Operation, Maintenance, and Replacement Plan

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DEVELOPED BY:
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Introduction

This Operation and Maintenance Plan oversees the surveillance and maintenance needs for the Mountain Watershed Association's projects and facilities in order to ensure routine inspections and monitoring of all project sites. In addition, it establishes a generalized timeline and coordinates sampling, monitoring, inspection, and maintenance activities. Routine maintenance and monitoring are essential and contribute to the effectiveness of each project as well as determination of the efficiency of each system.

The Mountain Watershed Association (MWA) was formed in 1994 in response to a deep mine proposal in the Indian Creek Watershed. After the proposal was defeated, citizens joined together to form an organization dedicated to cleaning up contaminated water and dangerous sites from years of poor mining practices in the watershed. MWA is concerned with the conservation, restoration and protection of the Indian Creek Watershed in Westmoreland and Fayette Counties, Pennsylvania. In 2003, MWA partnered with the international Waterkeeper Alliance to create the Youghiogheny Riverkeeper, a program of MWA, and has since expanded the organization's vision into the larger Youghiogheny River watershed.

MWA's major purposes include bringing about remediation of the numerous abandoned mine discharges resulting from over 125 years of mining in the Indian Creek Watershed, developing community awareness, promoting cooperative community efforts for remediation and encouraging sound environmental practices and informed stewardship decisions.

Since its inception, MWA has completed a variety of projects, including abandoned mine treatment systems, streambank stabilization projects, and the Indian Creek Valley Trail. These projects have dramatically improved the water quality, quality of life and recreational opportunities within the Indian Creek.

I. Safety Protocol

Field research and data collection are an integral part of the operation and maintenance of watershed projects; however, safety in the field is the first priority. During field work activities staff and/or volunteers can encounter physical and biological hazards. Recognizing the potential hazards associated with field work can help to prevent injuries and illnesses and result in successful data collection. These guidelines are intended to prevent illness and injury associated with fieldwork; however, in addition to these established protocols common sense should be exercised.

A. Emergency Communication and Coordination

Being aware of what to do and who to contact during an emergency situation can have life altering results. Staff and volunteers conducting field work should be aware of the potential hazards and who to contact in the event of an emergency. A list of emergency center contacts is located in the first aid kit. If an injury occurs, first aid should be sought immediately or as soon as possible. All injuries and emergencies should be reported to the MWA office once the urgency of the event is abated.

As a preventative measure field work should be conducted with at least two staff members and/or volunteers when applicable. A field itinerary identifying which staff member(s) will be conducting field work, where she/he is going, and an expected return time should be maintained at the MWA office. In addition, staff members should carry a cell phone while conducting field work. In the event that staff members must do field work alone, a mid-day check-in is required in order to maximize safety.

B. Motor Vehicle Safety

All motorized vehicle travel is conducted utilizing personal vehicles. Drivers must have a valid Pennsylvania Driver's license and carry Pennsylvania state minimum insurance for property damage and personal liability. Vehicle load limits and safety precautions such as having a seat belt for each passenger should be adhered to in addition to all highway and local by-laws, rules, and regulations. Drivers should use common sense and should operate their vehicles in a conservative manner.

C. Field Apparel & Gear

Staff and volunteers engaged in field work activities are required to wear long pants and boots. In some instances hip waders or chest waders may be required depending on the nature of the field work. Anyone engaged in field work activities should wear highly visible clothing and personal protection equipment for the job, using appropriate tools and equipment. During the hunting season highly visible clothing such as an orange vest and/or hat must be worn so that staff or volunteers are visible.

A fully stocked first aid kit is required to be taken anytime staff members conduct field work. In addition, a cell phone should be available for use for emergencies or to report back to the office.

Precautions should be taken to prevent injuries and illness while conducting field work. Bug repellant and sunscreen are provided for use during field activities. Wasp and hornet spray is also provided and staff should be aware when opening control boxes, gates, and other devices where stinging or biting insects may be nesting or hiding.

D. Storage and Use of Acids

Daily operations for field data collection may require the handling of acids or other potentially hazardous chemicals. Water samples taken in collaboration with the Pennsylvania Department of Environmental Protection (DEP) require the addition of HNO_3 and HCl. The preservation of macroinvertebrates collected in the field requires the use of Ethanol, also known as Ethyl alcohol. Preparation of these materials may be required and good sense should be utilized when handling or storing the chemicals. Material Safety Data Sheets (MSDS) are available for all chemicals used for water sampling and macroinvertebrates preservation in the MWA office.

1. **HNO_3 & HCl**

   For the storage and handling of HNO_3 and HCl, precautions must be taken to store the acids in a cool ventilated area in tightly sealed containers away from heat and ignition sources as both are highly combustible. Small spills should be cleaned up with a mop and water to dilute the acid. Both acids are corrosive and poisonous. Large spills should be absorbed using dry earth or sand. Both acids can be neutralized with sodium carbonate, which is kept in the office in case of emergency. Contact the appropriate organization for assistance with disposal of the waste.

   When handling the acids, avoid contact with skin and eyes. Skin contact can cause irritation or burns. If skin is exposed to either of the acids, rinse skin with water for 15 minutes and remove any contaminated clothing. For minor skin irritation, a disinfectant soap may be used and an anti-bacterial cream should be applied. In case of eye contact, remove contacts and flush with water for at least 15 minutes. Do not ingest. For cases of ingestion, do not induce vomiting. Use only in a well-ventilated area and if breathing becomes difficult move to an open area with fresh air. In case of severe exposure, difficulty breathing, or ingestion seek medical attention immediately.

2. **Ethanol 95% Completely Denatured**

   Ethanol, also known as Ethyl alcohol, needs to be stored in a tightly closed container in a cool, well-ventilated area. Keep away from oxidizing agents and strong acids. Spills should be handled by ventilating the area and removing any potential ignition or heat sources. Any non-essential personnel should exit the area until the air has cleared. Clean-up personnel should wear protective equipment and clothing to reduce the risk of exposure. Large spills should be cleaned with an absorbent material and disposed of properly.

   Exposure to ethanol fumes can irritate eyes and the respiratory system. Proper ventilation is necessary. Direct contact with skin should be flushed with plenty of water. In case of contact with eyes, remove contacts and rinse immediately then seek medical attention. If swallowed, do not induce vomiting. In case of severe exposure or ingestion, seek medical attention immediately.

E. Environmental Hazards

1. **Insect Stings**

   Treatment of insect stings should be administered as soon as possible. Generic medication for insect stings should be included in the field first aid kit. Anyone who is knowingly allergic to insect stings is required to carry their specific medication, notify those accompanying them of their allergy, and should seek medical assistance after being stung.

2. **Snake Bites**

   Care should be taken to identify and avoid poisonous snakes in the field. If bitten, immediately seek emergency medical attention.

3. **Poisonous Plants**
   Participants should be aware of what poisonous plants are commonly found in the area and should avoid them. This precaution includes plants that can cause contact dermatitis (poison ivy, poison oak, poison sumac, stinging nettle) and plants that might be poisonous upon ingestion.

4. **Ticks**
   Tick-borne diseases are a serious threat to individuals conducting field work. After working in the field, participants should inspect their entire body carefully and remove any ticks found. It is a good idea to document the date if a tick is found firmly attached and keep the specimen in an airtight container. This information can be used in the event that symptoms, such as fever, joint aches, swollen glands, or reddish flushing of skin, occur in the weeks following a tick bite. If symptoms appear medical treatment should be sought.

   In addition, participants should attempt to avoid tick contact by tucking and taping pant legs, using repellents, and conducting frequent tick checks. This applies to all seasons due to the increase in the presence of ticks even in the winter.

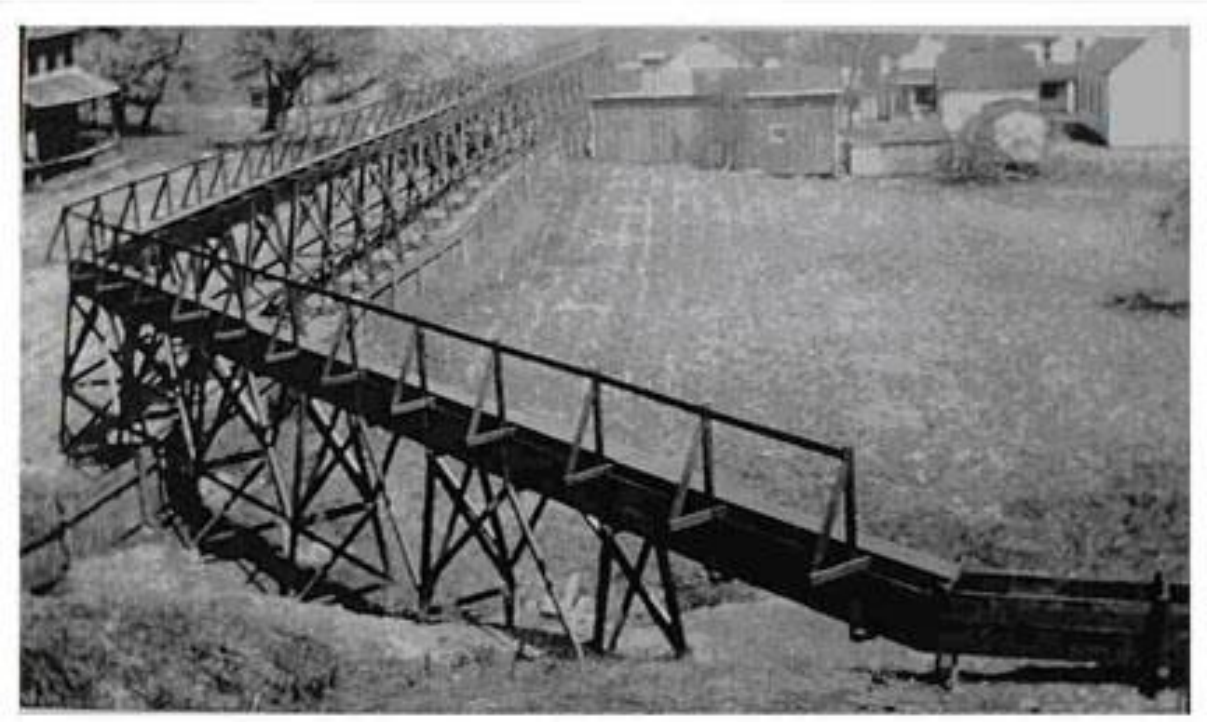
5. **Weather Related Illnesses**
   Depending on the season when field work is conducted a variety of weather-related illnesses could occur. Participants must be aware of these potential threats and seek to reduce the risks associated with them. For example, sunscreen should be utilized to prevent sunburn; lots of water should be consumed to avoid dehydration. Other potentially serious illnesses from weather include frostbite, hypothermia, heat exhaustion, and heat stroke. Field technicians and volunteers should be aware of, or briefed on, the possible problems and the symptoms so that corrective measures can be taken.

II. General History

Underground coal mining began in the Indian Creek valley in the mid to late 19th century and continued until the late 1960s. These mines were developed on the Middle Kittanning coal seam—known locally as the Miller B Coal—adjacent to the Indian Creek and Champion Creek valleys. With few exceptions, underground mines were developed up-dip to facilitate drainage, a practice that resulted in mines discharging into the local waterways.

Abandoned mine drainage (AMD) problems were prevalent early on during mine development and have continued through the present. As early as 1924, Melcroft Coal Company and other mining companies were enjoined and restrained from allowing AMD discharges into the upper Indian Creek watershed by the Fayette County Court of Common Pleas. The order resulted from a lawsuit brought against the various coal companies by the Pennsylvania Railroad and several private water companies. The lawsuit claimed that the mines were causing pollution downstream of the Mill Run Reservoir. In order to comply with the court ruling, the mining companies constructed a mine drainage "flume" to collect and convey mine drainage to a point downstream of the reservoir. The system was over seven

miles in length and utilized piping to provide connections to existing mine workings. The flume system discharged below the reservoir into Charles Run, a tributary of Indian Creek, near Normalville.



During the mid-1970s the flume system began to malfunction as a result of deterioration, plugging, and lack of any significant maintenance. AMD from these abandoned mines began to enter the main channel of Indian Creek at the down-dip mine entries or as coal cropline discharges. The majority of the discharges enter between the villages of Melcroft and Indian Head, where the axis of the Ohiopyle-Ligonier Syncline crosses the Indian Creek valley. Flow rates and corresponding pollution loads vary. In addition to abandoned underground mining AMD sources, several forfeited abandoned surface mine sites also contribute significant pollution loads to Indian Creek and its tributaries.

III. Mine Drainage Treatment Projects

A. KALP AMD Treatment System, aka Anna and Steve Gdosky Indian Creek Restoration Project

Prior to construction, approximately 184 million gallons of mine water were discharged into Indian Creek annually from the abandoned Melcroft #1 underground mine at a site known as the Kalp discharge. Annually this discharge deposited 38.5 tons of iron into Indian Creek and was responsible for 42 percent of the acid load and 31 percent of the iron load for the entire Indian Creek watershed.

Construction began in 2004. In-seam directional drilling was utilized to relocate the original discharge to an alternative location for passive treatment. Bore holes were drilled perpendicularly to the coal outcrop in order to capture the mine water. Valves were installed to adjust flow. Approximately 30 feet of the mine pool was gradually drawn down, which eliminated the discharge coming out of the Melcroft #1 mine opening. This enabled capture of the mine water at a lower elevation, facilitating dewatering of numerous seeps and smaller discharges along Route 711S.

The Kalp discharge is captured in a water control structure and then piped 1,600 feet to the treatment area. The Successive Alkalinity Producing (SAP) system utilizes alkalinity from limestone to neutralize the acid in the water which raises the pH. The water is collected and directed into up-flow wetland #1 where it passes through a limestone sediment basin where it is diverted through a series of baffles designed to precipitate additional metals out. The discharge then flows into two parallel settling basins allowing the remaining iron and aluminum to precipitate and settle out. The treated water flows through the wetlands to a polishing pond, where additional metals precipitate out before the water is ultimately released back into the stream.

In 2012, a design flaw was discovered when the treatment system became clogged. During the initial drilling only the first 60 feet of the bore holes were cased. The uncased portions collapsed which restricted the flow of water into the treatment system. This caused the mine pool to back up and then discharge out of the system through the original Melcroft #1 mine opening. Early in 2013, the project site was declared an emergency by Pennsylvania Department of Environmental Protection. The directional drilling was redone and stainless steel casing was installed all the way into the mine pool. The mine pool was again dewatered to an elevation at which the treatment system could function properly.

1. **Location**

   The treatment system is located along Route 711 approximately one mile south of Melcroft, the Kalp discharge flows from the Melcroft #1 mine pool, is collected into two tunnels emptying into a manhole on the west side of Route 711S, where it is then directed under the road, through the treatment system and into Indian Creek.

   Direction: From the Mountain Watershed Association office, turn left onto Route 711 south and proceed approximately one mile. The treatment system is located on the left.

2. **Cost**

The treatment system cost over $3.4 million. Construction activities accounted for $2.1 million. Funding for this phase included a 2004 Pennsylvania Department of Environmental Protection Growing Greener grant in the amount of $1.6 million. This was secured from the Bureau of Abandoned Mine Reclamation from monies received from the Federal Office of Surface Mining. Another $519,000 was from the U.S Department of Agriculture Natural Resources Conservation Services' Public Law 566 program.

An additional $1.2 million was spent to conduct an assessment, drilling, chemical treatment, acquiring land, and design prior to starting construction activities. Pennsylvania Department of Environmental Protection, Office of Surface Mining, Natural Resources Conservation Service and private foundations, including Western Pennsylvania Watershed Program (now the Foundation for Pennsylvania Watersheds) and the Anna and Joseph Garnter Foundation provided these funds.

The estimated annual operation and maintenance cost associated with the Kalp Treatment System is $24,242.10. See Table IV-1 for specific costs. However, if the treatment system needed to be replaced it is estimated that it would cost approximately $3.6 million. The estimated replacement cost was calculated using original construction cost adjusted for inflation as of 2012 and multiplied by 1.5 and then subtracted out the annual operation and maintenance cost.

3. **Partnerships and Responsibilities**

Mountain Watershed Association, Fayette County Conservation District, and Fayette County Commissioners sponsored the project. The Pennsylvania Department of Environmental Protection and United States Department of Agriculture Natural Resources Conservation Service (NRCS) were instrumental in the development of this treatment system. The Foundation for Pennsylvania Watersheds also provided guidance and funding for the project.

Mountain Watershed Association is responsible for the stewardship of the site including operation and maintenance of the treatment system. Water quality samples and routine system flushing are conducted bi-monthly. Mountain Watershed Association has an agreement with Saltlick Township to maintain the access road and to conduct mowing.

Macroinvertebrate sampling using a Surber sampler at IC5 just below the Sagamore Bridge

4. **System Inspections**

System inspections occur quarterly at the treatment system and following any major rain events, earthquake, drought, or other natural or manmade occurrence that may affect the performance of the structures. The elevation of the mine pool is also monitored weekly. A copy of the inspection form is attached in the appendix.

TABLE III-1

	Mileage Costs				Staff Costs					Contractual Costs			
Routine Maintenance	Miles	Rate	Frequency	Cost	Hrs.	# Staff	Frequency	Rate	Staff Cost	Rate	Hrs./Qty.	Total Cost	**TOTAL COST**
Monthly up flow pond flushing	8	$0.565	12	$54.24	1	1	12	$25.00	$300.00				$354.24
Bi-monthly system flushing	8	$0.565	6	$27.12	4	2	6	$25.00	$1,200.00				$1,227.12
Quarterly water sampling	33	$0.565	4	$74.58	2	2	4	$25.00	$400.00	300	48	$14,400.00	$14,874.58
Quarterly site inspections	5	$0.565	4	$11.30	0.5	1	4	$25.00	$50.00				$61.30
Quarterly mine pool elevation check	5	$0.565	4	$11.30	0.5	1	4	$25.00	$50.00				$61.30
Bi-annual Macroinvertebrate sampling	8	$0.565	2	$9.04	4	2	2	$25.00	$400.00				$409.04
Bi-annual Macroinvertebrate identification & analysis					48	1	2	$25.00	$2,400.00				$2,400.00
Bi-annual mowing										$400.00	2	$800.00	$800.00
Bi-annual Vegetation control by Gdosky's property	4	$0.565	2	$4.52	1	1	2	$25.00	$50.00				$54.52
Annual Pipe cleaning										$300.00	8	$2,400.00	$2,400.00
Annual Haines property pipe cleaning										$300.00	4	$1,200.00	$1,200.00
Annual Limestone bed turning										$100.00	4	$400.00	$400.00
TOTAL				**$192.10**					**$4,850.00**			**$19,200.00**	**$24,242.10**

5. Water Quality Monitoring

Water quality monitoring is needed in order to assess the efficiency and performance of the system.

a. Chemical Sampling

System monitoring includes a quarterly visit to the site to collect water samples. The samples are collected and transported to Pennsylvania Department of Environmental Protection for analysis to identify any significant changes in water quality and determine if the treatment system is functioning properly. Chemical water samples are collected from nine locations within the treatment system and three locations in Indian Creek. Sampling needs to occur prior to system flushing.

b. Macroinvertebrates Sampling

Biological samples were collected on Indian Creek at sample sites above and below the treatment system discharge (IC-4 & IC-5) in 2011 and 2012 following the protocol identified in Appendix A. Based upon the Biotic Index IC4 and IC5 primarily rank as clean streams. A complete species list and Biotic Index scores are identified in the appendix sections E & F.

KALP TREATMENT SYSTEM

1. **IC 4 –** *Indian Creek above treatment system*
2. **KALPDBRAW –** *Raw sample from directional boreholes before any treatment occurs*
3. **VFW1** *– the effluent to vertical up-flow pond before it enters the first settling basin*
4. **SB1 -** *Outlet pipe from settling basin #1*
5. **VFW2 -** *Outlet pipe from vertical flow wetland #2*
6. **VFW3 -** *Outlet pipe from vertical flow wetland #3*
7. **SB 2 –** *Effluent pipe from Settling Basin #2*
8. **COMBOUT –** *Combined effluent of system and bypass*
9. **MITWET2 –** *Mitigation wetland 2 near vertical flow ponds*
10. **MITWET1 –** *Mitigation wetland 1 lower end of site*
11. **IC-5 –** *Indian Creek at Sagamore Bridge*
12. **IC 6 –** *Indian Creek at Resh Park before confluence with Back Creek*

c. Visual assessment
A visual assessment using Pennsylvania Department of Environmental Protection's Water Quality Network Habitat Assessment form was completed for each site where macroinvertebrates were collected in 2012. The protocol ranks 12 features of the habitat scoring each feature as optimal, sub-optimal, marginal, or poor. Overall the habitat for IC4 and IC5 rates as suboptimal.

d. Flow calculation
Flow rates are calculated at vertical flow wetlands 2 & 3. In order to calculate flow, one measures the height from the top of the stop log and measures the height from the top of the water. Then one subtracts the height of the water from the height of the stop log to determine the height of the water flowing over the stop log. One must input the height of the water flowing over the stop log into Natural Resources Conservation Service formula to determine the flow.

6. Maintenance

Mountain Watershed Association is responsible for maintenance of the site, including flushing, water quality monitoring, vegetation control, snow removal, and repairing damages caused by vandals or natural processes. Materials used in repairing the systems need to be of equal quality or better and at least the same size, thickness, etc. as shown in the "as-built plans" or as stated in the original specifications. Repairs and modifications must receive prior approval from Natural Resources Conservation Service.

a. Flushing
The entire system needs to be flushed bi-monthly and up-flow wetland should be flushed monthly. When only flushing the up-flow wetland follow step one; when flushing entire system follow steps one and two.

Step 1: Open the two valves from the up-flow wetland #1 and allow it to flow until the discharge is clear or the pond is empty (approximately 30-45 minutes).

Step 2: Flush vertical flow wetlands 2 & 3, starting at the far end—near settling basin #2—by opening the last valve in each row (two valves per settling pond) and allowing them to flow until the effluent is clear. Once the effluent is clear, close the first set of valves and proceed to the next series of valves. Continue until all 16 valves have been flushed.
*If needed, because of water levels, flushing of the settling basins can be conducted over two days.

When flushing the treatment system you will need the following tools: valve wrench, extension bar, wasp and hornet spray, hammer, and work gloves.

B. Melcroft AMD Treatment System

Mine drainage backing up into the basement of a home before the construction of the Melcroft Treatment System

When the mine pool that created the portal pond in the village of Melcroft was completely full and not being drawn down and dewatered, the discharge would push laterally looking for an escape route. The path of least resistance often was into basements of area residents. In order to alleviate the problem a passive treatment system was built in 2009 to 2011 to reduce the volume of water in the portal pond by pumping the water out and treating it.

The mine drainage enters the Melcroft treatment system at the collection pond and is then slowly transported to one of the two vertical flow ponds. From there the water goes into the settling pond. After the settling pond the discharge is further treated as it passes through two aerobic wetlands before going through its final treatment phase in the manganese removal bed. It is then discharged into Champion Creek. This project is unique in that an informational trail around the treatment ponds and restored railroad trestle provide ready access for both monitoring and for the public to see how the system functions.

1. Location

The Melcroft treatment system is located in the village of Melcroft adjacent to the community park.

Directions: From the Mountain Watershed Association office turn left onto Route 711 south. In about.2 miles, turn right onto Melcroft Road. Travel approximately 100 yards to the treatment system on the left.

2. Cost

Completion of the Melcroft Treatment system cost approximately $1.1 million. Funding for the project was provided through the federal Office of Surface Mining's (OSM) Watershed Cooperative Agreement Program through the Appalachian Clean Streams Initiative and Pennsylvania's AML Program through Pennsylvania Department of Environmental Protection's Bureau of Abandoned Mine Reclamation.

The estimated annual operation and maintenance cost associated with the Melcroft Treatment System is $23,099.61. See Table IV-2 for specific costs. However, if the treatment system needed to be replaced it is estimated that it would cost nearly $1.7 million. The estimated replacement cost was calculated using original construction cost adjusted for inflation as of 2012 and multiplied by 1.5 and then subtracted out the annual operation and maintenance cost.

TABLE III-2

	Mileage Costs				Staff Costs					Contractual Costs			
Routine Maintenance	Miles	Rate	Frequency	Cost	Hrs	# Staff	Frequency	Rate	Staff Cost	Rate	Hrs/Qty	Total Cost	**TOTAL COST**
Monthly download flow meter	2	$0.565	12	$13.56	0.5	1	12	$25.00	$150.00				$163.56
Bi-monthly system flushing	6	$0.565	6	$20.34	2	2	6	$25.00	$600.00				$620.34
Quarterly water sampling	27	$0.565	4	$61.02	2	2	4	$25.00	$400.00	300	52	$15,600.00	$16,061.02
Quarterly site inspections	2	$0.565	4	$4.52	0.5	1	4	$25.00	$50.00				$54.52
Quarterly mine pool elevation check	2	$0.565	4	$4.52	1.5	1	4	$25.00	$150.00				$154.52
Bi-annual Macroinvertebrate sampling	4	$0.565	2	$4.52	4	2	2	$25.00	$400.00				$404.52
Bi-annual Macroinvertebrate identification & analysis					48	1	2	$25.00	$2,400.00				$2,400.00
Bi-annual mowing										395	2	$790.00	$790.00
Annual flushing of lower valve	2	$0.565	1	$1.13	1	2	1	$25.00	$50.00				$51.13
Annual pipe cleaning										300	8	$2,400.00	$2,400.00
TOTAL				$109.61					$4,200.00			$18,790	$23,099.61

3. **Partnerships and Responsibilities**
   Pennsylvania Department of Environmental Protection built the treatment system. Mountain Watershed Association is responsible for the maintenance and upkeep.

4. **System Inspections**
   System inspections occur quarterly at the treatment system and following any major rain events, earthquake, drought, or other natural or manmade occurrence that may affect the performance of the structures. A copy of this inspection form is attached in Appendix C.

5. **Water Quality Monitoring**
   Water quality monitoring is conducted in order to assess the efficiency and performance of the system.

   a. Chemical Sampling
      Water samples are collected and transported to Pennsylvania Department of Environmental Protection for analysis to identify any significant changes in water quality and determine if the treatment system is functioning properly. Samples will be collected following DEP's water monitoring protocol identified in Appendix A. System monitoring includes a quarterly visit to the site to collect water samples Chemical water samples are to be collected from 11 locations within the treatment system and two locations in Champion Creek. Sampling needs to occur prior to system flushing.

MELCROFT TREATMENT SYSTEM

1. **ChampUS** – *Champion Creek approximately 150 yards above treatment system*
2. **3PONDINL** – *System influent from directional boreholes at dock*
3. **NEWKALP** – *System influent on far side of the collection pond*
4. **VFP1IN** – *Influent of the vertical flow pond closes to Melcroft Road*
5. **VFP2IN** – *Influent of the vertical flow pond closes to Champion Creek*
6. **VFP1OUT** – *Effluent of vertical flow pond closes to Melcroft Road. Sample is collected in the control box*
7. **VFP2OUT** – *Collect sample from effluent of the vertical flow pond closes to Champion Creek. Sample is collected in the control box*
8. **Well** – *Artesian well discharges into sediment pond*
9. **SPOUT** – *Settling pond effluent as it enters the wetlands*
10. **AW1OUT** – *Effluent of the first aerobic wetland*
11. **AW2OUT** – *Effluent of the second aerobic wetland*
12. **3SYSOUT** – *Final effluent pipe as it discharges into Champion Creek*
13. **ChampDS** – *Champion Creek below the treatment system near the Route 711 bridge*

b. Macroinvertebrates Sampling

Biological samples were collected on Champion Creek at sample sites above and below the treatment system discharge (ChampUS & ChampDS) in 2011 and 2012 following the protocol identified in Appendix A. Based upon the Biotic Index Champion Creek within this section is primarily rank as moderately polluted. A complete species list and Biotic Index scores are identified in the appendix sections E & F.

c. Visual Assessment
A visual assessment using Pennsylvania Department of Environmental Protection's Water Quality Network Habitat Assessment form was completed for each site where macroinvertebrates were collected in 2012. The protocol ranks 12 features of the habitat scoring each feature as optimal, sub-optimal, marginal, or poor. Overall the habitat rates as suboptimal; however the upstream location is bordering on optimal.

The aerobic wetland section of the Melcroft Treatment System

d. Flow Calculation
Flow rates are calculated at the raw influents (3PONDINL, NEWKALP, and WELL) and at the effluent of the vertical flow ponds (VFP1OUT and VFP2OUT).

The 3PONDINL has a flow meter that monitors the amount of mine drainage that enters the system from the abandoned No. 3 coal mine. Data is downloaded and analyzed monthly. Information on how to download the flow meter and required maintenance for the flow meter is available in Appendix H.

Flow rate at the NEWKALP and WELL sites is conducted using a graduated five gallon bucket and a stop watch. Field technicians should calculate how long it takes to collect a designated amount of liquid and then convert it to gallons per minute. For example, if it takes two seconds to collect two gallons of liquid then the flow is 60 gallons per minute.

In order to calculate flow at the vertical flow ponds, measure the height from the top of the stop log and measure the height from the top of the water. Subtract the height of the water from the height of the stop log to determine the height of the water flowing over the stop log. Input the height of the water flowing over the stop log into the NRCS formula to determine the flow.

6. Maintenance

Mountain Watershed Association is responsible for the maintenance and upkeep at the Melcroft Treatment System. In order to keep the system functioning properly routine maintenance activities, including bi-monthly flushing and quarterly inspections, are conducted.

Flushing of the vertical flow ponds occurs over a three to five day period. To flush the system, begin with the valves at the top end of the system—near the collection pond. Open the valves in a horizontal row (two valves per settling pond) and allow them to flow until the discharging effluent is clear and then close the valves. Repeat this process for the middle valves on day three, and the lower valves on day five. It is

best to give the system a day to recover before flushing the next set of valves, but if needed the system could be flushed over three consecutive days

When flushing the treatment system you will need the following tools: valve wrench, extension bar, wasp and hornet spray, hammer, flashlight, and work gloves

C. Gallentine AMD Treatment System

Before construction of the Gallentine Treatment System could begin the design was modified and the treatment site was relocated from its originally proposed location in order to adhere to wetland permitting issues. The change in design required the mine pool and discharge elevation to be raised to attain adequate area for treatment.

The underlying piping in the first phase of treatment in the system

The initial system was constructed in 2003 and cost approximately $180,000. However, due to clogging of the ALD and subsequent changes in elevation, a blowout occurred upstream. In addition, failure of the ALD resulted in the system no longer adequately treating the discharge. The blowout had to be corrected with a grout curtain.

In 2008, the treatment system was redesigned and reconstructed at the same location. Rebuilding the Gallentine treatment system cost approximately $584,793.

The discharge enters the treatment system via perforated pipes beneath a bed of limestone in the vertical up-flow pond in order to increase alkalinity. The iron is preserved in the ferrous form and prevented from contacting oxygen so that it does not coat the limestone making it unreactive or clog the system. From there it flows into settling basin one where the metals begin to precipitate out as it passes through limestone baffles which again increases alkalinity. The discharge then enters the vertical down-flow pond where it flows through compost into another limestone bed before discharging into settling pond two. Additional metals deposit into the settling basin before it outlets through the natural wetlands and into Indian Creek.

The Gallentine discharge flows between 18 to 199 gallons per minute from a hazardous mine portal into Indian Creek. Acid levels range from 124 to 195 milligrams per liter, while iron is constant at 74 milligrams per liter and aluminum ranges 7-11 milligrams per liter. The treatment system utilizes a vertical up flow pond, a vertical down flow pond, two settling basins, rock waterways and rock aprons, piping, water level control structures, control valves, an access road, and permanent seeding.

1. **Location**

The Gallentine Treatment system is located 500 feet east of State Route 711 approximately one and a half miles south of the village of Indian Head near Normalville, Pa on the Springfield Township and Saltlick Township border.

Directions: From the MWA office turn left onto Route 711 south and travel approximately four miles. The system is located on the left-hand side of the road.

2. **Cost**

The reconstruction of the Gallentine Treatment System cost approximately $425,000. Funding for the project was provided by Natural Resource Conservation Service and Office of Surface Mining.

The estimated annual operation and maintenance cost associated with the Gallentine Treatment System is $13,888.99. See Table IV-3 for specific costs. However, if the treatment system needed to be replaced it is estimated that it would cost $666,590. The estimated replacement cost was calculated using original construction cost adjusted for inflation as of 2012 and multiplied by 1.5 and then subtracted out the annual operation and maintenance cost.

TABLE III-3

	Mileage Costs				Staff Costs					Contractual Costs			
Routine Maintenance	Miles	Rate	Frequency	Cost	Hrs	# Staff	Frequency	Rate	Staff Cost	Rate	Hrs/Qty	Total Cost	**TOTAL COST**
Bi-monthly system flushing	21	$0.565	6	$71.19	3	1	4	$25.00	$300.00				$371.19
Quarterly water sampling	19.5	$0.565	4	$44.07	2	2	4	$25.00	$400.00	$300	24	$7,200.00	$7,644.07
Quarterly site inspections	7	$0.565	4	$15.82	0.5	1	4	$25.00	$50.00				$65.82
Bi-annual Macroinvertebrate sampling	7	$0.565	2	$7.91	4	2	2	$25.00	$400.00				$407.91
Bi-annual Macroinvertebrate identification & analysis					48	1	2	$25.00	$2,400.00				$2,400.00
Bi-annual mowing										$300	2	$600.00	$600.00
Annual Pipe cleaning										$300	8	$2,400.00	$2,400.00
TOTAL				**$138.99**					**$3,550.00**			**$3,000.00**	**$13,888.99**

3. **Partnerships and Responsibilities**

Mountain Watershed Association is responsible for maintenance and upkeep of the treatment system. Natural Resources conservation services provided design and construction funds Pennsylvania Department of Environmental Protection assisted in developing the monitoring program and a construction inspector. Municipal Authority of Westmoreland County provided property to develop the treatment system and proceeds of timber sales from the property to the project.

4. **System Inspections**

System inspections occur quarterly at the treatment system and following any major rain events, earthquake, drought, or other natural or manmade occurrence that may affect the performance of the structures. A copy of this inspection form is attached in Appendix C.

5. **Water Quality Monitoring**

a. Chemical sampling

System monitoring includes a quarterly visit to the site to collect water samples. The water samples are transported to Pennsylvania Department of Environmental Protection for analysis to identify any significant changes in water quality and determine if the treatment system is functioning properly. Chemical water samples are to be collected from four locations within the treatment system and two locations in Indian Creek—above and below the treatment system effluent. Sampling needs to occur prior to system flushing.

GALLENTINE TREATMENT SYSTEM

1. **GALUP -** *Effluent of first pond at the H flume*
2. **GALSED** – *Rock apron below sediment pond*
3. **GALDOWN** – *Pipe outlet* from *vertical down-flow pond*
4. **GALOUT** – *System effluent pipe at bottom of access steps*
5. **IC 7 -** *Indian Creek upstream of Treatment system*
6. **IC 8 -** *Indian Creek below Treatment System and before confluence with Polar Run*

b. Macroinvertebrate sampling

Biological samples were collected in Indian Creek at sample sites above and below the treatment system discharge (IC-7 & IC-8) in 2011 and 2012 following the protocol identified in Appendix A. Based upon the Biotic Index, Appendix A, IC7 rank varies between moderately polluted to a clean stream. During the spring samples in both 2011 and 2012 monitoring indicated a moderately polluted rank, while the fall sampling indicates a clean stream. Further monitoring and evaluation is necessary at this site. IC8 is ranked as a clean stream. A complete species list and Biotic Index scores are identified in the appendix sections E & F.

c. Visual assessment

A visual assessment using Pennsylvania Department of Environmental Protection's Water Quality Network Habitat Assessment form was completed for each site where macroinvertebrates were collected in 2012. The protocol ranks 12 features of the habitat scoring each feature as optimal, suboptimal, marginal, or poor. Overall the habitat for IC7 and IC8 rates as suboptimal.

6. Maintenance

In order to maintain a functioning treatment system routine system flushing and site inspections are necessary. Bi-monthly flushing is conducted by opening a series of valves forcing the materials, such as iron, that build up in the pipes to be dislodged and transported to a discharge point, which then filters through a wetland before ultimately discharging into Indian Creek.

The valves are flushed in pairs. The first week valves #3 and #6 are completely opened until the flush discharge is clear, or until vertical up-flow pond #1 is emptied. The second week valves #4 and #7 are flushed following the same procedure as the first week. The third week valves #5 and #8 are then flushed again following the same procedure. When flushing the treatment system you will need the following tools: red steering wheel shaped valve wrench, located in the storage shed in Indian Head, wasp and hornet spray, hammer, and work gloves.

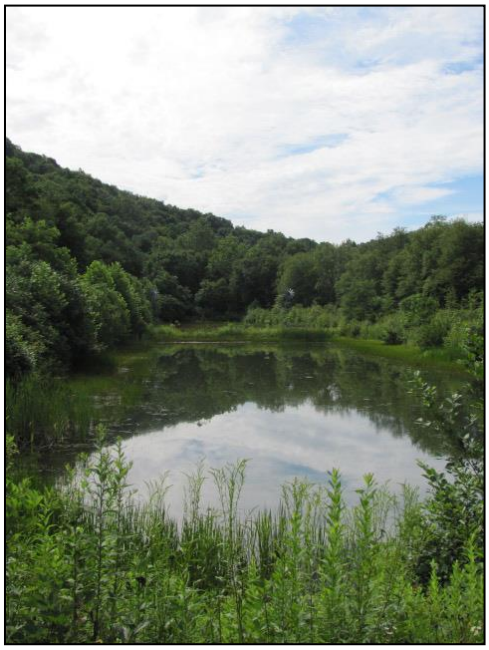
Based on the recommendations on the site inspections all materials used in repairing the structures shall be of equal quality or better, and at least the same size, thickness, etc. as shown on the "as-built plans" or as stated in the original specifications. The sponsors shall obtain prior NRCS approval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

D. Sagamore AMD Treatment System

The Sagamore treatment facility was Mountain Watershed Association's first mine drainage treatment system. It required the collection and treatment of two underground mine discharges from the abandoned Sagamore Coal Company's Big Chief Mine. Based

on its position within close proximity of the Indian Creek Valley Bike/Hike Trail and Indian Creek, the only suitable site for the treatment system was the location of an abandoned 70,000 cubic yard refuse pile along the banks of Indian Creek. Thus, construction of the project required the relocation and reclamation of a huge coal refuse pile which was ultimately incorporated into the project.

The system was built between September 1999 and March 2001. It contained two catch basins located north and south of the ponds. The discharges were unique because one was alkaline while the other was acidic. The two discharges were both piped into the first pond where the discharges treated each other with additional help from windmill aerators, which were installed to increase oxygen levels. This helps to remove the iron and acid from the water. The mine water leaves the first basin, with a pH of 6.2 to 6.8, and enters the second basin where the iron is given additional time to settle out before the system discharges into Indian Creek. Water is discharged with a pH of 6.5 to 6.9.



The Max B. Nobel Abandoned Mine Drainage Treatment System also known as the Sagamore Treatment System

Approximately four to six weeks prior to construction of the system the water chemistry of one of the discharges changed. The acidity increased from 5-80 mg/L to 1,900-2,300 mg/L, the iron increased from 5-10 mg/L to >300 mg/L, and the aluminum increased from 3-5 mg/L to >150 mg/L. Although no exact explanation for the changes was presented, it is probable that a subsidence event, such as a roof fall, occurred in the underground mine exposing pyretic material to the discharge. In order to treat the increased acidity and dissolved metals, an anoxic limestone drain was added to the treatment system.

Within the first two weeks of construction, a neighboring resident informed us that they had lost their water. It seemed we had severed the pipe serving as their delivery system. No one was aware prior to construction of the source or location. A delay ensued in which we had to find the source of his spring and determine how we were going to correct this problem. It was decided that the best solution was to provide the resident with new piping rather than try to find the spot where the pipe had collapsed. A generous donation from Alice Meadow enables us to replace the pipe and resume work.

February of the year 2000 brought terrible flooding and ice formation. This resulted in the destruction of our temporary stream crossing, the only access to the site and a $40,000 cost. Again, we were faced with how to correct this problem and re-establish the crossing. We eventually retrieved the pipe, which had flowed down Indian Creek like so many straws, reinstalled it, and were once more in business.

The treatment system is called the Max B. Nobel Mine Drainage Remediation Project in honor of the Nobel family's perpetual easement for use of the land for the treatment system. Without their generosity the Sagamore Mine Drainage Treatment System would not have been possible.

1. **Location**

   The Sagamore Abandoned Mine Drainage Treatment system is located between Melcroft and Indian Head in the former mining community of Sagamore. This site can be accessed via the old wooden bridge crossing Indian Creek, or by taking the Indian Creek Valley Trail from Indian Head towards Champion.

   Directions: From the MWA office turn left onto Route 711 south. Travel three miles to a gravel drive on the left. The gravel drive leads to the old wooden bridge. Travel across the bridge and drive up to the trail. Walk south towards Indian Head to the first pond.

2. **Cost**

   Construction of the system cost $358,000. Funding for the project was provided by USDA-NRCS, EPA Section 319 Funds, Western Pennsylvania Watershed Protection Program, McKenna Foundation, Baltimore Life, Community Foundation, The Eberly Foundation, Joseph and Anna Garter Foundation, Allegheny Power, and Alice Meadows.

   The estimated annual operation and maintenance cost associated with the Sagamore Treatment System is $12,209.89. See Table IV-4 for specific costs. The estimated replacement cost of the system is $683,739; it was calculated using the original construction cost adjusted for inflation as of 2012 and multiplied by 1.5 and then subtracted out the annual operation and maintenance cost.

TABLE III-4

	Mileage Costs				**Staff Costs**					**Contractual Costs**			
Routine Maintenance	Miles	Rate	Frequency	Cost	Hrs	# Staff	Frequency	Rate	Staff Cost	Rate	Hrs/Qty	Total Cost	**TOTAL COST**
Quarterly water sampling	17.5	$0.565	4	$39.55	2	2	4	$25.00	$400	300	20	6,000.00	$6,439.55
Quarterly site inspections	5	$0.565	4	$11.30	0.5	1	4	$25.00	$50				$61.30
Bi-annual macroinvertebrate sampling	8	$0.565	2	$9.04	4	2	2	$25.00	$400.00				$409.04
Bi-annual macroinvertebrate identification & analysis					48	1	2	$25.00	$2,400.00				$2,400.00
Bi-annual mowing										$250.00	2	$500.00	$500.00
Annual pipe cleaning										$300.00	8	$2,400.00	$2,400.00
TOTAL				**$59.89**					**$3,250.00**			**$8,900.00**	**$12,209.89**

3. **Partnerships and Responsibilities**

Pennsylvania Department of Environmental Protection's Bureau of Abandoned Mine Reclamation (BAMR), USDA's Natural Resources Conservation Service (NRCS), and Skelly and Loy, Inc. were instrumental in the development of this treatment system. NRCS provided the conceptual design, while BAMR provided aerial photography, mapping, and water quality and quantity information. Skelly and Loy completed the final design and monitored the construction of the project. Mountain Watershed Association is responsible for the maintenance, upkeep, and monitoring of the treatment system.

4. **System Inspections**

System inspections occur quarterly at the treatment system, and following any major rain events, earthquake, drought, or other natural or manmade occurrence that may affect the performance of the structures. A copy of this inspection form is attached in Appendix C.

5. **Water Quality Monitoring**

a. Chemical sampling

Routine water quality monitoring is conducted at the site on a quarterly basis by MWA. Water samples are collected and transported to Pennsylvania Department of Environmental Protection for analysis and to determine if the treatment system is functioning properly. Samples will be collected following DEP's water monitoring protocol identified in Appendix A. Chemical water samples are collected at five locations within the treatment system on a quarterly basis. The results of the chemical sampling are located in appendix D.

b. Macroinvertebrate sampling

Biological samples were collected in Indian Creek at sample sites above and below the treatment system discharge (IC-5 & IC-6) in 2011 and 2012 following the protocol identified in Appendix A.

Based upon the Biotic Index the stream primarily ranked as a clean stream. During the fall sample in 2011, the sampling locations rank as moderately polluted, however, it was only one point away from obtaining the ranking of a clean stream. A complete species list and Biotic Index scores are identified in the appendices E and F.

c. Visual assessment

A visual assessment using Pennsylvania Department of Environmental Protection's Water Quality Network Habitat Assessment form was completed for each site where macroinvertebrates were collected in 2012. A copy of the form is available in Appendix A. The protocol ranks 12 features of the habitat scoring each feature as optimal, suboptimal, marginal, or poor. Overall the habitat for IC5 and IC6 rates between optimal to suboptimal.

SAGAMORE TREATMENT SYSTEM

1. **SAGLARGE -** *Large raw discharge entering the first pond*
2. **SAGSMALL** – *Small raw discharge entering the first pond near its effluent*
3. **SAGOUT** – *Final effluent from the treatment system*
4. **SAGALD** – *Anoxic limestone drain sample collected before it unites with the ditch discharge and flows under the Indian Creek Valley Trail*
5. **SAGDITCH** - *Ditch discharge along the Indian Creek Valley Trail*

6. Maintenance
   The system is monitored quarterly when water samples are collected. The system has a tendency to clog at the southernmost or downstream catch basin towards Indian Head. The piping in the system should be cleaned annually.

E. Permapress AMD Treatment System

The Permapress treatment system is a low hazard mine drainage treatment system. It is considered low hazard because surface water does not enter the treatment system. A limestone treatment bed and settling basin constructed of earth fill are utilized to treat the mine drainage coming from a reclaimed stripmine near Normalville, PA. In addition to the limestone bed and settling basin, a siphon, valves, piping, permanent seeding, and access road are also used in treating the mine discharge.

Prior to treatment the 20 gallon per minute discharge contained 150 milligrams per liter of acidity, less than one milligram per liter of iron, and 23 milligrams per liter of aluminum. Due to the lack of iron in the discharge the project was given the name of Permapress after the chemical process in which fabrics are permanently treated for wrinkle resistance so that no ironing is needed.

1. **Location**

The treatment system is located approximately two miles east of Normalville and approximately 100 yards north of Route 653.

Directions: From the MWA office turn left on Route 711 south and continue to the blinking traffic light in Normalville. At the light turn left and proceed a quarter of a mile. Turn left on Route 653. Follow Route 653 for approximately 1.5 miles to a gravel pull-off with a white Permapress sign. Park and follow path to system.

Upper portion of the Permapress Treatment system

2. **Cost**

The estimated annual operation and maintenance cost associated with the Permapress Treatment System is $8,527.72. See Table IV-5 for specific costs. If the treatment system would fail it is estimated that replacing the system would cost is $287,989. The estimated replacement cost was calculated using original construction cost adjusted for inflation as of 2012 and multiplied by 1.5 and then subtracted out the annual operation and maintenance cost.

TABLE III-5

	Mileage Costs				Staff Costs					Contractual Costs			
Routine Maintenance	Miles	Rate	Frequency	Cost	Hrs	# Staff	Frequency	Rate	Staff Cost	Rate	Hrs/Qty	Total Cost	**TOTAL COST**
Quarterly water sampling	36	$0.565	4	$81.36	1	2	4	$25.00	$200.00	300	8	$2,400.00	$2,681.36
Quarterly site inspections	24	$0.565	4	$54.24	0.5	1	4	$25.00	$50.00				$104.24
Bi-annual Macroinvertebrate sampling	24	$0.565	2	$27.12	4	2	2	$25.00	$400.00				$427.12
Bi-annual Macroinvertebrate identification & analysis					48	1	2	$25.00	$2,400.00				$2,400.00
Bi-annual mowing										$257.50	2	$515.00	$515.00
Pipe cleaning										$300.00	8	$2,400.00	$2,400.00
Bell Siphon cleaning													?
TOTAL				**$162.72**					**$3,050.00**			**$5,315.00**	**$8,527.72**

3. **Partnerships and Responsibilities**

Mountain Watershed Association, in cooperation with Natural Resources Conservation Service and the Pennsylvania Department of Environmental Protection's Bureau of Abandoned Mine Reclamation, was responsible for establishing the Permapress Treatment system. MWA is responsible for all maintenance and upkeep of the system.

4. **System Inspections**

System inspections occur quarterly at the treatment system annually and following any major rain events, earthquake, drought, or other natural or manmade occurrence that may affect the performance of the structures. A copy of this inspection form is attached in Appendix C.

5. **Water Quality Monitoring**

a. Chemical sampling

System monitoring includes a quarterly visit to the site to collect water samples and to insure the siphon is functioning properly. Water samples are collected and transported to Pennsylvania Department of Environmental Protection for analysis to identify any significant changes in water quality and determine if the treatment system is functioning properly. Chemical water samples are collected from two locations within the treatment system. Chemical sampling results are available in Appendix D.

PERMAPRESS TREATMENT SYSTEM

1. **PERMIN** –*Raw discharge entering in the top corner of the treatment system.*
2. **PERMOUT** –*Final effluent of the system, which lies 150 feet beyond the lower pond.*

b. Macroinvertebrate sampling
Biological samples were collected on the unnamed tributary above and below the treatment system discharge in 2011 and 2012 following the protocol identified in Appendix A. Based upon the Biotic Index the stream is primarily ranked as moderately polluted. A complete species list and Biotic Index scores are identified in the appendix sections E & F.

c. Visual assessment
A visual assessment using Pennsylvania Department of Environmental Protection's Water Quality Network Habitat Assessment form was completed for each site where macroinvertebrates were collected in 2012. The protocol ranks 12 features of the habitat scoring each feature as optimal, suboptimal, marginal, or poor. Overall the habitat for this segment is rated as suboptimal. However, the tributary that the Permapress treatment system discharges into is a small unnamed tributary. The established protocol was designed for larger bodies of water.

6. Maintenance
The Mountain Watershed Association is responsible for all maintenance activities. Maintenance activities include vegetation control, maintaining outlets of pipes, cleaning the siphon, and repairing any damage caused by vandals or natural vectors. Occasionally the drain in the lower pond that discharges the final effluent becomes clogged and needs to be cleaned out. This can be done by wading or kayaking into the pond and unclogging the small hole located below the half piece of PVC pipe that is attached to the larger pipe.

Replacement of limestone or removal of accumulated precipitate is not expected during the life of the structure. However, if any repairs need to be made the materials used shall be of equal or better quality than those shown in the "as-built plans" or stated in the original specifications. MWA will obtain approval from NRCS for any repairs or modifications to the project.

2011 Summer Intern unclogging the final effluent drain in the final pond at the Permapress Treatment system

F. Poplar Run Land Liming Project

Poplar Run, a major tributary to Indian Creek, is impacted by 26 abandoned mine discharges which collectively produce 33 tons of acid, 7.4 tons of iron, and 0.9 tons of aluminum per year (PL566). The Poplar Run subwatershed, including Newmyer Run, originates on Chestnut Ridge approximately one mile west of the village of Clinton in Fayette County enters Indian Creek about a mile south of the village of Indian Head. The discharges are scattered. Many are streambed discharges; therefore, collection and treatment using the conventional passive treatment system is unrealistic.

Land liming staging area at one of the sites in the Poplar Run project area

Strategically placing alkaline lime throughout a 2,184-acre section of the Poplar Run watershed will improve the water quality coming from the mine scarred lands to the point where aquatic organisms and fish can re-establish. The Natural Resources Conservation Service (NRCS) has partnered with MWA to spread and dump approximately 3,200 tons of lime on 14 different properties primarily in the headwaters region of Poplar Run. The alkaline material will slowly dissolve into the soil and be carried into the stream thereby raising the pH from its current average of 4.0 to 6.0 and reducing the acidity to zero. This will also significantly boost the alkalinity. Treatment is anticipated to last approximately 10 years before additional doses of lime will be required. Poplar Run land liming in coordination with Marsolino-Leighty and Rondell Correal Treatment Systems will not only improve Poplar Run but also an additional 10 miles of Indian Creek.

1. **Location**

   The Poplar Run watershed originates on Chestnut Ridge approximately one mile west of Clinton, Pa and enters Indian Creek one mile south of Indian Head.

2. **Cost**

   The majority of the funding for the project, $60,000, was provided by NRCS. This funding covered mapping and the lime application. The Foundation for Pennsylvania Watersheds contributed $10,000 to the project for on-going water quality monitoring to track changes in the water quality over ten years.

   The estimated annual operation and maintenance cost associated with the Poplar Run Land Liming Project is $15,719.50. See Table IV-6 for specific costs. It is estimated that over the next 10 years an additional $130,969 will be required for monitoring.

TABLE III-6

	Mileage Costs				Staff Costs					Contractual Costs			
Routine Maintenance	Miles	Rate	Frequency	Cost	Hrs	# Staff	Frequency	Rate	Staff Cost	Rate	Hrs/Qty	Total Cost	**TOTAL COST**
Quarterly water sampling	25	$0.565	4	$56.50	2.5	2	4	$25.00	$500.00	300	20	6,000.00	$6,556.50
Quarterly site inspections	25	$0.565	4	$56.50	0.5	1	4	$25.00	$50.00				$106.50
Bi-annual Macroinvertebrate sampling	50	$0.565	2	$56.50	10	2	2	$25.00	$1,000.00				$1,056.50
Bi-annual Macroinvertebrate identification & analysis					160	1	2	$25.00	$8,000.00				$8,000.00
TOTAL				$169.50					$9,550.00			$6,000	$15,719.50

3. **Partnerships and Responsibilities**

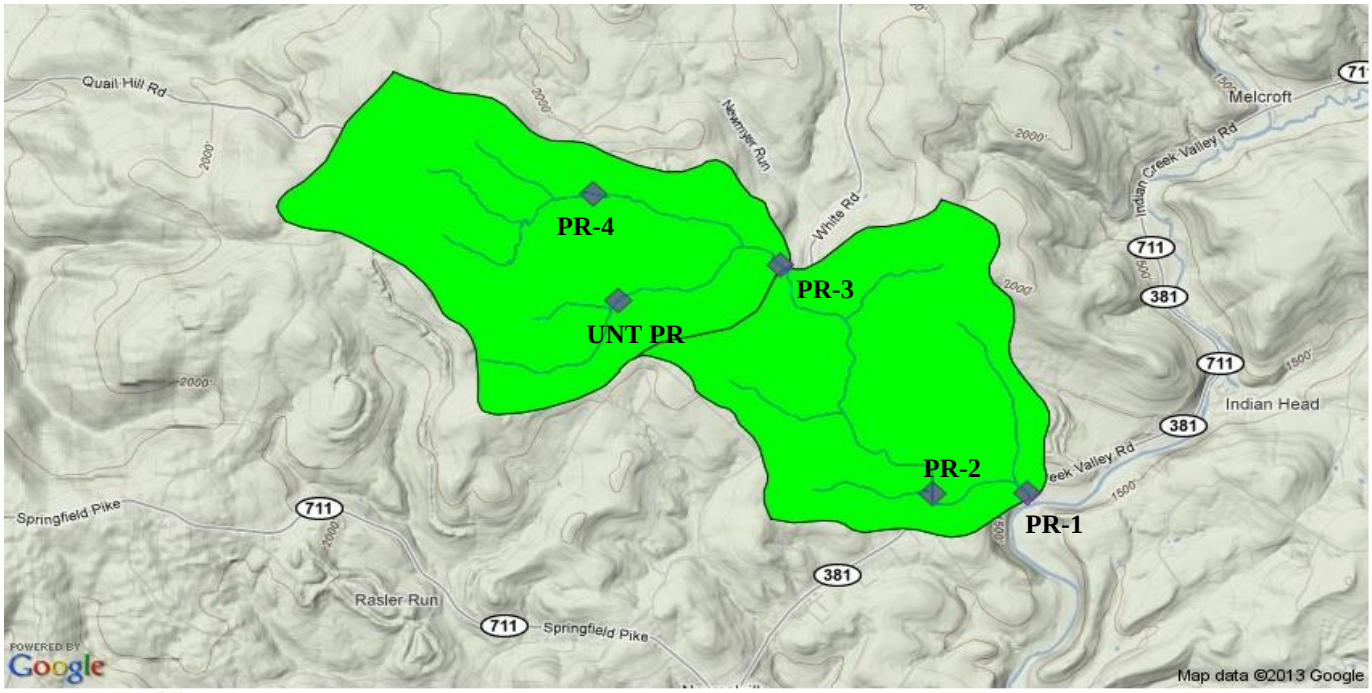
U.S. Department of Natural Resource Conservation developed the project maps and provided funding to purchase lime. Fayette County Conservation District provided technical assistance in selecting reputable companies from which to purchase the lime. Pennsylvania Fish and Boat Commission assisted by conducting pre- and post-project electro-fishing surveys. NRCS designed the sampling protocol and provided some funding for water quality monitoring. Foundation for Pennsylvania Watersheds also provided funding for monitoring the effectiveness of the system. Mountain Watershed Association was responsible for contacting landowners, explaining the program, and securing easements from them. MWA is also responsible for ongoing water quality monitoring and determining how to raise the funds necessary to repeat the program when necessary.

4. **Water Quality Monitoring**

Monitoring of water quality will occur for 10 years following the land liming application.

a. Chemical Sampling

Chemical water samples will be collected quarterly for the first two years following the lime application and then bi-annually for the next eight years. Samples will be collected following DEP's water monitoring protocol identified in Appendix A.



Poplar Run Monitoring Locations

Created by Carla Ruddock on Jun 21, 2013

1. **PR1** –Approximately 300 yards upstream from the mouth of Indian Creek
2. **PR2** – Approximately 100 yards upstream from Route 711 bridge

3. **PR3** – Fulton Park
4. **PR4** – Above the culvert at intersection of Poplar Run Road and Cavanaugh Road
5. **UNTPR** –Unnamed tributary along Cavanaugh Road before the intersection with.

b. Biological sampling

Two types of biological sampling will occur—macroinvertebrate and fish population surveys. Macroinvertebrates will be collected at five monitoring points annually for 10 years. The PA Fish & Boat Commission will be asked to electroshock after four years to determine whether diversity of fish populations, including native trout populations, have been established below the mined areas and within the main stem of Indian Creek below Poplar Run.

Biological samples were collected at five sites (PR1, PR2, PR3, PR4, and UNTPR) within the Poplar Run subwatershed in 2011 and 2012 following the protocol identified in Appendix A. Based upon the Biotic Index Poplar Run ranks as moderately polluted, while the unnamed tributary is deemed a clean stream. A complete species list and Biotic Index scores are identified in the appendix sections E & F.

c. Visual Assessment

A visual assessment using Pennsylvania Department of Environmental Protection's Water Quality Network Habitat Assessment form was completed for each site where macroinvertebrates were collected in 2012. The protocol ranks 12 features of the habitat scoring each feature as optimal, sub-optimal, marginal, or poor. Overall the habitat rates as suboptimal.

5. **Maintenance**

Mountain Watershed Association will be responsible for maintaining treatment. It is estimated that the original land liming will last for 10 years before additional doses of lime will be required. However, water quality monitoring will be utilized to determine if additional lime will be needed throughout the life of the project.

IV. Future Mine Drainage Treatment Projects

A. Marsolino-Leighty

The completed access road and stream crossing

During the 1970s, the Marsolino Coal Company mined the Lower Freeport and Upper Kittanning coal seams at the Marsolino Strip Mine approximately two miles south of the village of White. However, due to acidic abandoned mine drainages associated with the mine the company forfeited the bonds and abandoned the mine site. These discharges, which come from an improperly backfilled strip mine, allows the mine water to flow to the surface negatively impacting

the Newmyer Run subwatershed of Poplar Run. The combined flow rate of these discharges ranges from 100 to 250 gallons per minute. Acidity ranges from 186- 364 milligrams per liter, iron between 61-124 milligrams per liter and the aluminum 68-124 milligrams per liter (PL566).

1. **Location**

   Directions: From the MWA office turn left onto Route 711 south. In approximately 5.25 miles, turn right on Poplar Run Road. At the "Y" bear right and travel one-half mile. Turn left into a gravel driveway with three mailboxes on a blue pole. Travel this road approximately one-half mile until you reach a ford across the stream. You have arrived.

2. **Partnerships and Responsibilities**

   In 2008, Mountain Watershed Association, through a partnership with Pennsylvania Department of Environmental Protection's Bureau of Abandoned Mine Reclamation, U.S. Department of Interior's Office of Surface Mining, Pennsylvania Department of Conservation and Natural Resources, and the Foundation for Pennsylvania's Watersheds was able to purchase 9.55 acres of property necessary to establish a treatment system as it was first designed.

   In 2011, MWA worked with the Natural Resources Conservation Service to design and install a permanent ford that will be used to access the site for the proposed treatment system. This was completed with funding from NRCS and the Office of Surface Mining.

   MWA was awarded a Growing Greener grant for purchase of the additional land needed to address this set of discharges. Once purchased, Pennsylvania Department of Environmental Protection will complete design and construction phases of the project.

3. **Water Quality Monitoring**

   a. Chemical sampling

      Monitoring at the discharge site includes quarterly visits to collect water samples. Water samples are collected and transported to Pennsylvania Department of Environmental Protection for analysis to monitor the discharge and will be used in design preparations for development of a treatment system at the site. Chemical sampling results are available in Appendix D.

   b. Biological sampling

      Macroinvertebrate samples were collected on Newmyer Run above and below the discharge beginning in 2013 following the protocol identified in Appendix A.

   c. Visual assessment

      A visual assessment using Pennsylvania Department of Environmental Protection's Water Quality Network Habitat Assessment form was completed for each site where macroinvertebrates were collected in 2013. The protocol ranks 12

features of the habitat scoring each feature as optimal, suboptimal, marginal, or poor.

MARSOLINO-LEIGHTY DISCHARGE

1. **MRD** – *Raw discharge approximately three quarters of the way up the hill on the right hand side before it enters the culvert that flows under the access road*
2. **MSD** – *Effluent of the sump discharge by walking along the barbed wire fence on the right hand side of the access road, as you're going up the hill, just after crossing the ford*
3. **MPD** – *Discharge pipe coming out of the final pond discharge. The final pond is located on the left hand side of the access road, just after crossing the ford on your way up the hill*

4. **Cost**

Based on the PL566 study the estimated cost of establishing a treatment system to address the Marsolino-Leighty discharge was $1,111,000. However, that is what the cost would have been if constructed in 1999. As of 2012, the same treatment system would cost more than $1,500,000. The estimated cost does not include development of the access road that was established and the fact that MWA had to purchase an additional 42.3 acres of land for the project.

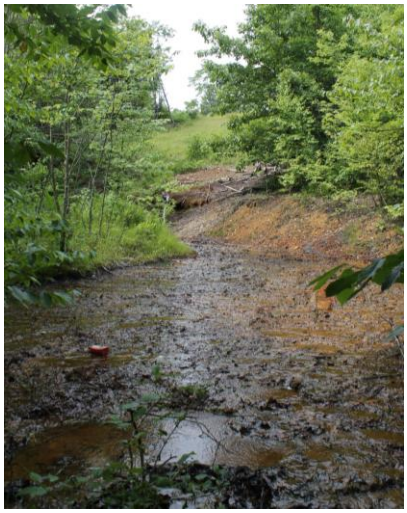
Annual monitoring costs associated with the Marsolino-Leighty discharge are estimated at $7,017.80. See Table V-1 for specific costs.

TABLE IV-1

	Mileage Costs				Staff Costs					Contractual Costs			
Routine Maintenance	Miles	Rate	Frequency	Cost	Hrs	# Staff	Frequency	Rate	Staff Cost	Rate	Hrs/Qty	Total Cost	**TOTAL COST**
Quarterly water sampling	12	$0.565	4	$27.12	2.5	2	4	$25.00	$500.00	300	12	$3,600.00	$4,127.12
Quarterly site inspections	12	$0.565	4	$27.12	0.5	1	4	$25.00	$50.00				$77.12
Bi-annual Macroinvertebrate sampling	12	$0.565	2	$13.56	4	2	2	$25.00	$400.00				$413.56
Bi-annual Macroinvertebrate identification & analysis					48	1	2	$25.00	$2,400.00				$2,400.00
TOTAL				**$67.80**					**$3,350.00**			**$3,600.00**	**$7,017.80**

B. Rondell-Correal

Located on the western edge of the Indian Creek watershed, the Rondell-Correal discharge impacts the Newmyer Run subwatershed of Poplar Run. The discharge is released from the Rondell strip mine operation that mined the Middle Kittanning and Brookville-Clarion coals. Low wall clay sealing technology was used to trap water into the backfilled strip mine pit in order to reduce oxygen levels with the intention of a lowering acid production. However, the clay had a high aluminum content, which caused high levels of acidity to be produced. The acidity levels in the discharge range from 908 to 1,188 milligrams. Iron levels range from 61 to 123 milligrams per liter while aluminum ranges from 68-124 mg per liter. This discharge has the most degraded water quality in the Indian Creek watershed. The flow rate varies at the site from 2 gallons per minute during low flow to 45 gallons per minute during times of high flow.



Discharge from the Rondell-Correal Mine site along Knopsnider Rd

1. Location

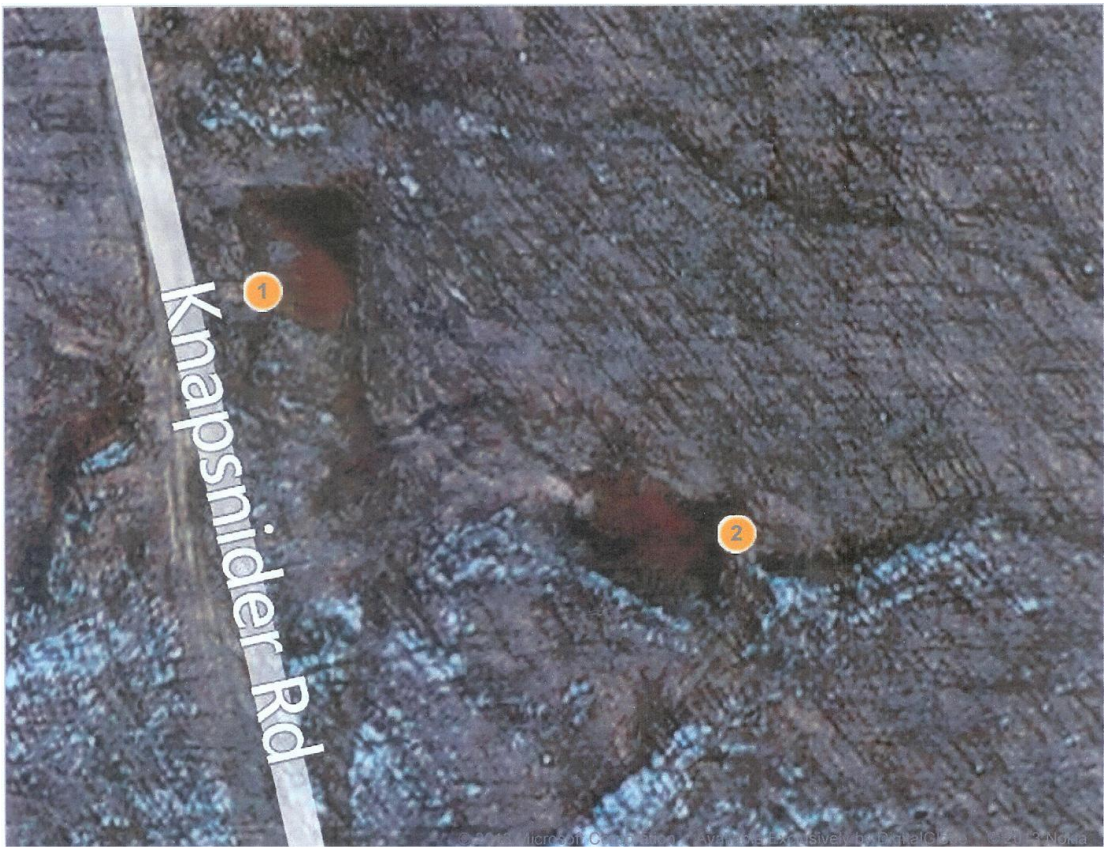
The discharge is located approximately one mile east of Clinton and a half mile north of State Route 1054 on Newmyer Run.

Directions: From the MWA office turn left onto Route 711 south. In approximately 5.25 miles, turn right on Poplar Run Road. At the "Y" bear left and continue to the second stop sign. At the second stop sign bear left onto Buchannan Road and then in approximately 4 tenths of a mile, turn right on Knopsnider Road and proceed one-half mile.

2. **Partnerships and Responsibilities**
   Mountain Watershed Association and Pennsylvania Department of Environmental Protection have partnered to monitor the discharge at the Rondell-Correal site. Based on monitoring results the organizations will determine if a treatment system at the site will be feasible.

   In 2013, GAI Consultants approached MWA about an experimental process for treating abandoned mine drainage. Through this partnership a potential pilot project may be conducted at the Rondell-Correal discharge site.

3. **Monitoring**
   Currently MWA is conducting quarterly water quality sampling to monitor the discharge. Water samples are collected and transported to Pennsylvania Department of Environmental Protection for analysis to identify any significant changes in water quality. Samples will be collected following DEP's water monitoring protocol identified in Appendix A



RONDELL-CORREAL DISCHARGE

1. **DRAIN** – *Spoil drain pipe, next to the road*
2. **FPO** –*Outlet of the final pond*

TABLE IV-2

	Mileage Costs				Staff Costs					Contractual Costs			
Routine Maintenance	Miles	Rate	Frequency	Cost	Hrs	# Staff	Frequency	Rate	Staff Cost	Rate	Hrs/Qty	Total Cost	**TOTAL COST**
Rondell-Correal - Quarterly water sampling	18	$0.565	4	$40.68	0.5	2	4	$25.00	$100.00	300	4	$1,200.00	$1,340.68
Bi-annual Macroinvertebrate sampling	18	$0.565	2	$20.34	4	2	2	$25.00	$400.00				$420.34
Bi-annual Macroinvertebrate identification & analysis					48	1	2	$25.00	$2,400.00				$2,400.00
TOTAL				$61.02					$2,900.00			$1,200.00	$4,161.02

4. **Cost**
   Based on the PL566 study it estimated the cost of establishing a treatment system to address the Rondell-Correal discharge at $525,000. However, that's what the cost would have been if constructed in 1999. As of 2012, the same treatment system would cost $714,787.66. The estimated annual operation and maintenance cost associated with the Rondell-Correal discharge is $4,161.02. See Table V-2 for specific costs.

C. Fulton Discharge

The Fulton discharge is located near the village of Clinton directly past the confluence of Newmyer and Poplar Runs. The flow rate ranges from 5-50 gallons per minute. The acidity is 150 milligrams per liter, the iron is 60 milligrams per liter, and the aluminum is one milligram per liter.

Although establishing a treatment system at the site was originally identified in the PL566 study due to a lack of available space and the number of streambed discharges within the Poplar Run watershed it is not currently feasible to establish a system. However, the Poplar Run land liming project minimizes the impacts from this discharge.

1. **Location**
   Directions: From the MWA office turn left onto Route 711 south. In 5.25 miles, turn right on Poplar Run Road. At the "Y" bear left and travel to the first bridge. Park and walk left towards the Rhododendron to find the discharge.

2. **Partnership and Responsibilities**
   Mountain Watershed Association and Pennsylvania Department of Environmental Protection have partnered up to monitor the Fulton discharge site..

3. **Monitoring**
   Currently MWA is collecting quarterly water quality samples for chemical analysis to monitor the discharge. Water samples are collected and transported to Pennsylvania Department of Environmental Protection for analysis to identify any significant

changes in water quality Samples will be collected following DEP's water monitoring protocol identified in Appendix A.

1) FD – Collect sample at the discharge site.

4. Cost

Based on the PL566 study it estimated the cost of establishing a treatment system to address the Fulton discharge is $525,000. However, that's what the cost would have been if constructed in 1999. As of 2012, the same treatment system would cost $714,787.66

The estimated annual operation and maintenance cost associated with monitoring the Fulton Discharge is $4,133.9 See Table V-3 for specific costs.

TABLE IV-3

	Mileage Costs				Staff Costs					Contractual Costs			
Routine Maintenance	Miles	Rate	Frequency	Cost	Hrs	# Staff	Frequency	Rate	Staff Cost	Rate	Hrs/Qty	Total Cost	**TOTAL COST**
Fulton - Quarterly water sampling	10	$0.565	4	$22.60	0.5	2	4	$25.00	$100.00	300	4	$1,200.00	$1,322.60
Bi-annual Macroinvertebrate sampling	10	$0.565	2	$11.30	4	2	2	$25.00	$400.00				$411.30
Bi-annual Macroinvertebrate identification & analysis					48	1	2	$25.00	$2,400.00				$2,400.00
TOTAL				$33.90					$2,900.00			$1,200.00	$4,133.90

D. Lawrence Coal Discharges

The discharges coming from the Lawrence Coal stripmine have a combined flow of 150 gallons per minute. This adds 400 mg/L of acidity, 20 mg/L of iron, and 40 mg/L of aluminum impacting the quality of Buck Run.

1. Location

Directions: From the MWA office turn left on Route 711 south and continue to the blinking traffic light in Normalville. At the light turn left and proceed a quarter of a mile. Turn left on Route 653. After crossing Indian Creek turn left onto Pritts Road. At the "Y" bear right onto Rogers Mill Road and then turn right onto Middle Fork Road. The discharge should be located before intersection with Brown Road

2. Partnerships

Mountain Watershed Association and Pennsylvania Department of Environmental Protection have partnered up to monitor the Lawrence coal discharges. Based on monitoring results the organizations will determine if a treatment system at the site will be feasible.

3. **Monitoring**
   Currently MWA is collecting quarterly water quality samples for chemical analysis to monitor the discharge. Water samples are collected and transported to Pennsylvania Department of Environmental Protection for analysis to identify any significant changes in water quality Samples will be collected following DEP's water monitoring protocol identified in Appendix A.

4. **Cost**
   Based on the PL566 study it estimated the cost of establishing a treatment system to address the Lawrence Coal discharge is $239,000. However, that's what the cost would have been if constructed in 1999. As of 2012, the same treatment system would cost $325,401.

E. Buck Run Discharge

Flowing from a reclaimed strip mine, the Buck Run discharge adds 200 mg/L of acidity, 5 mg/L of iron, and 30 mg/L of aluminum at a rate that ranges from 5 to 50 gallons per minute.

1. **Location**
   Directions: From the MWA office turn left on Route 711 south and continue to the blinking traffic light in Normalville. At the light turn left and proceed a quarter of a mile. Turn left on Route 653. After crossing Indian Creek turn left onto Pritts Road. At the "Y" bear right onto Rogers Mill Road and then turn right onto Middle Fork Road. Then turn right onto Brown Road

2. **Partnerships**
   Mountain Watershed Association and Pennsylvania Department of Environmental Protection have partnered up to monitor the discharge at the Buck Run discharge site. Based on monitoring results the organizations will determine if a treatment system at the site will be feasible.

3. **Monitoring**
   Once the discharge site is relocated MWA is reestablish quarterly water quality samples for chemical analysis to monitor the discharge. Water samples will be collected and transported to Pennsylvania Department of Environmental Protection for analysis to identify any significant changes in water quality Samples will be collected following DEP's water monitoring protocol identified in Appendix A.

4. **Cost**
   Based on the PL566 study it estimated the cost of establishing a treatment system to address the Buck discharge is $98,000. However, that's what the cost would have been if constructed in 1999. As of 2012, the same treatment system would cost $133,427.

F. Nicholson Discharge

Impacting the headwaters of Poplar Run the Nicholson discharge flows from a reclaimed strip mine. It produces 138 mg/L of acidity, 18 mg/L of iron, and 1 mg/L of aluminum.

Although establishing a treatment system at the site was originally identified in the PL566 study the number of streambed discharges within the Poplar Run watershed resulted in a re-evaluation of the treatment approach. The decision was made to implement the Poplar Run land liming project, which addresses the impacts from these discharges.

1. **Location**
   Directions: From the MWA office turn left onto Route 711 south. In approximately 5.25 miles, turn right on Poplar Run Road. At the "Y" bear left and continue to the second stop sign. At the second stop sign bear left onto Buchannan Road and then turn left onto Nicholson Road and proceed to the end of the road.

2. **Partnerships**
   Mountain Watershed Association and Pennsylvania Department of Environmental Protection have partnered to monitor the Nicholson discharge.

3. **Monitoring**
   Currently MWA is collecting quarterly water quality samples for chemical analysis to monitor the discharge. Water samples are collected and transported to Pennsylvania Department of Environmental Protection for analysis to identify any significant changes in water quality Samples will be collected following DEP's water monitoring protocol identified in Appendix A.

4. **Cost**
   Based on the PL566 study it estimated the cost of establishing a treatment system to address the Nicholson discharge is $64,000. However, that's what the cost would have been if constructed in 1999. As of 2012, the same treatment system would cost $87,136.

V. Other Projects

A. Streambank Stabilization Projects

Streambank stabilization projects have occurred at a few locations where the streambanks were eroding away.

1. **Mill Run Reach #15 Stream Restoration Project**
   The Mill Run Reach #15 Stream Restoration project was conducted to restore and stabilize approximately 1,600

feet of stream channel with the overall goal of relocating Mill Run to its approximate original location within the floodplain. Stabilizing areas of localized bank erosion or failure and providing additional flood storage capacity within the banks of the stream will improve the health of the Mill Run watershed.

Grade control structures were installed between September and November 2005 to help stabilize—horizontally and vertically—the new channel as well as enhance sediment transport and in-stream habitat. The Mill Run Reach #15 Stream Restoration Project contains seven cross rock vanes, a log vane, four root wads, and two boulder bank revetments which improve 1,600 feet of stream.

Restoration efforts were conducted to reduce the erosion of streambanks, sedimentation, and flooding within the reach and downstream. Natural stream channel design techniques were used in designing the site and include stream relocation, enhancement of flood-prone areas, rock vanes, and riparian plantings. Mill Run has migrated away from its original location in the floodplain and the left bank of the stream has been continuously eroding and is showing signs of continued down valley meander migration. Over the years berms were constructed along the banks of Mill Run to prevent flooding; however these berms effectively confined the flow of the stream and compounded the problems seen in the project area.

In addition to the seven cross rock vanes, a log vane and four root wads were installed between cross rock vane #2 and #3. Three-boulder bank revetments were installed to stabilize the stream banks. The first starts at root wad 4 and ends just before cross rock vane 4. The second begins across the stream from where the first boulder bank ends at the pavilion to the right and ends to the left of the second pavilion. The third area of boulder bank starts above cross rock vane 5 in the new channel and stops and the end of the new channel before cross rock vane #6. A vegetative riparian corridor containing 1,000 trees and small shrubs is located throughout the disturbed areas where the coir/jute mates are located.

a. Location
   The total area of disturbance for the project is approximately 2.9 acres. The project is located within Springfield Township at the bridge where Mill Run passes beneath State Route 381 and extends downstream to the Hampton Road Bridge.

b. Partnerships and Responsibility
   As with every project, partnerships were instrumental to the success of this project. The cooperation from the organizations and individuals helped save time and money. Skelly & Loy Engineering along with Pennsylvania Association of Conservation Districts were involved in design, inspection, and project oversight. Stoy Excavation was responsible for construction activities while volunteers, including Fayette County Conservation District and Mountain Watershed Association assisted with the plantings. The Springfield Township Supervisors, Mill Run Recreation Authority, Pennsylvania Department of

Environmental Protection, U.S. Department of Agriculture Natural Resources Conservation Services, Pennsylvania Fish and Boat Commission, and various adjacent landowners assisted MWA with pulling the project together.

c. Monitoring

Monitoring activities at the site occurs bi-annually and following major storm events by a trained volunteer or staff member. The inspection form is located in Appendix C.

d. Cost

Funding for the project was provided by Pennsylvania Department of Environmental Protection through the Growing Greener program, Western Pennsylvania Watershed Protection Program (now the Foundation for Pennsylvania Watersheds), Natural Resources Conservation Service.
In 2011, Fayette County Conservation District provided $11, 000 to cover repairs to two rock revetments.

2. Wedges Streambank Project

The Wedges Streambank project stabilized a three-foot high, nearly vertical, unstable slope on a wide stream bend on an unnamed tributary to Mill Run. R-5 riprap was installed 2.5 feet high and tied into the bank. This project stabilized 120 feet of streambank reducing erosion from entering Mill Run.

a. Location
Located on private property along the lower portion of Hampton Road in Springfield Township, Fayette County, PA

b. Partnerships and Responsibility
Mountain Watershed Association worked with Pennsylvania Association of Conservation Districts-who designed the streambank project, Springfield Township supervisors-who assisted with construction and the Fayette County Conservation District and adjacent landowners-who assisted in planting vegetation at the site.

c. Monitoring
Monitoring of the site should occur twice per year and following major storm events by a trained volunteer or staff member. When conducting the inspections, observed conditions should be documented on the inspection form, located in Appendix C.

Before (top) and after (bottom) streambank stabilization project

d. Cost
Funding for the project was combined with the Sandusky/Lininger streambank project and provided by Pennsylvania Department of Environmental Protection through the Growing Greener program, with match coming from Pennsylvania Association of Conservation Districts, Springfield Township Supervisors, Fayette County Conservation District, Mountain Watershed Association, and adjacent landowners. Combined the two projects cost $15,513.

3. Sandusky/Lininger Streambank Project

The Sandusky/Lininger streambank project stabilizes approximately 250 feet of Mill Run and diverts the concentration of flow towards the center of the stream. Downed and leaning trees were removed and 12 R-8 riprap boulder spurs were installed approximately 20 feet apart.

a. Location
Located on private property along the Bottom Road in Springfield Township, Fayette County, PA

b. Partnerships and Responsibility
Mountain Watershed Association worked with Pennsylvania Association of Conservation Districts-who designed the streambank project, Springfield Township supervisors-who assisted with construction and the Fayette County Conservation District and adjacent landowners-who assisted in planting vegetation at the site.

c. Monitoring
Monitoring of the site should occur twice per year and following major storm events by a trained volunteer or staff member. When conducting the inspections, observed conditions should be documented on the inspection form, located in Appendix C.

d. Cost
Funding for the project was combined with the Wedge Streambank project and provided by Pennsylvania Department of Environmental Protection through the Growing Greener program, with match coming from Pennsylvania Association of Conservation Districts, Springfield Township Supervisors, Fayette County Conservation District, Mountain Watershed Association, and adjacent landowners. Combined the two projects cost $15,513.

4. Donegal Streambank Stabilization Project

The project utilizes root wads, log vanes, and bank revetment to stabilize 125 feet of the Indian Creek streambank in order to reduce erosion and sedimentation. In addition to stabilizing the streambank the in-stream structures improve fish rearing and spawning habitat.

When root wads and log vanes are used in conjunction with vegetative plantings, as is the case with the Donegal Streambank project, biodiversity is enhanced.

The life of a streambank stabilization project is dependent upon climate and the species of trees utilized. It will tolerate high boundary shear stress if logs and rootwads are well anchored.

a. Location
Located along 125 feet of Indian Creek in Donegal Township, Westmoreland County

b. Partnerships and Responsibility
Westmoreland County Conservation District, Penn's Corner RC&D, Natural Resources Conservation Service, Western Pennsylvania Coalition of Abandoned Mine Reclamation, Mountain Watershed Association, Pennsylvania Fish and Boat Commission, and Pennsylvania Department of Environmental Protection were involved in the establishment of the Donegal Streambank stabilization project.

c. Monitoring

Monitoring of the site should occur twice per year and following major storm events by a trained volunteer or staff member. When conducting the inspections, observed conditions should be documented on the inspection form, located in Appendix C.

B. Laurel Highlands Monitoring Project

Vertical datalogger installation

The Laurel Highlands Monitoring Project is a scientific water quality monitoring initiative which involves chemical and biological sampling as well as the installation of in-stream water monitoring devices called dataloggers in waterways throughout the Laurel Highlands region. Mountain Watershed Association has partnered with Conemaugh Valley Conservancy, Jacob's Creek Watershed Association, Loyalhanna Watershed Association, and Somerset Conservation District on this comprehensive monitoring initiative.

Solinist Jr. LTC leveloggers were purchased and installed beginning in 2011. These dataloggers monitor conductivity, temperature, and water level of the stream by taking a reading every fifteen minutes. The data is then downloaded and analyzed monthly for any increases in conductivity.

A horizontal datalogger installation

The dataloggers are placed in waterways which have been identified as potential locations for Marcellus shale development based upon permitting, drilling, leasing, and the locations of natural gas pipelines. The coalition currently has 93 dataloggers installed; of these, MWA is responsible for maintaining 28 dataloggers.

Each datalogger location is visited monthly in order to download the data. However, other maintenance activities are required on a routine basis to keep the dataloggers functioning properly. At least once per quarter the dataloggers need to be recalibrated using a standard solution. Also, upgrades to the software program are provided by Solinist as needed. When this occurs each logger needs to be upgraded. Instructions for installing and maintaining the dataloggers are available in Appendix K.

Funding for the project has been provided by several private foundations and through the fundraising efforts of the Mountain Watershed Association.

As the project continues, we plan to expand the monitoring efforts to include chemical grab samples and macroinvertebrate surveys. Table VI-1 identifies the estimated annual operation and maintenance cost associated with the datalogger monitoring.

TABLE V-1

	Mileage Costs				Staff Costs					Contractual Costs			
Routine Maintenance	Miles	Rate	Frequency	Cost	Hrs	# Staff	Frequency	Rate	Staff Cost	Rate	Hrs/Qty	Total Cost	**TOTAL COST**
Downloading data - monthly	150	$0.565	26	$2,203.50	24	1	26	$25.00	$15,600.00				$17,803.50
Data Analysis - monthly					24	1	12	$25.00	$7,200.00				$7,200.00
Troubleshooting - monthly					8	1	4	$25.00	$800.00				$800.00
Calibration & Software upgrades - quarterly	150	$0.565	4	$339.00	14	1	4	$25.00	$1,400.00				$1,739.00
Macroinvertebrate sampling Bi-annual	150	$0.565	2	$169.50	56	2	2	$25.00	$5,600.00				$5,769.50
Macroinvertebrate identification & analysis bi-annual					448	1	2	$25.00	$22,400.00				$22,400.00
TOTAL				**$,2712**					**$53,000**				**$55,712**

C. Indian Creek Valley Trail

The Indian Creek Valley Hike-Bike Trail (ICV Trail) was initiated when the Indian Creek Valley Railroad was abandoned in the 1970s and Saltlick Township purchased the right-of-way within their municipality. Along the right-of-way, Saltlick Township converted the old railroad corridor into a rail-trail that was utilized by area residents for walking, cycling, cross-country skiing, and stream access for fishing.

In 1976, the right-of-way between Champion and Indian Head was acquired by Western Pennsylvania Conservancy. It was then conveyed to Mountain Watershed Association in 2001. In 2009, a Feasibility Study was conducted to explore the potential for expanding the Indian Creek Valley Hike-Bike Trail to both the north and south. Expansions will not only lengthen the ICV Trail from five to 27 miles, but will also accomplish our goal of connecting it with other area trails. The northern extension will connect the ICV Trail with the 26 mile PW&S trail system in Forbes State Forest. The southern extension would expand the trail to the north shore of the Youghiogheny River at the mouth of Indian Creek.

1. Monitoring

   Frequent patrolling of the trail corridor is necessary to maintain safe conditions for trail users. During the peak season (March to October) monthly patrols should be conducted. During non-peak season (November to February) bi-monthly patrols should occur.

   In addition to monthly and bi-monthly patrols the trail corridor should be inspected quarterly by a trained trail inspector. Inspectors can be volunteers or MWA staff

members who have completed a training session on trail maintenance hosted by Mountain Watershed Association. Overall coordination of the patrols and inspections lies with MWA's Field Technician or other appropriate personnel. Volunteers should be contacted in March of each year in order to develop a schedule.

2. Maintenance

Assessing trail conditions is essential in the spring, especially following the harsh winter conditions typical within the Laurel Highlands region. This assessment will identify any necessary maintenance activities needed to return the trail to a safe and functional status.

a. Routine maintenance activities

Routine maintenance activities are predictable activities that can be planned each year. Examples of these activities include vegetation control, and litter control.

1) *Vegetation control*

Vegetation control is a major maintenance component, especially during the spring and summer months. Vegetation control is needed to maintain the integrity of the trail. Mowing needs to occur three times a year (May, July, and September). A four-foot berm from the edge of the trail surface should be maintained.

In addition to mowing, the control and eradication of invasive species needs to occur. Once detected, invasive species need to be eradicated before the it can expand into adjacent areas. Caution also needs to be taken during the removal process to prevent contamination in other areas.

2) *Litter control*

Maintaining litter-free conditions along the trail corridor enhances trail aesthetics and features. Although Leave-no-Trace principals are highly encouraged for all trail users, some litter will inevitably occur. Establishing an annual cleanup, such as the Ohio River Sweep or the Great Pennsylvania Cleanup, could increase community presence and knowledge of the trail system while beautifying the area.

3) *Drainage systems*

Drainage systems need to be cleaned annually to ensure culverts are not blocked with debris and to allow water to flow. If culverts become blocked water can backup which can cause ponding and erosion on the trail; this ultimately negatively impacts the surface conditions.

4) *Signage*

Signage and trail markings may need to be replaced periodically due to vandalism or natural wear-and-tear. Replacement of missing or damaged signs will occur on an as-needed basis. Establishing a trail marking/orientation system will be necessary once the trail is connected to other nearby trails.

b. *Remedial maintenance*

Remedial maintenance activities are specialized and unplanned fixes or upgrades to the trail system. These activities are typically a result of natural wear-and-tear, environmental factors, and vandalism. Since these maintenance needs are unknown from year-to-year they must be addressed on an case by case basis.

Periodically, sections of the trail may need to be resurfaced or additional drainage structures may need to be installed. This will depend on weather conditions and use.

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