

Otto Passive Treatment System
SRI O&M TAG Project #7 Request #1
OSM PTS ID: PA-179

Requesting Organization: Schuylkill Headwaters Association
Receiving Stream: Muddy Branch Creek
Watershed: Schuylkill River
Municipality/County: Reilly Township, Schuylkill County
Latitude/ Longitude: 40°40'03"N / 76°19'12"W

This report is an update to and should replace the report completed in June 2015 under O&M TAG 1.

Stream Restoration Inc. was contacted by Bill Reichert (phone) and by Megan Blackmon (9/15/11 email) of the Schuylkill Headwaters Association seeking assistance in the maintenance of the Otto Passive Treatment System. On 9/19/11, Cliff Denholm met with Bill and Megan to conduct a site investigation as part of the system performance evaluation. Water samples of the influent and effluent were collected for laboratory analysis and provided in the table below.

The Otto Passive Treatment System consists of an intake, settling ponds, an electric-powered aeration system, and treatment wetlands. While not experiencing any known maintenance issues, treatment was less than the anticipated performance. Typical of discharges from abandoned anthracite coal mines, the water is net-alkaline with low concentrations of iron, but because of the high flow rate (averaging about 1200 gpm), the iron loading to the stream is substantial. There are also small concentrations of aluminum and manganese.

Otto Passive Treatment System: 9/19/11 Influent and Effluent Quality

Sample Point	Field pH	Lab pH	T (°C)	DO	ORP (mV)	Alk	Acid	TFe	DFe	TMn	DMn	TAI	DAI	SO ₄	TSS
RAW	6.1	6.1	12	6.1	133	36	-21	5.0	3.4	2.1	2.1	1.3	0.1	257	10
FINAL	6.6	6.4	17	9.2	115	37	-22	3.4	1.6	2.2	2.1	0.8	0.0	239	5

Concentrations in mg/L

The raw water influent is net-alkaline with relatively low concentrations of dissolved iron. Nonetheless, at the final effluent more than half of the total iron still remains and about half of the iron remaining is still in the dissolved form. There is sufficient oxygen within the water to provide for the oxidation of iron, but little iron removal is occurring. The ORP was relatively low, indicating the water is not highly oxidizing chemically. Field testing indicated that the pH is being depressed due to dissolved CO₂. Research has indicated that iron oxidation rates at circumneutral pH and higher are primarily controlled by pH. In order to improve treatment, an increase in the iron oxidation rate is desirable as well as increasing the settling of iron solids. Previous research conducted by Dr. Charles Cravotta, USGS, at this site also demonstrated the need to increase oxidation through aeration and CO₂ degassing.

Due to the large flow, complex conditions, and potentially excessive costs, a conceptual design and cost estimate were developed that included a variety of options that could be chosen and utilized in various combinations. These options have been explained and are included as an attachment along with the conceptual design and cost estimate. In general, the options seek to increase aeration, degas CO₂, increase the size of the system, and improve retention of the existing system for the purpose of increasing iron oxidation and settling of solids. As most of the recommendations are beyond the scope of SRI's O&M TAG as well as WCPAMR's Quick Response programs, additional funding would need to be sought.

The project team thanks the Schuylkill Headwaters Association, Inc. and Schuylkill County Conservation District for all of their efforts including support and assistance. 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.



Top Left: Low iron oxidation rate does not encourage the formation of iron solids within the treatment ponds.

Top Right: Meeting with watershed group representatives during a site visit to discuss potential solutions.

Bottom: The difference in elevation between the system outlet (left) and system inlet (right) is sufficient to allow passive aeration technologies to be utilized onsite.

