LT 2 KYLER Run AMD PROJECT

OPERATION AND MAINTENANCE PLAN

This is the operation and maintenance plan for the Kyler Run treatment system identified as LT-2 in the PL-566 LittleToby Creek Watershed Restoration Plan in Elk County, Pennsylvania. This water quality treatment structure is a class (a) structure which means that structure failure will not cause loss of life or serious damage to homes, buildings, utilities, highways or railroads.

The sponsors of this project are:

The Elk County Commissioners
Headwaters RC&D
Toby Creek Watershed Association
Elk County Conservation District

The sponsors are responsible for the structures covered in this plan. Although these structures were designed by the Natural Resources Conservation Service (NRCS) based on the best available knowledge, it must be recognized that the technology of passively treating acid mine water is relatively new. This structure was designed for a 25 year life span with minimal operation and maintenance inputs by the sponsors. However, in order for this structure to perform to its design capability, periodic inspection and maintenance is required to maximize performance.

This water treatment structure consists of constructed successive alkalinity producing systems (SAPS), anoxic limestone drains (ALDS), settling ponds, diversions, rock waterways, vegetated waterways, flow measurement devices, piping, water level control structures, valves, an access road, stream crossings, and permanent seeding.

These structures should be inspected after any major rain events, earthquakes, droughts, or other natural or manmade occurrences that may affect the performance of the structure; or, at a minimum, annually. The inspection shall be performed by a qualified registered engineer. A detailed inspection report that addresses all of the components listed on the attached inspection checklist after each inspection and distributed as follows: one copy for the sponsors and 3 copies for the local NRCS office. The reports are due immediately after inspection or on December 1 of each year for the annual inspection.

All materials used in repairing the structure shall be of equal quality or better, and at least the same size, thickness, etc. as shown on the "as-built plans" or as stated in the original specifications. The sponsors shall obtain prior NRCS approval for any repairs or modifications to the project

INSPECTION CHECKLIST

SAPS - The **two** successive alkalinity producing systems shall be maintained by flushing monthly for the first year, at approximately the same time each month. After the first year the flushing schedule will be evaluated and, if needed, adjusted to reflect the system flushing needs Prior to flushing the SAPS, the water elevation in the receiving settling basins shall be reduced by two feet. The drain shall be flushed for a period of time long enough for the water flowing from the drain to be clear.

Anoxic Limestone Drains – The **two** ALDS shall be maintained by flushing monthly for the first year, at approximately the same time each month. After the first year the flushing schedule will be evaluated and, if needed, adjusted to reflect the specific needs of this system. Prior to flushing the ALDS, the water elevation in the receiving settling basins shall be reduced by two feet. The drain shall be flushed for a period of time long enough for the discharge water flowing from the ALDS to be clear.

Settling Basins - The **two** settling basins shall be maintained by removing collected precipitate when the volume of the settling pond is reduced by one half. Inlet and out flow points shall be maintained so that they are stable, free flowing, and not eroding.

Wetlands – The **two** wetlands shall be maintained by assuring that the water control structures and the outlet pipes remain in a free flowing condition, that the rock splash pads at the end of the outlet pipes remain intact, and that the population of cattails covers approximately 75% of the surface area of each of the wetlands.

Diversion – The upslope diversion on the eastside of the treatment system consists of four sections; two of which are vegetated and two of which are rocked. These sections shall be maintained in a stable, non-eroding condition. The channel shall be kept free of any obstructions or debris that could restrict water flow.

Grassed Waterways – **Three** grassed waterways serve as outlets for the graded berms around the treatment components. The outlets for these grassed waterways consists of sections of grouted rock waterways. These waterways shall be maintained so that they are stable and not eroding. The channels shall be kept free of any obstructions or debris that restricts water flow in the channels.

Rock Waterways – The **eight** rock waterways that serve as outlets for the ALDS, SAPS settling basins, and the upslope diversions shall be maintained so that they are stable and not eroding. The channels shall be kept free of any obstructions or debris that could restrict water flow. Rock waterways that carry acid mine drainage shall be cleaned out when precipitate reduces the capacity of the channel by one half.

Piping - Piping within the structure shall be maintained by cleaning precipitate from the pipes if flow through the pipes is reduced by 25 percent.

Water Level Control Structures -.The **four** water level control structures located on the outlet pipes of both settling basins and both wetlands shall be maintained to assure that they are free flowing and not restricted by precipitate buildup or other debris. The end of each outlet pipe is protected by a rock splash pad that shall be maintained in a stable condition.

Valves – Valves used in the flushing maintenance of the systems shall be monitored and maintained so that free flow of water is obtained during flushing. They will also be monitored to assure that they close completely and no leakage occurs.

Flumes – The flumes located at the outlets of the two ALD's and the two SAP's will be used to measure and equalize flow through the treatment components. They shall be maintained in a free flowing condition and not restricted by precipitate build up or other debris. Under normal operating conditions, the inflow valves for the two ALD's and the two SAP's will be adjusted to result in an approximately equal flow through each of the four weirs. **However, maximum flow through each of the four weirs shall not exceed 300 gpm. The system is designed to by-pass total flows exceeding 1200gpm.**

Access Road - The access road shall be maintained so that the site can be easily accessed for maintenance and monitoring. The gate shall be kept locked so that unauthorized vehicular access is controlled.

Permanent Seeding - The permanent seeding on the site shall be limed, fertilized, and reseeded as necessary to maintain a stable, nonerosive ground cover on the site.

Monitoring - In order to assess the efficiency and performance of this system, water quality monitoring of each component of the system shall be completed according to the following schedule. The following water quality parameters shall be analyzed by an approved laboratory using standard chemical testing procedures.

Parameters - The following will be sampled:

pH
Acidity
Alkalinity
Total Iron
Ferrous Iron
Aluminum
Manganese
Sulfates
Specific Conductance

Samples will be collected at nine stations.

Sample #1 will be collected at the weir at the outlet of SAP # 1.

Sample #2 will be collected at the weir at the outlet of SAP # 2.

Sample #3 will be collected at the weir at the outlet of ALD # 1.

Sample #4 will be collected at the weir at the outlet of ALD # 2.

Sample # 5 will be collected at the water control structure at the outlet of Settling Basin # 1.

Sample # 6 will be collected at the water control structure at the outlet of Settling Basin # 2.

Sample # 7 will be collected at the end of the outlet pipe of wetland # 1.

Sample # 8 will be collected at the end of the outlet pipe of wetland # 2.

Sample # 9 will be collected from the sampling port near the mine opening.

Schedule For Sampling - Sampling will begin 3 months after the system begins discharging water from the final wetland. The nine sampling stations will be sampled monthly for the first year. The nine stations will be sampled every two months the second year. Following the second year, the nine sampling stations will then be sampled quarterly in January, April, July, and October of each year.

When collecting the samples as outlined above, flow measurements will be collected at the **four** weirs located at the outlets of both ALDS and both SAPS.

FLUSHING PROCEDURES

Table 1. Valve Positions, indicates the position the valves should be in for normal operation and during flushing.

1. Pull the stop logs in both settling basins to lower the water level two feet. Once the water level has been lowered, replace the stop logs before beginning the flushing operation.

2. Start with ADL # 1 and place the valves in the correct position for flushing. Flush until the discharge water is clear.

3. Proceed to ADL # 2, SAP's # 1, and SAP's # 2 and place the valves in the correct position for flushing. All four treatment components can be flushed simultaneously.

4. When the discharge from each of the four treatment components has cleared. Return the valves to the normal operation position.

5. The two ALD's have upper and lower pipe systems. After the first six months of operation, the upper pipe system in the both ALD's will be flushed separately before the regular flushing operation takes place. To flush the upper pipe systems:

   On ALD # 1, close valve 9 and open valve 8 and on ALD # 2, close valve 7 and open valve This procedure will allow water to flow directly through the upper pipe system in each ALD. If there are no signs of precipitate build up in the upper pipe system, NRCS will evaluate the possibility of lengthening or eliminating this flushing operation.

Table 1. Valve Positions

Valve #	Location	Valve Position	
		Normal Operation	During Flushing
8	ALD # 1, inflow on upper layer of pipe system	closed	open
15	ALD # 1, outflow on upper layer of pipe system	open	closed
9	ALD # 1, inflow on lower layer of pipe system	open	closed
14	ALD # 1, outflow on lower layer of pipe system	closed	open
6	ALD # 2, inflow on upper layer of pipe system	closed	open
13	ALD # 2, outflow of upper layer of pipe system	open	closed
7	ALD # 2, inflow of lower layer of pipe system	open	closed
12	ALD # 2, outflow of lower layer of pipe system	closed	closed
4	SAP # 1, inflow on upper layer of pipe system	closed	open
5	SAP # 1, inflow on lower layer of pipe system	open	closed
10	SAP # 1, outflow on lower layer of pipe system	closed	open
2	SAP # 2, inflow on upper layer of pipe system	closed	open
3	SAP # 2, inflow on lower layer of pipe system	open	closed
11	SAP # 2, outflow on lower layer of pipe system	closed	open
1	On the 12" line between the two manholes. This valve flushes the 12" pipe that carries the discharge under Kyler Run to the three treatment components on the other side. This valve should be opened for a few minutes or until the water runs clear each time the system is flushed. It should then be closed before rest of the system is flushed. If there is no sign of precipitate or sediment build up in this pipe NRCS will evaluate lengthening or eliminating this flushing operation.	closed	open

The attached plan view and cross section skematics of the ADLS and SAPS are provided as a reference.