

## **OPERATION, MAINTENANCE AND REPLACEMENT PLAN KLONDIKE PASSIVE TREATMENT SYSTEMS**

Arthur W. Rose  
November 12, 2008

Operation, maintenance and replacement of the Klondike passive treatment systems in Dean and Gallitzin Twps., Cambria County, PA is being conducted by the Clearfield Creek Watershed Association (CCWA). The location of the site is shown on Figure 1. The systems have a design life of 25 years. During this period, the CCWA will regularly monitor the systems, correct any minor problems, and arrange for remediation of any major problems.

Two treatment systems constitute the main facilities at the project. The KL-1 system treats the outflow of discharge 32R2 from strip mine spoil. The KL-1 system consists of a channel leading to two shallow Fe-precipitation ponds, then a deeper precipitation-settling pond, the vertical flow pond (VFP), an oxidation-settling pond, and a wetland (Figure 2). A 90-degree V-notch weir exists at the discharge, and a similar weir is being installed at the final outflow. Sampling sites are as follows:

1. Discharge weir 32R2
2. Inflow to deep pond 1 (KL1-2)
3. Inflow to VFP (KL-1-3)
4. Outflow of VFP (KL1-4)
5. Final outflow of system (KL1-5)

At the KL-2 system, the layout is similar. The discharge emerges from a caved portal to the underground Klondike Mine. A 3-foot rectangular weir is available to measure the flow at this point. The flow cascades down the hill for about 300 feet in a channel lined with large limestone riprap, and enters a settling pond. This pond flows into the VFP. The outflow of the VFP emerges into an oxidation-settling pond, which flows out down a rip-rapped channel to a wetland channel. At the end of this channel, the water flows down hill along the original path of the discharge and into Little Laurel Run. Sampling sites are:

1. Discharge 32R2A
2. Inflow to first pond (KL2-2)
3. Inflow to VFP (KL2-3)
3. Outflow of VFP (KL2-4)
4. Final outflow (KL2-5)

The general plan for monitoring and sampling is to visit KL-1 and KL-2 at least quarterly. The systems will be inspected for problems, such as leaks, blockage, and other potential physical problems. At least at the influent (32R2 and 32R2A) and the effluent (KL1-5 and KL2-5) we will measure flow, field pH, field alkalinity, temperature and conductance, and collect a sample for lab analysis of pH, alkalinity, hot acidity, Fe, Mn, Al, and SO<sub>4</sub>. The samples will be submitted to Mahaffey Labs or another certified lab for analysis. The VFP outlets (KL1-4 and KL2-4) will probably also be sampled and measured. Field measurements of ORP and dissolved oxygen will also be conducted as relevant at these sites. Values for acidity and the other parameters will be entered into a spread sheet and graphed.

The main criterion for satisfactory performance will be acidity. If the non-Mn acidity of the effluent becomes positive for two successive quarters (i.e., net acid in terms of pH, Fe, Al and alkalinity), we will conduct more detailed sampling and investigations to evaluate the cause. Secondary criteria will be dissolved Fe and Al concentrations less than 1 mg/L. The goal is that the systems furnish net alkaline water to Little Laurel Run.

If minor repairs or modifications will solve the problem, we will endeavor to accomplish this with our own efforts or local partners. If the system is determined to require significant rebuilding, we will seek funding for this step from sources in the state, federal government, foundations or other sources.

We also have 3 weirs/sampling points on Little Laurel Run. Site 32MS3 is just upstream from the inflow of the KL-1 system, 32MS2 is just downstream from the KL-2 inflow, and 32MS1 is at the mouth of Little Laurel Run, just upstream from PA 53. These sites will also be sampled at the quarterly sampling dates, and studied to examine the effects of the treatment systems on Little Laurel Run.

Quality control for the field measurements will include calibration of the pH meter against pH 4 and pH 7 buffers at the beginning of field work at the sites, and check of the conductance meter with a conductance standard. The ORP measurements will be calibrated with Zobell solution.