

**2005 ABANDONED MINE LAND  
RECLAMATION AWARDS**

**MIDDLE CREEK SOUTH  
REESTABLISHING STREAM CHANNEL  
AMD 54 (4214) 201.1  
Frailey Twp.  
Schuylkill County, Pennsylvania**

**Submitted By**

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**Project Information**

**Project Start Date: March 6, 2000  
Project Completion Date: October 7, 2003  
Total Construction Cost: \$1,361,547.17  
Project Reclaimed by: Pennsylvania Department of Environmental Protection  
Construction Contractor: Napcon, Inc  
190 Mundy Street  
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**Nomination Team:**

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**Date Submitted**

**March 17, 2005**

## **I: BACKGROUND**

The Middle Creek South Project is located in a rural area of Schuylkill County approximately 2 miles north of the Borough of Tremont and 45 miles northeast of Harrisburg. Middle Creek originates north of Interstate 81 and flows south to its confluence with Good Spring Creek in the Borough of Tremont. This area is part of the Upper Swatara Creek Watershed, which flows into the Susquehanna River 8 miles south of Harrisburg and eventually the Chesapeake Bay.

The project area lies on the southern part of the anthracite coal region. The project area was first mined in the mid 1800s and was mined heavily from the early 1900s to the 1950s. Deep mining was the primary method used for mining until the 1940s with strip mining becoming the prominent method during the late 1940s and 1950s. The combination of these two methods of mining created severe safety and environmental problems in the project area, both above and below the surface. Listed below are those problems:

### ➤ **MIDDLE CREEK**

A 1,300-foot section of Middle Creek was relocated several times during mining operations and when mining ceased, the creek was placed on an earthen bridge between two stripping pits within the project area. In June 1972 Hurricane Agnes struck the Northeastern U.S. and swamped the region with over 12 inches of rain. The massive amount of runoff volume led to the creek breaching the earthen bridge and permanently dumping all its contents into one of the stripping pits. The bottom of that stripping pit was connected to the deep mine workings, so the creek's contents seeped through the floor and directly into the mine pool. Prior to 1972 this mine pool discharged at only one point, but two additional discharges developed after the breaching of Middle Creek. The additional discharges were at higher elevations, which indicated that the mine pool level had risen. Middle Creek was bypassed for a distance of 3,600 feet before one of the two new discharges reestablished it with an average of 2,000 gallons per minute of acid mine drainage. Maximum flows were measured at over 10,000 gallons per minute. The second new discharge point empties an average 1,100 gallons per minute of acid mine drainage into the nearby Coal Run. The original discharge still flows at 800 gallons per minute as it did before 1972 and pollutes Coal Run.



**Picture #1**

This picture illustrates the location of the truncated section of Middle Creek below the stripping pit. This area was all grown in and hiding the fact that a vibrant creek once flowed there.

### ➤ **SAFETY**

The scarring of the landscape at the surface was quite evident with refuse banks and large strips pits that had dangerously steep highwalls and unstable slopes. Highwalls extended for approximately 4,000 linear feet and to heights up to 160 feet. The pits held pools of water that further increased the danger if an

accident were to occur. A serious concern was warranted because ATV riders, hunters and hikers, frequented this area creating potential for injuries or fatalities.

**Middle  
Creek**



Picture #2

This picture shows the dangerous highwalls, refuse piles, unstable slopes, and ponding water left by years of scarring from mining. The pond at the bottom of this stripping pit is a vivid blue from high concentrations of metals. Also seen at the top part of the pond is Middle Creek emptying into this pit.

➤ ACID MINE DRAINAGE

When mining companies were still operating they would use pumps to control groundwater seepage into the mines. Once the mining operations ceased, the pumps were stopped. The groundwater that filled the mines created mine pools with high acidity and elevated levels of iron, sulfur and other pollutants. Gravity discharges from these pools at points below the mined areas polluted the watersheds and created adverse effects on the downstream habitat. The oxygen-rich water that Middle Creek emptied into the mine pool compounded this problem. The oxygen reacted with the underground mine workings at a much higher rate than the normal mine pool water, thus creating acids and dissolved metals that greatly increased the contamination.

➤ RUNOFF

The project area was comprised of spoil areas and strip pits without heavy vegetated ground cover. Instead of topsoil, these areas were covered with pyritic materials that oxidized when there was no precipitation, creating sulfuric acid and ferrous sulfate. When precipitation occurred, these pollutants were transported to further pollute the watershed.

➤ PROPERTY OWNER

Though coal is no longer king in the Anthracite Region, it is still a valuable commodity. The property owner of this and the surrounding lands was seeking a permit to actively mine his property at and adjacent to the Middle Creek site. Obtaining the property owner's permission to take on this project was imperative.

➤ BOX CULVERT

Township Road 571 (T-571) crosses over Middle Creek downstream approximately 2000 feet south of its discharge into the mine pool. A partially crushed 48" corrugated metal pipe beneath the road carried the water that exited the mine discharge point. This pipe was not adequate to handle the quantities of water a reestablished Middle Creek would discharge. It was essential that the existing pipe be replaced; not doing so would have resulted in roadway flooding and major damage to the road.

## II: SOLUTION

This section will describe the methods used in the Middle Creek South Project to either eliminate or reduce these aforementioned problems.

- The first issue that needed to be addressed was to gain the property owner's permission to tackle this project. The landowner's desire to perform additional strip mining in this area posed a hurdle. The Bureau of Abandoned Mine Reclamation and Bureau of District Mining Operations agreed that there were environmental and safety concerns within the project area. All three parties worked together and devised a plan to allow this project to be performed and allow the property owner to actively mine their surrounding properties.
- A new culvert design was needed at T-571 to handle the increased quantity of water that a reestablished Middle Creek would supply. Hydrology calculations were performed and it was determined that an 8-foot by 5-foot reinforced concrete box culvert would sustain a 25-year storm event.

The installation of this box culvert was performed early in the project staging and prior to the reestablishment of Middle Creek. This allowed the work to be performed in relatively dry conditions. The road was closed to perform the work and traffic was detoured. The existing pipe was removed and the new box culvert was set to allow the Middle Creek to flow under the roadway.

- It was determined that approximately 280 million gallons of oxygen-rich water per year was entering the mine pool from Middle Creek and then discharging at three discharge points along Middle Creek and Coal Run. Water quality tests of stream samples taken before the water entered the pit confirmed considerably lower concentrations of iron and other pollutants compared to the samples taken at 3 discharge locations of the mine pool. These contaminants greatly affected the water quality of Middle Creek, Coal Run, and downstream in Good Spring Creek. The 5 miles of these creeks that are polluted impact a significant portion of the watershed. The plan was to rebuild the portion of Middle Creek that had been destroyed to prevent its contents from entering the mine pool. It was anticipated that this work would cause the water level of the mine pool to drop and eliminate the two discharge points that developed after Hurricane Agnes in 1972.



Picture #3

This picture displays the mine pool discharge that flows into Middle Creek. This discharge first started to flow when Middle Creek breached its channel and began emptying into the mine pool in 1972. The discolored water and mud demonstrates the unhealthy amounts of metals that this discharge is carrying. At this location, the discharge is flowing through a V-shaped weir so that water levels can be monitored. Because of this project, it is anticipated that this and one of the two mine pool discharges into Coal Run will be eliminated.

The original location of Middle Creek was determined using maps that pre-dated the mining, so that the new creek alignment would follow the old as closely as possible. The new creek design utilized principles of fluvial geomorphology. This approach aims for lower velocity flows in the main stream channel by constructing a series of steps and pools as dictated by the geography of the valley. The main channel is designed to handle a two-year storm. For higher flows, a larger flood plain is designed outside of the main stream channel to handle up to a fifty-year storm. Strategically placed cross-veins, J-hook rock veins, and root wads are used to prevent bank erosion and channel undermining.

The first step in the construction to reestablish Middle Creek was to temporarily redirect its flow so that the strip pit could be backfilled and the new creek constructed. The new creek alignment was located in the field and material was excavated so that an impervious geosynthetic liner could be placed below the creek to prevent any seepage into the mine pool. This liner was covered with small diameter material and compacted to prevent tearing from larger rocks. The creek was then shaped and rock structures were placed to meet the design criteria. Once completed, the existing creek was diverted into the new channel allowing Middle Creek to flow naturally for the first time in over 30 years.



#### Cover Photo

The picture shown on the cover depicts the rebirth of Middle Creek and its condition with a normal flow. At the top, the creek is in the process of filling the channel that it will call home from now on. Also seen are the features in the fluvial geomorphic design. There is a steeper section lined with rock to provide turbulence to the creek that flows to a large rock structure that will form a pool to slow the creeks velocity and erosion power. The bottom picture shows the turbulence in the steeper area and how the energy slows in the pool below it.

- The project area encompasses approximately 58 acres that consisted of two large stripping pits and a large spoil pile. The stripping pits contained dangerously steep highwalls with ponding water at the bottom that posed a serious danger to public health and safety. A concern for safety was warranted because hunters, hikers, and ATV and motorcycle riders frequent this area. A fall from a highwall or unstable slope would most likely result in a serious injury or even death. The objective of the project was to backfill the strip pits with spoil and other mine refuse material.

The new design incorporated spoil and other on-site material to fill in the strip pits. Approximately 1.05 million cubic yards needed to be regraded. Slopes were designed to conform to existing surrounding contours and fall at a reasonable slope towards Middle Creek. Ditches were designed to direct much of the runoff into two constructed wetlands.

The project grading coincided with the reestablishment of Middle Creek. The material was graded to match the design contours with ditches and wetlands constructed as part of the grading plan. Permanent slope stabilization was established by seeding with a variety of seed mixtures depending on slope steepness. A high concentration of lime was added to the soil material to allow plant growth in the less than ideal pyritic material.



Picture #4

This picture displays an aerial view of the project during construction. The right side is completed and the left side is nearing completion. The highwalls and refuse pile shown in the above Picture #2 have been removed resulting in an area that is much safer. At this point Middle Creek has been reestablished, one wetland constructed, and about half the project seeded with considerable vegetative growth.

### III: RESULTS

This section will explain how the completion of this project has provided positive benefits in correcting the severe safety and environmental problems listed above.

#### ➤ MIDDLE CREEK & ACID MINE DRAINAGE

The reestablishment of Middle Creek has been a great improvement to the watershed. Though the acid mine drainage problem has not been eliminated it has been lessened. Millions of gallons of water are prevented from entering the mine pool and to be exposed to pollutants. This project has improved the quality of the water by raising the pH and lessening irons, sulfurs and other impurities. The use of the fluvial geomorphic stream design with its steps, riffles and pools meandering downstream has given the creek the natural look of an undisturbed watercourse.

In September 2004, much of the east coast of the U. S. was deluged by rain from Hurricane Ivan. Approximately 8 inches of rain was dumped in the region. The newly constructed stream received its first major test, receiving runoff amounts much greater than the 50-year design it was designed to withstand. The creek handled this storm event very well and without any significant problems. Due to a wet season the ground was already at a saturated level and when this storm occurred most of the rainfall became runoff. It was estimated that the creek handled approximately 180 million gallons of water during this storm event, well over the 100-year storm frequency for this area. Prior to the reestablishment of Middle Creek this amount of water would have flowed through the mine pool and subsequently shocked the downstream watercourses with a massive amount of pollutants.

Another objective of this project was an attempt to lower the mine pool water level and thus eliminating the two discharges that developed after Middle Creek began flowing into the mine pool. As of now, these two discharges still flow from the mine pool into Middle Creek and Coal Run. However, both 2003 and 2004 have been very wet years and the ground has been at a saturated level. A comparison will be done when rainfall conditions are within their normal limits.

#### ➤ SAFETY

With the completed project, the dangerous strip pits and refuse banks were eliminated making this area considerably safer. The steep and unstable highwalls that once posed a hazard are now gradual slopes that can be traversed with no concern. No longer do impoundments exist below steep highwalls that allowed the potential for drowning. With the project's gradually rolling slopes, it now mirrors the terrain that occurs naturally in Pennsylvania.

➤ RUNOFF

Upon the completion of the project the newly graded slopes were hydroseeded after lime was incorporated into the soil material. The seed germinated well and heavy vegetative growth was established throughout the project area. This heavy vegetated ground cover now is preventing the pyritic material from becoming oxidized and causing sulfurs and irons to be washed away. The vegetation's root structure stabilizes the slope, lessening sediment loading in the runoff. These factors directly lead to a healthy creek, which is evident by the observation of wildlife that has moved into this new habitat.



Picture #5

This picture shows the completed project looking down onto the two wetlands and the reestablished Middle Creek. The natural appearing meandering course of the creek is evident with the wetlands on either side. In addition, this picture illustrates that an individual would be able to journey down these slopes without any danger.

➤ WETLAND PONDS

Two wetlands with a combined area of over two acres were constructed to support a permanent wetland ecosystem. The ecosystem will promote the existence of insects, birds and other wildlife. These wetlands were constructed containing rock piles and stumps that will further attract birds, reptiles and amphibians to the area.

➤ HABITAT

The rebirth of the stream has allowed aquatic life and insects to inhabit the stream. Crawfish, frogs and other species have reestablished themselves into this once dead area. Wildlife habitats were created at various locations by constructing piles of the cleared trees for cover for birds and small mammals.

➤ BOX CULVERT

The installation of the box culvert at T-571 has provided a structure that can handle heavy rain events and not create damage to the roadway. If this structure were not installed beneath this road, damage would most likely have been extensive from Hurricane Ivan.

#### IV: CONCLUSION

The completion of the Middle Creek South Project has been a great benefit to the region by reducing or eliminating safety and environmental problems that were created by years of past coal mining. The completed reconstructing 1,300 feet of Middle Creek over 3,600 feet of the stream was reborn and allowed to flow unimpeded just as Mother Nature intended. Millions of gallons of water are prevented from flowing through the mine pools, and five miles of streams have seen water quality improvements. Aquatic creatures now populate the new habitat created by Middle Creek. The reconstruction of 1,300 feet Middle Creek resulted in the rebirth of over 3,600 feet of the stream with unimpeded flow just as Mother Nature intended. The once black and sparsely vegetated landscape is now colored with green vegetation that prevents rainfall from washing away materials that pollute the watershed.