

sent copy  
Eric  
Larry 3-11-09

**Reitz #1 AMD Passive Treatment Facility  
Shade Creek Watershed Association**

**FINAL  
OPERATION AND MAINTENANCE PLAN**

This is the operation and maintenance plan for the Reitz #1 Passive Treatment Facility of the Shade Creek Watershed Restoration Plan, in Somerset County, Pennsylvania. The structural components of the abandoned mine drainage treatment system are all class (a) structures, which means that structure failure will not cause loss of life or serious damage to homes, buildings, utilities, highways or railroads.

The sponsor of this project is the Shade Creek Watershed Association .

The sponsor is responsible for operation and maintenance of the structures covered in this plan. These structures were designed by the Pennsylvania Association of Conservation Districts (PACD) based on the best available knowledge. It must be recognized that the technology of passively treating acid mine water is relatively new. The structures were 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.

The water treatment system consists of an alkalinity producing vertical flow pond, settling basin, bioreactor, piping, water level control structures, control valves, 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 structures; or, at a minimum, every 3 months.

All materials used in repairing the structures 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 PACD approval for any repairs or modifications to the project.

## OPERATION AND MAINTENANCE CHECKLIST

**Vertical Flow Pond** - The alkalinity producing vertical flow pond shall be maintained by flushing quarterly for the first year. After the first year the flushing schedule will be evaluated and, if needed, adjusted to reflect the system flushing needs. Prior to flushing the Vertical Flow Pond, the water elevation in the receiving settling basin shall be reduced to the top of its existing outflow pipe. The drains shall be flushed for a period of time long enough for the discharge water flowing from the Vertical Flow Pond to be clear. Flushing shall be performed 2 times by opening the 2 valves on opposite sides of the Vertical Flow Pond.

**Sediment Basins** - The Settling Basin shall be maintained by removing collected precipitate when the volume of the pond has been reduced to the point where precipitates are passing through the basin, as determined by a visual inspection. Inlet and outlet channels shall be maintained so that they are stable, free flowing, and not eroding. A slurry pump may be used to empty the ponds, where the water level can not be regulated by means of a water level control structure or valve.

**Bioreactor** - The Bioreactor shall be maintained by replacing the bioreactor substrate material when it has been reduced in volume by half. The bioreactor shall also be monitored by checking sediment levels on top of the substrate. Precipitate shall be removed when the volume of the bioreactor has been reduced to the point where precipitates are passing through the bioreactor or causing water to build up and flow over the emergency spillway as determined by a visual inspection.

**Rock Waterways and Apron** - The various rock waterways and rock apron 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, as determined by a visual inspection.

**Piping** - Piping within the structures shall be maintained in a free-flowing condition and shall be cleaned out if plugging occurs or if the flow is reduced by 25 percent, as determined by monitoring the flow through the pipe weirs.

**Water Level Control Structures** - Water level control structures shall be maintained to assure that they are free flowing and not restricted by precipitate buildup or other debris.

**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.

**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. An approved laboratory, using standard chemical testing procedures, shall analyze the following water quality parameters:

- A. Flow Rate – to be read by measuring the height of water flowing over the stop logs in all water control structures and matching to the flow rates provided in the attached chart.
- B. Chemical Sample – **samples will be collected at five (5) stations**, as described below:

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

Sample #1 will be collected NEAREST THE INFLOW INLET BOX in the Vertical Flow Pond and shall be referred to as RAWWFP and have the code 4477001.

Sample #2 will be collected in THE WATER CONTROL STRUCTURE ON THE VERTICAL FLOW POND NEAREST THE STREAM and shall be referred to as VFPBOXSTREAM and have the code 4477002.

Sample #3 will be collected in THE WATER CONTROL STRUCTURE ON THE VERTICAL FLOW POND NEAREST THE WOODS and shall be referred to as VFPBOXWOODS and have the code 4477003.

Sample #4 will be collected at the OVERFLOW BERM BETWEEN THE SETTLING BASING AND BIOREACTOR and shall be referred to as WETBIO and have the code 4477004.

Sample #5 will be collected in THE WATER CONTROL STRUCTURE OF THE BIOREACTOR and shall be referred to as BIOOUT and have the code 4477005.

C. Schedule For Sampling - The five sampling stations will be sampled monthly for the first year. The six stations will be sampled every two months the second year. Following the second year, the six sampling stations will then be sampled quarterly in January, April, July, and October of each year. Sampling shall be done before any flushing procedures.

D. Piezometer Monitoring – The piezometer system was installed to measure the long term effects of changes in vertical and lateral pressure gradient across the system in both directions. Initial piezometer readings have been taken and recorded. Piezometer readings are taken by lowering a sounding device into the existing ports so that a depth reading can be measured to the nearest hundredth of a foot. The depth reading is only important relative to the initial readings and will diagnose short circuits and maintenance events for the system. Piezometer readings should be taken at a minimum once yearly for the first 2 years and a determination will be made for the scheduling of future readings. Piezometer readings should also be taken if the effluent water quality becomes degraded.

## FLUSHING PROCEDURES

- STEP 1: Open Settling Basin drain valve A\* and allow basin to drain to top of pipe. Once drained, close valve A.
- STEP 2: Open valves B and C of the Vertical Flow Pond. Allow the water to run until the flush water is clear. Once the water has cleared close valves B and C.
- STEP 3: Once the water level in the Settling Basin has risen to the original level, wait for a period of two days before proceeding to step 4.
- STEP 4: Repeat STEP #1.
- STEP 5: Open valves D and E of the Vertical Flow Pond. Allow the water to run until the flush water is clear. Once the water has cleared close valves.
- VALVE F - Opening Valve F will convert the system from a downflow system to an upflow system. This valve should only be opened with the approval of PACD or NRCS engineers. Its function is to provide relief should the top of the compost layer become plugged with metal precipitate.
- VALVE G - Opening Valve F will bypass all flow from the Vertical Flow Pond.

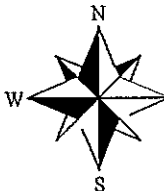
\* Please see attached map for valve locations

**Reitz #1 Water Control  
Structure Flow Rates**

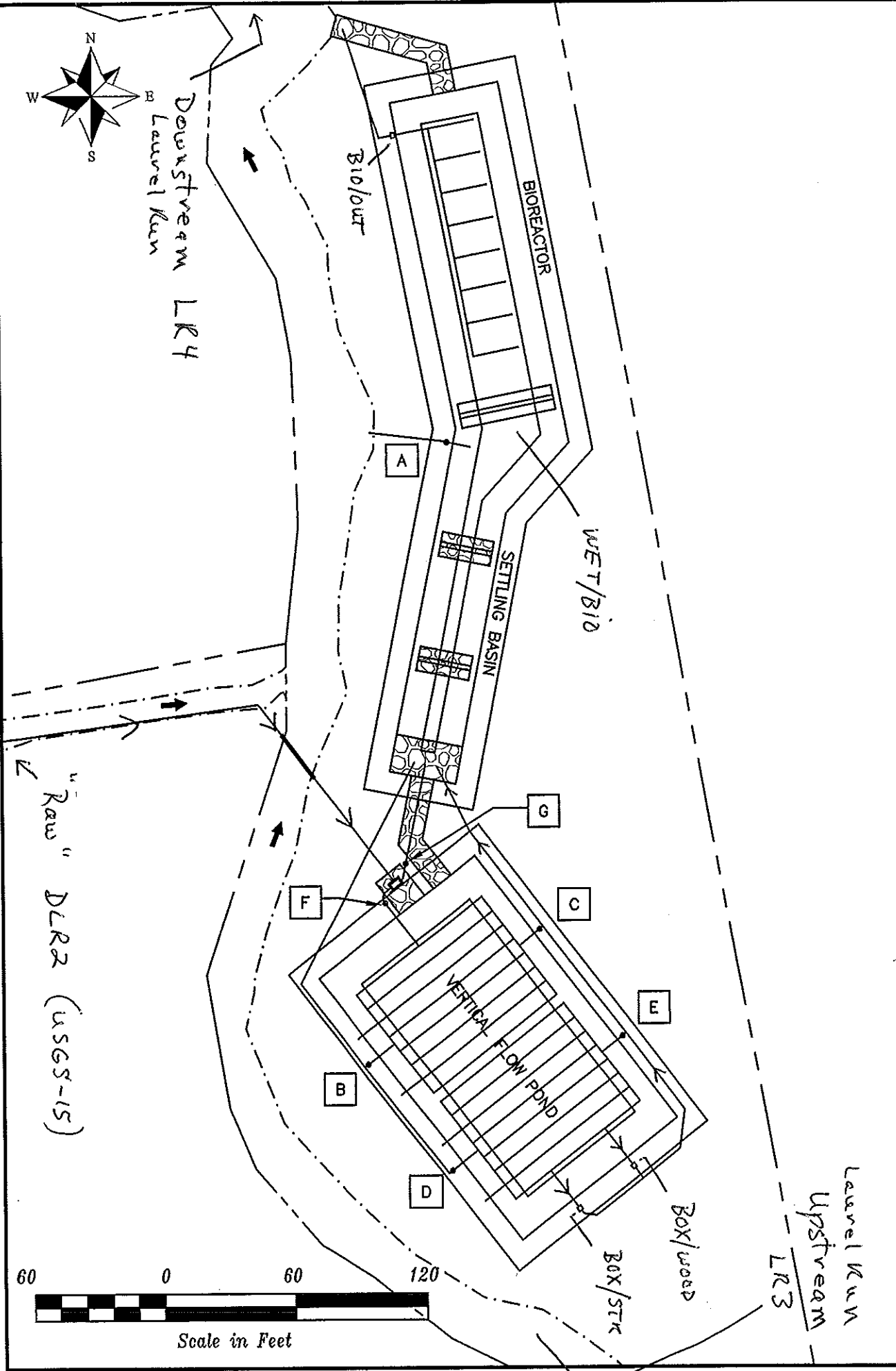
$$Q = 3.3 (L-0.2H) H^{1.5}$$

$$L = 0.83'$$

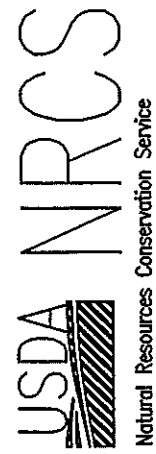
H (ft)	Q (GPM)	H (ft)	Q (GPM)
<b>0.00</b>	<b>0.0</b>	<b>0.25</b>	<b>144.4</b>
0.01	1.2	0.26	152.8
0.02	3.5	0.27	161.2
0.03	6.3	0.28	169.8
0.04	9.7	0.29	178.6
<b>0.05</b>	<b>13.6</b>	<b>0.30</b>	<b>187.4</b>
0.06	17.8	0.31	196.3
0.07	22.4	0.32	205.4
0.08	27.3	0.33	214.5
0.09	32.5	0.34	223.7
<b>0.10</b>	<b>37.9</b>	<b>0.35</b>	<b>233.1</b>
0.11	43.7	0.36	242.5
0.12	49.6	0.37	252.0
0.13	55.8	0.38	261.6
0.14	62.2	0.39	271.3
<b>0.15</b>	<b>68.8</b>	<b>0.40</b>	<b>281.0</b>
0.16	75.6	0.41	290.8
0.17	82.6	0.42	300.7
0.18	89.8	0.43	310.7
0.19	97.1	0.44	320.7
<b>0.20</b>	<b>104.6</b>	<b>0.45</b>	<b>330.8</b>
0.21	112.3	0.46	341.0
0.22	120.1	0.47	351.2
0.23	128.1	0.48	361.5
0.24	136.2	0.49	371.9
<b>0.25</b>	<b>144.4</b>	<b>0.50</b>	<b>382.2</b>



Downstream LK4  
at Laurel Run



Date _____ Approved by _____ Title _____	Date <u>02/07</u> Drawn <u>E. ROBERTSON</u> Revised _____ Checked _____
--	--



SHADE CREEK WATERSHED ASSOCIATION  
 RETZ #1 AND PASSIVE TREATMENT SYSTEM  
 SOMERSET COUNTY, PENNSYLVANIA  
 OPERATIONS & MAINTENANCE DRAWING

Project # _____ Date _____ Sheet # _____ of _____	O&M PLOT
---	----------