

## **SITE BACKGROUND**

Located approximately 8 miles southeast of Clearfield, this is the downstream-most discharge affecting Morgan Run. The abandoned mine drainage (AMD) in this area was created after the site was strip mined and abandoned by Chews Contracting Little D Job, SMP#17813143. Previous surface reclamation at the site was performed, but that has not improved the water quality of the discharge. Since this site was abandoned, all bonds were forfeited and the discharge became a priority treatment area for the Moshannon District Mining Office. The Little D Discharge is a deep mine discharge with a pH measured at 3.5. Average water quality of the discharge was: 114 mg/L of acidity, 1.8 mg/L of aluminum, 4.5 mg/L of iron, 39.7 mg/L of manganese, and 450 mg/L of sulfates.

## **TREATMENT SYSTEM**

The treatment system was constructed between late 2015 and mid 2016 with funding from the Surface Mining Conservation and Reclamation Act program.

The entrance to the site is located at approximately 7370 Old Erie Pike, West Decatur, PA, and can be accessed through a gated haul road approximately  $\frac{3}{4}$  miles long. There will be a combination lock on the access gate, instructions on how to access the gate can be obtained from the Clearfield County Conservation District.

### ***System components/synopsis***

The Little D passive treatment system has a design flow of 25 gpm. Average water quality of the discharge was: 114 mg/L of acidity, 1.8 mg/L of aluminum, 4.5 mg/L of iron, 39.7 mg/L of manganese, and 450 mg/L of sulfates. The treatment train consists of collecting the discharges into an equalization basin, which discharges to a vertical flow wetland cell, into a settling basin, and then into a horizontal flow limestone cell. A more detailed description of the proposed treatment train is documented below:

AMD seeps are intercepted by the equalization basin, which regulates the flow entering the treatment system. The equalization basin has a 10" overflow pipe used to convey flow from the basin to the vertical flow wetland (VFW) cell, and an emergency spillway has been constructed approximately 6" above the overflow pipe. The equalization basin was sized to be 4,200 s.f. at the top of freeboard with an overall depth of 8'. The basin will convey flows of 25 gpm to the succeeding VFW. Flows over 25 gpm will exit the equalization basin via the emergency spillway on the western berm where a channel will convey flows to the unnamed tributary. A 6" valve drain pipe was also installed to drain the basin to the unnamed tributary for maintenance.

The VFW contains a mixture of approximately 160 tons of mushroom compost in the upper 2' of the basin underlain by 4' of high-purity limestone. The VFW has an overall depth of 10', and is lined with a 40 mil HDPE geomembrane. The bottom 1' of the cell contains a drainage system containing approximately 300' of 6" perforated pipe bedded in limestone with geotextile on the top and bottom to provide filtration draining through a 10" solid-walled pipe leading to the settling basin. An inline water level control structure is used to regulate the water elevation approximately at elevation 1748'. A solar flusher has also been installed to periodically flush the system down to approximately elevation 1744', and a 10" drain pipe was installed to completely drain the VFW through the settling basin. The bottom of the emergency spillway is approximately 1.5' below the berm.

A settling basin has been constructed following the VFW. An overflow pipe was installed at elevation 1747.5', and a solar flusher has been installed to periodically drain the basin to elevation 1743'. A valve drain pipe has been installed to completely drain the basin for maintenance. The settling basin was sized at approximately 1,500 s.f. at the top of freeboard with an overall depth of 10'.

The final component in the treatment train is a horizontal flow limestone cell (HFL). The HFL contains approximately 6' of high-purity limestone. The HFL has an overall depth of 10', and is lined with a 40 mil HDPE geomembrane. The bottom 1' of the cell contains a drainage system containing approximately 145' of 6"

perforated pipe bedded in limestone draining through a 10” solid-walled pipe discharging to the unnamed tributary. An inline water level control structure is used to regulate the water elevation approximately at elevation 1746.5’. The bottom of the emergency spillway is approximately 3.0’ below the berm.

The equalization basin was installed to both regulate flow into the system, but also to allow precipitation of iron/manganese before it enters the VFW. The VFW is a mixture of limestone and organic matter to allow for long term alkalinity production through both dissolution and sulfate reducing bacteria. The depth of the material will maintain reduced conditions and will not allow metals to precipitate in the system. The settling basin will collect the precipitate from the VFW outflow. The HFL will provide additional pH treatment before discharge to the unnamed tributary. The treatment train is anticipated to provide for a 90% reduction in both acid and iron load.

### **OPERATIONAL CHECK-UPS**

Six-months of post-construction monitoring with water sample analysis should be conducted. Water samples should be collected of raw water, outflow of the settling basin, and 100 yards below the treatment train on the unnamed tributary. A flow device should be installed at each location if possible for long term monitoring. Samples should be sent to Mahaffey Laboratory or other approved qualified lab for standard AMD analysis. After the initial six-months, monthly pH and flow should be collected in order to ensure the long term success of the system. Every quarter Hach Kits should be taken into the field and tested for iron, aluminum, and acidity. Once per year, samples should be sent to the lab for analysis. Regular monitoring will allow for the early detection of a decline in system efficiency and modifications can be made immediately.

### **INSPECTION CHECKLIST**

Each month, the monitor should check to make sure the all inlets, outlets, and spillways are clear from debris and growth. Any overflow should be measured and recorded. Any berm subsidence or leaks should be noted. The berms should also be examined for pest damage. In addition, basic site investigation for vegetation growth, vandalism, cut locks, tracks, and garbage should be noted.

### **MAINTENANCE ACTIVITIES**

Post construction monitoring and long-term maintenance of the project will be provided by the PA DEP Moshannon District Mining Office with assistance from the Clearfield County Conservation District. Monitoring and maintenance activities of the site should be conducted monthly and after significant storm events. Some common problems that could be encountered include: inadequate berm stability, pest control, leaves/debris, and erosion.

One item that will need evaluated on a yearly basis is the assessment of accumulated metals in the settling basin. The settling basin needs a detention time of 24 hours to perform properly. The basin was oversized at a 48 hours detention time to allow for additional detention while increasing times between sludge removal. Once the metals have settled and accumulated and the settling basin is approaching the 24 hour detention time, the basin shall be dredged and sludge shall be hauled away to a permitted landfill facility. In addition to monitoring the settling basin, the equalization basin will also need to be monitored for sludge removal. Its purpose is to precipitate metals before entering the VFW. This will then need to be hauled to a landfill facility.

### **REPLACEMENT**

Upon exhaustion of the compost and limestone materials at the end of the 20 year design life, the VFW and HFL will need to be refilled.