

Raccoon Creek Watershed Abandoned Mine Drainage (AMD) Survey and Preliminary Restoration Plan EPA Section 104(b)(3) Document

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Washington County Conservation District
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Executive Summary

Abandoned mine lands in Pennsylvania present a significant liability to public health and contribute to environmental degradation. These scars are a result of Pennsylvania's 200-year industrial history that was characterized by fossil fuel and mineral extraction. The Commonwealth's industrial legacy has left more than 250,000 acres of abandoned surface mines and an estimated 2,300 miles of streams polluted with abandoned mine drainage (AMD). This report catalogues the AMD conditions within the entire 184 square miles of the Raccoon Creek watershed that is located in southwestern Pennsylvania (Refer to Figures 1 and 2). AMD not only impairs water quality, it affects the health and condition of aquatic habitat as well. Contemporary planning and restoration efforts now conducted using a holistic approach, acknowledging that the environment, the economy and society are directly linked. The restoration of the Raccoon Creek watershed's water quality from AMD degradation will provide not only an improved physical environment but will also create opportunity for economic development within the watershed. The combination of these two benefits will significantly improve the quality of life for the local residents of the communities within the watershed, as well as contribute to regional improvement for the Pittsburgh metropolitan area.

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I. INTRODUCTION

A. Purpose

The purpose of this report is to complete an abandoned mine drainage (AMD) survey and preliminary restoration plan for the Raccoon Creek watershed. There has been an increasing focus on utilizing a watershed-based approach to remediating the streams of Pennsylvania. According to the Report of the Pennsylvania 21st Century Environment Commission (1998), the Commonwealth's goal is to remediate all streams impacted by AMD by the year 2025. To accomplish this goal, the Commission has made three recommendations:

1. To develop a watershed-based approach to solving AMD problems;
2. To prevent potential AMD problems in future mining activities; and
3. To identify, catalog, categorize and prioritize existing AMD locations in the development of a comprehensive strategic plan (p. 48).

In accordance with these recommendations, the Washington County Conservation District (WCCD) coordinated this plan. Mr. Gary Stokum, of the WCCD, was instrumental in forming the Washington County Watershed Alliance, Inc. (WCWA) and the Raccoon Creek Watershed Association (RCWA). These local organizations, along with the Pennsylvania Department of Environmental Protection (PADEP), and Skelly and Loy, Inc., have proceeded with development of a preliminary restoration plan in an effort to identify and remediate AMD pollution within the watershed.

The objectives of this report are:

1. To identify, categorize and prioritize the most significant AMD discharge locations within the Raccoon Creek watershed; and
2. To propose the most appropriate remediation strategies economically and physically feasible.

The proposed results expected from the adoption of this plan are:

1. To significantly restore and protect the water quality of Raccoon Creek from past, present and future AMD pollution;
2. To create opportunity for economic development;
3. To reduce local government costs;
4. To enhance the quality of life for residents within the watershed;
5. To provide environmental and socio-economic improvements for the Pittsburgh region; and

6. To create a heightened awareness among the general public, local government officials, agencies and the business community of watershed values, problems and solutions.

The Raccoon Creek watershed is known to have at least 175 to 200 AMD discharges. Many of these sites are minor AMD discharges and are insignificant when weighed economically as feasible for remediation. This plan identifies seven (7) primary AMD sites and seventeen (17) secondary AMD sites (Refer to Figure 3) within the watershed. Remediation of these seven sites would significantly improve the overall water quality of the watershed. One of these sites, the Langeloth Borehole (L2), has been addressed and the implementation of a passive treatment system is 90% complete at this time. However, all parties have agreed that continued monitoring of this site is necessary, and that it should be included within this report as a major source of AMD.

To monitor the water quality of Raccoon Creek and its tributaries, twelve (12) stream sampling points have been established (Refer to Figure 3). The primary AMD sites were selected by Mr. John Davidson, PADEP, based upon historical data collection, his extensive knowledge of the Raccoon Creek watershed, and the large amount of historical and current water quality data for these locations. Additional water quality data and flow estimations were then provided by PADEP for incorporation into this plan. These sampling points, in addition to the primary AMD sites, have been monitored for twelve (12) months or more in order to make a contemporary assessment of the overall water quality of the watershed (Refer to Appendix A, B, and C).

Funding for this report has been supplied by a United States Environmental Protection Agency (USEPA) Section 104 grant provided by the Pennsylvania Department of Environmental Protection (PADEP). In order to compete for implementation funds for future land and water quality improvement projects, an updated assessment must be completed in the format required by the PADEP. The intent of this report is to provide the necessary assessment. Following the completion and adoption of this preliminary plan, the proposed remediation projects suggested herein will be eligible for funding from various state and federal programs (Refer to Appendix D).

B. Location and Characteristics of the Raccoon Creek Watershed

The Raccoon Creek watershed is located in western Allegheny, southern Beaver, and northern Washington Counties, Pennsylvania (Refer to Figure 1). The Raccoon Creek watershed encompasses an area that is approximately 477 km² (184 mi²). The length of Raccoon Creek within this area is approximately 74 km (46 mi.). Raccoon Creek's headwaters are located in Hickory, PA. Sub-basins of Raccoon Creek include (Refer to Figure 2):

- Bigger Run
- Brush Run
- Burgetts Fork
- Little Service Creek
- Little Traverse Creek
- Potato Garden Run

- Chamberlain Run
- Cherry Run
- Dilloe Run
- Frames Run
- Fishpot Run
- Gums Run
- Little Raccoon Run
- Raredon Run
- Service Creek
- St. Patrick Run
- Trampmill Run
- Traverse Creek
- Lower Raccoon Creek
- Upper Raccoon Creek

As Raccoon Creek flows downstream (north), it meanders through mostly rural areas (i.e., small villages, agricultural land, wood lots, and previously strip-mined areas) until it discharges into the Ohio River near Josephtown in Beaver County. The watershed/study area lies within the following municipalities (Refer to Figure 3):

- **Allegheny County:** Findlay and North Fayette;
- **Beaver County:** Aliquippa, Center, Greene, Hanover, Hopewell, Independence, Potter, and Raccoon; and
- **Washington County:** Burgettstown, Cross Creek, Hanover, Mt. Pleasant, Robinson, and Smith.

The mean annual precipitation in the watershed is between 914 to 1,016 mm (36 to 40 in)(USDOJ, 1984). The Pennsylvania Water Quality Standards (Chapter 93) classifies the main stem of Raccoon Creek as a Warm Water Fishery (PA Code, 1994). Approved trout waters in the Raccoon Creek watershed include Raccoon Lake and Traverse Creek (PFBC, 2000). Raccoon Creek is considered a navigable waterway by the U.S. Army Corps of Engineers and their jurisdiction extends 1.8 miles upstream from its confluence with the Ohio River (USACOE, 1981).

C. Previous Investigations

Raccoon Creek has been the focus of numerous state and federal agency assessments and reports concerning water quality within the watershed. These include:

1. "Sources of Coal Mining Drainage Pollution of Raccoon Creek Watershed, Pennsylvania" (USDOJ, 1968):

This study is a detailed mine drainage source investigation that located and quantified all coal mine drainage discharges and attempted to establish a county-wide network of stream sampling water quality locations for long-term monitoring. The study indicates that Raccoon Creek is degraded from the Cherry Valley area to its mouth (approximately 40 miles). It is also noted that another 30 to 40 miles of tributary streams are impacted. These streams are impacted by approximately 200 mining related sites that caused water quality to be characterized as acidic, highly mineralized, devoid of normal aquatic life, and unsuitable for many legitimate water uses. It is noted that with the exception of Potato Garden Run, tributaries to Raccoon Creek polluted by

mine drainage are restricted to Washington County. Finally, twenty-eight principal mine drainage sources were found to contribute 87 percent of the acidity discharged to streams at the time of the study (USDOl, 1968).

2. Within the watershed, a total of eighteen Pennsylvania Operation Scarlift Reports were filed. Of the eighteen, two reports were reviewed in preparation of this plan (Project SL 130-2 & 130-7). The criteria used in choosing these two reports are that they directly relate to the purpose of this plan and that they are comprehensive to the watershed. A complete listing of the eighteen reports are listed in Appendix E.

"Operation Scarlift Report (Project SL 130-2)", Giorgione and Ackenheil, 1972:

The 1972 Scarlift Report (SL 130-2) was performed as a by-product of Mr. James F. Hillman's gift of the land to the Commonwealth of Pennsylvania. With the knowledge of the AMD problems that existed in the area from the USDOl 1968 study and as part of the planning process for Hillman State Park, it was decided that a Scarlift Report would be completed for the park area. All sites were sampled for chemical parameters only. This report stated that Brush Run drains approximately 85% of the total park area.

"Operation Scarlift Report (Project SL 130-7)", Gooding and Dougherty, 1976:

The 1976 Scarlift Report (SL 130-7) sampled for chemical parameters only. This report states that four tributaries are responsible for the majority of water quality degradation in the Upper Raccoon Creek basin. These basins are:

- Potato Garden Run
- Little Raccoon Run, and
- Two unnamed tributaries (from the Joffre, PA basin and PA State Gamelands areas [SR-36]).

Three other sub-basins are marginally degraded by mine drainage:

- Dilloe Run
- Burgetts Fork, and
- Unnamed tributary to St. Patrick Run [SR-37].

The SL 130-7 study indicates sites JB1 and JB2 (Stream Reach Abatement Priority Index #4) and site H3 (Stream Reach Abatement Priority Index #18) are located in the priority areas. These areas have been recommended to have surface reclamation (Gooding and Dougherty, 1976). The SL 130-7 report also found 115 AMD sources contributing 24 tons per day of net acidity to the SL 130-7 study area. However, the USDOl 1968 study for the same study area found 28 mine drainage sources, contributing 71 tons per day of net acidity. When the 1968 and 1976 studies are

compared, even though more AMD discharge locations had been found in 1976, net acidic discharges to the watershed was reported at 47 tons per day less. The improvements to water quality are most likely due to a combination of natural and anthropogenic improvements.

3. "Water Quality of Raccoon Creek- Washington/Beaver Counties" (PADER, February 1980):

This study was prompted by water quality improvement as observed in the Water Quality Network data (USDOJ, 1968 study recommendation) and the lack of information concerning many of the tributaries to Raccoon Creek. All sites were sampled for chemical and biological parameters (benthic macro-invertebrate and fish populations). The area is impacted by historic and abandoned mine sites (both surface and underground mines), mainly in the Washington County portion of the watershed. In the 1980 PADER study, it was noted that Raccoon Creek's water quality is marginal for most of its length. However, many of its tributaries are of good to excellent water quality. At the time, recent data showed significant improvement in water quality. It was also noted that most of its degradation was due to abandoned mine workings in the Allegheny and Washington County portions of the watershed. The 1980 PADER study states that Raccoon Creek still suffers from severe AMD pollution; however, improvement to water quality and macro-invertebrate/fish populations were observed at a number of sampling station locations. The watershed, at that time, was described as a "biological wasteland."

4. "Raccoon Creek Watershed Survey" (PADER, November 1983):

The 1983 PADER study was performed to document further improving trends in water quality to Raccoon Creek in Smith, Robinson, and Hanover Townships in Washington County. This study involved chemical and biological parameters (benthic macro-invertebrate and fish populations). It found that water quality conditions were improving when compared to Scarlift data collected in 1976. Significant increases in alkalinity versus acidity were observed, especially at the stations located at Little Raccoon Run and Potato Garden Run. These two large tributaries are adding net alkalinity to Raccoon Creek instead of high acidities (PADER, 1983). Finally, the 1983 study states that overall improvements are apparent, but localized AMD sources continue to pose a serious problem.

5. "Raccoon Creek (820D) Management Report, Sections 01 & 02" (Pennsylvania Fish and Boat Commission [PFBC], 1989):

In 1989 the PFBC collected chemical water quality data in Raccoon Creek, along with limited biological data at three sites. Section 01 (Headwaters to T-821 bridge) was characterized by one sampling location that was suitable for an aquatic community. Species were indicative of a warm water stream community with pollution intolerant species present.

Section 02 (T-821 bridge to mouth) was characterized by four sampling locations. Habitat in Section 02 was good for aquatic life production. However, chemical parameters indicated impact from AMD. It is noted that the AMD has created a pollution block that may prevent fish migration above or below Section 02 under normal to low flow conditions. Species were indicative of a warm water stream community with pollution tolerant species present (PFBC, 1989).

6. "PFBC Cost/Benefit Information Letter" (PFBC, 2000)

The PFBC provided a cost/benefit analysis of Raccoon Creek involving the potential remediation of AMD. According to the PFBC information, when the proposed remediation work is completed, an additional 75 miles of warmwater/coolwater stream fishing would be created. This would produce an estimated stream reach of 213.4 acres. PFBC estimates for these water types are 370 angler trips per year, per acre. When compiled, total angler trips per year potential is 78,958. Knowing that the estimated value of an angler trip in Pennsylvania is \$31.04 (1996 dollars), this means that this proposed AMD remediation would yield an estimated \$2,454,804 annually to the communities within the watershed (PFBC, 2000).

It is known from these studies, and on going water quality sampling, that the water quality of the main stem of Raccoon Creek is degraded due to AMD in approximately 40 miles of stream. Additionally, another 30 to 40 miles of tributaries to Raccoon Creek are also impacted by AMD. The review of these documents support the present finding that most of these streams are acidic, highly mineralized (Fe, Al and Mn), lack normal aquatic life, and are unsuitable for most water uses. Most of the effected streams in this watershed are located in the headwater areas of Raccoon Creek in Washington County (Refer to Appendix A and Figures 3 and 4).

D. The Value of Watershed Restoration

The Raccoon Creek watershed offers extensive open and green space for its inhabitants, for the City of Pittsburgh and for the region. Unlike adjacent watersheds, such as Chartiers Creek to the east, Raccoon Creek has yet to experience significant urban sprawl and development from Pittsburgh. This means that the Raccoon Creek watershed has the potential to become a regional recreation destination. The restoration of the water quality degraded by AMD in Raccoon Creek will also provide local landowners and government officials more decision making options in regards to local issues such as 'smart growth', which is encouraged in Pennsylvania's *Growing Greener* program. In other words, a cleaner physical environment empowers the local communities in deciding the direction of their planning efforts, whether it is to encourage outside investment into their community, or to place restrictions on development in effort to resist urban and suburban sprawl.

Across the entire Commonwealth, fishing and boating activities accumulate in estimated earnings of more than \$2.5 billion per year. Pennsylvania's physical beauty is not only an environmental treasure, it is also an economic draw that should be protected. Much of the Raccoon Creek watershed is particularly suited for potential outdoor recreational uses if the needed AMD remediation were to take place. In fact, the PFBC, Division of Fisheries Management (PFBC, 1989) identifies AMD as the critical factor to water quality improvements in the Raccoon Creek watershed and continue to state that improved water quality would provide a valuable recreational warm water stream fishery.

II. GEOLOGY

A. Factors Affecting Mine Drainage

Past anthropologic (man-made) activities in the watershed have caused a variety of negative impacts to the environment. The major type of non-point source (NPS) pollution to water quality is AMD. AMD results when water and pyrite (iron sulfide) are exposed to oxygen. Metals (Iron- Fe, Aluminum- Al, and Manganese- Mn) that are in solution in underground minepools, precipitate out of solution when the AMD discharges into a stream, pond, or other surface feature. These precipitates are in the form of oxides and hydroxides. AMD can have varying levels of pH, acidity, and alkalinity, depending on how much interaction the discharge has had with carbonate rocks (USDA, 1995).

Past mining activity (underground [deep] mines, surface [strip] mines, and coal refuse piles) have had the greatest negative impact to the watershed(s) water quality. Mining activity has been present in the area for over 200 years. The deep mines have expansive underground tunnel networks that are now flooded (minepools), thus permitting groundwater to be impacted by pyrite. This degraded water can move from one watershed to another via this underground tunnel network and then be discharged to receiving streams in a completely different watershed than the one from which the water initiated. Surface mines and coal refuse piles also have a negative impact on water quality because surface-mined coal and pyrite is exposed to the atmosphere, which then permits any associated water to react chemically with oxygen in the atmosphere.

B. Physiography

The Raccoon Creek watershed is located entirely within the Pittsburgh Low Plateau Section-Prototypical Area of the Appalachian Plateaus Province. The Appalachian Plateaus Province occupies more than 26,000 mi², almost 60% of the area of the state. Of that 26,000 mi², the Pittsburgh Low Plateau Section-Prototypical Area occupies approximately 6,500 mi². The Prototypical Area of the Pittsburgh Low Plateau Section forms the largest unit of the Appalachian Plateaus Province in Pennsylvania.

The study area has a general relief pattern of a broad, dissected upland underlain by essentially horizontal sedimentary rocks. The present surface consists of broad, rounded ridges and intervening valleys.

C. Stratigraphy

The Raccoon Creek watershed is located within two different portions of the stratigraphic sequence. The southern portion of the watershed is sporadically located in the Pennsylvanian-Permian Transition and Permian System. The northern and predominate portion of the watershed is located within the Pennsylvanian System.

The Pennsylvanian-Permian Transition and Permian System is identical to the Dunkard Group. The Dunkard Group extends from the base of the Waynesburg coal bed to the present topographical surface. The Dunkard Group is divided into the Waynesburg, Washington, and Greene Formations, in ascending order. The boundary between the Waynesburg and Washington Formations is at the base of the Washington coal bed, and the boundary between the Washington and Greene Formations is at the top of the Upper Washington limestone bed. The exact placement of the Pennsylvanian-Permian boundary is a complex and controversial problem. Conventionally, it is placed at the bottom of the Waynesburg coal bed. The bedrock strata exposed over various portions of the Pennsylvanian System are members of the Monongahela and Conemaugh groups. The total stratigraphic thickness exposed of the Dunkard, Monongahela, and Conemaugh groups is on the order of 800 feet. All of the strata are sedimentary in origin. The formations within the Dunkard, Monongahela, and Conemaugh groups are comprised principally of shales and sandstones but also contain prominent limestone and coal horizons. The area of outcrop of the Monongahela Group is more extensive than that of any other group in the Raccoon Creek study area. The Pittsburgh coal seam is the lowest bed in the Monongahela Group and rests unconformably on the Conemaugh Group. Below the Pittsburgh Coal is about 2 ft. of dark to light gray brecciated limestone. The Pittsburgh coal seam is approximately 5 to 6 ft. thick, with some thickening and thinning in various areas. The upper part of the Pittsburgh Coal consists of alternating bands of black carbonaceous shales and boney coal 6 in. to 2 ft. in thickness for about 7 to 8 ft. above the main seam (Refer to Appendix F and Plate 1). Iron sulfide minerals (pyrite and marcasite) are generally associated with the coal and the black carbonaceous shales and sandstone overlying the coal bed. These minerals, upon oxidation, represent the principal source of acid from coal mining related activities.

Iron sulfide minerals are also found in the main coal seam as horizontal shaly partings and as concretions known as sulfur balls. The iron sulfide minerals in these partings are generally in the form of flaky crystals and the concretions occur as black to brassy spheres in various sizes. The sulfur balls, in the Pittsburgh Coal, are irregular in distribution and their composition is largely pyritic. These sulfur balls are one of the sources of acid in the main coal seam (PADCNR, 1999).

D. Structure

Raccoon Creek watershed is contained within the physiographic province known as the Appalachian Plateaus. This province is characterized by essentially flat-lying strata whose regularity is broken by low broad folds. The regional dip of the stratified rocks exposed in the watershed is to the southeast. Two structural folds modify the local geology. The West Middletown syncline is the fold that most predominately affects the

local geology of the Raccoon Creek study area. The northern axis of the syncline crosses Raccoon Creek near Bavington, PA. The closure of the syncline just to the northeast results in a basin-like structure within the main watershed area. This condition is evident by noting the circular pattern formed by the Pittsburgh Coal structural contours. The Cross Creek syncline, which trends east-west across the Cherry Valley sub-watershed, intersects the West Middletown syncline west of the Cherry Valley sub-watershed. The structure contour of the coal also indicates that a certain amount of AMD that enters the Raccoon Creek watershed results from surface water sources that originate outside the topographic boundaries of the basin (PADCNR, 1999).

III. MINING

A. History

The Raccoon Creek watershed is located in portions of three counties in southwestern Pennsylvania (Allegheny, Beaver, and Washington). However, the majority of the coal mining activity in the watershed has taken place in Washington County (Refer to Figures 4, 5, and 6). This study, therefore, primarily focuses on the Washington County portion of the watershed.

Coal mining in the watershed began in the late eighteenth century. The earliest mine (coal) known to exist in Washington County is depicted on a map of the City of Washington (then Bassettown), dated 1781. After this date, other outcrop mines were opened near Coal Center and Canonsburg. Due to the relative ease of access and the quality of the coal, Washington County soon had numerous small mines operating. These mines operated for home heating and the powering of small, localized industrial activity. After 1820, the need for coal was increased for home heating purposes. By 1840, the early Pittsburgh industrial complex became another consumer of the region's abundant coal resources. Soon, railroads and locks and dams were constructed, which facilitated the transportation of coal to the Pittsburgh market and further spurred increased mining/production of Washington County coal (circa 1880 Washington County delivered 700,000 tons of coal to market). From 1880 to 1923 there were annual increases in the amount of coal produced, and by 1923 the highest amount of coal produced was recorded (24.5 million tons). Decreases in coal production occurred after 1923 until the 1960's when large steel companies created a certain amount of industry stability. Large steel companies owned seven of the nine major mines at this time and 14.1 million tons of coal were produced in 1966 in Washington County. Only one year later (1967), however, coal production in the Raccoon Creek watershed was estimated to be less than 100,000 tons (USDOJ, 1968).

According to the 1968 United States Department of the Interior study, recoverable coal reserves are estimated at 2.1 million tons in the Washington, Waynesburg, Redstone, Pittsburgh, and Upper Freeport seams in Washington County. This study also states that the only significant coal reserves that remain in the Raccoon Creek watershed are in the Washington County portion of the Pittsburgh coal seam.

B. Current Mining

The primary source of coal in Washington County is from the Pittsburgh coal seam. Despite the fact that coal production has decreased from 1923 to present, Washington County ranks number two among Pennsylvania counties in coal production, producing 9,613,000 tons of coal in 1999. There are currently eleven permitted mining operations in the Raccoon Creek watershed, four of them active and seven of them inactive operations. The active operations consist of two surface (strip) mines, and five refuse disposal, reprocessing, and coal preparation facilities. There are no underground (deep) mines currently active within the watershed. Approximately 20,000 to 25,000 tons (18,000 to 23,000 tonnes) of coal was produced in the Raccoon Creek watershed in 1999 (Davidson, 2000).

After a period of decline of coal production in Raccoon Creek watershed, coal production is on the increase. PADEP personnel have indicated that some of the seven inactive permits may become active in the near future (2000-2001). With this renewed mining activity, it is expected that coal production in 2000 will increase to approximately 200,000 tons (181,436 tonnes) in Raccoon Creek watershed (Davidson, 2000). Besides these active mining operations, the watershed contains a large amount of coal refuse from abandoned and/or historic mining/waste sites. These areas remain as a legacy to previous mining activities and are a source of many water quality/environmental problems in the watershed. The re-mining and processing of these refuse sites provides both economic and environmental benefits to the community and the watershed (Refer to Figure 4).

IV. WATER QUALITY EVALUATIONS

A. SUMMARY

1. General Discussion

In Pennsylvania, approximately 2,425 miles of streams do not achieve water quality standards due to drainage from past coal mining (PADEP, 1999). Raccoon Creek and its tributaries are a component of this larger statewide picture concerning AMD, and this plan is a tool to assist in reducing the number of AMD impacted stream miles.

Raccoon Creek flows through its watershed in a northwestern direction from Hickory in Washington County to the Ohio River near Josephtown in Beaver County (Refer to Figures 1 and 2). The City of Pittsburgh is 30 miles upstream on the Ohio River from Raccoon Creek. The length of Raccoon Creek is approximately 74 km (46 mi) and the size of the watershed is approximately 477 km² (184 mi²). The annual mean discharge (water years 1942 to 1999) of Raccoon Creek is 5.5 cu m/s (192 cfs) (Refer to Appendix F and Plate 2, USDOI 2000). Additionally, three reservoirs are located in the watershed: Raccoon Creek Lake, Cherry Run, and Silver Creek (PADER, 1980). The Raccoon Creek watershed is bordered to the north by the Ohio River, to the northeast by the Elkhorn Run, Flaugherty Run, and Montour Run watersheds, to the east by the Chartiers Creek watershed, and to the south and west by Cross Creek, Harmon Creek, Kings Creek, Mill Creek, and Tomlinson Run watersheds.

Since the 1980 study, water quality and aquatic life continues to be impacted; mainly in the Raccoon Creek and Burgetts Fork portions of the watershed. As one moves downstream, water quality and aquatic life generally improve. Since the 1980 PADER study, mine reclamation activities have improved water quality in portions of the watershed (Potato Garden Run, Little Raccoon Run and St. Patrick Run) and assisted in restoring benthic macro-invertebrate and fish populations to previously impacted streams (PADER, February 1980).

2. 2000 Data Findings

For this study, the following review discusses upstream sample locations and then progresses to downstream sample locations. A discussion of each sampling point and a comparison of results to historical water quality data from previous studies follows. The water quality samples in downstream order were obtained at the following stream sampling sites: SL1, SL2, SL3, SL4, SL5, SL6, SL7, SL8, R1, SL9, SL10, and SL11 (Refer to Appendices A, B, C, and G and Figure 3).

Sites SL1 through SL3 are headwater sites on Raccoon Creek and Burgetts Fork. Water quality at these sites is characterized by net-alkaline water and low-metal concentrations. When 2000 data is compared to the 1974 and 1983 water quality data from similar sampling sites, SL1 has remained relatively constant

with an average pH ranging between 7.2 - 7.7 and average Total Iron ranging between 0.3 - 1.4 mg/L. SL2 has also remained relatively constant with average pH of 7.8 and average Total Iron ranging between 0.5 - 2.1 mg/L. SL3 was not previously sampled in other studies, however, its average pH was 7.3 and its average Total Iron was 2.2 mg/L.

Sample sites SL4 through SL6 are located in the Burgetts Fork sub-basin and exhibit decreased water quality from upstream sampling locations. Water quality at these sites is characterized by net-alkaline water and increasing metal concentrations (mostly iron). SL4 has improved since the 1983 study. It had not been sampled in the 1974 study. In 1983, SL4 had an average pH of 3.2 and an average Total Iron of 47.3 mg/L. During this investigation, SL4 was observed to improve with an average pH of 6.4 and average Total Iron of 40.7 mg/L. SL5 has also improved since the 1983 study. It had not been sampled in the 1974 study. In 1983, SL5 had an average pH of 4.3 and an average Total Iron of 5.8 mg/L. During this investigation, SL5 was observed to improve with an average pH of 5.7 and average Total Iron of 3.0 mg/L. SL6 has also improved since the 1983 study. It had not been sampled in the 1974 study. In 1983, SL6 had an average pH of 5.4 and an average Total Iron of 0.3 mg/L. During this investigation, SL6 was observed to improve with an average pH of 6.7 and average Total Iron of 0.3 mg/L.

Sample site SL7 is located in the Upper Raccoon Creek sub-basin downstream of the confluence of Burgetts Fork and Raccoon Creek. Water quality at this site is characterized by net-alkaline water and low-metal concentrations. SL7 had not been sampled in the 1974 or 1983 studies. During this investigation, SL7 was observed to have an average pH of 7.1 and average Total Iron of 2.9 mg/L. Though metal concentrations are low at this location, SL7 does exhibit the degradation that sample site SL8 characterizes in the Joffre area.

Sample site SL8 is located on an unnamed tributary to Raccoon Creek near the Village of Joffre. Water quality at this site is erratic. During this investigation, SL8 was observed to have an average pH of 4.5 and average Total Iron of 2.8 mg/L. SL8 had not been sampled in the 1974 or 1983 studies. As was discussed above, SL8 is a source of further degradation to downstream areas. Additionally, as the 1976 Scarlift Report (SL 130-7) discussed, this unnamed tributary (in the Joffre area) is one of the four tributaries responsible for water quality degradation (Gooding and Dougherty, 1976).

Sample site R1 is located at an unnamed tributary to Raccoon Creek along U.S. Route 22 near the Village of Bavington. Water quality at this site is characterized by net-alkaline water and low-metal concentrations. When compared to the 1974 and 1983 water quality data from a similar sampling site, R1 has remained relatively constant with an average pH ranging between 6.7 - 7.4 and average Total Iron ranging between 0.3 - 1.7 mg/L.

Sample site SL9 is located near the confluence of the Little Raccoon Run and Upper Raccoon Creek sub-basins. Water quality at this site is characterized by net-alkaline water and low-metal concentrations. SL9 has improved since the 1974 study. In 1974, SL9 had an average pH of 3.0 and an average Total Iron of 102 mg/L. During this investigation, SL9 was observed to improve with an average pH of 7.1 and average Total Iron of 0.3 mg/L. Since the 1976 Scarliff Report (SL 130-7) significant improvement has occurred in the Little Raccoon Creek sub-basin (as was also observed in the 1983 investigation) to Raccoon Creek. As was noted, Little Raccoon Creek was one of the four tributaries responsible for the majority of water quality degradation (Gooding and Dougherty, 1976).

Sample site SL10 is located on Raccoon Creek at Murdocksville. Water quality at this site is characterized by net-alkaline water and low-metal concentrations. During this investigation, SL10 was observed to have an average pH of 7.3 and average Total Iron of 1.1 mg/L. SL10 had not been sampled in the 1974 or 1983 studies.

Sample site SL11 is located on Potato Garden Run nearing the confluence with Raccoon Creek. Water quality at this site is characterized by net-alkaline water and low-metal concentrations. During this investigation, SL11 was observed to improve with an average pH of 7.3 and average Total Iron of 0.4 mg/L. SL11 had been sampled in the 1974 or 1983 studies. SL11 has improved since the 1974 study. In 1974, SL11 had an average pH of 2.9 and an average Total Iron of 70.9 mg/L. Additionally, as the 1976 Scarliff Report (SL 130-7) discussed, Potato Garden Run is one of the four tributaries responsible for water quality degradation (Gooding and Dougherty, 1976).

As is observed in Figures 3 and 4, the municipalities that contain the most significant AMD pollution are Burgettstown, Findlay, Hanover (Washington County), Robinson, and Smith. Burgettstown has an estimated population of 1,634 persons (PSDC, 1997) and is the largest community by population in Raccoon Creek watershed. Thus, Burgettstown has more people impacted by AMD in the watershed.

3. Comparison of 1974 Data versus 2000 Data Findings

A comparison of water quality data (1974 Scarliff Data [Gooding and Dougherty, 1976] versus 1999/2000 Data) was performed for this investigation (USDA, 2000). Current data was available for fifty-one of the seventy-one Scarliff sampling points. This comparison indicates that of the fifty-one sample locations, twenty-nine sites are adding increased amounts alkalinity (loadings) to the watershed (4,784 tons per year) versus the 1974 quantities, one is adding increased acidity (loadings) to the watershed (8 tons per year) versus the 1974 quantities, four are adding increased iron (loadings) to the watershed (15 tons per year) versus the 1974 quantities, and five are adding increased sulfates (loadings) to the watershed (80 tons per year) versus the 1974 data. Impacts to the watershed continue from the Upper Raccoon Creek (Joffre area) sub-basin

(SR2, SR3, SR5, and SR10) in terms of iron and sulfate loadings. For this comparison, the majority of the improvements to water quality from 1974 to the present have occurred in the Little Raccoon Run and Potato Garden Run sub-basins. In Little Raccoon Run, though some negative increases have occurred to a few sampling locations (SR22, SR23, SR30, SR40, and SR47) in terms of acidity, iron, and sulfate loadings, these increases have been negated by more substantial improvements in alkalinity loadings at other sampling locations (SR21, SR25, SR26, SR27, SR28, SR32, SR33, SR 42, SR43, SR45, SR46, and SR47). In the Potato Garden Run sub-basin, an increase in the alkalinity loadings has occurred here (SR34, SR55, SR57, SR58, SR61, SR65, and SR66) since 1974 (Refer to Appendix G). From this comparison, it can be seen that the Raccoon Creek watershed has made improvements to its overall water quality. Degradation in areas still exist, however, remediation projects to reduce the major discharge problems in the Burgetts Fork, Upper Raccoon Creek, and Potato Garden Run sub-basins are detailed in Section V, Proposed Remediation Design. When completed, these treatment systems will further improve conditions.

4. RCWA Biological Data Findings

Additional biological samples have been collected by the RCWA, in partnership with Burgettstown High School. Students and RCWA members completed a benthic macro-invertebrate study in fall 1999 and spring 2000 (RCWA, 1999/2000). Five stream reach locations were sampled. Generally the biological samples confirm the condition of the watershed's streams. The study also showed the same trend in the streams' biological conditions as was shown in earlier studies (Refer to Appendix H).

B. PRIMARY AMD SITES

The seven primary AMD discharge sites in the Raccoon Creek watershed are L2, P6, P7, E1, JB1, JB2, and H3 (Refer to Appendices A through C and Figure 3): The sites were selected as the primary AMD sites by Mr. John Davidson, PADEP, based upon historical data collection, his extensive knowledge of the Raccoon Creek watershed, and the large amount of historical and current water quality data for these locations. Additional water quality data and flow estimations were then provided by PADEP for incorporation into this plan. SL 130-7 ranks the stream reach areas to make improvements to water quality. Three of the present (2000) plan's seven primary AMD sites are located in the 1976 Scarlift study area. Of the primary AMD sites, sites JB1 and JB2 (Stream Reach Abatement Priority Index #4) and site H3 (Stream Reach Abatement Priority Index #18) are located in the priority areas. These areas have been recommended to have surface reclamation (Gooding and Dougherty, 1976). The primary AMD sites are characterized below and prioritized for remediation in Section V, Proposed Remediation Design.

1. Langeloth Borehole (L2)

The Langeloth Borehole project is under construction and is approximately 90% complete. This project is a partnership between the RCWA, WCWA, WCCD, WPCAMR, and PADEP. Funding was provided by both WPCAMR (\$42,106.00) and PADEP (\$19,600.00). The L2 site is located along Balogna Industrial Road west of State Route 18, 1/4 mile west of the Village of Slovan in Smith Township, Washington County. The treatment system design consists of an aerobic wetland or simple pond/wetland system, which provides detention, aeration, and storage for iron sludge.

2. East Plum Run (P6)

The East Plum Run site is located behind the structure located at 37 Plum Run Avenue in Burgettstown. The estimated flow rate is 19 gallons per minute (gpm). The discharge is characterized as a low-flow, net-acid, metal-laden discharge. Aluminum is present in the discharge at a concentration measured at 6 milligrams per Liter (mg/L). This limits the method of passive treatment and design of the system. Iron is also present in the discharge at a measured concentration of 31 mg/L. One and a third tons per year of iron and 1/4 ton per year of aluminum is introduced to the watershed via this discharge point.

3. West Plum Run (P7)

The West Plum Run site is located 50 feet upstream from P6 along Plum Run Avenue. The estimated flow rate is 247 gpm. The discharge is characterized as a high-flow, slightly net-acid, metal-laden discharge. Aluminum is present in the discharge at an average concentration of less than 0.5 mg/L. Iron is also present in the discharge at an average concentration of 73 mg/L. Over 39 tons per year of iron and approximately 1/4 ton per year of aluminum is introduced to the watershed via this discharge point.

4. Erie Mine (E1)

The Erie Mine site is located along Burgetts Fork below Ballfield Road and next to Hill Stadium in Burgettstown. Flow rates vary from under 30 gpm to 250 gpm. The estimated flow rate is 113 gpm. The discharge is characterized as a moderate-flow, net-alkaline, iron-laden discharge. Although a small amount of aluminum is also present, iron is the main contaminant of concern and is present at an average concentration measured at 73 mg/L. Over 18 tons per year of iron is introduced to the watershed via this discharge point.

5. Joffre Borehole (JB1)

This Joffre Borehole site is located adjacent at the end of Bonnymeade Drive along State Route 4015 in the Village of Bonnymeade, Smith Township. The estimated flow rate is 980 gpm. The discharge is characterized as a high-flow, net-acid, metal-laden discharge. Aluminum is present in the discharge at an average concentration measured at 6 mg/L. This limits the method of passive treatment and design of the system. Iron is also present in the discharge at an average

concentration measured at 43 mg/L. Ninety-two tons per year of iron and 13 tons per year of aluminum are introduced to the watershed via this discharge point.

JB1 is an artesian discharge located about 20 feet above the base of the Pittsburgh coal seam. The SL 130-7 Report stated that the JB1 discharge drained a large mine pool with an elevation estimated at or near 1,000 feet. According to the Pittsburgh and Eastern Coal Company Mine No. 2 Map (scale 1" = 400') dated 1925, JB1 emerges from an open slope entry into the No. 2 Mine. The map also indicates a haulage-way to the north, underneath Raccoon Creek, connecting the No. 2 Mine with the No. 3 Mine of the Pittsburgh and Eastern Coal Company. This haulage-way may serve as a link for a supply of water into the mine pool (Gooding and Dougherty, 1976). Currently, on the western side of Raccoon Creek downstream from the JB1 site, there is a refuse disposal site in operation (PennBalt, Inc. – Mine Permit #63871301, Mine #1 Refuse Disposal Site).

6. Joffre Borehole (JB2)

PADEP's Bureau of Abandoned Mine Reclamation, Ebensburg District Office, in conjunction with the RCWA, has designed the JB2 project to treat this major source of AMD. The project was awarded two EPA Section 319 grants for \$80,000 & \$142,800 from the PADEP.

The JB2 site is located along the east side of State Route 4015 between the villages of Cherry Valley and Hickton in Smith Township, Washington County. The discharge currently passes under the roadway through a 36-inch diameter culvert. Using water chemistry and flow data provided by Mr. John Davidson of the PADEP, Greensburg District Mining Office, a vertical flow (also known as a successive alkalinity producing system [SAPS]) passive treatment system was designed. The treatment system consists of a sedimentation pond, a vertical flow wetland, and a second sedimentation pond.

The estimated flow rate is 94 gpm. The discharge is characterized as a moderate-flow, net-acid, metal-laden discharge. Aluminum is present in the discharge at an average concentration measured at 12 mg/L. This limits the method of passive treatment and design of the system. Iron is also present in the discharge at an average concentration measured at 65 mg/L. Over thirteen tons per year of iron and 2.5 tons per year of aluminum are introduced to the watershed via this discharge point.

JB2 is a combination strip mine and deep mine discharge emerging from the base of strip mine spoils at the original outcrop. The source is situated near the location of an old drift to the Armide No. 1 Mine. The drift entry was strip mined in the mid 1960's (Gooding and Dougherty, 1976). Currently, on the western side of Raccoon Creek across from the JB2 site, there is a refuse disposal site in operation (PennBalt, Inc. – Mine Permit #63871301, Mine #1 Refuse Disposal Site).

7. Hamilton (H3)

The Pennsylvania Turnpike Commission (PTC) and the U. S. Department of Interior, Office of Surface Mining (OSM), in conjunction with the RCWA, is in the planning stages to treat this major source of AMD in the watershed. The PTC is providing \$100,000.00 (stream and wetland mitigation funds for the Southern Beltway project) and the OSM is providing \$80,000.00 (Appalachian Clean Streams Initiative Program) for this project.

The H3 site is located along the east side of State Route 3089 between U.S. Route 30 and State Route 3071 in Findlay Township, Allegheny County. The treatment system being designed by PADEP, Bureau of Abandoned Mine Reclamation consists of an aerobic wetland and successive alkalinity producing system (PADEP, 2000).

Flow rates vary from under 11 gpm to 148 gpm. The estimated flow rate is 75 gpm. The discharge is characterized as a moderate-flow, net-alkaline, iron-laden discharge. Iron is present in the discharge at an average concentration measured at 45 mg/L. Over seven tons per year of iron is introduced to the watershed via this discharge point.

C. SECONDARY AMD SITES

Numerous secondary AMD discharge sites exist in the watershed and should be considered important sources of water quality degradation. Mr. John Davidson of PADEP, Greensburg District Mining Office provided water quality data on the secondary AMD sites as a guide for potential future remediation activities, once the primary AMD sites are remediated. The following seventeen secondary AMD sites have been grouped into the following three categories so as to provide insight. These sites will need further detailed study in order to complete engineering/design remediation specifications (Refer to Figure 3):

- Net Acid with Metals: PG4, PG20, PG21, PG22, PG31, PG32, PG36, BR9, JB5, JB6, JB7, and JB25;
- Net Acid with No Metals: SP15 and SP16; and
- Net Alkaline with Iron: PG26, SR8, and SR68.

V. PROPOSED REMEDIATION DESIGN

The following proposed remedial actions for primary AMD sites involve the use of passive treatment technologies. Passive treatment technologies are considered the most feasible option since maintenance costs associated with this type of treatment are typically lower in comparison to other systems. These other systems are usually cost prohibitive for local conservation organizations. Three of seven primary AMD sites (L2, JB2, and H3) are currently either under construction or are being prepared for construction activities. Based on a prioritization of acidity and iron loadings per discharge, remediation of the remaining four primary AMD sites would be as follows:

1. JB1 (Acidity 24.91 tons/yr. + iron 91.63 tons/yr. = 116.54 tons/yr.);
2. P7 (Acidity 19.08 tons/yr. + iron 85.31 tons/yr. = 104.39 tons/yr.);
3. E1 (Acidity 3.07 tons/yr. + iron 18.07 tons/yr. = 21.14 tons/yr.); and
4. P6 (Acidity 17.58 tons/yr. + iron 1.86 tons/yr. = 19.44 tons/yr.).

Besides providing proposed remediation designs for the seven primary AMD sites as separate facilities, an eighth design for a combined or hybrid system for discharges P6, P7, and E1 has been prepared.

The following proposed remediation design cost estimations are based upon other projects of similar nature that have been completed by Skelly and Loy, Inc. Certain assumptions were made in regard to the major bid items in order complete cost estimations for the primary AMD sites and involve a variety of site specific constraints (Refer to Appendix I and Figures 3 and 5). *Some costs may vary and additional specific site information needed to more specifically estimate costs for recommended actions. The cost estimate information is provided to assist readers in gauging the approximate cost of each proposed remediation action and in prioritizing activities. The cost estimate information should not be inferred as the cost of completing each action.*

A. Langeloth Borehole (L2)

The L2 project is approximately 90% complete, however all parties have agreed that continued monitoring of this site is necessary, and that it should be included within this report as a major source of AMD. This project is a partnership between the RCWA, WCWA, WCCD, WPCAMR, PADEP, and the United State Department of Agriculture, Natural Resource Conservation Service (USDA, NRCS). Engineering/Site Design was provided by USDA – NRCS and funding was provided by WPCAMR (\$42,106.00) and PADEP (\$19,600.00). The L2 site is located along Balogna Industrial Road west of State Route 18, 1/4 mile west of the Village of Slovan in Smith Township, Washington County. The treatment system design consists of an aerobic wetland or simple pond/wetland system, which provides detention, aeration, and storage for iron sludge.

B. East Plum Run (P6)

The recommended passive treatment system for this discharge is a vertical flow wetland (also known as a successive alkalinity producing system [SAPS]) consisting of an alkaline-producing cell. The alkaline producing cell consists of a column of water above a compost layer which overlays a limestone layer. A flushing mechanism should also be included for removal of aluminum from the cell. Water discharging from the cell should be directed to an aerobic cell with a pond/wetland system for aeration, detention, and storage of metal sludges. Based upon the water quality data and general design criteria, approximately 800 tons of limestone may be required. The alkaline addition cell would be placed in an area of 1/3 to 2/3 acre. The discharge would be directed to a small pond/wetland system that may be placed in an area of less than one acre. It may be possible to place the treatment system on less than two acres, depending on topographic conditions and other constraints. As appropriate, emerging technologies should be considered such as passive flushing systems for aluminum and windmill or water-wheel power for aeration (Refer to Appendix J). A passive aluminum flushing system would involve the use of PVC piping with sanitary fittings and a valve. The outlet pipe from the SAPS, is sloped to allow enough velocity in the outlet pipe to siphon aluminum precipitate from the system. Periodically, this flushing maintenance activity may need to be performed in order to keep the system fully functional.

MAJOR BID ITEMS	QUANTITY	UNIT	UNIT PRICE	COST
Clearing/Grubbing	2	Acre(s)	\$500.00	\$1,000
Pollution Control	400	Feet	\$3.00	\$1,200.00
Seeding	2	Acre(s)	\$1,500.00	\$3,000.00
Access	1	Job	\$5,000.00	\$5,000.00
Excavation & Fill Settling Basin	1	Each	\$15,000.00	\$15,000.00
Excavation & Fill Wetland	1	Each	\$5,000.00	\$5,000.00
Compost Wetland	2,500	Square Yards	\$4.00	\$10,000.00
Limestone Channel	100	Feet	\$28.00	\$2,800.00
Rockfill -SAP	800	Tons	\$20.00	\$16,000.00
Compost - SAP	2,500	Square yards	\$4.00	\$10,000.00
Pipe (6") - SAP	400	Feet	\$8.00	<u>\$3,200.00</u>
Construction Sub-Total				\$72,200.00
Construction Cost				
Contingencies		20 Percent		\$14,440.00
Engineering = % of Construction		10 Percent		\$7,220.00
Project Administration = % of Construction		8 Percent		\$5,776.00
Mobilization/Demobilization % of Construction		10 Percent		\$7,220.00
Land Rights	2	Acre(s)	\$2,000.00	<u>\$4,000.00</u>
Total				<u>\$110,856.00</u>

C. West Plum Run (P7)

The recommended passive treatment system for this discharge is an Anoxic Limestone Drain (ALD). An ALD includes a buried bed of limestone for alkalinity production. A backup flushing mechanism may be included for removal of aluminum from the ALD. Water discharging from the ALD would be directed to an aerobic cell with a pond/wetland system for aeration, detention, and storage of metal sludges. This system would include at least two ponds for iron removal followed by a wetland. Based upon the water quality data and general design criteria, approximately 15,000 tons of limestone may be required. This limestone may be placed in an area of approximately two acres. The alkaline addition cell may be followed by two ponds and a wetland approximately 6 acres in size. The entire treatment system may take an area of approximately 10 acres. As appropriate, emerging technologies should be considered such as ALD flushing systems for aluminum and windmill or water-wheel power for supplemental aeration.

MAJOR BID ITEMS	QUANTITY	UNIT	UNIT PRICE	COST
Clearing/Grubbing	10	Acre(s)	\$500.00	\$5,000.00
Pollution Control	2,000	Feet	\$3.00	\$6,000.00
Seeding	10	Acre(s)	\$1,500.00	\$15,000.00
Access	1	Job	\$5,000.00	\$5,000.00
Excavation & Fill Settling Basin	2	Each	\$30,000.00	\$60,000.00
Excavation & Fill Wetland	1	Each	\$10,000.00	\$10,000.00
Compost Wetland	28,000	Square Yards	\$4.00	\$112,000.00
Limestone Channel	2,000	Feet	\$28.00	\$56,000.00
Rockfill -ALD	15,000	Tons	\$20.00	\$300,000.00
Pipe (6") - ALD	800	Feet	\$8.00	<u>\$6,400.00</u>
Construction Sub-Total				\$575,400.00
Construction Cost Contingencies		20 Percent		\$115,080.00
Engineering = % of Construction		10 Percent		\$57,540.00
Project Administration = % of Construction		8 Percent		\$46,032.00
Mobilization/Demobilization % of Construction		10 Percent		\$57,540.00
Land Rights	10	Acre(s)	\$2,000.00	<u>\$20,000.00</u>
Total				\$851,592.00

D. Erie Mine (E1)

The recommended passive treatment system for this discharge is an aerobic wetland or a simple pond/wetland system to provide detention, aeration, and storage of iron sludge. Given adequate space to provide retention time, the iron will precipitate. Based on typical sizing criteria for maximum flow rates, a treatment area of approximately three acres would be required, possibly consisting of two ponds and a wetland. Typical design criteria should be coupled with space limitations to optimize design. As appropriate, emerging technologies should be considered such as windmill or water-wheel power for aeration.

MAJOR BID ITEMS	QUANTITY	UNIT	UNIT PRICE	COST
Clearing/Grubbing	3	Acre(s)	\$500.00	\$1,500.00
Pollution Control	600	Feet	\$3.00	\$1,800.00
Seeding	3	Acre(s)	\$1,500.00	\$4,500.00
Access	1	Job	\$5,000.00	\$5,000.00
Excavation & Fill Settling Basin	2	Each	\$15,000.00	\$30,000.00
Excavation & Fill Wetland	1	Each	\$5,000.00	\$5,000.00
Compost Wetland	14,000	Square Yards	\$4.00	\$56,000.00
Limestone Channel	300	Feet	\$28.00	<u>\$8,400.00</u>
Construction Sub-Total				\$112,200.00
Construction Cost Contingencies		20 Percent		\$22,440.00
Engineering = % of Construction		10 Percent		\$11,220.00
Project Administration = % of Construction		8 Percent		\$8,976.00
Mobilization/Demobilization % of Construction		10 Percent		\$11,220.00
Land Rights	3	Acre(s)	\$2,000.00	<u>\$6,000.00</u>
Total				\$172,056.00

E. East Plum Run/West Plum Run/Erie Mine Hybrid

The recommended passive treatment system for these combined discharges would involve a hybrid passive treatment approach. Each discharge (P6, P7, and E1) has different water quality issues. However, the water quality and flow data suggest that combining these discharges may result in a net alkaline discharge which may eliminate or reduce the need for alkaline addition. Average alkalinity and acidity loading indicate that a net alkaline discharge would result. However, occasions did exist when a net acid load would result in a small percentage of the sample events.

The recommended passive treatment system approach for the combination of the Erie Mine (E1) and Plum Run (P6 and P7) discharges is a water transmission line for the Plum Run discharges and a simple pond/wetland system for the combined discharges to provide detention, aeration, and storage of the metal sludge. Given adequate space to provide retention time, the metals will precipitate and drop out. Based on typical sizing criteria for maximum flow rates, a treatment area of approximately fifteen acres would be required, possibly consisting of multiple ponds, wetlands, and aeration berms. Typical design criteria should be coupled with space limitations to optimize design.

The most difficult part for this hybrid system may be in the transmission of the water from the Plum Run discharges to the Erie Mine area. The water transmission line would bisect a neighborhood area and multiple properties. An easement or right-of-way must be negotiated for this purpose. In order to provide aeration and detention for the combined discharges, a location needs to be identified which contains approximately fifteen acres with gravity drainage below the Erie Mine. A possible location is found directly below the Erie Mine discharge. This location must be field verified utilizing surveying techniques as necessary to confirm the feasibility. If the location is suitable (barring other potential constraints), and land rights can be acquired, a hybrid treatment system could be constructed. Typical design criteria should be coupled with space limitations to optimize design. As appropriate, emerging technologies should be considered such as windmill or water-wheel power for aeration.

There are advantages to this remediation option. These include:

- 1) The treatment of the three discharges is accomplished at one location, therefore maintenance activities are minimized;
- 2) With one significant project, three of the four remaining seven primary AMD sites would be constructed. This would lead to significant improvements to water quality in the Burgetts Fork drainage area;
- 3) Construction of this option and its environmental benefits (as discussed in Section I) would yield improved economic benefits from fishing and other outdoor recreation;
- 4) Construction of this option would give local educators a unique passive system / laboratory that students could use to expand local science curriculums;
- 5) Improved aesthetics would potentially assist in fostering community

- development activities that otherwise would not have occurred; and
- 6) Costs associated with alkaline limestone addition may be eliminated or significantly reduced.

However, there are disadvantages as well. These include:

- 1) Potential problems associated with transporting the Plum Run discharges to this location;
- 2) Attaining land rights, rights-of-way, and/or easements from numerous property owners;
- 3) Limited hydraulic head available for transmitting the Plum Run discharges to Erie Mine; and
- 4) The possibility that a net alkaline discharge would not occur at all times resulting in lower overall treatment efficiencies.

MAJOR BID ITEMS	QUANTITY	UNIT	UNIT PRICE	COST
Clearing/Grubbing	15	Acre(s)	\$500.00	\$7,500.00
Pollution Control	3,000	Feet	\$3.00	\$9,000.00
Seeding	15	Acre(s)	\$1,500.00	\$22,500.00
Access	1	Job	\$5,000.00	\$5,000.00
Excavation & Fill Settling Basin	6	Acres	\$30,000.00	\$180,000.00
Excavation & Fill Wetland	4	Acres	\$20,000.00	\$80,000.00
Pipe (18") Transport P6 and P7	6,000	Feet	\$30.00	\$180,000.00
Construction Sub-Total				\$484,000.00
Construction Cost Contingencies		20 Percent		\$96,800.00
Engineering = % of Construction		10 Percent		\$58,800.00
Project Administration = % of Construction		8 Percent		\$46,400.00
Mobilization/Demobilization % of Construction		Lump Sum		\$20,000.00
Land Rights	15	Acre(s)	\$2,000.00	\$30,000.00
Total				\$736,000.00

F. Joffre Borehole (JB1)

The recommended passive treatment system for this discharge is a vertical flow wetland consisting of an alkaline-producing cell with a compost layer and limestone layer, a flushing mechanism for removal of aluminum from the cell, and an aerobic component with a pond/wetland system for aeration, detention, and storage of metal sludges. Recovery of aluminum will be considered as a potential asset to this project. Based upon the water quality data and general design criteria, up to 28,500 tons of limestone may be required. The total system area may require 12-15 acres. It may be possible to reduce the limestone tonnage based on bench scale testing to determine actual alkalinity production rates. This would also reduce the required treatment area size. The use of emerging technologies such as passive flushing systems for aluminum handling and windmill or water-wheel power for aeration should also be considered.

MAJOR BID ITEMS	QUANTITY	UNIT	UNIT PRICE	COST
Clearing/Grubbing	15	Acre(s)	\$500.00	\$7,500.00
Pollution Control	3,000	Feet	\$3.00	\$9,000.00
Seeding	15	Acre(s)	\$1,500.00	\$22,500.00
Access	1	Job	\$5,000.00	\$5,000.00
Excavation & Fill Settling Basin	1	Each	\$100,000.00	\$100,000.00
Excavation & Fill Wetland	1	Each	\$50,000.00	\$50,000.00
Compost Wetland	4,800	Square Yards	\$4.00	\$19,200.00
Limestone Channel	3,000	Feet	\$28.00	\$84,000.00
Rockfill -SAP	28,500	Tons	\$20.00	\$570,000.00
Compost - SAP	56,000	Square Yards	\$4.00	\$224,000.00
Pipe (6") - SAP	9,600	Feet	\$8.00	<u>\$76,800.00</u>
Construction Sub-Total				\$1,168,000.00
Construction Cost Contingencies		20 Percent		\$233,600.00
Engineering = % of Construction		10 Percent		\$116,800.00
Project Administration = % of Construction		8 Percent		\$93,440.00
Mobilization/Demobilization % of Construction		10 Percent		\$116,800.00
Land Rights	15	Acre(s)	\$2,000.00	<u>\$30,000.00</u>
Total				<u>\$1,758,640.00</u>

G. Joffre Borehole (JB2)

Using water chemistry and flow data provided by Mr. John Davidson of the PADEP, Greensburg District Mining Office, a vertical flow (also known as a SAPS) passive treatment system has been designed by PADEP, Bureau of Abandoned Mine Reclamation. The treatment system consists of a sedimentation pond, a vertical flow wetland (SAPS), and a second sedimentation pond. The project was awarded two EPA Section 319 grants for \$80,000 and \$142,800 from the PADEP for a total project cost of \$220,800 for construction. Construction for this project should begin in 2001.

H. Hamilton (H3)

The PADEP, Bureau of Abandoned Mine Reclamation has completed the engineering design for this AMD remediation project. The following project cost estimate was a part of the engineering design by PADEP (PADEP, 2000). The PTC is providing \$100,000.00 and the OSM is providing \$80,000.00 for construction of this project.

MAJOR BID ITEMS	QUANTITY	UNIT	UNIT PRICE	COST
Clearing/Grubbing	Job	Job	Lump Sum	\$1,000.00
Implementation of E&S Plan	Job	Job	Lump Sum	\$1,000.00
Seeding	Job	Job	Lump Sum	\$4,200.00
Wetland Construction:				
Pond 1	712	Cubic Yards	\$3.00	\$2,136.00
SAPS Excavation	34,500	Cubic Yards	\$3.00	\$103,500.00
SAPS Limestone	4,082	Tons	\$10.00	\$40,820.00
6 inch PVC Pipe	705	Linear Feet	\$7.00	\$4,935.00
10 inch PVC Pipe	150	Linear Feet	\$8.00	\$1,200.00
Inline Level Control Structure	Job	Job	Lump Sum	\$1,500.00
Spent Mushroom Compost	2,300	Cubic Yards	\$12.00	\$27,600.00
Aerobic Wetland:				
Spent Mushroom Compost	210	Cubic Yards	12.00	\$2,520.00
Wetland Planting	Job	Job	Lump Sum	\$1,000.00
Mobilization/Demobilization	Job	Job		<u>\$5,000.00</u>
Total				\$196,411.00

VI. RECOMMENDATIONS

Raccoon Creek watershed has been impacted by AMD for many years. The numerous studies that have been completed to date have detailed the past and current water quality conditions that existed when each particular study was completed. The remediation of some discharges by re-mining/reclamation activities has resulted in water quality improvement. The primary sources of acidity and metals are sites L2, P6, P7, E1, JB1, JB2, and H3 (Refer to Figure 3). The remediation of these sites is critical to restoring Raccoon Creek's water quality and aquatic ecosystem.

Due to the recent efforts of the RCWA and their partnership, three on-going remediation activities are in differing states of completion (sites L2, JB2, and H3). These help the RCWA and its partnership towards their goal of restoring the Raccoon Creek watershed from degradation. These projects, along with the recently (1999) completed sewer project in the Burgettstown area, will make further watershed restoration improvements by addressing two significant NPS water quality issues.

Continued chemical and biological sampling of the watershed's AMD discharges and stream aquatic habitat will help gauge the effect remedial actions (current or future) will have on water quality.

The following recommendations are being made for the future remediation of AMD from the Raccoon Creek watershed:

- Complete PADEP Environmental Good Samaritan Act Forms for all AMD-related projects that are located on private property prior to commencing project activities (Refer to Appendix K);
- Continue on-going remediation projects (sites L2, JB2, and H3);
- Utilize the RCWA and other potential volunteers to assist with monitoring water quality and invertebrate community of Raccoon Creek and its tributaries;
- RCWA, local school districts, and other interested organizations continue to partner, and facilitate youth and adult environmental education (Refer to Figure 7);
- Partner with the PFBC to update the 1989 Raccoon Creek (and its tributaries) fish communities electrofishing evaluation;
- Continue planning proposed future remediation of the remaining four primary AMD discharge sites (P6, P7, E1, and JB1). These activities can include, but are not limited to, water sampling/analysis, flow calculations, land acquisition, funding acquisition, grant writing, and engineering/design of treatment system. Based on a prioritization of acidity and iron loadings per discharge location, remediation of the primary AMD sites would be as follows:

1. JB1;

2. P7;
3. E1; and
4. P6;

- Remediate secondary AMD sites after primary AMD sites have been corrected;
- Utilize re-mining as a tool for reclamation of abandoned mine lands and associated AMD discharges;
- Utilize various state and federal funding programs (i.e., EPA Section 319, Title IV, Surface Mining Control and Reclamation Act [SMCRA], 10% Set Aside, OSM Emergency Reclamation, etc.) to remediate AMD sites. Submit grant applications to the Growing Greener program and submit additional grant applications to programs identified in Appendix D.




The completion of this watershed plan will further assist by giving a higher ranking to all grant applications submitted by the partnership for making any and all future improvement projects to the Raccoon Creek watershed.

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FIGURES

<p>LEGEND</p> <p> Raccoon Creek Watershed</p> <p>4 0 4 8 Miles</p> 		<p>RACCOON CREEK WATERSHED ASSOCIATION</p> <p>AND SURVEY AND PRELIMINARY RESTORATION PLAN</p> <p>RACCOON CREEK WATERSHED</p> <p>ALLEGHENY, BEAVER AND WASHINGTON COUNTIES</p>	
		<p>PROJECT REGION</p>	
<p>FIGURE 1</p>		<p>SKELLY AND LOY, INC. CONSULTING ENVIRONMENTAL - ENERGY ENGINEERING - PLANNING</p>	



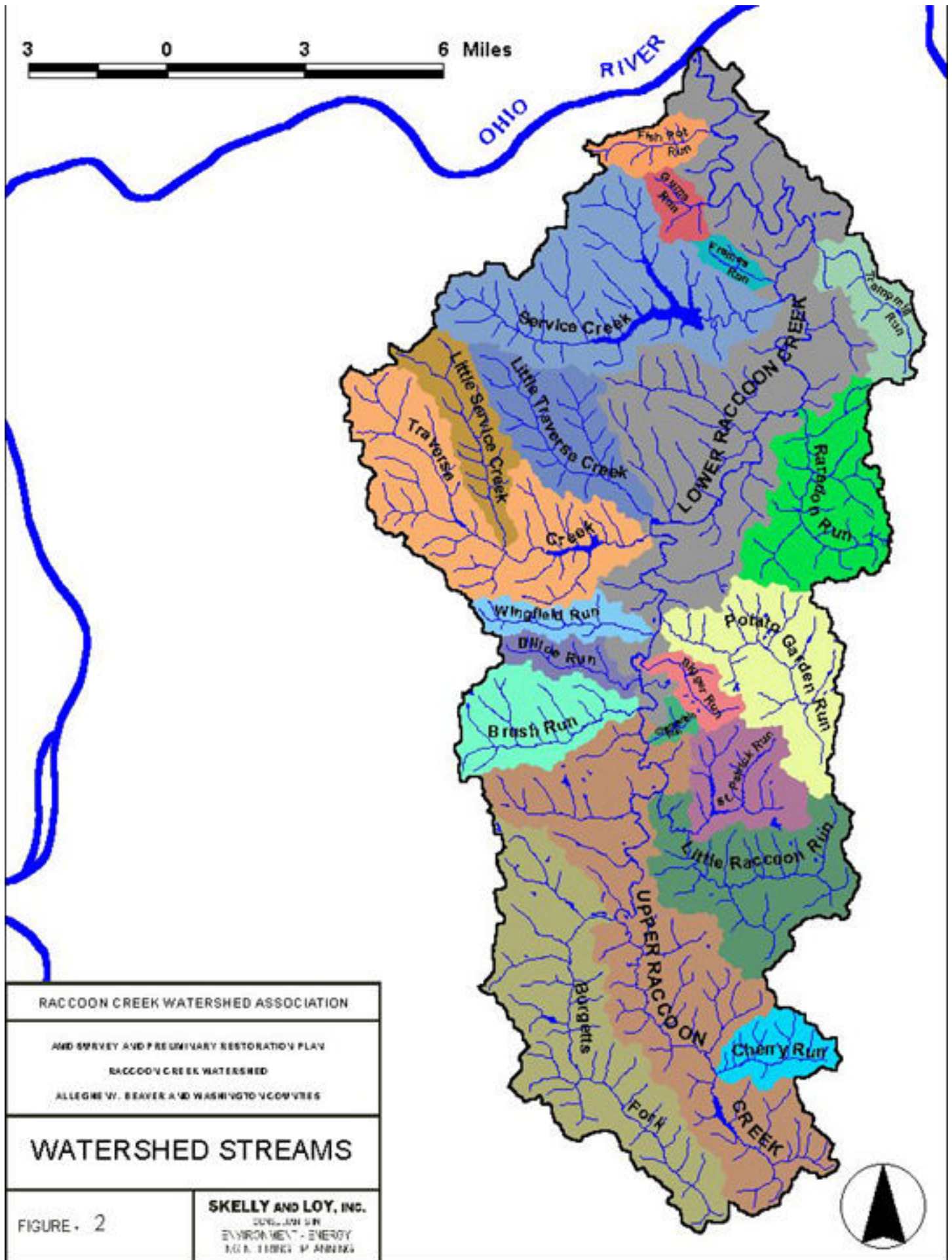
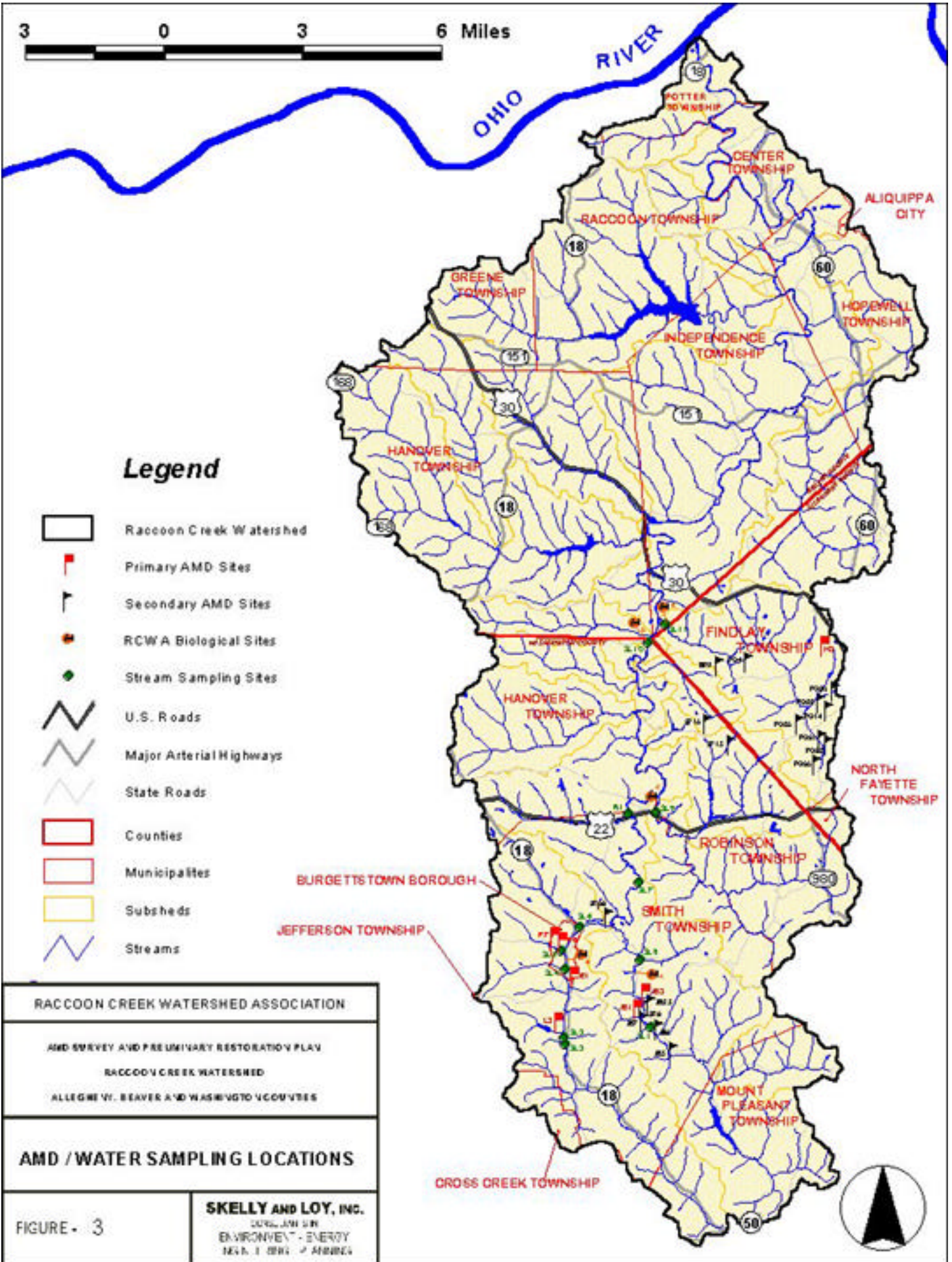
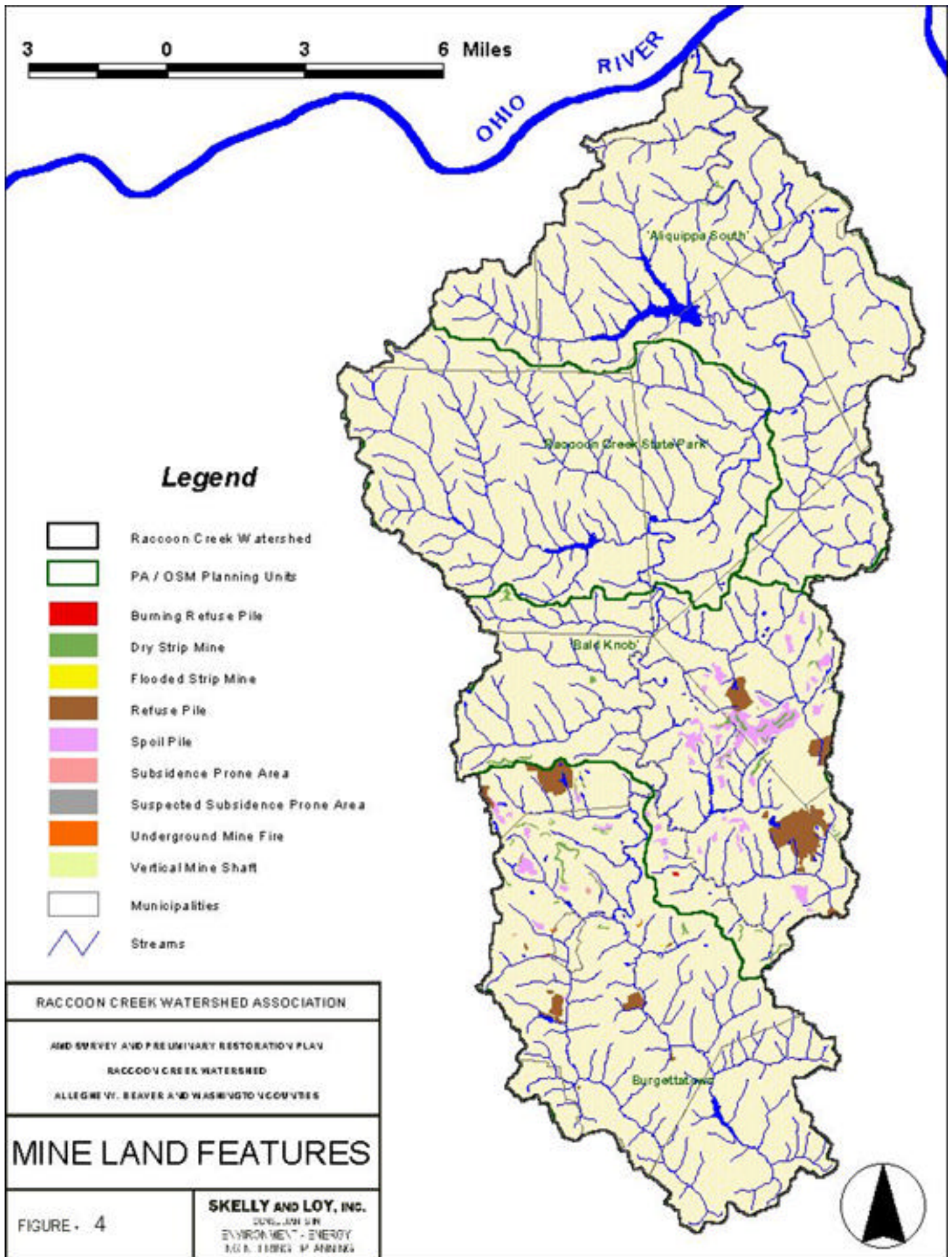
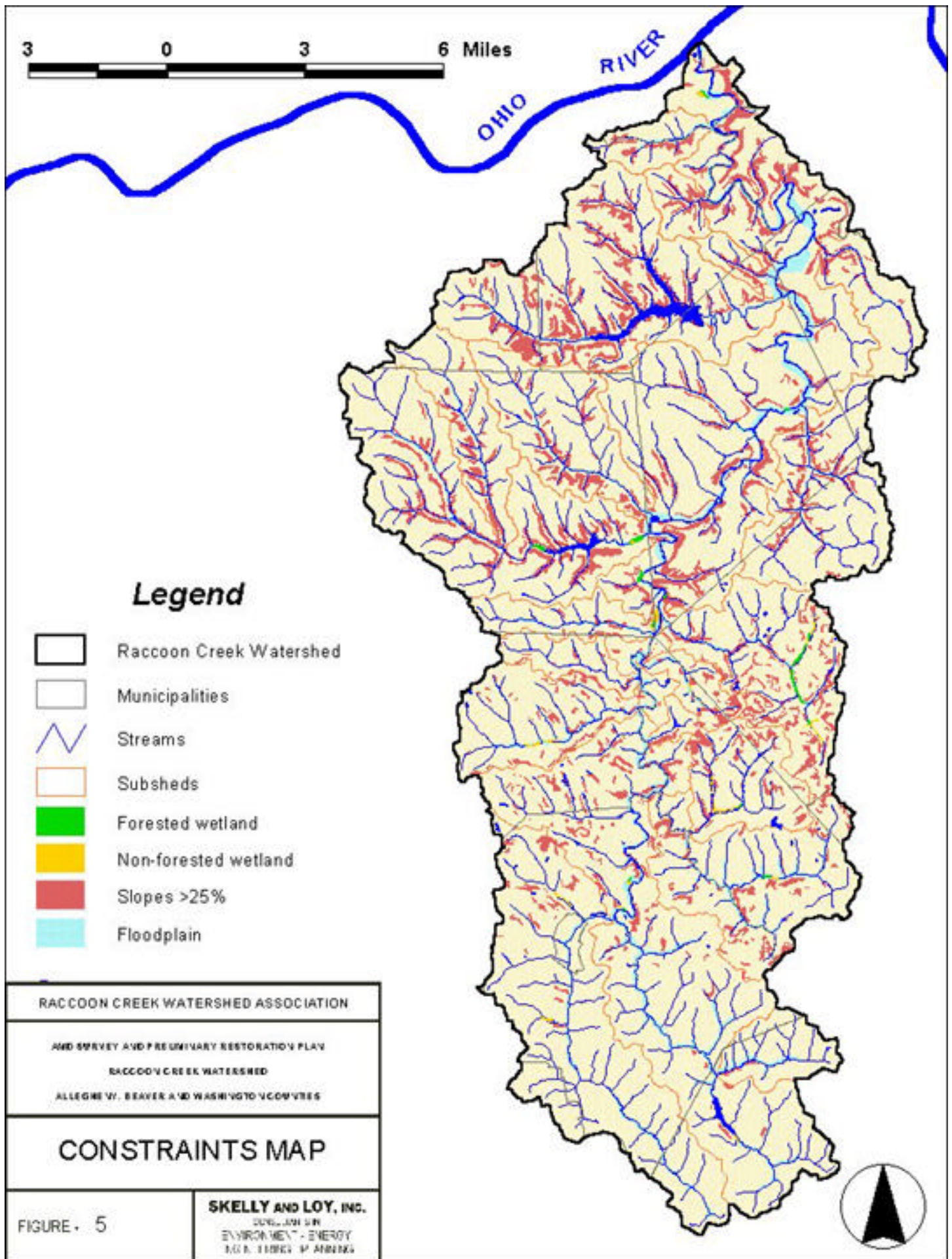


FIGURE 2




SKELLY AND LOY, INC.
 CONSULTING
 ENVIRONMENT - ENERGY
 AND CONSTRUCTION







Legend

-  Raccoon Creek Watershed
-  Municipalities
-  Streams
-  Subsheds
-  Forested wetland
-  Non-forested wetland
-  Slopes >25%
-  Floodplain

RACCOON CREEK WATERSHED ASSOCIATION

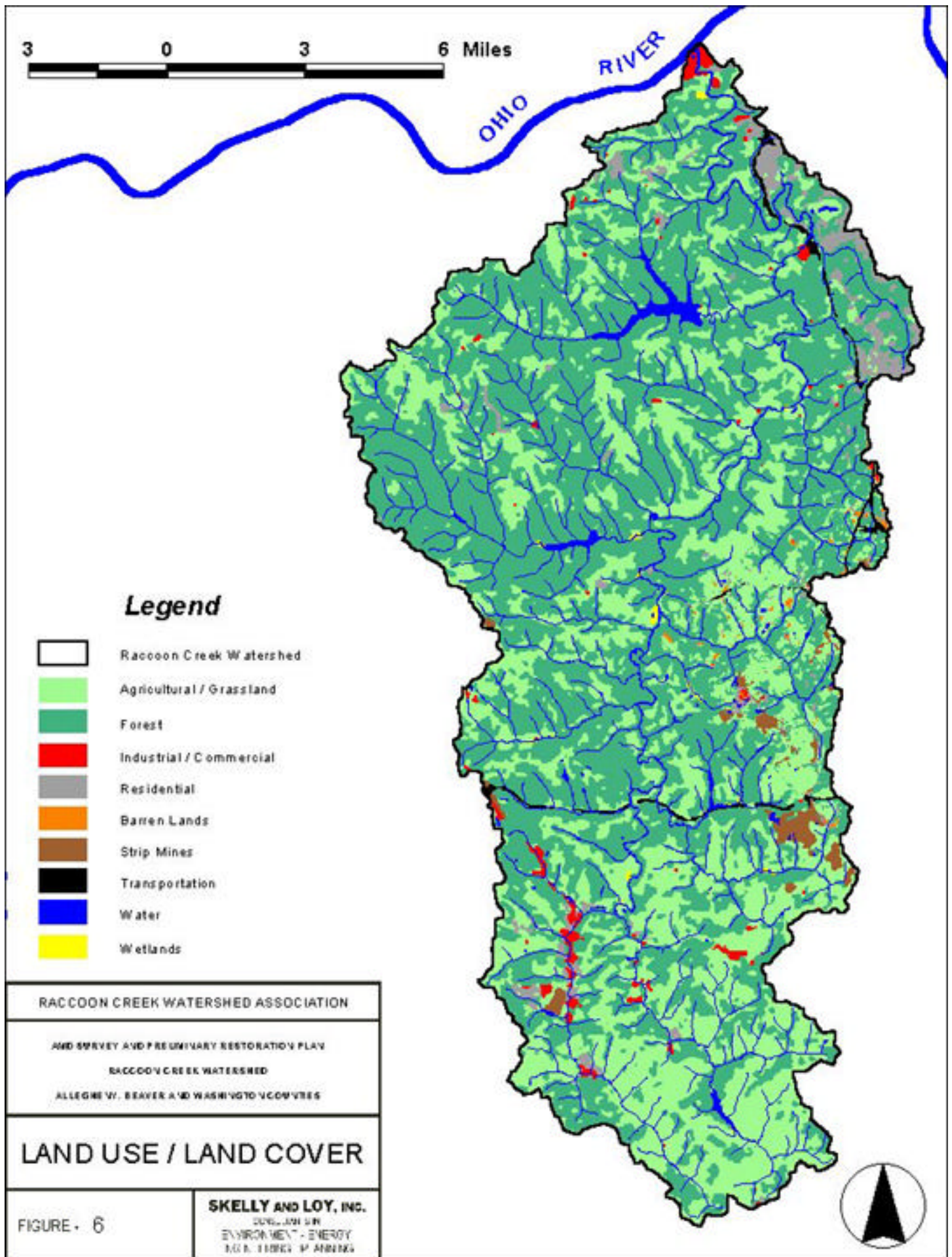
AND SURVEY AND PRELIMINARY RESTORATION PLAN
 RACCOON CREEK WATERSHED
 ALLEGANY, BEAVER AND WASHINGTON COUNTIES

CONSTRAINTS MAP

FIGURE 5

SKELLY AND LOY, INC.
 CONSULTING
 ENVIRONMENT - ENERGY
 100 N. THIRD ST. AMHERST





Legend

-  Raccoon Creek Watershed
-  Agricultural / Grassland
-  Forest
-  Industrial / Commercial
-  Residential
-  Barren Lands
-  Strip Mines
-  Transportation
-  Water
-  Wetlands

RACCOON CREEK WATERSHED ASSOCIATION

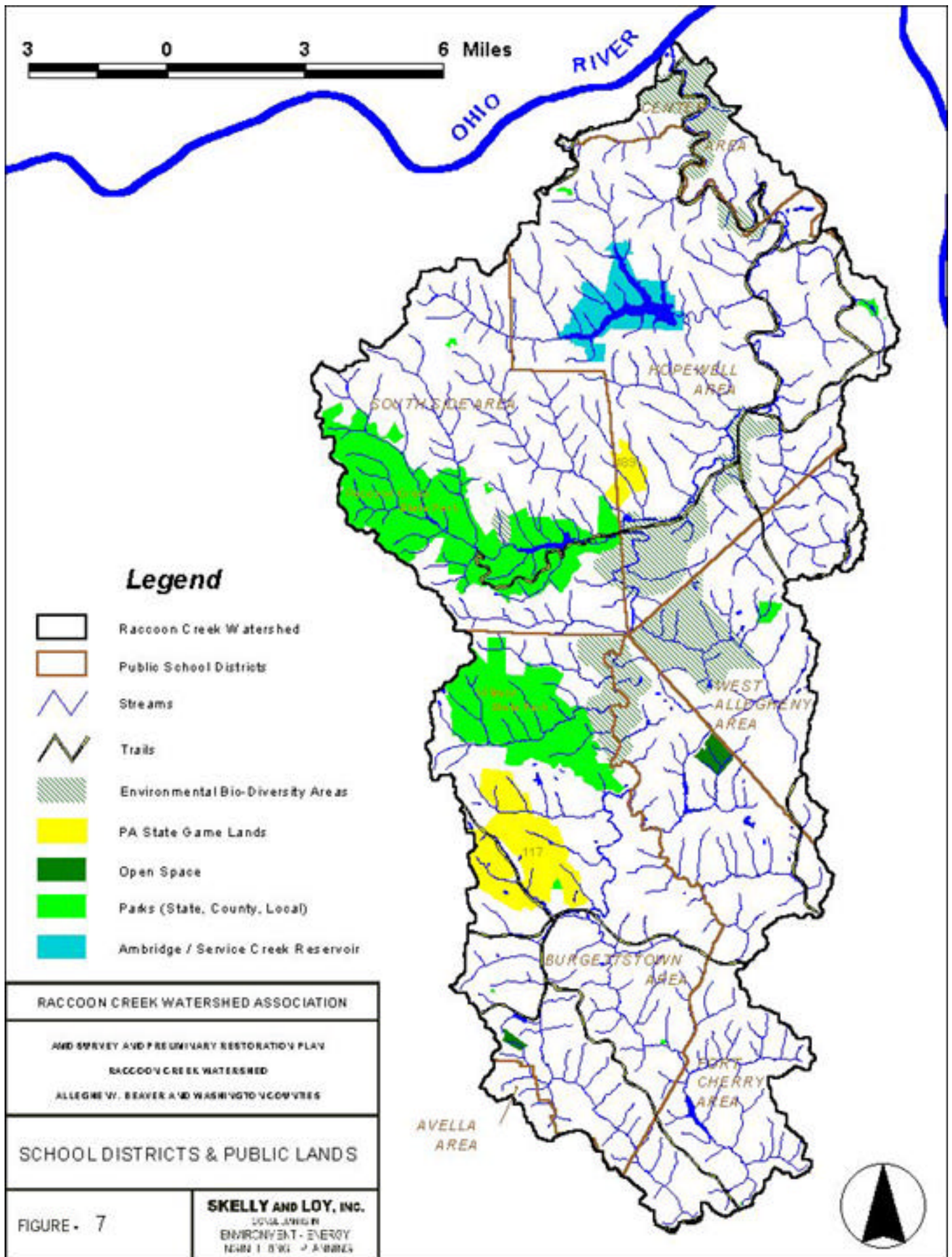
AND SURVEY AND PRELIMINARY RESTORATION PLAN
 RACCOON CREEK WATERSHED
 ALLEGANY, BEAVER AND WASHINGTON COUNTIES

LAND USE / LAND COVER

FIGURE - 6

SKELLY AND LOY, INC.
 CONSULTING
 ENVIRONMENT - ENERGY
 100 N. THIRD ST. AMHERST





Legend

-  Raccoon Creek Watershed
-  Public School Districts
-  Streams
-  Trails
-  Environmental Bio-Diversity Areas
-  PA State Game Lands
-  Open Space
-  Parks (State, County, Local)
-  Ambridge / Service Creek Reservoir

RACCOON CREEK WATERSHED ASSOCIATION

AND SURVEY AND PRELIMINARY RESTORATION PLAN
 RACCOON CREEK WATERSHED
 ALLEGANY, BEAVER AND WASHINGTON COUNTIES

SCHOOL DISTRICTS & PUBLIC LANDS

FIGURE 7

SKELLY AND LOY, INC.
 CIVIL ENGINEER
 ENVIRONMENT - ENERGY
 WATER - WASTE SERVICES



LIST OF PREPARERS

Ronald Heater, CADD Specialist

2 year Technical Degree, 1988

9 years of experience

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12 years experience

APPENDICES

APPENDIX A
Water Quality Tables

Discharge Water Quality Table

Site	Date	Sample	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Sulfates	Est. Flow (gpm)	FeAvgTons	MnAvgTon	AlAvgTon	AcidAvgTons/Yr
E1	2/16/96	4166627	6.2	124	58	71.10	1.33	0.50	831.00	112.72	17.63	0.33	0.12	14.38
E1	3/11/96	4166665	6.3	190	0	70.10	1.45	0.50	844.00	112.72	17.38	0.36	0.12	0.00
E1	4/12/96	4166811	5.9	92	36	67.60	1.43	0.71	884.00	112.72	16.76	0.35	0.18	8.93
E1	5/16/96	4166880	6.2	174	44	60.60	1.36	2.01	901.00	112.72	15.03	0.34	0.50	10.91
E1	7/1/96	4166998	6.2	100	0	71.40	1.40	0.59	826.00	112.72	17.71	0.35	0.15	0.00
E1	7/12/96	4166048	6.1	178	24	74.00	1.51	0.50	860.00	112.72	18.35	0.37	0.12	5.95
E1	8/30/96	4166167	6	102	0	83.60	1.54	0.90	861.00	112.72	20.73	0.38	0.22	0.00
E1	9/26/96	4166240	6.3	186	30	67.80	1.42	0.86	806.00	112.72	16.81	0.35	0.21	7.44
E1	10/17/96	4166329	6.2	168	40	73.60	1.50	0.88	897.00	112.72	18.25	0.37	0.22	9.92
E1	11/26/96	4166405	6.4	186	40	70.80	1.36	0.90	924.00	112.72	17.56	0.34	0.22	9.92
E1	12/30/96	4166549	6.3	186	0	82.10	1.52	0.73	880.00	112.72	20.36	0.38	0.18	0.00
E1	1/29/97	4166636	6.3	188	32	67.30	1.34	0.53	844.00	112.72	16.69	0.33	0.13	7.94
E1	3/3/97	4166587	6.2	174	20	71.10	1.35	0.50	770.00	112.72	17.63	0.33	0.12	4.96
E1	4/29/97	4166716	6.2	186	9.8	61.90	1.36	0.50	801.00	112.72	15.35	0.34	0.12	2.43
E1	10/27/97	4117085	6.4	182	94	82.40	1.54	1.04	899.00	112.72	20.43	0.38	0.26	23.31
E1	11/19/97	4117179	6.4	192	86	73.10	1.46	0.98	864.00	112.72	18.13	0.36	0.24	21.33
E1	2/25/98	4117213	6.4	206	0	61.70	1.30	0.54	815.00	112.72	15.30	0.32	0.13	0.00
E1	3/26/98	4117344	6.2	200	0	60.70	1.24	0.50	744.00	112.72	15.05	0.31	0.12	0.00
E1	4/23/98	4117486	6.3	200	0	61.70	1.23	0.50	395.00	112.72	15.30	0.31	0.12	0.00
E1	5/20/98	4117574	6.4	206	0	57.70	1.26	0.50	720.00	112.72	14.31	0.31	0.12	0.00
E1	6/30/98	4117655	6.3	160	0	89.10	1.40	0.84	789.00	112.72	22.10	0.35	0.21	0.00
E1	7/28/98	4117746	6.2	162	0	101.00	1.35	0.86	780.00	112.72	25.05	0.33	0.21	0.00
E1	8/27/98	4117838	6.3	180	0	66.80	1.28	0.50	893.00	112.72	16.57	0.32	0.12	0.00
E1	9/29/98	4117904	6.3	196	0	90.10	1.74	1.09	916.00	112.72	22.34	0.43	0.27	0.00
E1	10/29/98	4117013	6.3	170	0	90.30	1.44	1.82	891.00	112.72	22.39	0.36	0.45	0.00
E1	11/18/98	4117051	6.3	156	9.6	73.90	1.49	2.23	915.00	112.72	18.33	0.37	0.55	2.38
E1	12/14/98	4117099	6.3	162	2.8	82.50	1.63	1.96	941.00	112.72	20.46	0.40	0.49	0.69
E1	1/20/99	4117073	6.3	174	7.6	72.80	1.39	1.75	729.00	112.72	18.05	0.34	0.43	1.88
E1	2/24/99	4117220	6.4	218	0	65.20	1.33	0.50	753.00	112.72	16.17	0.33	0.12	0.00
E1	3/17/99	4117280	6.4	220	0	64.00	1.30	0.55	707.00	112.72	15.87	0.32	0.14	0.00
E1	1/10/00	4117023	6.4	186	0	79.30	1.38	1.31	819.30	112.72	19.67	0.34	0.32	0.00
E1	2/16/00	4117195	6.4	172	0	68.60	1.28	0.97	705.00	112.72	17.01	0.32	0.24	0.00
E1	3/7/00	4117273	6.4	190	0	77.50	1.37	0.63	1016.70	112.72	19.22	0.34	0.16	0.00
E1	4/20/00	4117436	6.3	196	0	66.50	1.30	0.50	718.20	112.72	16.49	0.32	0.12	0.00
H3	5/21/98	4117585	5.5	14	122	75.50	6.28	0.00	766.20	74.85	12.43	1.03	0.00	20.09
H3	6/1/98	4117645	6.1	26	40	32.60	5.26	0.00	584.00	74.85	5.37	0.87	0.00	6.59
H3	7/22/98	4117730	5.3	10.8	120	63.00	7.13	0.00	828.30	74.85	10.37	1.17	0.00	19.76
H3	9/28/98	4117887	5.5	10.6	86	50.40	8.80	0.00	904.50	74.85	8.30	1.45	0.00	14.16
H3	2/24/99	4117228	6.1	28	114	66.00	6.51	0.00	709.10	74.85	10.87	1.07	0.00	18.77
H3	4/14/99	527235	6	17.2	64	53.60	5.56	0.00	532.00	74.85	8.83	0.92	0.00	10.54
H3	4/22/99	4117425	6.1	26	24	32.10	3.95	0.00	407.60	74.85	5.29	0.65	0.00	3.95
H3	6/23/99	4117571	5.4	12.4	122	74.00	7.80	0.00	923.60	74.85	12.19	1.28	0.00	20.09
H3	7/29/99	4117686	6.5	40	0	4.32	2.60	0.00	441.00	74.85	0.71	0.43	0.00	0.00
H3	10/26/99	4117960	6.1	20	38	20.80	8.76	0.00	920.10	74.85	3.43	1.44	0.00	6.26
H3	10/28/99	4117002	5.9	16.6	62	28.30	7.01	0.00	834.20	74.85	4.66	1.15	0.00	10.21

Discharge Water Quality Table

Site	Date	Sample	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Sulfates	Est. Flow (gpm)	FeAvgTons	MnAvgTon	AlAvgTon	AcidAvgTons/Yr
H3	4/26/00	4117467	5.9	19.8	60	40.90	5.18	0.00	619.30	74.85	6.74	0.85	0.00	9.88
H3	6/20/00	4117697	5.9	19.6	78	42.10	5.45	0.00	665.70	74.85	6.93	0.90	0.00	12.84
JB1	1/11/95	4166298	4.6	14.2	226	69.10	1.77	10.20	830.00	979.50	148.90	3.81	21.98	487.01
JB1	2/24/95	4166416	4.5	11.4	170	53.70	1.55	7.83	737.00	979.50	115.72	3.34	16.87	366.33
JB1	3/17/95	4166446	4.7	14.6	146	46.70	1.43	6.59	618.00	979.50	100.63	3.08	14.20	314.62
JB1	4/13/95	4166513	4.6	13.2	118	43.50	1.45	6.81	571.00	979.50	93.74	3.12	14.67	254.28
JB1	5/4/95	4166589	4.6	12	128	44.00	1.51	6.97	611.00	979.50	94.82	3.25	15.02	275.83
JB1	6/13/95	4166686	4.7	13.6	148	48.00	1.69	7.22	603.00	979.50	103.44	3.64	15.56	318.93
JB1	8/8/95	4166861	4.8	15.8	138	51.10	1.62	6.98	633.00	979.50	110.12	3.49	15.04	297.38
JB1	10/26/95	4166372	4.9	17.6	180	56.40	1.67	6.46	747.00	979.50	121.54	3.60	13.92	387.88
JB1	11/8/95	4166407	4.8	15.4	194	63.50	1.86	6.53	722.00	979.50	136.84	4.01	14.07	418.05
JB1	12/13/95	4166462	5.1	26	132	53.00	1.52	4.61	715.00	979.50	114.21	3.28	9.93	284.45
JB1	1/11/96	4166515	5.3	24	124	59.10	1.63	4.71	780.00	979.50	127.35	3.51	10.15	267.21
JB1	3/18/96	4166704	4.6	10.6	190	45.30	1.44	7.39	667.00	979.50	97.62	3.10	15.92	409.43
JB1	4/9/96	4166788	4.3	7.4	194	43.60	1.36	8.46	653.00	979.50	93.95	2.93	18.23	418.05
JB1	5/21/96	4166899	4.4	9	158	40.20	1.50	9.50	682.00	979.50	86.63	3.23	20.47	340.47
JB1	6/6/96	4166921	4.5	9.6	168	42.90	1.58	9.66	658.00	979.50	92.45	3.40	20.82	362.02
JB1	7/1/96	4166006	4.6	12.4	170	41.40	1.54	9.00	612.00	979.50	89.21	3.32	19.39	366.33
JB1	8/1/96	4166108	4.6	11.8	128	38.40	1.36	7.38	616.00	979.50	82.75	2.93	15.90	275.83
JB1	9/10/96	4166188	4.7	13.2	170	42.10	1.39	6.53	696.00	979.50	90.72	3.00	14.07	366.33
JB1	10/24/96	4166360	4.7	14	156	48.60	1.55	6.00	751.00	979.50	104.73	3.34	12.93	336.16
JB1	11/8/96	4166381	4.8	16.2	127	46.40	1.42	5.79	662.00	979.50	99.99	3.06	12.48	273.67
JB1	12/30/96	4166544	4.7	13.8	14	40.80	1.51	6.82	670.00	979.50	87.92	3.25	14.70	30.17
JB1	1/23/97	4166619	4.7	13.6	124	30.40	1.18	5.10	730.00	979.50	65.51	2.54	10.99	267.21
JB1	2/25/97	4166578	4.6	12.4	118	27.60	1.29	5.13	626.00	979.50	59.48	2.78	11.05	254.28
JB1	3/24/97	4166636	4.5	11	92	25.30	1.23	5.27	496.00	979.50	54.52	2.65	11.36	198.25
JB1	4/28/97	4166703	4.6	12.2	116	23.90	1.20	5.46	586.00	979.50	51.50	2.59	11.77	249.97
JB1	5/21/97	4166752	4.7	14.6	114	26.40	1.26	5.24	753.00	979.50	56.89	2.72	11.29	245.66
JB1	6/24/97	4166813	4.6	9.8	124	29.40	1.34	5.99	523.00	979.50	63.35	2.89	12.91	267.21
JB1	7/14/97	4166871	4.9	17.4	156	30.10	1.25	4.79	486.00	979.50	64.86	2.69	10.32	336.16
JB1	10/23/97	4117060	5.1	17.8	160	41.80	1.36	4.55	626.00	979.50	90.07	2.93	9.80	344.78
JB1	2/11/98	4117158	4.9	16.6	78	34.20	1.19	3.79	575.00	979.50	73.70	2.56	8.17	168.08
JB1	4/16/98	4117445	4.9	18	104	33.00	1.31	4.48	574.00	979.50	71.11	2.82	9.65	224.11
JB1	6/10/98	4117624	4.7	11.8	104	35.20	1.27	5.29	588.00	979.50	75.85	2.74	11.40	224.11
JB1	8/24/98	4117823	5	22	80	34.30	1.09	3.41	639.00	979.50	73.91	2.35	7.35	172.39
JB1	10/29/98	4117021	5.2	24	92	44.70	1.37	3.75	685.00	979.50	96.32	2.95	8.08	198.25
JB1	12/16/98	4117122	5.3	22	102	56.70	1.64	4.48	747.00	979.50	122.18	3.53	9.65	219.80
JB1	1/27/99	4117114	5.3	28	86	52.40	1.52	4.09	629.00	979.50	112.92	3.28	8.81	185.32
JB1	2/8/99	4117169	5.2	26	92	49.90	1.49	4.31	695.00	979.50	107.53	3.21	9.29	198.25
JB1	3/9/99	4117264	5	18.6	84	39.70	1.34	3.88	514.00	979.50	85.55	2.89	8.36	181.01
JB1	4/14/99	4117378	4.8	16	80	37.70	1.42	4.67	582.00	979.50	81.24	3.06	10.06	172.39
JB1	2/2/00	4117144	5.5	34	100	46.10	1.23	3.42	786.20	979.50	99.34	2.65	7.37	215.49
JB1	3/6/00	4117264	5.3	32	108	63.80	1.73	4.26	679.80	979.50	137.48	3.73	9.18	232.73
JB1	4/20/00	4117453	5.2	24	110	47.60	1.36	3.36	623.60	979.50	102.57	2.93	7.24	237.04
JB1	5/2/00	4117488	5.1	22	68	0.42	1.26	3.22	654.00	979.50	0.91	2.72	6.94	146.53

Discharge Water Quality Table

Site	Date	Sample	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Sulfates	Est. Flow (gpm)	FeAvgTons	MnAvgTon	AlAvgTon	AcidAvgTons/Yr
JB2	1/11/95	4166297	3.6	0	406	101.00	6.19	23.90	1145.00	93.67	20.81	1.28	4.93	83.67
JB2	2/24/95	4166415	3.7	0	348	87.70	5.81	22.60	1116.00	93.67	18.07	1.20	4.66	71.71
JB2	4/13/95	4166512	3.7	0	278	78.30	5.60	18.20	1013.00	93.67	16.14	1.15	3.75	57.29
JB2	5/4/95	4166591	3.7	0	264	74.90	5.17	15.20	999.00	93.67	15.43	1.07	3.13	54.40
JB2	6/13/95	4166688	3.6	0	294	73.90	5.35	16.70	981.00	93.67	15.23	1.10	3.44	60.59
JB2	12/13/95	4166463	3.6	0	312	78.20	5.57	17.60	1050.00	93.67	16.11	1.15	3.63	64.30
JB2	1/11/96	4166514	3.6	0	282	73.80	5.36	17.60	1113.00	93.67	15.21	1.10	3.63	58.11
JB2	3/18/96	4166703	3.6	0	250	39.10	5.18	14.10	958.00	93.67	8.06	1.07	2.91	51.52
JB2	4/9/96	4166787	3.7	0	208	37.30	4.70	12.00	929.00	93.67	7.69	0.97	2.47	42.86
JB2	6/6/96	4166922	3.7	0	236	63.80	5.90	13.70	1032.00	93.67	13.15	1.22	2.82	48.63
JB2	7/1/96	4166005	3.6	0	242	76.60	5.73	14.80	971.00	93.67	15.79	1.18	3.05	49.87
JB2	8/1/96	4166110	3.6	0	262	72.80	5.18	12.40	1087.00	93.67	15.00	1.07	2.56	53.99
JB2	9/10/96	4166187	3.6	0	298	80.80	5.18	13.10	1287.00	93.67	16.65	1.07	2.70	61.41
JB2	12/30/96	4166542	3.9	0	246	74.10	5.39	14.00	951.00	93.67	15.27	1.11	2.89	50.69
JB2	1/23/97	4166620	3.6	0	278	64.70	4.98	13.50	1183.00	93.67	13.33	1.03	2.78	57.29
JB2	2/25/97	4166579	3.7	0	236	62.50	5.02	12.20	1010.00	93.67	12.88	1.03	2.51	48.63
JB2	3/24/97	4166634	3.8	0	208	50.60	4.80	10.40	831.00	93.67	10.43	0.99	2.14	42.86
JB2	4/28/97	4166705	3.8	0	232	53.20	4.47	9.48	826.00	93.67	10.96	0.92	1.95	47.81
JB2	5/21/97	4166753	3.8	0	236	58.40	4.63	9.50	1015.00	93.67	12.03	0.95	1.96	48.63
JB2	6/24/97	4166812	3.8	0	202	52.90	4.79	9.33	775.00	93.67	10.90	0.99	1.92	41.63
JB2	7/14/97	4166868	4	3.6	246	61.00	5.17	8.98	892.00	93.67	12.57	1.07	1.85	50.69
JB2	8/25/97	4167890	3.8	0	242	66.80	4.80	8.81	940.00	93.67	13.77	0.99	1.82	49.87
JB2	9/18/97	4117930	3.8	0	246	73.30	4.88	9.70	935.00	93.67	15.11	1.01	2.00	50.69
JB2	10/22/97	4117061	3.7	0	280	75.20	4.78	11.30	841.00	93.67	15.50	0.99	2.33	57.70
JB2	11/12/97	4117143	3.8	0	260	68.40	4.48	11.10	881.00	93.67	14.10	0.92	2.29	53.58
JB2	1/28/98	4117093	3.7	0	210	57.90	5.54	10.50	952.00	93.67	11.93	1.14	2.16	43.28
JB2	2/11/98	4117157	3.8	0	186	55.50	4.87	9.46	897.00	93.67	11.44	1.00	1.95	38.33
JB2	3/24/98	4117327	4	3	146	47.70	4.62	8.73	820.00	93.67	9.83	0.95	1.80	30.09
JB2	4/16/98	4117444	4.1	5.4	192	57.20	5.12	9.11	868.00	93.67	11.79	1.06	1.88	39.57
JB2	5/20/98	4117582	4	3	154	46.20	4.65	7.90	870.00	93.67	9.52	0.96	1.63	31.74
JB2	6/10/98	4117625	3.9	0	202	60.70	4.84	8.31	841.00	93.67	12.51	1.00	1.71	41.63
JB2	8/24/98	4117824	3.7	0	212	64.10	4.24	7.73	1041.00	93.67	13.21	0.87	1.59	43.69
JB2	9/16/98	4117880	3.7	0	211	78.80	4.95	9.69	1011.00	93.67	16.24	1.02	2.00	43.48
JB2	10/29/98	4117022	3.8	0	258	85.80	4.90	11.70	999.00	93.67	17.68	1.01	2.41	53.17
JB2	12/16/98	4117121	4	1.6	274	104.00	5.15	14.20	1034.00	93.67	21.43	1.06	2.93	56.46
JB2	1/27/99	4117115	4.2	5	158	54.40	4.26	10.90	861.00	93.67	11.21	0.88	2.25	32.56
JB2	2/8/99	4117170	4.5	10.8	160	60.00	5.38	10.00	878.00	93.67	12.36	1.11	2.06	32.97
JB2	3/9/99	4117265	4.3	8	170	55.50	4.74	10.30	875.00	93.67	11.44	0.98	2.12	35.03
JB2	4/14/99	4117379	4.4	9.8	164	62.30	4.97	10.20	823.00	93.67	12.84	1.02	2.10	33.80
JB2	2/2/00	4117145	3.7	0	250	62.90	4.05	11.50	1503.20	93.67	12.96	0.83	2.37	51.52
JB2	3/6/00	4117265	3.9	0	174	62.30	5.00	10.80	826.40	93.67	12.84	1.03	2.23	35.86
JB2	4/20/00	4117454	3.9	0	178	43.90	4.51	9.30	881.70	93.67	9.05	0.93	1.92	36.68
JB2	5/2/00	4117487	4	3.2	152	44.20	4.32	9.40	848.00	93.67	9.11	0.89	1.94	31.32
L2	2/2/96	4166574	6	282	282	257.00	4.28	0.50	2518.00	113.50	64.17	1.07	0.12	70.42
L2	2/13/96	4166605	6.1	272	322	233.00	3.99	0.50	2431.00	113.50	58.18	1.00	0.12	80.40

Discharge Water Quality Table

Site	Date	Sample	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Sulfates	Est. Flow (gpm)	FeAvgTons	MnAvgTon	AlAvgTon	AcidAvgTons/Yr
L2	3/26/96	4166730	6.2	278	256	245.00	4.18	0.50	1985.00	113.50	61.18	1.04	0.12	63.92
L2	4/12/96	4166807	5.6	104	312	240.00	4.04	0.50	2727.00	113.50	59.93	1.01	0.12	77.91
L2	5/16/96	4166882	6.1	286	328	220.00	3.71	0.50	1877.00	113.50	54.93	0.93	0.12	81.90
L2	7/1/96	4166994	6.1	266	246	217.00	3.77	0.50	2260.00	113.50	54.18	0.94	0.12	61.43
L2	7/11/96	4166043	6.1	258	234	204.00	3.61	0.50	2253.00	113.50	50.94	0.90	0.12	58.43
L2	8/30/96	4166162	6	178	298	198.00	3.88	0.50	2534.00	113.50	49.44	0.97	0.12	74.41
L2	9/26/96	4166236	6.1	254	270	189.00	3.24	0.50	2274.00	113.50	47.19	0.81	0.12	67.42
L2	10/17/96	4166321	6	270	272	210.00	3.53	0.50	2221.00	113.50	52.44	0.88	0.12	67.92
L2	11/26/96	4166402	6.2	272	340	218.00	3.54	0.50	2369.00	113.50	54.43	0.88	0.12	84.90
L2	12/30/96	4166546	6.3	262	170	209.00	3.63	0.50	2463.00	113.50	52.19	0.91	0.12	42.45
L2	1/29/97	4166633	6.2	276	208	204.00	3.33	0.50	2429.00	113.50	50.94	0.83	0.12	51.94
L2	2/28/97	4166584	6	282	234	211.00	3.54	5.00	2501.00	113.50	52.69	0.88	1.25	58.43
L2	4/1/97	4166644	6.1	270	230	197.00	3.40	0.50	2463.00	113.50	49.19	0.85	0.12	57.43
L2	4/29/97	4166713	6.2	268	374	228.00	3.79	0.14	2435.00	113.50	56.93	0.95	0.03	93.39
L2	9/4/97	4117908	6	260	401	248.00	3.70	0.20	2276.00	113.50	61.93	0.92	0.05	100.13
L2	10/16/97	4117045	6.2	268	348	205.00	3.45	0.50	2452.00	113.50	51.19	0.86	0.12	86.90
L2	11/19/97	4117175	6.2	296	226	233.00	3.86	0.50	2541.00	113.50	58.18	0.96	0.12	56.43
L2	2/12/98	4117173	6.2	308	220	230.00	3.65	0.50	2731.00	113.50	57.43	0.91	0.12	54.93
L2	3/26/98	4117340	6.1	290	172	231.00	3.68	0.50	2894.00	113.50	57.68	0.92	0.12	42.95
L2	4/23/98	4117482	6.3	282	176	209.00	3.36	0.50	1526.00	113.50	52.19	0.84	0.12	43.95
L2	5/20/98	4117570	6.2	300	164	215.00	3.63	0.50	2394.00	113.50	53.69	0.91	0.12	40.95
L2	6/30/98	4117651	6.2	292	158	198.00	3.31	0.50	2502.00	113.50	49.44	0.83	0.12	39.45
L2	7/28/98	4117742	6.1	284	148	198.00	3.21	0.50	2172.00	113.50	49.44	0.80	0.12	36.96
L2	8/27/98	4117834	6.2	266	132	170.00	2.81	0.50	2425.00	113.50	42.45	0.70	0.12	32.96
L2	10/29/98	4117009	6.4	300	102	183.00	3.29	0.50	2334.00	113.50	45.70	0.82	0.12	25.47
L2	2/24/99	4117215	6.2	330	244	259.00	4.34	0.50	1976.00	113.50	64.67	1.08	0.12	60.93
L2	5/15/00	4117520	6.2	320	270	277.00	4.31	0.50	231	113.50	69.17	1.08	0.12	67.42
P6	7/1/96	4166003	5.4	34	76	30.00	6.68	5.12	1186.00	18.91	1.25	0.28	0.21	3.16
P6	7/12/96	4166050	5.4	32	90	28.60	6.74	5.08	1370.00	18.91	1.19	0.28	0.21	3.74
P6	8/30/96	4166169	5.5	24	110	29.80	5.95	4.83	1351.00	18.91	1.24	0.25	0.20	4.58
P6	9/26/96	4166242	5.2	28	104	32.00	6.26	5.41	1601.00	18.91	1.33	0.26	0.23	4.33
P6	10/17/96	4166325	5.2	30	118	32.20	6.50	5.47	1624.00	18.91	1.34	0.27	0.23	4.91
P6	11/26/96	4166407	5.5	38	58	34.10	7.14	4.04	1293.00	18.91	1.42	0.30	0.17	2.41
P6	1/29/97	4166637	5.5	36	96	30.90	6.32	4.48	1227.00	18.91	1.29	0.26	0.19	3.99
P6	3/3/97	4166589	5.4	34	82	28.30	6.10	3.79	1151.00	18.91	1.18	0.25	0.16	3.41
P6	4/1/97	4166648	5.6	38	82	26.70	6.19	3.61	1258.00	18.91	1.11	0.26	0.15	3.41
P6	4/29/97	4166718	5.8	38	82	27.80	5.84	4.92	1154.00	18.91	1.16	0.24	0.20	3.41
P6	10/27/97	4117086	5.4	46	106	31.90	5.96	4.66	1210.00	18.91	1.33	0.25	0.19	4.41
P6	11/19/97	4117180	5.5	38	110	28.50	6.12	3.48	1148.00	18.91	1.19	0.25	0.14	4.58
P6	2/25/98	4117217	5.5	46	70	24.60	5.69	2.88	1193.00	18.91	1.02	0.24	0.12	2.91
P6	3/26/98	4117348	5.6	42	42	26.80	6.45	3.67	1249.00	18.91	1.11	0.27	0.15	1.75
P6	4/23/98	4117490	5.3	26	74	25.20	5.66	4.09	1282.00	18.91	1.05	0.24	0.17	3.08
P6	5/20/98	4117578	5.3	26	58	23.90	6.03	4.60	1131.00	18.91	0.99	0.25	0.19	2.41
P6	6/30/98	4117659	5	24	140	35.90	7.23	7.42	1357.00	18.91	1.49	0.30	0.31	5.82
P6	7/28/98	417750	4.9	19.4	94	34.60	6.37	6.57	1311.00	18.91	1.44	0.27	0.27	3.91

Discharge Water Quality Table

Site	Date	Sample	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Sulfates	Est. Flow (gpm)	FeAvgTons	MnAvgTon	AlAvgTon	AcidAvgTons/Yr
P6	8/27/98	4117842	5	22	102	36.90	6.27	6.75	1472.00	18.91	1.54	0.26	0.28	4.24
P6	9/29/98	4117908	4.9	18.2	92	41.50	6.53	7.13	1435.00	18.91	1.73	0.27	0.30	3.83
P6	10/29/98	4117017	4.8	19	108	41.00	6.53	7.55	1411.00	18.91	1.71	0.27	0.31	4.49
P6	11/18/98	4117055	5	26	120	40.30	6.51	7.55	1345.00	18.91	1.68	0.27	0.31	4.99
P6	12/14/98	4117103	4.8	18.4	126	42.30	6.64	8.05	1460.00	18.91	1.76	0.28	0.33	5.24
P6	1/20/99	4117077	5.3	30	70	26.90	5.78	3.75	1144.00	18.91	1.12	0.24	0.16	2.91
P6	2/24/99	4117224	5.2	22	78	31.40	6.46	5.88	903.00	18.91	1.31	0.27	0.24	3.24
P6	3/17/99	4117284	5.3	30	66	26.90	5.66	5.11	1014.00	18.91	1.12	0.24	0.21	2.75
P6	4/20/99	4117402	5.3	30	54	29.50	6.45	5.14	1161.00	18.91	1.23	0.27	0.21	2.25
P6	3/7/00	4117277	4.3	7.8	102	31.00	6.17	6.89	1052.00	18.91	1.29	0.26	0.29	4.24
P6	4/20/00	4117440	4.4	7.8	82	26.00	5.92	6.15	1083.70	18.91	1.08	0.25	0.26	3.41
P6	5/15/00	4117529	4.2	3.8	102	29.70	6.17	7.19	1.69	18.91	1.24	0.26	0.30	4.24
P7	4/26/96	4166243	5.7	68	94	72.00	2.52	0.50	1082.00	247.06	39.13	1.37	0.27	51.09
P7	7/1/96	4166002	5.8	74		70.40	2.62	0.50	976.00	247.06	38.26	1.42	0.27	0.00
P7	7/12/96	4166051	5.8	7	104	65.20	2.43	0.50	1026.00	247.06	35.44	1.32	0.27	56.53
P7	8/30/96	4166170	5.8	62	128	72.60	2.58	0.50	1060.00	247.06	39.46	1.40	0.27	69.57
P7	10/17/96	4166326	5.7	7	162	75.00	2.55	0.50	1061.00	247.06	40.76	1.39	0.27	88.05
P7	11/26/96	4166408	5.8	78	110	74.90	2.57	0.50	1111.00	247.06	40.71	1.40	0.27	59.79
P7	1/29/97	4166638	5.8	76	100	72.60	2.45	0.50	1069.00	247.06	39.46	1.33	0.27	54.35
P7	3/3/97	4166590	5.7	76	104	70.80	2.47	0.50	1239.00	247.06	38.48	1.34	0.27	56.53
P7	4/1/97	4166649	5.9	78	110	64.90	2.25	0.50	985.00	247.06	35.28	1.22	0.27	59.79
P7	4/29/97	4166719	6.1	68	118	59.90	2.32	0.50	942.00	247.06	32.56	1.26	0.27	64.14
P7	10/27/97	4117087	5.8	80	154	76.50	2.58	0.50	1101.00	247.06	41.58	1.40	0.27	83.70
P7	11/19/97	4117181	5.8	80	188	77.50	2.61	0.50	1078.00	247.06	42.12	1.42	0.27	102.18
P7	2/25/98	4117216	5.9	82	108	67.20	2.24	0.50	908.00	247.06	36.53	1.22	0.27	58.70
P7	3/26/98	4117347	5.7	8	110	72.50	2.50	0.50	983.00	247.06	39.41	1.36	0.27	59.79
P7	4/23/98	4117489	5.9	84	94	63.00	2.12	0.50	928.00	247.06	34.24	1.15	0.27	51.09
P7	5/20/98	4117577	6	90	80	65.70	2.30	0.50	884.00	247.06	35.71	1.25	0.27	43.48
P7	6/30/98	4117658	5.8	88	124	73.50	2.64	0.50	979.00	247.06	39.95	1.43	0.27	67.40
P7	7/28/98	4117749	5.9	86	74	64.80	2.24	0.50	87.40	247.06	35.22	1.22	0.27	40.22
P7	8/27/98	4117841	5.9	88	78	67.50	2.38	0.50	1079.00	247.06	36.69	1.29	0.27	42.40
P7	9/29/98	4117907	5.9	84	72	79.00	2.63	0.50	1043.00	247.06	42.94	1.43	0.27	39.13
P7	10/29/98	4117016	5.9	88	88	77.10	2.59	0.50	1054.00	247.06	41.91	1.41	0.27	47.83
P7	11/18/98	4117054	5.9	88	94	78.50	2.57	0.50	967.00	247.06	42.67	1.40	0.27	51.09
P7	12/14/98	4117102	5.9	86	98	86.00	2.74	0.50	1147.00	247.06	46.74	1.49	0.27	53.27
P7	1/20/99	4117076	5.9	84	108	77.20	2.57	0.50	1099.00	247.06	41.96	1.40	0.27	58.70
P7	2/24/99	4117223	5.9	82	76	70.00	2.31	0.50	1073.00	247.06	38.05	1.26	0.27	41.31
P7	3/17/99	4117283	5.9	84	74	69.50	2.34	0.50	863.00	247.06	37.78	1.27	0.27	40.22
P7	4/20/99	4117401	5.9	84	68	74.60	2.53	0.50	726.00	247.06	40.55	1.38	0.27	36.96
P7	1/10/00	4117031	5.8	86	76	89.00	2.65	0.50	943.10	247.06	48.37	1.44	0.27	41.31
P7	2/16/00	4117202	5.8	82	92	69.00	2.11	0.50	1342.00	247.06	37.50	1.15	0.27	50.00
P7	3/7/00	4117280	5.9	80	88	83.10	2.53	0.50	1023.80	247.06	45.17	1.38	0.27	47.83
P7	4/20/00	4117444	5.8	88	70	77.80	2.41	0.50	1059.30	247.06	42.29	1.31	0.27	38.05
P7	5/15/00	4117533	5.9	90	74	72.20	2.29	0.50	949.00	247.06	39.24	1.24	0.27	40.22

Sample Site Water Quality Table

Site	Date	Sample	pH	Alkalinity	Aciditiy	Iron	Manganese	Aluminum	Sulfates
1	8/9/99	4117710	7.3	160	0	0.477	0.451	0.5	75.3
1	10/18/99	4117930	7.7	200	0	0.3	0.09	0.5	85.4
1	11/15/99	4117005	7.4	180	0	0.447	0.103	0.5	141.3
1	12/1/99	4117052	7.4	166	0	0.3	0.083	0.5	134.9
1	1/10/00	4117034	7.9	162	0	0.3	0.078	0.5	57.7
1	2/16/00	4117206	7.5	118	0	1.32	0.084	1.03	51
1	3/7/00	4117284	8.3	168	0	0.3	0.064	0.5	71.1
1	4/2/00	4117447	7.9	188	0	0.3	0.082	0.5	121
1	5/15/00	4117534	8.1	192	0	0.3	0.089	0.5	86.1
1	6/27/00	4117736	7.8	210	0	0.8	0.076	0.5	129
1	7/24/00	4117855	7.7	200	0	0.3	0.052	0.5	53.1
1	8/28/00	4117937	7.9	200	0	0.3	0.05	0.5	66.9
2	9/13/99	4117804	7.9	264	0	0.3	0.227	0.5	151.2
2	10/18/99	4117915	8	246	0	0.3	0.164	0.5	165
2	11/15/99	4117989	7.5	226	0	0.3	0.133	0.5	135
2	12/1/99	4117037	7.5	212	0	0.356	0.182	0.5	98.9
2	1/10/00	4117021	8	184	0	0.3	0.085	0.5	54.5
2	2/16/00	4117193	7.5	148	0	1.11	0.074	0.766	45
2	3/7/00	4117271	8.1	200	0	0.308	0.077	0.5	65.4
2	4/2/00	4117434	7.7	200	0	0.374	0.077	0.5	81.9
2	5/15/00	4117523	8.1	214	0	0.46	0.167	0.5	50
2	6/27/00	4117725	7.9	226	0	1.84	0.148	1.25	72
2	7/24/00	4117844	8	228	0	0.423	0.76	0.5	55.2
2	8/28/00	4117926	7.9	238	0	0.3	0.05	0.5	91.7
3	9/13/99	4117803	7.4	204	0	0.64	1.52	0.5	860.3
3	10/18/99	4117914	7.7	200	0	0.411	1.07	0.5	675
3	11/15/99	4117988	7.1	202	0	0.559	0.778	0.5	490
3	12/1/99	4117036	7.3	202	0	0.942	0.5	0.5	287.2
3	1/10/00	4117020	7.5	154	0	1.51	0.502	0.5	254.2
3	2/16/00	4117192	6.9	110	0	1.11	0.316	0.684	147
3	3/7/00	4117270	7.6	180	0	1.56	0.463	0.5	254
3	4/20/00	4117433	7.2	170	0	1.31	0.3	0.607	225
3	5/15/00	4117522	7.9	218	0	1.22	0.502	0.5	460
3	6/27/00	4117724	7.1	172	0	4.57	0.663	0.5	376

Sample Site Water Quality Table

Site	Date	Sample	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Sulfates
3	7/24/00	4117843	7.2	194	0	2.45	0.935	0.5	502.2
3	8/28/00	4117925	6.9	168	0	9.49	0.955	0.5	725
4	9/13/99	4117811	6.2	70	58	60.6	2.86	0.5	1068
4	10/18/99	4117922	6.2	60	50	49.2	2.4	0.5	1036
4	11/15/99	4117996	6.1	62	54	50.7	2.78	0.5	1166
4	12/1/99	4117044	6.4	72	58	58.8	3.18	0.5	924
4	1/10/00	4117028	6.6	134	0	36	2.37	0.5	529.7
4	2/16/00	4117200	6.6	126	0	20.2	1.27	0.581	406
4	3/7/00	4117278	6.5	120	0	33.3	1.86	0.5	589
4	4/20/00	4117441	6.5	126	0	26.3	1.58	0.5	541
4	5/15/00	4117528	6.4	212	0	49.9	2.69	0.5	854
4	6/27/00	4117730	6.5	126	0	28.2	1.7	0.5	498
4	7/24/00	4117849	6.3	98	0	44.6	2.46	0.5	798.8
4	8/28/00	4117931	6.4	92	0	30.5	1.79	0.5	657.3
5	9/9/99	4117792	6.4	28	0	1.4	3.52	0.5	1520
5	10/18/99	4117926	6.6	48	0	0.453	2.94	0.5	1242
5	11/15/99	4117001	6.3	52	0	1.72	2.94	1.04	1355
5	12/1/99	4117048	6.5	58	0	3.66	2.86	1.76	1026
5	1/10/00	4117032	6.6	42	0	2.77	2.11	3.58	833.1
5	2/16/00	4117204	6.8	68	0	1.64	1.37	1.63	576
5	3/7/00	4117282	5.2	11.4	16.8	4	2.05	6.11	938
5	4/20/00	4117445	4.8	11.8	44	7.82	2.29	8.18	1115
5	5/15/00	4117535	4.6	11.2	66	3.39	2.59	8.96	1481
5	6/27/00	4117737	4.8	10.8	30	2.93	2.66	6.19	1104
5	7/24/00	4117856	4.9	11.6	22	3.13	2.63	5.95	1284
5	8/28/00	4117938	4.5	11	82	3.51	3.5	12.9	1917
6	8/9/99	4117712	6.8	70	0	0.3	0.589	0.5	938.2
6	10/18/99	4117927	7.1	74	0	0.3	0.362	2.83	1055
6	11/15/99	4117002	6.5	68	0	0.3	0.256	0.5	1281
6	12/1/99	4117049	6.7	64	0	0.329	0.87	0.5	885
6	1/10/00	4117033	6.9	52	0	0.3	0.843	0.5	365.6
6	2/16/00	4117205	6.7	46	0	0.3	1.32	0.5	538
6	3/7/00	4117283	6.8	48	0	0.3	8.47	0.5	1361
6	4/20/00	4117446	6.4	30	0	0.3	1.51	0.5	754

Sample Site Water Quality Table

Site	Date	Sample	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Sulfates
6	5/15/00	4117536	6.8	38	0	0.3	1.75	0.5	1042
6	6/27/00	4117738	6.8	68	0	0.3	0.582	0.5	929
6	7/24/00	4117857	6.7	72	0	0.3	0.413	0.5	991
6	8/28/00	4117939	6.4	32	0	0.457	6.59	0.5	1180
7	9/9/99	4117793	6.6	56	0	1.2	2.41	0.5	829
7	10/18/99	4117928	7	88	0	0.557	1.92	0.5	979
7	11/15/99	4117003	6.6	98	0	0.672	1.73	0.5	697
7	12/1/99	4117050	6.9	116	0	2.33	1.27	0.5	577.3
7	1/10/00	4117036	7.5	132	0	2.62	0.695	0.5	510
7	2/16/00	4117208	7.2	118	0	3.11	0.438	1.11	163
7	3/7/00	4117285	7.4	128	0	4.06	0.81	1.37	280
7	4/20/00	4117449	7.1	136	0	3.56	0.697	1.34	288.6
7	5/15/00	4117537	7.3	96	0	4.31	1.3	1.64	691
7	6/27/00	4117739	7.4	150	0	4.12	0.59	1.46	303
7	7/24/00	4117858	7	110	0	2.3	0.995	0.772	593.9
7	8/28/00	4117940	6.7	80		5.86	1.78	4.08	584.4
8	8/9/99	4117711	4.5	8.8	72	1.04	2.45	11.5	433
8	10/18/99	4117929	4.7	10	26	1.38	2.52	5.55	561
8	11/12/99	4117004	4.9	12.4	24	1.56	2.74	5	597
8	12/1/99	4117051	6.1	20	4.2	2.52	2.51	4.75	538.2
8	1/10/00	4117035	5.6	13.6	9.2	1.96	2.34	6.94	710.7
8	2/16/00	4117207	5.5	13.8	15.2	2.12	1.82	7.41	397.7
8	3/7/00	4117290	3.9	0	114	3.2	2.68	17.7	586
8	4/20/00	4117455	4.2	6	122	3.35	2.32	15	592
8	5/15/00	4117538	3.6	0	142	4.98	2.5	17.4	592
8	6/27/00	4117740	4.1	3.4	92	2.02	1.99	11.7	524.3
8	7/24/00	4117859	3.9	0	92	2.61	2.45	14.2	873.8
8	8/28/00	4117941	3.5	0	204	6.53	3.5	29.4	775.7
9	8/18/99	4117752	6.8	68	0	0.3	0.164	0.5	822
9	10/18/99	4117931	7.1	74	0	0.3	0.164	0.5	1697
9	11/15/99	4117006	6.8	72	0	0.3	0.475	0.5	1178
9	12/1/99	4117053	6.9	78	0	0.3	0.358	0.5	686.5
9	1/10/00	4117038	7.3	74	0	0.3	0.386	0.5	543.6
9	2/16/00	4117210	6.9	58	0	0.527	0.435	0.5	303

Sample Site Water Quality Table

Site	Date	Sample	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Sulfates
9	3/7/00	4117287	7.5	80	0	0.3	0.46	0.5	404
9	4/20/00	4117450	7.2	74	0	0.3	0.4	0.5	309.5
9	5/15/00	4117539	7.6	88	0	0.3	0.068	0.5	694
9	6/27/00	4117741	7.1	88	0	0.3	0.105	0.5	488.3
9	7/24/00	4117860	6.9	88	0	0.3	0.107	0.5	793.4
9	8/28/00	4117942	6.9	78	0	0.3	0.211	0.5	644.3
10	10/18/99	4117932	7.4	92	0	0.3	0.198	0.5	956
10	11/15/99	4117007	7.1	94	0	0.3	0.266	0.5	859
10	12/1/99	4117054	7.2	102	0	0.3	0.599	0.5	931.1
10	1/10/00	4117039	7.6	106	0	0.674	0.466	0.5	370.2
10	2/16/00	4117211	7.3	88	0	1.73	0.384	0.671	247
10	3/7/00	4117288	7.8	110	0	6.26	0.517	0.5	400
10	4/20/00	4117451	7.5	112	0	1.09	0.475	0.5	381
10	5/15/00	4117540	5.1	102	0	0.3	0.123	0.5	645
10	6/27/00	4117742	7.6	134	0	0.8	0.232	0.5	413.8
10	7/24/00	4117861	8.2	112	0	0.3	0.13	0.5	548.9
10	8/28/00	4117943	7.3	84	0	0.499	0.812	0.5	706.1
11	8/18/99	4117764	7.3	88	0	0.3	0.139	0.5	1103
11	10/18/99	4117933	7.5	84	0	0.3	0.308	0.5	1250
11	11/15/99	4117008	7.2	86	0	0.3	0.437	0.5	1242
11	12/1/99	4117055	7	82	0	0.3	0.874	0.5	604
11	1/10/00	4117040	7.4	78	0	0.485	1.18	0.5	723.7
11	2/16/00	4117212	7	58	0	0.589	0.803	0.5	270
11	3/7/00	4117289	7.4	76	0	0.3	1.15	0.5	520
11	4/20/00	4117452	7	74	0	0.414	0.885	0.5	448
11	5/15/00	4117541	7.8	80	0	0.3	0.491	0.5	1136
11	6/27/00	4117743	7	78	0	0.3	0.372	0.5	710.5
11	7/24/00	4117862	7.8	84	0	0.3	0.31	0.5	890.1
11	8/28/00	4117944	7.1	76	0	0.3	0.803	0.5	1057.8
R1	5/12/99	4117538	7.3	106	0	3.53	1.13	1.44	5.18
R1	6/14/99	4117613	7	80	0	1.09	1.46	0.553	611
R1	7/14/99	4117622	7	62	0	0.3	1.69	0.5	668
R1	8/10/99	4117726	6.5	56	0	0.3	1.87	0.5	847
R1	9/13/99	4117814	6.6	50	0	0.3	2.11	0.5	856

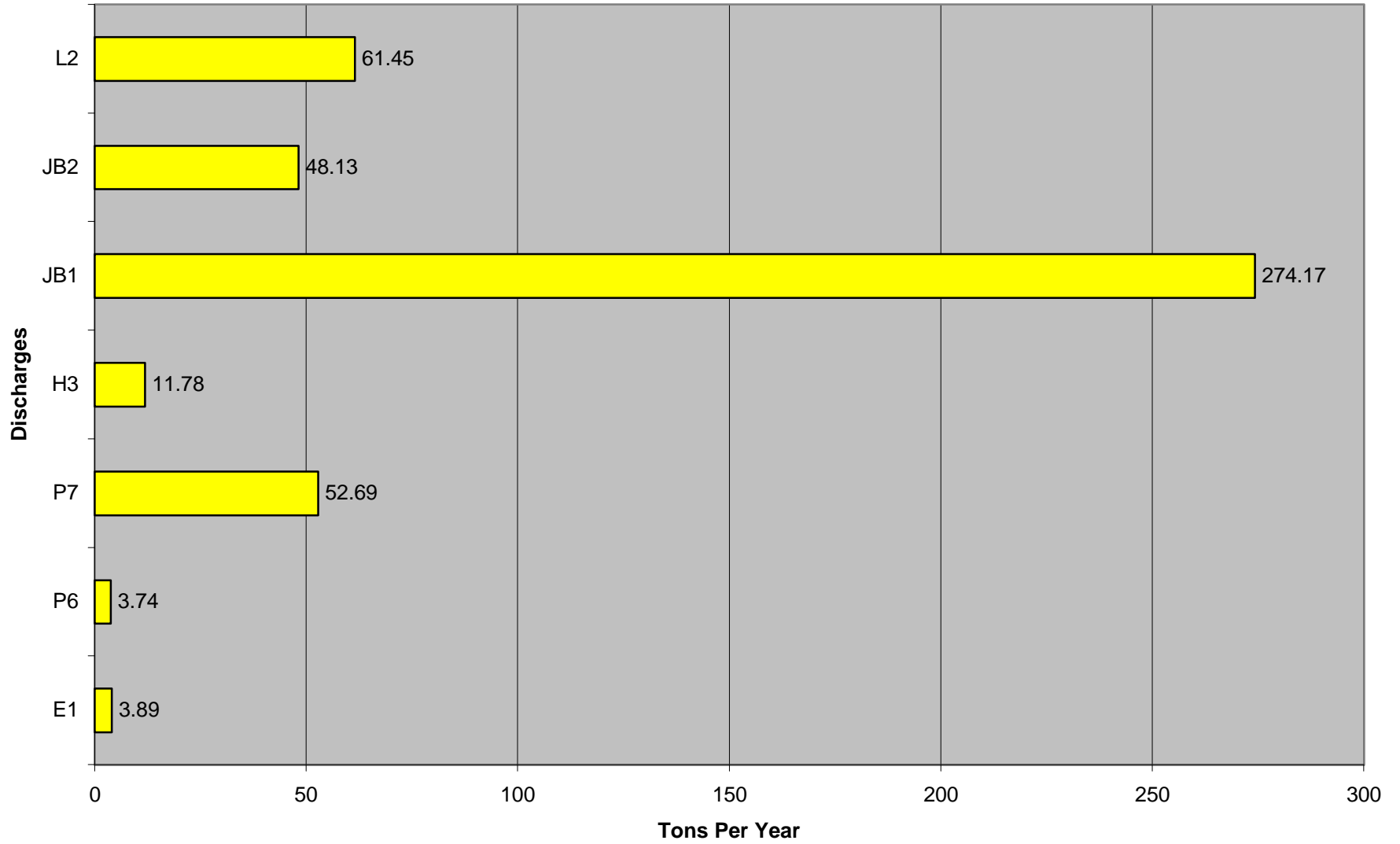
Sample Site Water Quality Table

Site	Date	Sample	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Sulfates
R1	10/18/99	4117925	6.9	84	0	0.3	1.58	0.5	1061
R1	11/15/99	4117999	6.6	90	0	0.5	1.53	0.5	809
R1	12/1/99	4117047	7	118	0	1.14	1.14	0.5	601
R1	1/10/00	4117037	7.5	130	0	2.07	0.687	0.5	508.3
R1	2/16/00	4117209	7.3	114	0	3.01	0.463	1.28	181
R1	3/7/00	4117286	7.5	122	0	3.14	0.775	1.13	293.7
R1	4/20/00	4117448	7.3	132	0	3.1	0.678	1.28	259.8
R1	5/15/00	4117542	7.8	90	0	0.84	1.16	0.5	634
R1	6/27/00	4117744	7.5	146	0	3.29	0.561	1.1	331.8
R1	7/24/00	4117863	7.9	104	0	0.3	0.693	0.5	482.8
R1	8/28/00	4117945	6.8	76	0	4.29	1.57	3.21	601.8

APPENDIX B

Annual Acid Loadings Graph

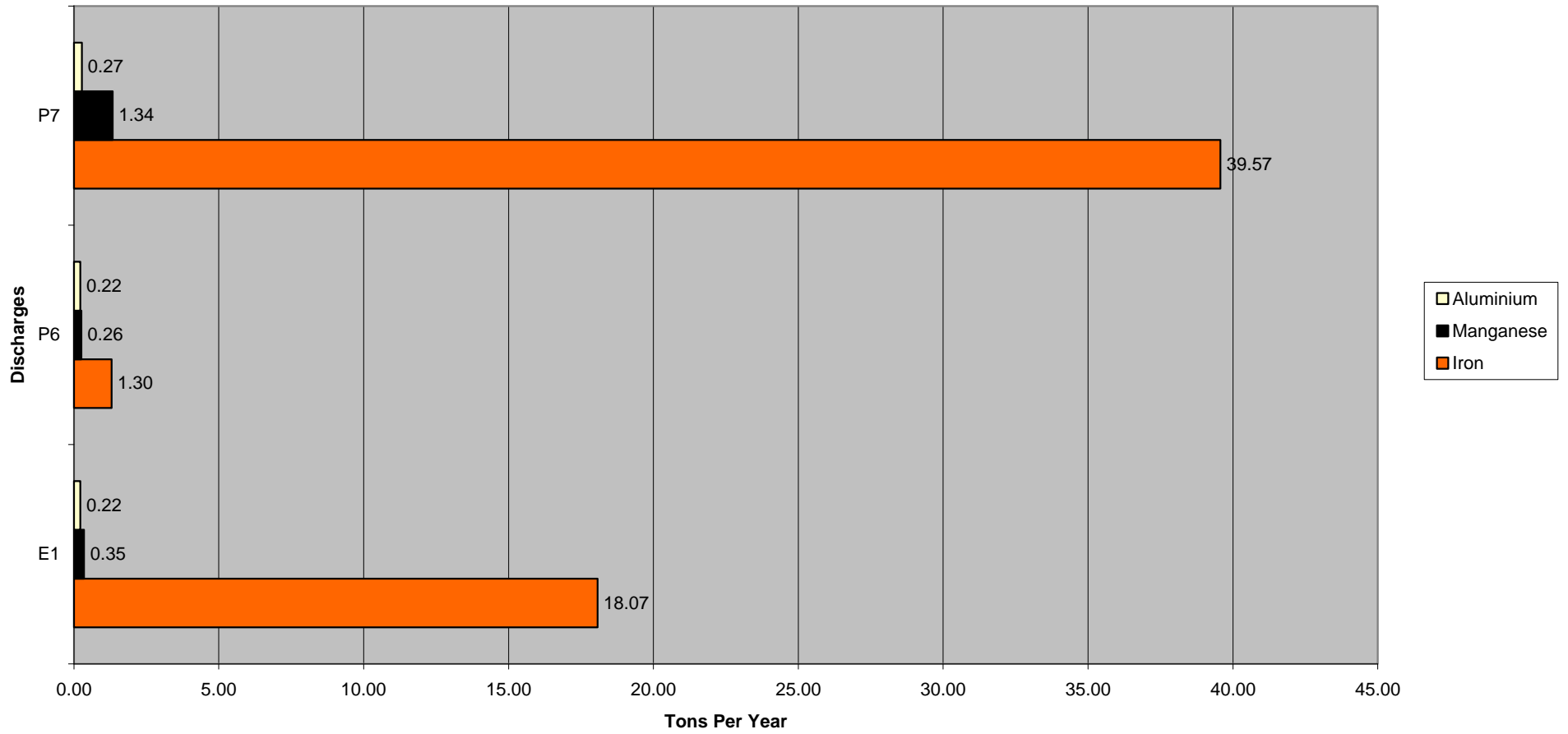
Average Acidity Loadings



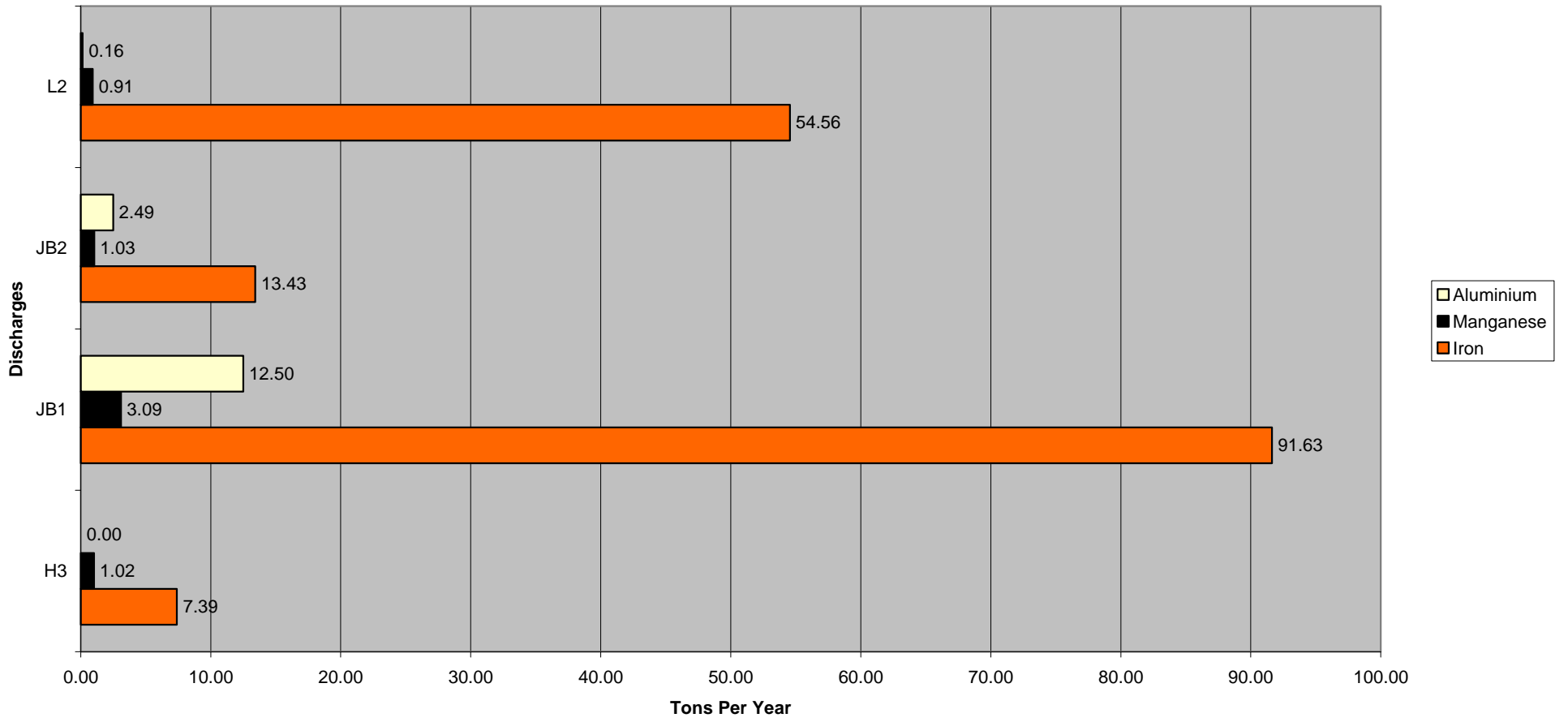
APPENDIX C

Annual Metal Loadings Graphs

Average Metal Loading



Average Metal Loading



APPENDIX D

Potential Technical & Funding Assistance Sources

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS IN PENNSYLVANIA

Source of Assistance	Phone	Contact Information	Assistance Information	Planning	Const.	Other
Farm Service Agency	(T) 724-222-3060 Ms. Linda Barnett	2800 North Main Street Extension PO Box 329 Meadowlands, PA 15347 www.fsa.usda.gov www.fs.fed.us	FSA offers financial assistance for streambank fencing and crossings for farmers.	NO	YES	YES
Allegheny Co. Conservation District	(412) 241-7645 Mr. Ed Feigel	Lexington Tech Park Building Room 1 102-400 North Lexington Street Pittsburgh, PA 15208-2521	Provides technical and financial assistance for conservation activities.	YES	YES	YES
Appalachian Clean Streams Initiative	(T) 412-937-2863 Mr. Milton Allen (T) 717-782-4036 Mr. David Hamilton	Office of Surface Mining 1951 Constitution Ave. NW Washington, DC 20240 mallen@osmre.gov	Assists with restoration activities involving abandoned mine drainage issues throughout Appalachia.	YES	YES	YES
DCNR: Rivers Conservation Program	(T) 717-788-8526 Mr. Jim Mays (T) 412-880-0486 Ms. Tracey Robinson	1405 State Office Building 300 Liberty Avenue Pittsburgh, PA 15222 www.dcnr.state.pa.us	Offer technical and financial assistance for planning, implementation, development, and acquisition grants. Applications: Late August Proposals: Early February	YES	YES	YES
DEP: Stormwater Management Program	(T) 717-772-4048 Mr. Durla Lathia	400 Market Street Harrisburg, PA 17105 www.dep.state.pa.us	Watershed planning for stormwater control and implementation of programs at local levels.	YES	YES	YES
Dirt and Gravel Road Maintenance State Conservation Commission	(T) 717-787-8821 Mr. Woody Colbert	2301 North Cameron Street Harrisburg, PA 17110-9408	Groups may be able to work with their local municipalities and state agencies, regarding erosion and sedimentation control problems, and fugitive dust in watersheds.	YES	YES	YES
PA Association of Conservation Districts: Educational Mini-Projects Program	(T) 717-545-8878 Education Specialist	4999 Jonestown Road Suite 203 Harrisburg, PA 17109	Small grants for PA based grassroots educational projects that address non-point source watershed concepts.	NO	NO	YES

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS IN PENNSYLVANIA

Source of Assistance	Phone	Contact Information	Assistance Information	Planning	Const.	Other
Environmental Protection Agency: Region III	(T) 215-814-5756 Mr. Bernie Sarnoski	Water Protection Division 3WP10, 1650 Arch Street Philadelphia, PA 19103-2029 www.epa.gov	Grants awarded to small non-profit groups for various projects in Region III	YES	YES	YES
EPA - Region III Environmental Education Grants	(T) 215-814-5546 Ms. Nan Ides	3G00, 16 th Floor 1651 Arch Street Philadelphia, PA 19103 www.epa.gov	Grants awarded to small non-profit groups for various projects in Region III	YES	YES	YES
Natural Resources Conservation Service (NRCS)	(T) 724-222-3060 Mr. Tom Sierzega (T) 724-774-7090 Mr. Robin Moyer (T) 814-445-8979 Mr. Dan Seibert	2800 North Main Street Extension PO Box 329 Meadowlands, PA 15347 www.nrcs.usda.gov	Technical and funding assistance to farmers for planning, design, construction, and maintenance activities. These involve many programs (i.e., fencing and stream crossings, farmland protection).	YES	YES	YES
NRCS PL 83-566, Watershed Protection and Flood Prevention Act	(T) 717-782-4429 (T) 814-445-8979 Mr. Dan Seibert	North Ridge Building, Suite 105 1590 North Center Avenue Somerset, PA 15501	Plan development for natural resource concerns within a watershed area: cost-sharing available to carry out plan.	YES	YES	YES
Office of Surface Mining Reclamation and Enforcement	(T) 717-782-4473 Mr. David Hamilton	415 Market Street Transportation Building Suite 3C Harrisburg, PA 17101	Provides funds to Appalachian Clean Streams Initiative for Abandoned Mine related activities.	YES	YES	YES
PA - Growing Greener	(T) 717- 705-5400 1-877-PAGREEN Ms. Patricia Grim	Rachel Carson St. Office Bldg. 9 th Floor, 400 Market Street PO Box 8776 Harrisburg, PA 17109-8776 www.dep.state.pa.us	Funds for PennVest, PA Department of Agriculture, Department of Environmental Protection and Department of Conservation and Natural Resource activities.	YES	YES	YES
PA DEP - Nonpoint Source Management Program (Section 319 & WRAP)	(T) 717- 787-5259 Ms. Jane Earle	400 Market Street PO Box 8555 Harrisburg, PA 17105-8555 www.dep.state.pa.us	Provide funding for improving Non-point source water pollution.	YES	YES	YES

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS IN PENNSYLVANIA

Source of Assistance	Phone	Contact Information	Assistance Information	Planning	Const.	Other
PA Organization for Watersheds and Rivers	(T) 717-234-7910 Mr. Walt Pomeroy wpomeroy@aol.com	PO Box 765 Harrisburg, PA 17108	POWR assists river and watershed organizations in Pennsylvania.	YES	NO	YES
PADEP Southwest Regional Office	(T) 412-442-4149 (F) 412-442-4194 Ms. Rita Coleman (T) 412-442-4049 Ms. Karen Crowley	400 Waterfront Drive Pittsburgh, PA 15222-4745 www.dep.state.pa.us	Grants for various environmental, conservation, and educational activities.	YES	YES	YES
PA Stream ReLeaf Program	(T) 717-236-8825 Ms. Susan Richards	Alliance for the Chesapeake Bay 600 North Second Street Harrisburg, PA 17101	Grants for riparian buffers along streams. For the purchase of trees, seed and planting mats. Grants between \$500-\$1000.00 Application: January Begin: Spring Complete: July	YES	YES	YES
Penn's Corner RC&D	(T) 724-834-9063 Mr. Nevin Ulery	Donhoe Center RD 12, Box 202B Greensburg, PA 15601	Provides technical assistance and small financial grants to non-profit organizations in 9 southwestern PA counties.	YES	YES	YES
Pennsylvania Fish and Boat Commission	(T) 814-359-5185 (T) 412-341-0370 Mr. Bob Wheeler	Adopt-A-Stream Program 450 Robinson Lane Bellefonte, PA 16823 www.fish.state.pa.us	Offers technical assistance on design and construction of stabilized stream crossings.	YES	YES	YES
Pennsylvania Game Commission	(T) 717-787-6400 Mr. Dennis Neideigh	2001 Elmerton Avenue Harrisburg, PA 17110-9797 www.pgc.state.pa.us	Streambank fencing financial and technical assistance to farmers who participate in one of the commission's cooperative public-access programs.	YES	YES	YES
Pennsylvania Senior Environment Corps: Environmental Alliance for Senior Involvement	(T) 717-787-9580 Mr. Christopher Allen	400 Market Street Harrisburg, PA 17105 www.dep.state.pa.us	EASI provides technical assistance numerous environmental and education issues amongst many more.	YES	NO	YES

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS IN PENNSYLVANIA

Source of Assistance	Phone	Contact Information	Funding Information	Planning	Const.	Other
The Leo Model Foundation	(T) 215-546-8058 Extension 3021 Ms. Margaret Stridick	ICO - Model Entities 310 South Juniper Street Philadelphia, PA 19107-5818	Grants for habitat, conservation, watershed conservation, and species preservation.	YES	YES	YES
The Pittsburgh Foundation	(T) 412-391-5122 Mr. Alfred Wishart, Jr.	The Pittsburgh Foundation One PPG Place - 30 th Floor Pittsburgh, PA 15222-5401	Funding grants to organizations located in Allegheny County for special projects, seed money for new programs, or grants which would leverage additional funding. Submit proposals Jan. 1, March 15, June 1, and Sept. 15	YES	YES	YES
The William Penn Foundation	(T) 215-988-1830 Ms. Hollister Knowlton	Two Logan Square 11 th Floor 100 North 18 Street Philadelphia, PA 19103-2757	Grants to preserve natural areas, including environmental education and planning, within the foundation's geographic area.	YES	YES	YES
US Army Corps of Engineers	(T) 412-395-7210 Dr. Ed Smith	1928 Federal Building 1000 Liberty Avenue Pittsburgh, PA 15222 www.usace.army.mil/	Provides funding and technical assistance through a variety of planning and construction programs for environmental improvement, flood protection, and other projects.	YES	YES	YES
US Geological Survey	(T) 717-730-6916 Mr. John Nantz jmnantz@usgs.gov	840 Market Street Lemoine, PA 17043 http://pa.water.usgs.gov	Provides technical assistance through planning programs for environmental improvement, flood protection, and other projects.	YES	YES	YES
Vira I. Heinz Endowment	(T) 412-281-5777 (F) 412-281-5788 Mr. Andrew McElwaine	30 CNG Tower 625 Liberty Avenue Pittsburgh, PA 15222-3115 www.heinz.org/low/environment/	Funds to implement ecosystem programs in selected western PA watersheds. Small matching grants are provided to the DCNR for the Coldwater Heritage program.	YES	YES	YES
Washington Co. Conservation District	(T) 724-228-6774 Mr. Gary Stokum	602 Courthouse Square 100 West Beau Street Washington, PA 15301-4402 WCCD@COBWEB.NET	Provides technical and financial assistance to farmers, developers, and conservation organizations.	YES	YES	YES

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS IN PENNSYLVANIA

Source of Assistance	Phone	Contact Information	Assistance Information	Planning	Const.	Other
Waterways Conservation Grant Program (Conserve 2000 Fund) Commonwealth of PA PA Fish and Boat Commission	(T) 717-657-4515 717-657-4540 (F) 717-657-4033 (T) 814-445-3454 Mr. Rick Lorson	PA Fish and Boat Commission PO Box 67000 Harrisburg, PA 17160-7000 www.fish.state.pa.us	Grants support activities directed at restoring and protecting watersheds; including acquisition, and enhancing riparian habitat. Application Deadline: June.	YES	YES	YES
Western PA Watershed Protection Program	(T) 814-869-4847 Mr. John Dawes	RD #1, Box 152 Alexandria, PA 16611	Provides funding to grassroot organizations and watershed associations for site specific watershed remediation in western PA.	YES	YES	YES
WPCAMR: Western PA Coalition For Abandoned Mine Reclamation	(T) 724-837-5271 (F) 724-837-4127 Mr. Mark Killar	Donohoe Center RD # 12 - Box 202-B Greensburg, PA 15601 wpcamr@westol.com	Grants through the Regional Watershed Support Initiative Applications -December Received - January Complete - June	YES	YES	YES
Canaan Valley Institute	(T) 814-768-9584 Ms. Janie French (T) 304-866-4739 1-800-922-3601 Ms. Emily Grafton	650 Leonard Street Clearfield, PA 16830 www.canaanvi.org	Promotes the development and growth of local organizations committed to improving or maintaining the natural resources of their watersheds, in the Mid-Atlantic Highlands portions of PA. MD. VA and all of WV.	YES	YES	YES
Penn State Cooperative Extension	(T) 412-473-2540 Mr. Dino De Ciantis	400 North Lexington Street Pittsburgh, PA 15208 www.allegheny.extension.psu.edu	Provide technical assistance to homeowners, farmers, and others concerning agricultural issues.	YES	NO	YES
League of Women Voters: Citizen Education Fund and Water Resources Education Network	(T) 724-465-2595 (T) 724-465-4687 1-800-692-7281 Ms. Sherene Hess	226 Forester Street Harrisburg, PA 17102 http://www.pa/lwv.org/wren	Grants up to \$3000.00 Application: January Begin: Spring Grants are available for community education or outreach projects pertaining to water resource issues.	YES	YES	NO

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS NATIONAL ORGANIZATIONS

Source of Assistance	Phone	Address	Assistance Information	Planning	Const.	Other
American Canoe Association	(T) 703-451-0141 Mr. David Jenkins	7432 Alban Station Boulevard Suite B232 Springfield, VA 22150	May provide funding for various watershed related projects including starting groups and lobbying.	YES	NO	YES
National Park Service: Rivers, Trails, and Conservation Assistance Program	(T) 215-597-1581 Mr. Jody Bellows	200 Chestnut Street, 3 rd Floor Philadelphia, PA 19106	Provide technical, administrative, public facilitation and other services for a variety of projects.	YES	NO	YES
Charles A. and Anne Morrow Lindbergh Foundation	(T) 763-576-1596	2150 Third Avenue North, Suite 310 Anoka, MN 55303-2200 www.lindberghfoundation.org	Grants awarded from the conservation of natural resources and water resource management.	YES	NO	YES
American Sportfish Association and Foundation	(T) 703-519-9691 Mr. Thomas Marshall	1033 North Fairfax Street, #200 Alexandria, VA 22314 www.fishamerica.org www.asafishing.org	Grants awarded for: stream bank stabilization materials, instream habitat improvements, contracted heavy equipment, and stream morphology work.	NO	YES	NO
Scenic America	(T) 202-543-6200 Ms. Debra Myerson	801 Pennsylvania Avenue, SE Suite 300 Washington, DC 20003 www.scenic.org	Technical assistance for improving community visual quality assessments, sign control, cellular tower location, amongst other visual pollution issues.	YES	YES	YES
Wildlife Forever	(T) 612-936-0605 (F) 612-936-0915 Ms. Andrea Stoffregen	12301 Whitewater Drive Suite 210 PO Box 3404 Minnetonka, MN 55343 www.wildlife forever.org	Provides technical and financial assistance for habitat enhancement projects.	YES	YES	YES
USEPA: Five Star Restoration Program	(T) 202-260-8076 Mr. John Pai	Office of Wetlands, Oceans, and Watersheds (4502F) Ariel Rios Building 1200 Pennsylvania Avenue Washington, DC 20460 www.epa.gov/owow/wetlands/restore/5star/	Clean Water Act Section 104 (b)(3) Program Applications - Jan./Feb.	YES	YES	YES

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS NATIONAL ORGANIZATIONS

Source of Assistance	Phone	Contact Information	Assistance Information	Planning	Const.	Other
North American Wetlands Conservation Council	(T) 413-253-8269 Attention: Small Grants Coordinator	Atlantic Coast Joint Venture US Fish and Wildlife Service 300 Westgate Center Drive Hadley, MA 01035-9589 www.fws.gov/r9nawwo	Program promotes long-term wetland activities through encouraging participation by new partners who may not be able to compete in the standard grant program. Grants no larger than \$50,000. Application: December	YES	YES	YES
WalMart/Sam's Club: Environmental Clean Air and Water Grant	See Local WalMart/Sam's Club	Grants are administered through the local stores. Talk with Store Manager for applications. Washington and Robinson Town Center, PA Stores.	Funding distributed on a first come first serve basis. Funding Distribution: February	YES	YES	YES
National Tree Trust	(T) 202-628-8733 Ms. Joanne Miller	1120 G Street, NW Suite 770 Washington, DC 20005 www.nationaltreetrust.org/	Grants awarded: Tree plantings, education, administration, and national/regional programs.	YES	YES	YES
The Foundation Center	(T) 212-620-4230 (T) 412-622-1917	4400 Forbes Avenue Pittsburgh, PA 15213 http://fdncenter.org	An independent national service organization established by foundations to provide an authoritative source of information about private philanthropic giving.	NO	NO	YES
National Audubon Society	(T) 412-963-6100	614 Dorseyville Road Pittsburgh, PA 15238 www.audubon.org	Inspire and educate people of southwestern PA to be respectful of the natural world.	NO	NO	YES
Wildlife Habitat Council	(T) 301-588-8994 (T) 412-433-5900 Ms. Marsh Mazlavic	1010 Wayne Avenue, Suite 920 Silver Springs, MD 2-910 http://www.wildlifehc.org	Provide technical assistance to corporate and community organizations to improve wildlife habitat.	YES	NO	YES
National Wildlife Federation: Community and Backyard Wildlife Habitat Programs	(T) 703-790-4434 1-800-822-9919	8925 Leesburg Pike Vienna, VA 22184-0001 http://www.nwf.org/habitats	Provide technical assistance to corporate, communities, and organizations to improve wildlife habitat.	YES	NO	YES

POTENTIAL TECHNICAL & FUNDING ASSISTANCE FOR WATERSHED PROJECTS IN PENNSYLVANIA

Source of Assistance	Phone	Contact Information	Assistance Information	Planning	Const.	Other
<p><u>PennVest (Pennsylvania Infrastructure Investment Authority):</u> V.A. Johnson. 1997. <i>A Water, Sewer and Stormwater Utility's Guide to Financial and Technical Assistance Programs</i>. Harrisburg, PA. A 56 page guidance document that provides telephone numbers, addresses, Internet and email addresses, and contacts for a variety of infrastructure grant programs. These include sewer, septic, and water systems, stormwater, floodplain management, community planning, municipal training, Appalachian Regional activities, and rural development activities. For assistance and to receive a copy of this guidance document, please call Ms. Vickie Johnson at 717-783-8618.</p>						
<p><u>Pennsylvania Department of Community and Economic Development (PADCED):</u> <i>PADCED Funding Source Directory</i>. 2000. A 15 page guidance document that provides sources of information concerning a variety of funding programs to assist in community and economic development. Please contact the PADCED for assistance in attaining this guidance document at 1-800-379-7448.</p>						
PADEP Greensburg District Office	(T) 724-925-5500 (F) 724-925-5557 Ms. Margaret Hall HALL.MARGARET@A 1.dep.state.pa.us	RR2, Box 603-C Greensburg, PA 15601-8739 www.dep.state.pa.us	Grants for various environmental and conservation activities (i.e., Reclaim PA, Community Environmental Projects, and Growing Greener Grants for Mine Drainage Treatment and Mine Reclamation.	YES	YES	YES

APPENDIX E

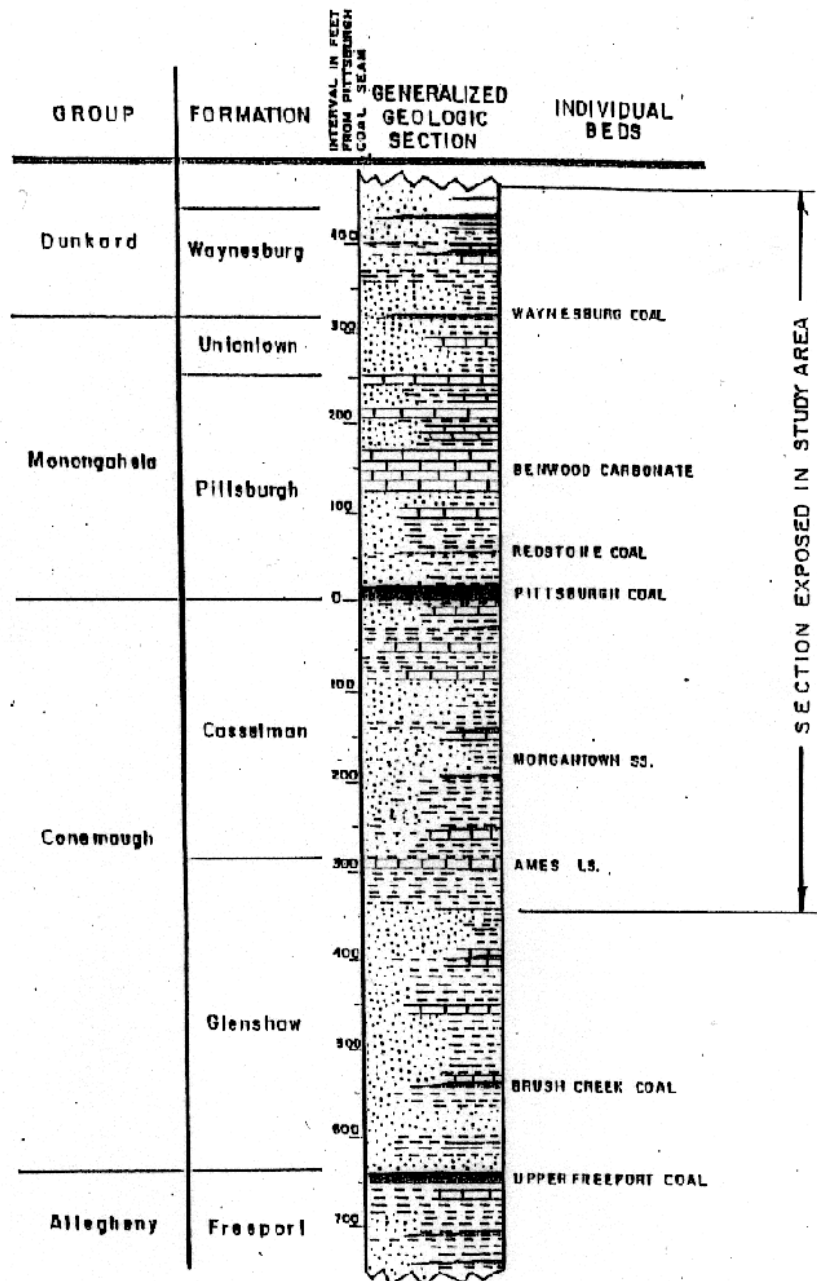
Scarlift Reports

Scarlift Reports

Project Number	Project Description	Engineer/Contractor	Project Cost	Project Date	Location1	Location2
SL 130	Feasibility Study of Lengeloth Francis Mine Complex	E. D'Appolonia	38,903.72	1/70-12/75	Burgetts Fork of Raccoon Creek	Washington Co.
SL 130-1	Study and Design for Acid Mine Drainage Pollution Abatement on State Game Land #117	E. D'Appolonia	58,299.20		Raccoon Creek, Smith and Hanover Twps.	Washington Co.
SL 130-1-101.1	Construction of Acid Mine Drainage Pollution Abatement Facilities, State Game Land #117	Anjo Construction Co.	721,535.99	10/75-3/77	Raccoon Creek, Smith and Hanover Twps.	Washington Co.
SL 130-2	Mine Drainage Pollution Survey	A.C. Ackenheil & Associates, Inc.	75,420.00	9/70-11/72	Hillman State Park	Washington Co.
SL 130-2-1	Design of Reclamation Project Areas 1A, 1B, 3 and 4	A. C. Ackenheil & Associates, Inc.	121,810.00	11/72-7/77	Raccoon Creek, Hillman State Park	Washington Co.
SL 130-2-1.1A	Strip Mine Reclamation Project Area 1A	M. F. Fetterolf Coal Co., Inc.	423,833.73	10/73-11/74	Raccoon Creek, Hillman State Park	Washington Co.
SL 130-2-1.1B*	Construction - Acid Mine Drainage Abatement Facilities Project Area #1B	Beaver Construction and Grading Co., Inc.	1,180,004.88	7/75-8/77	Raccoon Creek, Hillman State Park	Washington Co.
SL 130-2-1.3	Construction of Strip Mine Reclamation Project Area No. 3	M & M Equipment Sales Co.	436,063.36	8/73-5/75	Raccoon Creek, Hillman State Park	Washington Co.
SL 130-2-1.4	Strip Mine Reclamation Project Area No. 4	M. F. Fetterolf Coal	80,565.00	8/73-4/74	Raccoon Creek, Hillman State Park	Washington Co.
SL 130-3	Remove, transport and sell all coal uncovered	Bologna Coal Co.	245,446.10	1/71-8/72	Hanover and Smith Townships	Washington Co.
SL 130-3-1A	Construction of Acid Mine Drainage Facilities	Transcontinental Construction Co., Inc.	401,402.26	5/78-11/78	Raccoon Creek, Smith Township	Washington Co.
SL 130-4	Core Drilling - Langeloth Mine	Sprague & Henwood, Inc.	2,221.82	25965	Raccoon Creek	Washington Co.
SL 130-5	Subsidence Sealing and Backfill	Alex E. Paris Contracting Co.	13,869.20	2/73-3/73	Cherry Valley, Raccoon Creek	Washington Co.
SL 130-7	Watershed Study	A. C. Ackenheil & Associates, Inc.	122,455.19	9/73-4/76	Raccoon Creek	Allegheny, Beaver, & Washington Co.s
SL 130-7-1	Design of Abatement Measures Strip Mine Reclamation	A. C. Ackenheil & Associates, Inc.	30,014.01	10/74-7/76	Raccoon Creek	Washington Co.
SL 130-7-2	Mine Drainage Site Evaluation	A. C. Ackenheil & Associates, Inc	44,746.33		Raccoon Creek	Washington Co.
SL 130-8*	Demonstration Project	A. C. Ackenheil & Associates, Inc.	106,560.40		Raccoon Creek	Allegheny, Beaver, & Washington Co.s
SL 130-10-101.1	Channel Construction	M&M Equipment Sales Co.	9,680.15		Smith Township	Washington Co.

APPENDIX F

Plate 1 and 2



DATA FROM: Pennsylvania General Geology Report G-59

GENERALIZED COLUMNAR SECTION OF RACCOON CREEK STUDY AREA

PLATE 1

RACCOON CREEK BASIN

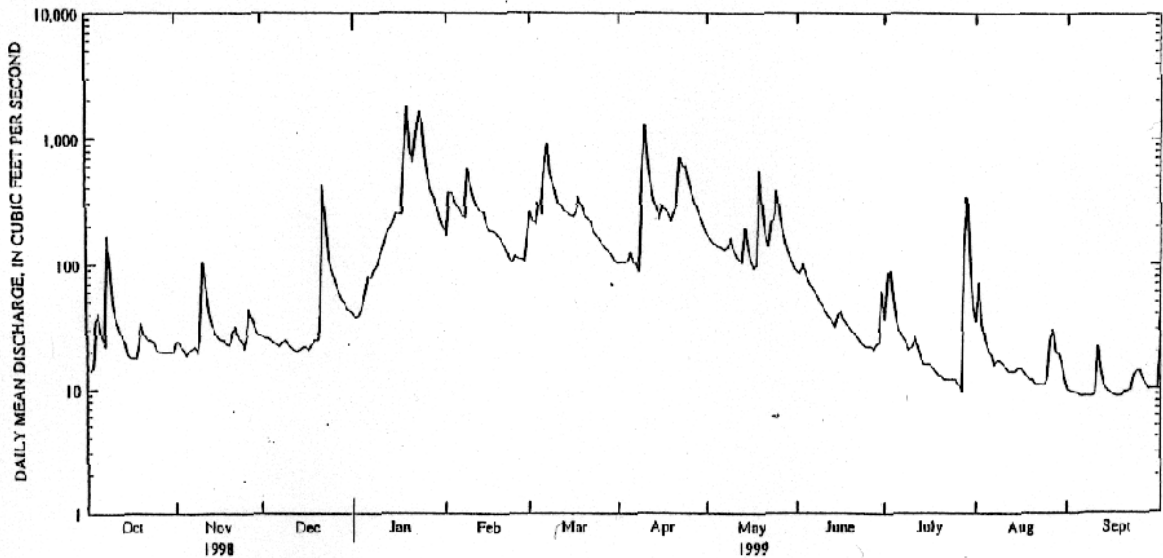
03108000 RACCOON CREEK AT MOFFATTS MILL, PA--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1999, BY WATER YEAR (WY)

MEAN	63.2	112	193	254	320	409	342	263	142	86.1	68.9	54.8
MAX	355	764	717	737	788	1010	757	618	611	389	651	453
(WY)	1955	1986	1991	1952	1956	1945	1957	1933	1989	1990	1980	1975
MIN	7.98	14.8	15.1	14.5	47.7	56.3	94.7	65.6	26.3	15.6	10.2	9.73
(WY)	1964	1964	1964	1967	1964	1969	1946	1986	1988	1965	1965	1964

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR		FOR 1999 WATER YEAR		WATER YEARS 1942 - 1999	
ANNUAL TOTAL	66616		49904.7			
ANNUAL MEAN	183		137		192	
HIGHEST ANNUAL MEAN					314	
LOWEST ANNUAL MEAN					90.9	
HIGHEST DAILY MEAN	2510	Jan 8	1810	Jan 19	6120	Jan 27 1952
LOWEST DAILY MEAN	14	Oct 2	8.8	Sep 5a	4.8	Sep 8 1945
ANNUAL SEVEN-DAY MINIMUM	16	Sep 14	9.1	Sep 13	5.6	Aug 20 1965
INSTANTANEOUS PEAK FLOW			2570	Jan 19	b8590	Jan 27 1952
INSTANTANEOUS PEAK STAGE			c5.18	Jan 19	9.71	Jan 27 1952
INSTANTANEOUS LOW FLOW			8.8	Sep 4d	4.5	Aug 24 1965
ANNUAL RUNOFF (CFSD)	1.03		.77		1.08	
ANNUAL RUNOFF (INCHES)	13.92		10.43		14.64	
10 PERCENT EXCEEDS	434		321		449	
50 PERCENT EXCEEDS	87		42		97	
90 PERCENT EXCEEDS	20		12		20	

- a Also Sept. 6, 7, 15-17.
- b From rating curve extended above 3,600 ft³/s.
- c Maximum gage height, 5.19 ft, Jan. 18 (backwater from ice).
- d Also Sept. 5-8, 14-17.



1-YEAR HYDROGRAPH
OCTOBER 1, 1998 TO SEPTEMBER 30, 1999
PLATE 2

APPENDIX G

Scarlift 1974 Data Versus 2000 Data

		RACCOON CREEK WATERSHED				SCARLIFT WATER QUALITY-STREAM DATA						
						AVG			AVG			AVG
						TONS OF			TONS OF			TONS OF
STREAM	DATA SOURCE	STREAM REACH	AVG FLOW	AVG ACIDITY	AVG TONS OF ACID PER YEAR	AVG ALKALINITY	AVG TONS OF ALK. PER YEAR	AVG TOTAL IRON	AVG TONS OF IRON PER YEAR	AVG SULFATES	AVG SULFATES PER YEAR	
RACCOON CREEK	SCARLIFT - 1974	SR-1	3005	5	33	275	1813	0.3	2	170	1121	
	J. DAVIDSON - 2000		3005	0	0	144	949	0.37	2	42	277	
						33		864		0		844
CHERRY RUN	SCARLIFT - 1974	SR-2	1283	0	0	275	774	0.3	1	170	478	
	J. DAVIDSON - 2000		1283		0	200	563	1.1	3	41	115	
						0		211		-2		363
UNT. RACCOON CK.	SCARLIFT - 1974	SR-3	480	4	4	351	370	0.3	0	170	179	
	J. DAVIDSON - 2000		480	0	0	264	278	0.55	1	222	234	
						4		92		0		-55
UNT. RACCOON CK.	SCARLIFT - 1974	SR-4	93	1	0	351	72	0.2	0	170	35	
	J. DAVIDSON - 2000		93	0	0	264	54	0.76	0	44	9	
						0		18		0		26
RACCOON CREEK	SCARLIFT - 1974	SR-5	5489	2	24	251	3022	0.3	4	160	1927	
	J. DAVIDSON - 2000		5489	0	0	188	2264	1.2	14	55	662	
						24		759		-11		1264
UNT. RACCOON CK.	SCARLIFT - 1974	SR-6	368	0	0	347	280	0.2	0	160	129	
	J. DAVIDSON - 2000		368	0	0	274	221	0.39	0	51	41	
						0		59		0		88
UNT. RACCOON CK.	SCARLIFT - 1974	SR-7	167	2	1	233	85	0.2	0	180	66	
	J. DAVIDSON - 2000		167	0	0	218	80	0.64	0	49	18	
						1		5		0		48
RACCOON CREEK	SCARLIFT - 1974	SR-8	6518	41	586	119	1701	13.6	194	290	4146	
	J. DAVIDSON - 2000		6518	0	0	162	2316	10	143	182.5	2609	
						586		-615		51		1537
UNT. RACCOON CK.	SCARLIFT - 1974	SR-9	183	1	0	278	112	0.1	0	160	64	
	J. DAVIDSON - 2000		183	0	0	232	93	0.72	0	50	20	
						0		18		0		44
UNT. RACCOON CK.	SCARLIFT - 1974	SR-10	86	4	1	377	71	1.3	0	370	70	
	J. DAVIDSON - 2000		86	0	0	292	55	0.3	0	416	78	
						1		16		0		-9
UNT. RACCOON CK.		SR-11	64	3	0	233	33	0.2	0	180	25	
						0	0	0	0	0	0	
						0		33		0		25
UNT. RACCOON CK.		SR-12	855	317	595	0	0	21.8	41	800	1500	
						0	0	0	0	0	0	
						595		0		41		1500
UNT. RACCOON CK.		SR-13	97	650	138	0	0	0.7	0	830	177	
						0	0	0	0	0	0	
						138		0		0		177
UNT. RACCOON CK.	SCARLIFT - 1974	SR-14	171	133	50	3	1	140	53	560	210	
	J. DAVIDSON - 2000		171	0	0	154	58	0.4	0	263	99	
						50		-57		52		111
UNT. RACCOON CK.		SR-15	191	110	46	2	1	12.5	5	610	256	
						0	0	0	0	0	0	
						46		1		5		256
RACCOON CREEK		SR-16	27336	66	3958	69	4138	13.2	792	410	24586	
						0	0	0	0	0	0	
						3958		4138		792		24586
UNT. RACCOON CK.		SR-17	67	93	14	4	1	1.7	0	970	143	
						0	0	0	0	0	0	
						14		1		0		143
UNT. RACCOON CK.	SCARLIFT - 1974	SR-18	27	18	1	50	3	1.1	0	750	44	
	J. DAVIDSON - 2000		27	0	0	60	4	3.2	0	487	29	

STREAM	DATA SOURCE	STREAM REACH	AVG FLOW	AVG ACIDITY	AVG	AVG	AVG	AVG	AVG	AVG	
					TONS OF ACID PER YEAR	ALKALINITY	TONS OF ALK. PER YEAR	AVG TOTAL IRON	TONS OF IRON PER YEAR	SULFATES	TONS OF SULFATES PER YEAR
					1		-1		0	16	
UNT. RACCOON CK.	SCARLIFT - 1974	SR-19	47	425	44	2	0	6.8	1	1370	141
	J. DAVIDSON - 2000		47	228	24	0	0	5.5	1	1105	114
					20		0		0		27
RACCOON CK.		SR-20	22562	57	2821	64	3168	11.2	554	560	27716
					0		0		0		0
					2821		3168		554		27716
L. RACCOON CK	SCARLIFT - 1974	SR-21	328	4822	3470	0	0	2416.4	1739	640	460
	J. DAVIDSON - 2000		328	0	0	104	75	0.3	0	473	340
					3470		-75		1738		120
UNT. L. RACCOON CK	SCARLIFT - 1974	SR-22	62	4	1	235	32	0.1	0	300	41
	J. DAVIDSON - 2000		62	0	0	160	22	0.37	0	314	43
					1		10		0		-2
UNT. L. RACCOON CK	SCARLIFT - 1974	SR-23	185	9	4	52	21	0.8	0	780	317
	J. DAVIDSON - 2000		185	0	0	44	18	0.3	0	787	319
					4		3		0		-3
UNT. L. RACCOON CK		SR-24	84	3	1	190	35	0.3	0	300	55
					0		0		0		0
					1		35		0		55
UNT. L. RACCOON CK	SCARLIFT - 1974	SR-25	450	5	5	115	114	1	1	630	622
	J. DAVIDSON - 2000		450	0	0	130	128	0.3	0	549	542
					5		-15		1		80
UNT. L. RACCOON CK	SCARLIFT - 1974	SR-26	351	66	51	10	8	9.4	7	1460	1124
	J. DAVIDSON - 2000		351	0	0	78	60	0.3	0	921	709
					51		-52		7		415
UNT. L. RACCOON CK	SCARLIFT - 1974	SR-27	171	303	114	1	0	2.3	1	1740	653
	J. DAVIDSON - 2000		171	0	0	92	35	0.45	0	359	135
					114		-34		1		518
UNT. L. RACCOON CK	SCARLIFT - 1974	SR-28	1414	152	471	5	16	6.5	20	1360	4218
	J. DAVIDSON - 2000		1414	0	0	50	155	0.71	2	238	738
					471		-140		18		3480
UNT. L. RACCOON CK		SR-29	3105	114	776	7	48	4.4	30	1220	8310
					0		0		0		0
					776		48		30		8310
UNT. L. RACCOON CK	SCARLIFT - 1974	SR-30	188	10	4	75	31	0.2	0	290	120
	J. DAVIDSON - 2000		188	0	0	74	31	0.53	0	316	130
					4		0		0		-11
UNT. L. RACCOON CK	SCARLIFT - 1974	SR-31	84	3	1	119	22	0.2	0	240	44
	J. DAVIDSON - 2000		84		0	98	18	0.7	0	140.4	26
					1		4		0		18
L. RACCOON CK	SCARLIFT - 1974	SR-32	3296	789	5705	0	0	291	2104	850	6146
	J. DAVIDSON - 2000		3296	0	0	92	665	0.3	2	343.4	2483
					5705		-665		2102		3663
UNT. L. RACCOON CK	SCARLIFT - 1974	SR-33	333	45	33	24	18	6.6	5	1030	752
	J. DAVIDSON - 2000		333	0	0	110	80	0.4	0	716.9	524
					33		-63		5		229
UNT. POTATO GAR	SCARLIFT - 1974	SR-34	558	1339	1639	0	0	237.3	290	2460	3011
	J. DAVIDSON - 2000		558	0	0	294	360	1	1	1205	1475
					1639		-360		289		1536
RACCOON CREEK		SR-35	15128	378	12544	0	0	102.1	3388	770	25553
					0		0		0		0
					12544		0		3388		25553
UNT. RACCOON CK.	SCARLIFT - 1974	SR-36	347	83	63	6	5	6.2	5	1460	1111
	J. DAVIDSON - 2000		347	0	0	120	91	0.3	0	1330	1012
					63		-87		4		99

STREAM	DATA SOURCE	STREAM REACH	AVG FLOW	AVG ACIDITY	AVG TONS OF ACID PER YEAR		AVG TONS OF ALK. PER YEAR		AVG TONS OF IRON PER YEAR		AVG TONS OF SULFATES PER YEAR	
					ALKALINITY	AVG	AVG TOTAL IRON	AVG	AVG	AVG		
UNT. RACCOON CK.		SR-37	218	3	1	143	68	0.2	0	900	430	
					0		0		0			
					1		68		0	430		
UNT. RACCOON CK.		SR-38	141	0	0	287	89	0.3	0	840	260	
					0		0		0			
					0		89		0	260		
UNT. RACCOON CK.		SR-39	1800	3	12	106	419	0.5	2	920	3633	
					0		0		0			
					12		419		2	3633		
UNT. L. RACCOON CK	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-40	44	8	1	40	4	0.7	0	690	67	
			44	94	9	0	0	2.87	0	611	59	
					-8		4		0	8		
UNT. L. RACCOON CK	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-41	72	10	2	48	8	0.4	0	860	136	
			72	0	0	46	7	0.3	0	522.7	83	
					2		0		0	53		
UNT. L. RACCOON CK	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-42	660	53	77	9	13	5.8	8	1350	1955	
			660	0	0	82	119	0.4	1	871.7	1262	
					77		-106		8	692		
UNT. L. RACCOON CK	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-43	379	23	19	17	14	4.4	4	760	632	
			379	0	0	102	85	0.3	0	543	451	
					19		-71		3	180		
UNT. L. RACCOON CK	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-44	58	0	0	169	22	3.8	0	220	28	
			58	0	0	154	20	0.73	0	134	17	
					0		2		0	11		
UNT. L. RACCOON CK	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-45	2126	26	121	8	37	3.8	18	810	3778	
			2126	0	0	72	336	0.3	1	757.5	3533	
					121		-298		16	245		
UNT. L. RACCOON CK	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-46	76	2	0	177	30	0.5	0	180	30	
			76	0	0	184	31	0.3	0	42.6	7	
					0		-1		0	23		
UNT. L. RACCOON CK	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-47	2341	23	118	14	72	0.3	2	830	4262	
			2341	0	0	74	380	0.5	3	702	3605	
					118		-308		-1	657		
CHAMBERLAIN RUN	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-48	377	8	7	57	47	0.1	0	590	488	
			377	0	0	94	78	0.3	0	475	393	
					7		-31		0	95		
RACCOON CREEK		SR-49	31206	78	5339	14	958	21.1	1444	560	38335	
					0		0		0			
					5339		958		1444		38335	
UNT. RACCOON CK.	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-50	90	4	1	77	15	0.9	0	230	45	
			90	0	0	80	16	0.8	0	126	25	
					1		-1		0	21		
BIGGER RUN	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-51	333	82	60	0	0	12.8	9	1440	1052	
			333	0	0	104	76	0.5	0	878	641	
					60		-76		9	411		
UNT. BIGGER RUN	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-52	75	5	1	135	22	0.6	0	240	39	
			75	0	0	110	18	0.47	0	110	18	
					1		4		0	21		
BIGGER RUN	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-53	1041	16	37	31	71	2.3	5	940	2147	
			1041	0	0	110	251	0.3	1	894	2042	
					37		-180		5	105		
POTATO GARDEN		SR-54	1596	1047	3666	0	0	191.4	670	2210	7737	
					0		0		0			
					3666		0		670		7737	
UNT POTATO GAR	SCARLIFT - 1974 J. DAVIDSON - 2000	SR-55	522	150	172	0	0	23.9	27	1390	1592	
			522	0	0	84	96	0.3	0	845	968	
					172		-96		27	624		

STREAM	DATA SOURCE	STREAM REACH	AVG FLOW	AVG ACIDITY	AVG	AVG	AVG	AVG	AVG	AVG	
					TONS OF ACID PER YEAR	ALKALINITY	TONS OF ALK. PER YEAR	TOTAL IRON	TONS OF IRON PER YEAR	SULFATES	TONS OF SULFATES PER YEAR
UNT POTATO GAR	SCARLIFT - 1974	SR-56	324	10	7	99	70	6.6	5	390	277
	J. DAVIDSON - 2000		324	0	0	60	43	5.8	4	291	207
						7		28		1	
POTATO GARDEN	SCARLIFT - 1974	SR-57	2583	595	3371	9	51	80.2	454	1370	7763
	J. DAVIDSON - 2000		2583	0	0	78	442	1.5	8	597	3383
						3371		-391		446	
UNT POTATO GAR	SCARLIFT - 1974	SR-58	733	13	21	20	32	1.3	2	300	482
	J. DAVIDSON - 2000		733	0	0	60	96	1.6	3	160	257
						21		-64		0	
UNT POTATO GAR	SCARLIFT - 1974	SR-59	399	3	3	132	116	0.5	0	180	158
	J. DAVIDSON - 2000		399	0	0	110	96	0.5	0	38.7	34
						3		19		0	
UNT POTATO GAR	SCARLIFT - 1974	SR-60	133	4	1	133	39	3.7	1	180	53
	J. DAVIDSON - 2000		133	0	0	92	27	0.56	0	38	11
						1		12		1	
POTATO GARDEN	SCARLIFT - 1974	SR-61	4961	452	4919	0	0	70.9	772	990	10774
	J. DAVIDSON - 2000		4961	0	0	78	849	0.92	10	460	5006
						4919		-849		762	
POTATO GARDEN		SR-62	5949	403	5259	0	0	49.8	650	1130	14747
						0	0		0		0
						5259		0		650	
UNT. DILLOE RUN		SR-63	48	8	1	35	4	0.5	0	860	91
						0	0		0		0
						1		4		0	
UNT. DILLOE RUN		SR-64	162	5	2	231	82	2.9	1	340	121
						0	0		0		0
						2		82		1	
UNT POTATO GAR	SCARLIFT - 1974	SR-65	336	267	197	0	0	46.2	34	900	663
	J. DAVIDSON - 2000		336	0	0	66	49	0.3	0	346	255
						197		-49		34	
UNT POTATO GAR	SCARLIFT - 1974	SR-66	353	334	259	0	0	19.5	15	1180	914
	J. DAVIDSON - 2000		353	0	0	36	28	4.6	4	712.3	552
						259		-28		12	
RACCOON CREEK		SR-67	43470	72	6866	9	858	16.1	1535	620	59122
						0	0		0		0
						6866		858		1535	
BURGETTS FORK		SR-68	9531	57	1192	48	1004	17.6	368	740	15472
						0	0		0		0
						1192		1004		368	
BRUSH RUN	SCARLIFT - 1974	SR-69	4573	5	50	134	1344	0.2	2	1070	10734
	J. DAVIDSON - 2000		4573	0	0	124	1244	0.3	3	995	9981
						50		100		-1	
DILLOE RUN	SCARLIFT - 1974	SR-70	1766	10	39	56	217	1.2	5	810	3138
	J. DAVIDSON - 2000		1766	0	0	62	240	0.3	1	1034	4006
						39		-23		3	
WINGFIELD RUN	SCARLIFT - 1974	SR-71	2713	4	24	96	571	0.6	4	460	2738
	J. DAVIDSON - 2000		2713	0	0	104	619	0.3	2	289	1720
						24		-48		2	

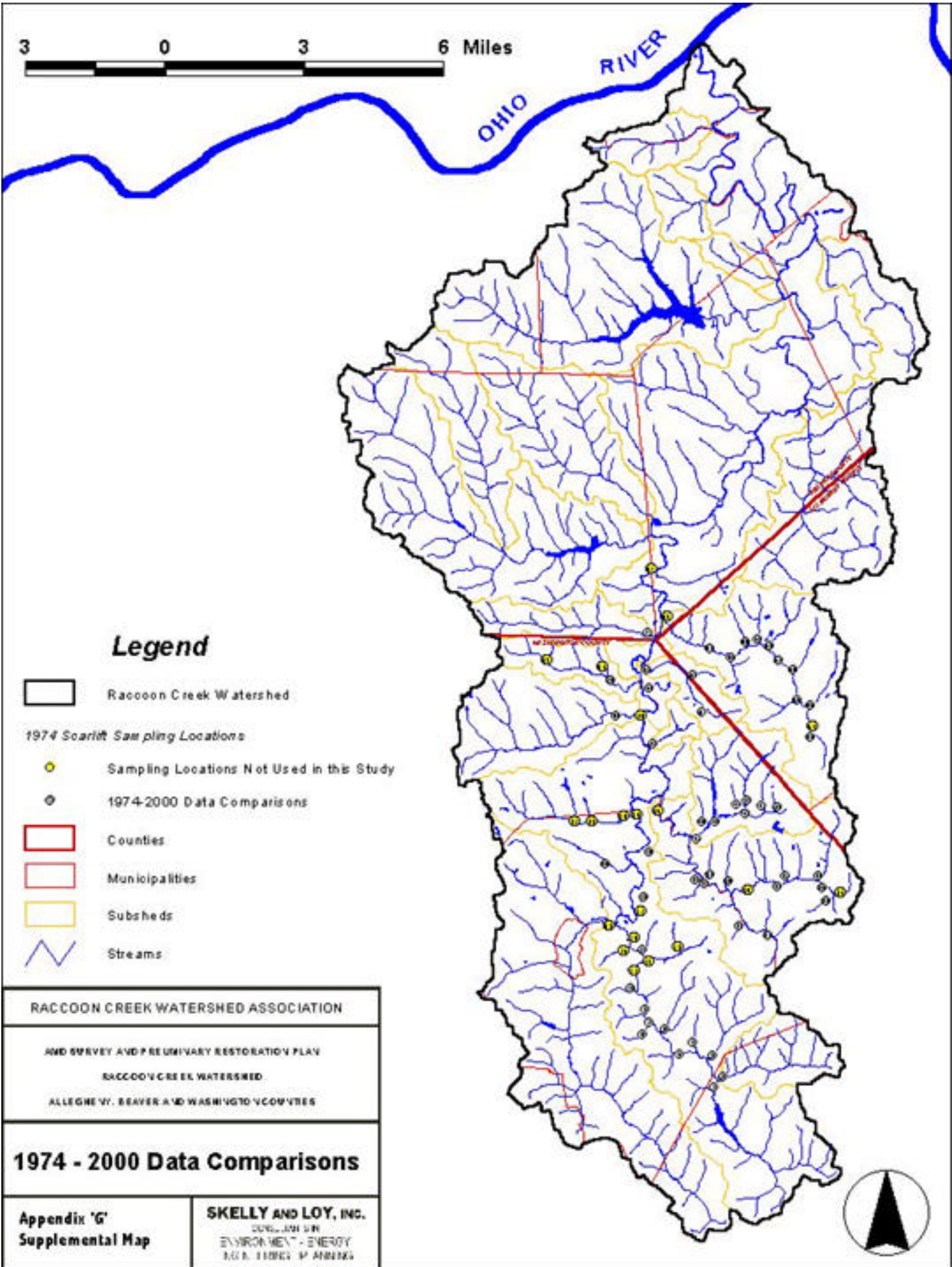
Notes: 2000 data has been subtracted from scarlift to get a net change in loading. Therefore, a negative number means there has been a net increase in loading.

Sampling Reach points highlighted in green indicate increases in alkalinity loading, increases in acid, iron and sulfates are highlighted in red.

Numbers have been rounded to one decimal, so sometimes the product of the formula is 0 even if there is a small amount of a pollutant.

Sampling Reach points highlighted in yellow is where new data is needed for comparison.



Scarlift flow data at each point was assumed for comparison purposes.



3 0 3 6 Miles

OHIO RIVER

Legend

-  Raccoon Creek Watershed
- 1974 Soaritt Sampling Locations*
-  Sampling Locations Not Used in this Study
-  1974-2000 Data Comparisons
-  Counties
-  Municipalities
-  Subheds
-  Streams

<p>RACCOON CREEK WATERSHED ASSOCIATION</p> <p>AND SURVEY AND PRELIMINARY RESTORATION PLAN</p> <p>RACCOON CREEK WATERSHED</p> <p>ALLEGANY, BEAVER AND WASHINGTON COUNTIES</p>	
<p>1974 - 2000 Data Comparisons</p>	
<p>Appendix 'G'</p> <p>Supplemental Map</p>	<p>SKELLY AND LOY, INC.</p> <p>CONSULTING</p> <p>ENVIRONMENT - ENERGY</p> <p>100 N. THIRD ST. AMING</p>



APPENDIX H

RCWA Benthic Macro-Invertebrate Study

**Raccoon Creek Watershed Association
Raccoon Creek Macro-Invertebrate Study
Identification to Order/Family
1999/2000**

Sample Location and Organism	Sampling Event		
	10/99	4/00	10/00
Location A (Keys Run @ Joffre)			
Order: Megaloptera Family: Sialidae (Alderfly)	2	1	0
Order: Megaloptera Family: Corydalidae (Dobsonfly/Hellgrammite)	0	0	1
Order: Diptera Family: Chironomidae (Midges)	0	2	0
Order: Amphipoda (Scud)	0	1	0
Phylum: Annelida Class: Oligochaeta	0	1	0
Water Quality Rating	3.2 (Poor)	8.8 (Poor)	5.0 (Poor)

Sample Location and Organism	Sampling Event		
	10/99	4/00	10/00
Location B (Burgetts Fork @ Burgettstown)			
Order: Diptera Family: Chironomidae (Midges)	155	3	0
Order: Diptera Family: Ceratopogonidae (Biting midges)	2	0	0
Order: Odonata Family: Zygoptera (Dragonfly)	1	0	0
Order: Megaloptera Family: Sialidae (Alderfly)	5	0	0
Order: Megaloptera Family: Corydalidae (Dobsonfly/Hellgrammite)	0	0	5
Phylum: Trichoptera Class: Hydropsychidae (Caddisfly, Net-spinning)	0	0	5
Phylum: Annelida Class: Oligochaeta	0	23	0
Water Quality Rating	4.2 (Poor)	2.3 (Poor)	8.2 (Poor)

**Raccoon Creek Watershed Association
Raccoon Creek Macro-Invertebrate Study
Identification to Order/Family
1999/2000**

Sample Location and Organism	Sampling Event		
	10/99	4/00	10/00
Location C (Raccoon Creek @ Bavington)			
Order: Plecoptera Family: Capniidae (Winter stonefly)	1	0	0
Order: Megaloptera Family: Corydalidae (Dobsonfly)	1	0	1
Order: Diptera Family: Simuliidae (Blackfly)	0	7	0
Order: Diptera Family: Tipulidae (Cranefly)	9	3	6
Family: Chironomidae (Midge)	0	0	1
Order: Odonata Family: Anisoptera (Dragonfly nymph)	0	0	1
Order: Coleoptera (Riffle Beetle)	0	0	2
Order: Decapoda (Crayfish)	0	0	1
Order: Trichoptera Family: Polycentropodidae (Tube-making caddisfly)	0	9	2
Order: Trichoptera Family: Hydropsychidae (Net spinner caddisfly)	73	0	104
Water Quality Rating	11.6 (Poor)	7.6 (Poor)	28.8 (Fair)

**Raccoon Creek Watershed Association
Raccoon Creek Macro-Invertebrate Study
Identification to Order/Family
1999/2000**

Sample Location and Organism	Sampling Event		
	10/99	4/00	10/00
Location D (Raccoon Creek @ Murdocksville)			
Order: Plecoptera Family: Perlodidae (Perlodid stonefly)	SNS	1	0
Order: Megaloptera Family: Sialidae (Alderfly)	SNS	1	0
Order: Megaloptera Family: Corydalidae (Dobsonfly/Hellgrammite)	SNS	0	1
Order: Diptera Family: Tipulidae (Cranefly)	SNS	1	21
Order: Diptera Family: Ceratopogonidae (Biting Midge)	SNS	0	9
Order: Trichoptera Family: Glososomatidae (Saddlecase making caddisfly)	SNS	3	0
Order: Trichoptera Family: Hydropsychidae (Net spinner caddisfly)	SNS	1	178
Order: Trichoptera Family: Philopotamidae (Fingernet caddisfly)	SNS	0	1
Class: Crustacea Order: Amphipoda (Scuds)	SNS	0	3
Class: Crustacea Order: Decapoda (Crayfish)	SNS	1	3
Water Quality Rating	NA	22.8 (Fair)	19.0 (Poor)

SNS = Site not sampled

NA = Not Applicable

**Raccoon Creek Watershed Association
Raccoon Creek Macro-Invertebrate Study
Identification to Order/Family
1999/2000**

Sample Location and Organism	Sampling Event		
	10/99	4/00	10/00
Location E (Potato Garden Run near Murdocksville)			
Order: Plecoptera Family: Perlidae (Perlodid stonefly)	1	1	2
Order: Plecoptera Family: Peloperlidae (Roachlike stonefly)	0	1	0
Order: Diptera Family: Tipulidae (Cranefly)	1	3	9
Order: Diptera Family: Ceratopogonidae (Biting midges)	0	1	0
Order: Diptera Family: Empididae (Aquatic dance flies)	0	0	8
Order: Diptera Family: Chironomidae (Midges)	0	0	2
Order: Diptera Family: Athericidae (Watersnipefly)	1	0	0
Order: Trichoptera Family: Polycentropodidae (Tube making caddisfly)	1	7	0
Order: Trichoptera Family: Hydropsychidae (Net spinner caddisfly)	21	9	111
Order: Trichoptera Family: Limnephidae (Northern casemaker caddisfly)	0	1	1
Order: Trichoptera Family: Philopamidae (Fingernet caddisfly)	246	0	0
Order: Trichoptera Family: Hydroptilidae (Micro caddisfly)	0	0	62
Class: Crustacea Order: Decapoda (Crayfish)	0	2	0
Water Quality Rating	16.9 (Poor)	20.8 (Poor/Fair)	18.6 (Poor)

APPENDIX I

Primary AMD Site Photographs



Discharge JB-1 which flows into main stem Raccoon Creek and is located at the end of Bonnymede Drive in Smith Township.



Discharge JB-2 which flows into main stem Raccoon Creek and is located adjacent to State Route 4015 across from the Penn-Balt, Inc. Mine No.1 Refuse Disposal Site.



Discharge P6: This discharge flows into Plum Run, and is downstream discharge P7. It is best accessed at 37 Plum Run



Discharge P7: This discharge is located upstream of discharge P6, and into Plum Run. It is accessed off of Plum Run Avenue at a "No Dumping"



Discharge L2 : This discharge is being passively treated facility located at Balogna Industrial Road and then flows into Burnetts Fork



Discharge E1: This discharge flows into Burgetts Fork and is Ballfield Road and the High School Stadium in Burgettstown.



Discharge H3: This discharge flows into a un-named tributary of Potato Garden Run and is located approximately 0.3 mile from State Route 3089 above an abandoned farm house

APPENDIX J

Emerging Technology Information

Passive Aluminum Flushing System

- 4.65'

128

259625

Note: Refer to Description in Document.

6" PVC FLOW

1/2" PERFORATED COLLECTION PIPES (6" PVC)

TYPICAL 6' CENTERS

18'

6" PVC PIPE (SOLID)

OUTLET HYBRID

18'

36'

259625

57'

259625

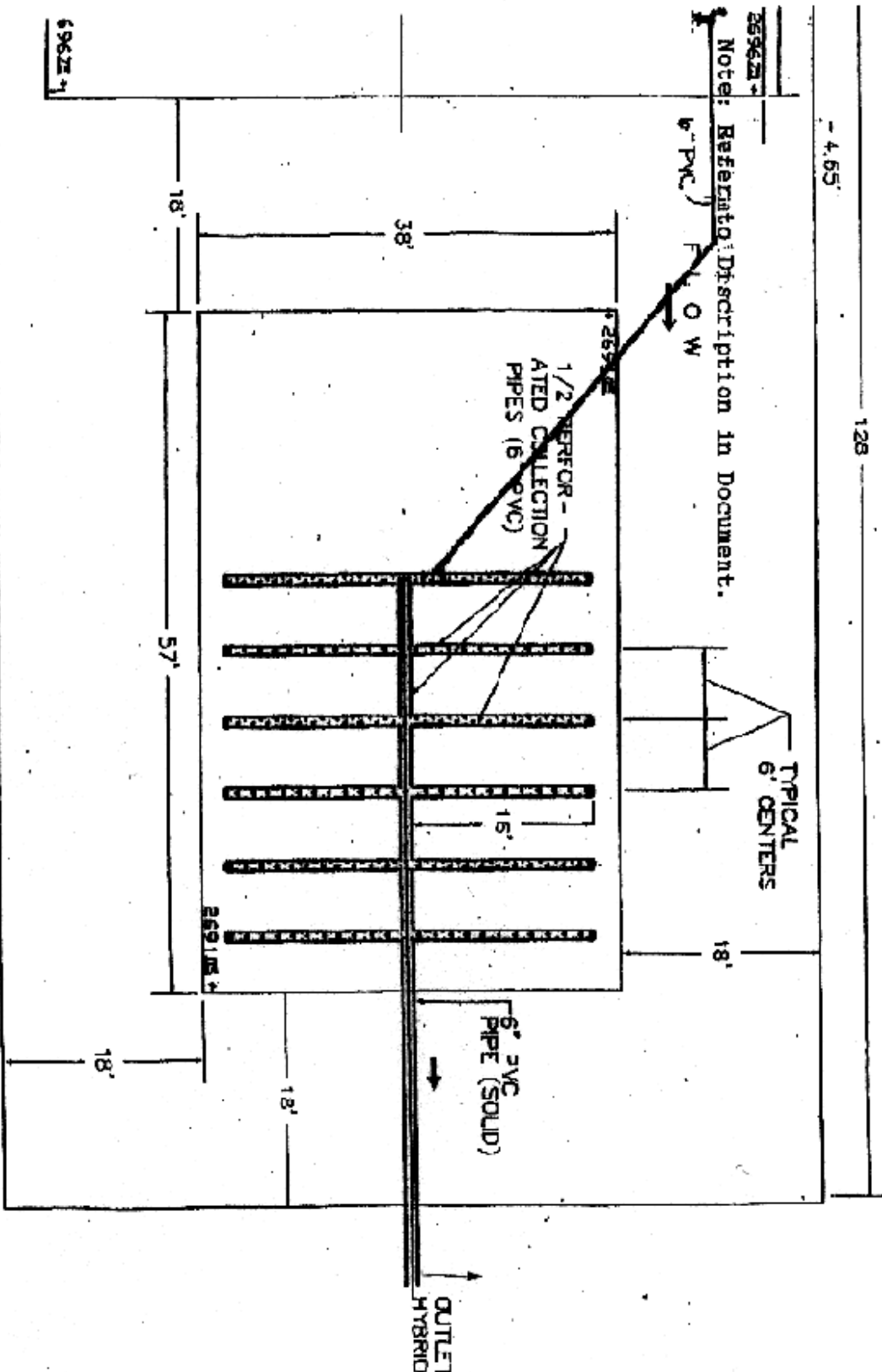
18'

18'

4.65'

SAPS CELL

NTS



Please visit

www.pondaeration.com

for the latest in passive treatment technologies.

APPENDIX K

**PADEP: Environmental Good Samaritan Act and
Project Instructions, Proposal, and Approval Forms**



COMMONWEALTH OF PENNSYLVANIA
 DEPARTMENT OF ENVIRONMENTAL PROTECTION
 BUREAU OF MINING AND RECLAMATION

DEP USE ONLY
Date Received
I.D. Number

**ENVIRONMENTAL GOOD SAMARITAN
 PROJECT PROPOSAL**

SECTION A. APPLICANT

<p>1. Applicant's Name: Mailing Address: E-mail address:</p>	<p>Applicant is: (check appropriate blocks)</p> <p><input type="checkbox"/> an individual <input type="checkbox"/> an authority</p> <p><input type="checkbox"/> an association <input type="checkbox"/> other body of local government</p> <p><input type="checkbox"/> a business <input type="checkbox"/> a state or federal agency</p> <p><input type="checkbox"/> Other: describe: _____</p>
<p>2. Project Coordinator's Name: Mailing Address: E-mail address:</p>	<p style="text-align: right;">Telephone No.: () -</p> <p>3. Provide the names and addresses of project landowners on Attachment A and project participants on Attachment B. Provide the names and addresses of adjacent and downstream landowners on Attachment C.</p>

SECTION B. LOCATION

1. County:	Municipality:
<p>2. Narrative description of the boundaries of the project; identify the properties and their owners within and adjacent to the project area. The applicant may attach a map that provides this information instead of the narrative.</p>	
<p>3. Newspaper with general circulation in the locality of the project:</p> <p>Name:</p> <p>Address:</p> <p>Telephone:</p>	

SECTION C. DESCRIPTION OF PROJECT

1. Project Name: _____

Has project started? Yes When? _____ No

Check type of project: Water Pollution Abatement Reclamation Both

2. Project Area: _____ acres **Project duration (months)** _____

3. Project Description - Describe the problem to be addressed by the project and the sequence and timing of project activities, include identifiable milestones and the timetable for completing each milestone. If the project has started, identify the activities currently taking place.

4. Right of Entry: Attach documentation that each landowner has given the applicant, the participants and the Department permission to enter onto the project area to Attachment D.

5. Certification and Signature:

I certify that the information in this application is true and correct to the best of my knowledge.

Submitted by: _____ Date _____
Applicant

Signature: _____ Title _____

Department I.D.

Attachment A List of Landowners

(Project Name)	(Township)	(County)
----------------	------------	----------

The following landowners have or will have provided access to their land for the reclamation or water pollution abatement project identified above. These landowners may be eligible for coverage under the Environmental Good Samaritan Act of 1999.

Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____	Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____
Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____	Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____
Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____	Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____
Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____	Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____

Department I.D.

Attachment B List of Project Participants

(Project Name)	(Township)	(County)
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The following persons have or will have provided equipment, materials or services for the reclamation or water pollution abatement project identified above. These persons may be eligible for coverage under the Environmental Good Samaritan Act of 1999.

Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____	Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____
Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____	Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____
Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____	Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____
Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____	Name: Mailing Address: Phone #: Type of person: <input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Corporation <input type="checkbox"/> Association <input type="checkbox"/> Authority or Local Government <input type="checkbox"/> State or federal agency <input type="checkbox"/> Other Signature _____

Attachment C List of Adjacent and Riparian Landowners

(Project Name) (Township) (County)

The following landowners either:

- (1) own property immediately next to the property on which the project will take place; or
- (2) own stream-side property within 1,000 feet (304.8 meters) downstream of the project.

Name: Mailing Address: <input type="checkbox"/> Adjacent <input type="checkbox"/> Downstream	Name: Mailing Address: <input type="checkbox"/> Adjacent <input type="checkbox"/> Downstream
Name: Mailing Address: <input type="checkbox"/> Adjacent <input type="checkbox"/> Downstream	Name: Mailing Address: <input type="checkbox"/> Adjacent <input type="checkbox"/> Downstream
Name: Mailing Address: <input type="checkbox"/> Adjacent <input type="checkbox"/> Downstream	Name: Mailing Address: <input type="checkbox"/> Adjacent <input type="checkbox"/> Downstream
Name: Mailing Address: <input type="checkbox"/> Adjacent <input type="checkbox"/> Downstream	Name: Mailing Address: <input type="checkbox"/> Adjacent <input type="checkbox"/> Downstream
Name: Mailing Address: <input type="checkbox"/> Adjacent <input type="checkbox"/> Downstream	Name: Mailing Address: <input type="checkbox"/> Adjacent <input type="checkbox"/> Downstream
Name: Mailing Address: <input type="checkbox"/> Adjacent <input type="checkbox"/> Downstream	Name: Mailing Address: <input type="checkbox"/> Adjacent <input type="checkbox"/> Downstream

Attachment D
Permission to Enter Project Area

Each landowner, whose property will be used for the proposed project or used to provide access to the project area, must give in writing his or her permission for the project applicant and participants to come onto the property to work on the proposed project. Each landowner must also give the Department of Environmental Protection permission to come onto the property to observe project activities, collect samples and otherwise do its job. Attach documents here.



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING AND RECLAMATION

**APPROVAL OF COVERAGE UNDER THE ENVIRONMENTAL
GOOD SAMARITAN ACT**

In compliance with the provisions of the Environmental Good Samaritan Act of 1999, the Pennsylvania Department of Environmental Protection hereby approves the _____
(Name of Project)

(Water Pollution Abatement and/or Reclamation Project)

to be conducted by the _____
(Applicant)

in _____, _____
(township) (county)

The attached lists of landowners and project participants may qualify for the protections and immunities provided by the Environmental Good Samaritan Act for their voluntary reclamation of land or water adversely affected by abandoned mining, oil or gas extraction or exploration for these resources. A person who under existing law is or may become responsible to reclaim the land or address the water pollution or anyone who by order or otherwise is required to or agrees to perform the reclamation or abate the water pollution is not eligible for the protections and immunities provided by the Environmental Good Samaritan Act. This project approval makes no determination as to the eligibility of the landowners and participants identified on the attached lists for protection and immunities provided by the Environmental Good Samaritan Act.

The following permits must be applied for and issued before work on the project site may begin. Applications for these permits may be obtained from this DEP office.

Coverage approval date _____

Authorized by _____

_____ Office

Attachments

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING AND RECLAMATION

**ENVIRONMENTAL GOOD SAMARITAN
PROJECT PROPOSAL**

INSTRUCTIONS

GENERAL INFORMATION

1. Eligible Projects are:

Projects that reclaim lands that have been adversely affected by mining, oil or gas extraction or exploration for these resources.

Projects that treat or abate water pollution caused by mining or oil or gas extraction.

2. This information is provided to assist the applicant in obtaining DEP approval for reclamation and water pollution abatement projects under the Environmental Good Samaritan Act.
3. Complete the application by typing or printing clearly. If additional space is required to provide information in this application, attach an 8½ x 11 inch sheet of paper appropriately labeled.
4. One original of this application must be completed and submitted to the appropriate DEP District Mining Office.

GROWING GREENER PROJECTS

If a project is approved for a grant under the Pennsylvania Growing Greener program, the applicant may apply for coverage under the Environmental Good Samaritan Act by completing Attachments A, B, C and D and sending them along with one copy of the Growing Greener grant application to the appropriate District Mining office.

SECTION A. APPLICANT INFORMATION

1. **Applicant:** Identify the person or organization under which the application is filed, the applicant's legal mailing address, and the type of person or persons. The applicant is usually the person who has overall responsibility and control of the project activities.
2. **Project Coordinator:** Give the name of the individual representing the applicant and having primary control of on-site activities; the daytime telephone number for the project coordinator; and the legal mailing address of the project coordinator.
3. **List of Landowners:** Identify all landowners within the project area on Attachment A.
4. **List of Project Participants:** Identify the persons or organizations that will be working on the project on Attachment B. It is not necessary, but it is a good idea, to identify individual members of participating organizations. The project applicant can add

persons to this list as the project progresses. Persons not on the list are not prohibited from working on the project.

5. **List of Adjacent and Riparian Landowners:** Provide the names and addresses of property owners adjacent to the property(ies) on which the project will take place on Attachment C.

If the project is adjacent to a stream or involves a discharge to a stream, provide the names and addresses of persons who own property along the stream downstream of the project area.

SECTION B. LOCATION

1. **Location:** Give the name of the county and municipality, for each site.
2. **Project boundaries:** Provide a narrative describing the boundaries of the project or a map of the project boundaries. Identify the properties and their owners within and adjacent to the project area.
3. **Newspaper of general circulation published in locality of proposed project:** List the name, address and telephone number of a newspaper of general circulation published in the locality of the proposed project. The Department will be responsible for project notices.

SECTION C. PROJECT DESCRIPTION

1. **Project Name:** Give the name of the project and check the box which identifies the type of project.
2. **Project area:** Give the total area in acres to be affected by the project and indicate the expected duration of the reclamation and abatement activities that will be taking place on the project site.
3. **Description of the problem to be addressed by the project:** If the project is a land reclamation project, describe the existing site conditions and total acres to be reclaimed. If the project is a water pollution abatement project, describe the discharges, identifying the polluting substances and their respective concentrations and flow rates. Describe the general nature of the impacts of the discharges on the receiving stream.

Describe the work to be done and the sequence and timing of activities.

- a. For reclamation projects, include a description of the reclamation to be accomplished.
- b. For water pollution abatement projects, include a description of the abatement or treatment measures planned.

Include a table that identifies the major project milestones and the estimated date for completing each milestone.

4. **Permission to Enter Project Area:** Each landowner, whose property will be used for the proposed project or used to provide access to the project area, must give his or her **permission in writing** to the project applicant to come onto the property to work on the proposed project. Each landowner must also give the Department of Environmental Protection permission to come onto the property to observe project activities, collect samples and otherwise do its job. Documentation of landowner permission may be in the

form of a letter to the applicant, signed by the landowner. Documentation should be attached to Attachment D.

Once the project is approved, DEP will maintain a permanent record of the participants and landowners who are protected under the Environmental Good Samaritan Act.

For more information or assistance, please contact DEP's District Mining Offices:

Pottsville District Mining Office

5 West Laurel Boulevard
Pottsville, PA 17901-2454
Telephone: 570-621-3118

Counties Served: Adams, Berks, Bucks, Carbon, Chester, Columbia, Cumberland, Dauphin, Delaware, Franklin, Juniata, Lackawanna, Lancaster, Lebanon, Lehigh, Luzerne, Mifflin, Monroe, Montgomery, Montour, Northampton, Northumberland, Perry, Pike, Philadelphia, Schuylkill, Snyder, Susquehanna, Union, Wayne, Wyoming and York.

Hawk Run District Mining Office

Empire Road, P.O. Box 209
Hawk Run, PA 16840-0209
Telephone: 814-342-8200

Counties Served: Bradford, Cameron, Centre, Clearfield, Clinton, Lycoming, Potter, Sullivan and Tioga.

Knox District Mining Office

White Memorial Building, P.O. Box 669
Knox, PA 16232-0669
Telephone: 814-797-1191

Counties Serves: Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren.

Cambria Office

286 Industrial Park Road
Ebensburg, PA 15931
Telephone: 814-472-1900

Counties Served: Bedford, Blair, Cambria, Fulton, Huntingdon, Indiana and Somerset.

Greensburg District Mining Office

Armbrust Building, RR 2, Box 603C
Greensburg, PA 15601-0982
Telephone: 724-925-5500

Counties Served: Allegheny, Armstrong, Beaver, Fayette, Greene, Washington and Westmoreland.

McMurray District Mining Office

3913 Washington Road
McMurray, PA 15317-2532
Telephone: 724-941-7100

Counties Served: All counties with underground bituminous mining and subsidence.

