Fox Run Restoration Project - Phase I Operation and Maintenance Plan ME # 352997 Jackson Township, Mercer County, Pennsylvania

June 2005

Fox Run Restoration Project – Phase I

"A Pennsylvania Growing Greener Initiative"

OPERATION AND MAINTENANCE PLAN

June 2005

Jackson Twp., Mercer Co., PA

"A Public-Private Partnership Effort"

Brenner's Ecological Service Grove City College Urban Wetland Institute Kish Family Mercer County Conservation District Pennsylvania Department of Environmental Protection Quality Aggregates Inc. Quality Wetland Products Kosmic Signs & Designs BioMost, Inc. Stream Restoration Inc.

OPERATION AND MAINTENANCE PLAN

This is the Operation and Maintenance Plan for the Fox Run Restoration Project Phase I passive treatment system located on the Kish property in Jackson Township, Mercer County, PA. The passive system was installed along Fox Run, which is a tributary of Yellow Creek. The hydrologic order is Fox Run \rightarrow Yellow Creek \rightarrow Cool Spring Creek \rightarrow Neshannock Creek \rightarrow Shenango River. The passive treatment system consists of one collection channel, one settling pond, and one aerobic wetland.

The Mercer County Conservation District will be responsible for monitoring and minor maintenance of all structures in order for the passive treatment system to continue to function properly. Quality Aggregates Inc. has pledged a 5-year maintenance agreement for structural integrity of the constructed facility and site vegetation. This will expire in November 2009.

This AMD treatment system was designed, based on the best available knowledge and technology at the time, and implemented through a public-private partnership effort coordinated by the Mercer County Conservation District and Stream Restoration Inc. [non-profit]. Design of all structures focused on minimal operation and maintenance compared to conventional chemical treatment systems. As with any facility, periodic inspections and maintenance will help to guaranty optimum long-term effectiveness. This Operation and Maintenance Plan has been specifically designed and written for this site to be user friendly and easily implemented in order to encourage sustainability of the abandoned mine drainage treatment at Fox Run Phase I. Inspection report forms, site schematic, and location map have been provided in sheet protectors for ease in copying for field use.

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PASSIVE TREATMENT COMPONENT OVERVIEW

Passive systems use no electricity, require limited maintenance, and use environmentally friendly materials for treatment, such as limestone aggregate and spent mushroom compost. This provides a cost-effective alternative to the harsh chemicals typically used for conventional treatment of mine drainage. Passive systems can be designed to neutralize acidity and add alkalinity while providing an environment suitable for beneficial chemical reactions and biological activity to take place. Adding alkalinity encourages the metals dissolved in the mine drainage to form particulates, which are then retained in the channels, settling ponds and/or constructed, naturally functioning, wetlands. In some cases, there is sufficient alkalinity present within the discharge such that only settling ponds and wetlands are required. This is the case at the Fox Run Phase I passive treatment system.

There are several main types of passive treatment components that can be used, often in series, to treat degraded mine drainage. These components are chosen based upon the drainage characteristics (quality and flow rate), chemical or biological reaction preferred, and available construction space. The following is a brief description of the Fox Run Phase I passive treatment components.

Collection Channels serve to collect, intercept, and/or combine discharges and seeps as well as to convey water. These components also collect debris such as sticks and leaves as well as sediment and iron precipitates. There is one Collection Channel (Top Right Photo) at the Fox Run Phase I passive treatment system.

Settling Ponds and Wetlands are typically used in passive treatment systems to allow for the oxidation, precipitation, and accumulation of metal solids that occur when alkaline drainage issues from a minesite or after acidic drainage has passed through an alkalinitygenerating treatment component. Although many treatment wetlands are angular-shaped shallow ponds supporting predominantly cattails, the wetlands at Fox Run Phase I have been designed, built, and planted to look and function as a natural wetland with high species diversity that provides not only treatment but also exceptional wildlife habitat. There is one Settling Pond and one aerobic wetland (Bottom Right Photo) at the Fox Run Phase I passive treatment system. (One to two years are generally needed after planting for the wetlands to become well vegetated. The Fox Run Phase I wetlands were planted in June 2005.)





SITE SPECIFIC INSTRUCTIONS

All who will be involved in the operation of the site should have an understanding of, and the ability to perform, basic routine duties, such as site inspections that include evaluating channels, spillways and passive treatment components as well as water sampling and measuring flows.

PASSIVE TREATMENT SYSTEM O&M INSPECTION REPORT

To maintain the passive treatment facility, the site should be inspected periodically and after major precipitation events or other natural/manmade occurrences that may affect the performance or integrity of the structure. Regular site inspections should be conducted on a quarterly basis for the first two years after construction and twice a year thereafter. A qualified person should perform the inspection and complete the appropriate report. (See attached inspection report form.) The inspectors should keep the paper copy of the report in permanent files in chronological order at a specified location. The report data may be posted on-line via the website, <u>www.datashed.org</u>, which is provided by Stream Restoration Inc., a PA Non-Profit. "Datashed" is a GIS-enabled, user-friendly, on-line database that can easily serve as a valuable tool in the Operation and Maintenance of passive treatment systems.

The report should include the inspection date, the inspector's name, the organization with which the inspector is affiliated, and the start and end time of the actual inspection. The following sections correspond with the attached Passive Treatment System O&M Inspection Report.

A. Site Vegetation

Vegetation (i.e. groundcover) is extremely important to provide wildlife habitat and to prevent erosion. Erosion can carry sediment into streams resulting in turbidity and siltation. Sediment entering the passive treatment components can cause plugging or loss of capacity. During the inspection, overall condition of the site vegetation should be observed and numerically rated from 0 to 5. If significant areas are barren, describe the action needed as well as the location. Normal husbandry practices (such as fertilizing, removing unwanted species, etc.) should be implemented, as necessary, to maintain a stable non-erosive groundcover and viable wildlife habitat on the site.

Rating	Description	Recommended Action
0	Site barren	Revegetate as soon as practicable; temporary seeding, install staked straw/hay bales, filter fabric, etc. until stabilization with permanent seed mix
1	Site mostly barren. Only small isolated areas of vegetation	(Same as for "0" rating)
2	Large area(s) barren	Outline approximate area(s) on Site Schematic; revegetate as described for "0" rating
3	Revegetation spotty; erosion gullies present	Outline approximate area(s) on Site Schematic; on poorly vegetated areas, seed, mulch, apply soil amendments, as necessary; install staked straw/hay bales, rip-rap, etc. in gullies to control erosion
4	Successful vegetation >70% groundcover; few, isolated, minor erosion features or areas with <70% groundcover	Identify potential problem areas; note changes on future Inspection Reports
5	Successful vegetation >70% groundcover	No remedial action required

B. Access

Stabilized access is needed for the maintenance, monitoring, and any educational/outreach programs. THE FOX RUN PHASE I SITE IS LOCATED ALONG A BUSY AND DANGEROUS HIGHWAY (SR 62). <u>TAKE EXTREME CARE!!!!</u>

On the inspection sheet:

- <u>Paths passable (Yes or No):</u> Are fallen trees or debris blocking access? Are there significant erosion gullies present?
- <u>Maintenance needed:</u> Do portions need to be stabilized? If so, identify area on Site Schematic. Is machinery required to remove debris?

C. "Housekeeping"

The Fox Run Phase I passive system is located on private property owned by the Kish Family. They have allowed this facility to be constructed on their property in order to help restore Fox Run. Please collect any litter you see during your inspection and dispose of it properly. Do not touch anything that you feel may be dangerous (such as, broken glass) or hazardous. Note these items and their location as a comment in the inspection report. Also report if the project or interpretive signs have been damaged by vandalism or other causes.

D. Vandalism

Please record any type of vandalism and evidence of trespassing on the inspection report. Note any damage to the passive treatment system. Also report any damage to the project sign and interpretative signs and constructed wildlife habitat, such as wood duck boxes.

E. Diversion Ditch and Spillways

All diversion ditches and spillways should be inspected and maintained to minimize erosion and insure proper water handling. The channels should be kept free of obstructions/debris that would restrict water flow. Any debris/obstructions should be removed. Vegetation should also be removed from spillways if it is causing significant water level increase in the component that it drains. If disturbed or eroded areas are present, then these areas should be stabilized as soon as possible with riprap or noninvasive plant species. Channels or ditches that carry mine drainage should be cleaned out when precipitate reduces the capacity by one half. Particular attention should be paid to the stability of rock-lined channels and spillways to assure that the rock lining is intact.

On the inspection sheet, for each identified channel or spillway note:

- <u>Significant erosion present (Yes or No)</u>: Is the riprap or vegetative lining impaired or absent? Has the berm been overtopped and/or breached? Is there significant sedimentation as a result of erosion?
- <u>Significant debris present (Yes or No)</u>: Are there tree limbs, leaves, trash, etc. that would "dam" the water in the diversion ditches and collection channels? Are there vegetation and/or debris in the riprap-lined spillways that would cause the water level to rise in the passive components?
- <u>Maintenance performed:</u> Have the plants been removed from the riprap-lined spillways? (Removal of plants from riprap-lined spillways on a regular basis as part of "general housekeeping" prevents overtopping of berms and loss of function of the facility.) Have tree limbs, leaves, trash, etc. been removed? Has the erosion been addressed (rocks

placed in erosion features; sediment cleaned from ditches, dirt placed and compacted on berms of ditches and channels, etc.)?

• <u>Maintenance Remaining</u>: Describe additional maintenance needed. Indicate areas for additional maintenance on the Site Schematic.

F. Passive Treatment System Components

The Collection Channel, Settling Pond, and Wetland need to be inspected for erosion, berm (slope) stability, vegetation, siltation, leaks, etc. Any problem should be noted and corrected as soon as practicable.

Water inlet areas for all structures should be observed during each site inspection and kept free from sediment, leaves, and any other foreign objects. This is important for the efficient operation of the system. Any debris present in the water inlet areas should be removed. All flow control structures should be maintained to assure that they are free flowing and not restricted.

During inspections, the condition of the vegetation and the presence of any disturbed or eroded areas should be noted. These areas will need to be stabilized as soon as possible with staked straw/hay bales, riprap, plantings with accepted species, etc., whichever is appropriate.

On the inspection sheet for each identified passive treatment component note as applicable:

- <u>Significant erosion present (Yes or No)</u>: Are there erosion gullies on the inside and outside berms?
- <u>Features relating to berm condition (Yes or No)</u>: Are the berms stable? Is any slumping noted? Are there erosion gullies on the inside or outside of the berms? Are there tension cracks on top of the berms? Are there significant areas on the inside and outside berms that need to be revegetated? Overall does the vegetation appear healthy?
- <u>Successful vegetation (Yes or No):</u> Are there significant areas on the inside and outside berms that need to be revegetated? Overall does the vegetation appear healthy?
- <u>Significant siltation/sedimentation present (Yes or No)</u>: Is there significant sediment from erosion of berms or upland areas accumulating in the passive component?
- <u>Significant change in water level:</u> Is the water level rising or lowering in the passive component? Is the water level appropriate? Is there evidence of water overtopping the berm? Is there evidence of water escaping the channels?
- <u>Maintenance required:</u> Do portions of the berms need to be stabilized with riprap and/or reconstructed? Does supplemental reseeding and mulching need to be completed? Do any passive components need to be cleaned of sediment or debris? Is there vandalism?

G. Wildlife Utilization

Wildlife habitat and utilization should be considered. If, however, during inspections, signs of damage are noted, as a result of wildlife, appropriate steps should be taken to continue the function of the passive system and general site restoration. Significant damage needs to be corrected by repairing berms, removing invasive species, replanting, as well as hunting and trapping if necessary (contact PA Game Commission).

On the inspection sheet:

• <u>Animals observed:</u> Although not an inventory, please record whether there were tracks or visual observations of wildlife utilizing the site. Describe any damage observed.

• <u>Invasive plants observed:</u> If invasive or undesirable plants are observed, please note and remove as soon as practicable.

H. Field Water Monitoring and Sample Collection

In order to assess the efficiency and performance of this system and the impact to Fox Run, field tests should be completed including flow rate of passive system final effluent, pH, temperature, alkalinity, and dissolved iron. Water samples, to confirm field analyses, may also be taken and analyzed by the PA State Lab or other approved laboratory using standard chemical testing procedures for pH, alkalinity, acidity, total iron, dissolved iron, total manganese, dissolved manganese, sulfates, and total suspended solids. Field testing is recommended to be completed quarterly or biannually, with confirming lab tests conducted when possible.

Water sampling and field testing at the following locations will enable evaluation of the degree of success of the passive components, individually and combined, in treating the mine drainage:

- 1. 87-7 (Raw)
- 2. Collection Channel
- 3. Settling Pond (87 SP)
- 4. Wetland (87 WL)
- 5. Fox Up (Fox Run Upstream)
- 6. Fox Dn (Fox Run Downstream)

The monitoring program should include points other than the final effluent in order to provide a complete description of the water quality through the passive treatment complex at the time of sampling. For instance, the untreated raw mine water (as close to the source as possible), each component (at the effluent), and the stream (above and below the system) should be monitored. Monitoring point locations are identified on the O&M Inspection Sheet and site schematic.

When collecting samples and/or conducting site inspections, flow rates should be measured. Currently there is no method available to monitor flows within the system. It is recommended that a pipe, weir or flume be installed to monitor flow rates and calculate loadings. This plan should then be modified to include specific directions on how to conduct flow measurements.

In order to conduct laboratory analyses for pH, alkalinity, acidity, sulfates, conductivity, and total suspended solids, a 500-ml (or other specified volume), unfiltered, sample should be collected, stored in a cooler, and transported to the laboratory. To differentiate between dissolved and total metal concentrations, the laboratory requires two, 125-ml (or other specified volume) samples that are preserved with trace metal-grade nitric acid to ensure that the pH is <2. The sample for total metals is not filtered. The sample for dissolved metals is filtered using a 0.45-µm filter in the field prior to placing the sample in the bottle. Each bottle should be labeled with a unique number.

A record of every sample taken should be made directly on the inspection sheet. Information such as sampler's name, sample location, sample date, flow rate, field tests, and sample bottle identification will be written on the inspection sheet. Pertinent information is then transferred from the inspection sheets to the laboratory's Record of Sample form or Chain of Custody form.

On the inspection sheet for each Sampling Point complete the following:

• Monitoring point field measurements recorded:

Parameter	Method
Flow	Cross-Section, weir/flume, or
FIOW	bucket & stopwatch, where appropriate
pH	HACH pH kit, pH meter, etc.
Temperature	Field thermometer, pH meter, etc.
Alkalinity	HACH Digital Titrator, etc.
Iron	HACH iron kit, etc.
Dissolved Oxygen (optional)	HACH DO kit, DO meter, etc.

Record readings to nearest whole number, except pH (record to nearest tenth). If the discharge is not piped at the monitoring point, a weir or flume may be installed. Stream flow is generally measured by cross-section. This procedure is to be described by personnel of the Mercer County Conservation District in order to conform with available equipment.

- <u>Sample bottle data:</u> If water samples are collected, assign and record bottle numbers on the inspection sheet. You will need to transfer this information to the laboratory's Record of Sample or Chain of Custody form.
- <u>Comments:</u> Observations such as color of the sample or other information may be recorded in the "Comments" column.

I. Sludge Accumulation

While not necessary to complete an actual sludge accumulation report, one has been provided for use if desired. It is recommended that a sludge accumulation inspection be completed every year or every other year. The primary purpose of this inspection is to assess the type and amount of sludge that is accumulating within the passive treatment components. This can give an indication as to how the system is functioning and when action is needed to remove the sludge from the component.

Items of interest to consider when conducting the inspection could include:

- Color and depth (estimated) of the sludge. Typically, white, red, and black colors indicate precipitate rich in aluminum, iron, and manganese, respectively.
- Has the sludge filled the component to within 2 feet of the total berm height?
- Is there significant organic debris in the sludge?

J. Schematic

A site schematic has been provided to orient the inspector to the site and is keyed to the various sections of the inspection report. The schematic can also be used to identify specific locations where maintenance is needed. This is particularly valuable for locations within the site that do not already have a specific identified name and location. For instance, if a section of the site was not well vegetated and experiencing erosion, that area could be circled on the schematic and then a copy or fax could be provided to the person(s) responsible for addressing the issue.

ANNUAL WETLAND PLANT DIVERSITY REPORT

It is also recommended that an Annual Wetland Plant Diversity Report be completed once a year. The primary purpose of this report is to assess the diversity of plant species within the constructed treatment wetlands in order to determine if species diversity is increasing or decreasing. Species diversity is believed to increase the health, productivity, and treatment capability of the wetland. In addition, increased plant species diversity should result in an increase in wildlife diversity. A secondary purpose is to identify if unwanted invasive plants have become established. These plants should be removed from the wetlands.

On the report provide the common name and/or scientific name for each plant, the plot number, the location of the plot, and the population within that plot.

MISCELLANEOUS MAINTENANCE CONSIDERATIONS

All materials used in repairs should be of equal or better quality and have the same capacity and function as shown on the "As-Built" plans.

Removal and disposal of accumulated precipitate or sediment

Precipitates from chemical reactions and other solids will be retained within passive treatment components such as the Collection Channel, Settling Pond, and Wetland. This sludge should be removed when the storage volume of the component is reduced by one half. Inlet and outlets should be kept clear of debris and obstructions. Sludge removal is planned for every fifteen years or as desired. Opportunities may be available to utilize the sludge for metal recovery or the sludge may be allowed to drain/dewater for burial on-site. (An Erosion and Sediment Pollution Control Plan should be completed for the placement area.)

REPLACEMENT

Sizing of components and sludge storage capacity for a projected design life of 25 years were based upon data collected by the Mercer County Conservation District Fox Run Watershed Abandoned Mine Drainage Survey. Higher flow rates and poorer water quality can substantially affect the design life. While there is no treatment media that will need to be replaced, accumulated sludge will need to be removed and organic matter may need to be added. Additional plantings may be necessary. At the time of sludge removal, advances in technology and changes in raw drainage quality and quantity should be considered to determine if revisions to the size and/or design of the system would be advantageous. Replacement considerations include:

- Estimating Best Management Practice (BMP) design life;
- Determining replacement responsibility, including a successor, as necessary;
- Determining approximate costs for the following possible needs:
 - o removing accumulated sediments;
 - o re-sizing the system to accommodate changed water quality or quantity;
 - o recharging organic matter in wetlands;



LOCATION MAP - USGS 7.5' JACKSON CENTER, PA (PR1970) AND USGS 7.5' SANDY LAKE, PA (PR1970) FOX RUN RESTORATION PROJECT - PHASE I Jackson Township, Butler County, PA

Stream Restoration Incorporated June 2005, Scale 1" = 2000'

Approximate Center of Project (deg-min-sec) 41-18-03 latitude 80-07-19 longitude

2000	1000	U	2000
2000	1000	0	2000



PASSIVE TREATMENT SYSTEM O&M INSPECTION REPORT

Inspection Date:			Project Name:	Fox Run Rest	oration Project- Phase	e I
Inspected by:			Municipality:	Jackson Tow	nship	
Organization:			County:	Mercer		State: PA
Time Start:	End:		Project Coordina	ates:	41° 17′ 47″ Lat	80° 07' 34" Long
Receiving Stream:	Fox Run		Subwatershed:	Yellow Creek	Watershed:	Cool Spring Creek
Weather (circle one): Is maintenance require	Snow Heavy Rain d? Yes/No If yes, pro	Rain vide expl	Light Rain Overc	ast Fair/Sunny	Temp(°F): #32	33-40 41-50 51-60 60+

INSPECTION SUMMARY

A. Site Vegetation (Uplands and Associated Slopes)

Overall condition of vegetation on site: 0 1 2 3 4 5

(0=poor, 5=excellent, circle one) (See instructions.)

Is any reseeding required? Yes/No If yes, describe area size and identify location on Site Schematic:

B. Access

Is the access road accessible for operation and monitoring? Yes No No Does the access need maintenance? Yes No Describe maintenance performed and remaining (Identify location on Site Schematic.):

C. "Housekeeping"

Is there litter along the road? Yes □ No □	Is there litter around or in the passive system? Yes \Box No \Box
Is there litter that may be considered hazardou	s or dangerous that requires special disposal? Yes 🗌 No 🗌
Additional comments:	

D. Vandalism

Is there any defacing or damage to signs?	Yes 🗌 No 🗌	Have trees been cut?	Yes 🗌	No 🗌
Additional comments:				

E. Diversion Ditch and Spillways

Channel Identification	Significant Erosion (Y/N)	Debris Present (Y/N)	Maintenance Performed (Y/N)	Maintenance Performed and Remaining (Indicate ditch by number i.e. 2b = Settling Pond Outlet)
1. Upland Diversion Ditch				
2. Rock-Lined Spillways				
a. Level Spreader (SP Outlet)				
b. Wetland Outlet				

F. Passive Treatment System Components

Component	Significant Erosion (Y/N)	Berms Stable (Y/N)	Vegetation Successful (Y/N)	Siltation Significant (Y/N)	Water Level Change (Y/N)	Maintenance Performed and Remaining Indicate which component i.e. Settling Pond
Collection						
Channel						
Settling						
Pond						
Wetland						

G. Wildlife Utilization

Animal sighted or tracks observed: _

H. Field Water Monitoring and Sample Collection - Raw water sample locations as marked on plan. For passive components sample effluent.

Sampling	Fl Measur	ow rements	ated gpm)		(°C)))	ng/L)	(J/gr mg/L)	Comments	#	# netals)	# metals)
Point	gals	sec.	Calcul Flow (Hd	Temp	Alkalir (mg/L)	DO (n	Iron (Bottle	Bottle (total n	Bottle (diss.
Discharge (87-7)												
Collection Channel												
Settling Pond (87 SP)												
Wetland (87 WL)												
Fox Run Up												
Fox Run Down												

I. Sludge Accumulation

J.

- Not monitored

Component	Sludge Accumulation (within 1-2' of Spillway Y/N*)	Sludge Description	Comments
Collection Channel			
Settling Pond			
Wetland*			

*Note: The sludge accumulation in the Wetland may exceed the crest of the spillway as vegetation continues to grow in accumulated precipitates and helps to stabilize the sludge. In this case the sludge may continue to accumulate to within about 2' of the total berm height.



WETLAND PLANT DIVERSITY REPORT

Inspection Date:		Project Name:	Fox Run Restorat	tion Project– Phase I	
Inspected by:		Municipality:	Jackson Townshi	ip	
Organization:		County:	Mercer		State: PA
Time Start:	End:	Project Coordina	tes: 41°	17' 47" Lat	80° 07' 34" Long
Receiving Stream:	Fox Run	Subwatershed:	Yellow Creek	Watershed:	Cool Spring Creek

Weather (circle one): Snow Heavy Rain Rain Light Rain Overcast Fair/Sunny Temp(°F): #32 33-40 41-50 51-60 60+ Wetland:

Common Name	Scientific Name	Plot #	Plot Location	Number

6/2005