regularly flushed on about a weekly basis. SRI recommended that the flushing frequency be decreased in order to evaluate if flushing was contributing to the significant iron solids content within the final effluent. Once monitoring has been conducted, the system can be further evaluated to determine if additional actions can be taken.

**Laurel Run Reitz #1 Passive Treatment System: 11/20/12 Influent & Effluent Quality**

<b>SAMPLE Point</b>	<b>Lab pH</b>	<b>ALK.</b>	<b>ACIDITY</b>	<b>TFe</b>	<b>TMn</b>	<b>TAI</b>	<b>SO<sub>4</sub></b>	<b>TSS</b>
RAW	3.44	ND	120.99	40.00	8.54	10.08	519.1	<5
FINAL	6.84	156.63	-114.03	17.45	7.46	0.53	515.6	12

*All values in mg/L except pH provided in standard units*

The project team appreciates the efforts of Larry Hutchinson and Austin Russel of the Shade Creek Watershed Association, especially the help provided while onsite to assist with system restoration and their input in future system renovation. Funding for technical assistance and maintenance was provided by the PA DEP’s Growing Greener and the Foundation for Pennsylvania Watersheds grant programs and in-kind services by project partners.

**Additional Recommendations and Consideration**

- Conduct site inspections and water monitoring on at least a quarterly basis, although monthly is preferred. Include field measurements of pH, alkalinity, and flow at a minimum.
- Reduce VFP flushing to an as needed basis. When the VFP is flushed it should be allowed to flush completely for best benefits.
- Consider future installation of baffle curtains to assist in settling of iron solids



A primary maintenance issue identified for the Reitz #1 Passive Treatment System was that portions of the compost layer had been disturbed and transported across the pond (*top left*) by a large flow event or possible high winds resulting in the compost layer being significantly thinner near the inlet (*top right*) which was likely leading to short-circuiting. In addition, a large quantity of logs (*bottom left*) from the Bioreactor had floated up out of the media and needed to be removed. The compost was leveled and mixed into the top layer of limestone aggregate (*bottom right*).

