



Reeds Run AMD
Remediation Design

Technical
Report

A Public-Private Partnership Effort
AWARE & Stream Restoration Inc.

Aultmans Run Watershed
Armstrong Township
Indiana County, Pennsylvania

June 2007

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EXECUTIVE SUMMARY

The entire 7.3-square mile Reeds Run Watershed has been identified as being impacted by extensive, historical coal mining activities. Over 3.4 miles of Reeds Run has been identified as impacted by abandoned mine drainage (metals) in the 2006 Integrated List of All Waters prepared by the PA Department of Environmental Protection (PA DEP) and an EPA approved TMDL (4/26/07) has been developed for the entire Reeds Run Watershed. An assessment prepared by the Aultman Watershed Association for Restoring the Environment (AWARE) and Skelly & Loy, Inc. has identified the major discharges to Reeds Run. The RD0-D1 discharge, located in the headwaters of Reeds Run, has been targeted for restoration by AWARE. According to this report, the RD0-D1 discharge is the second largest contributor of iron, manganese, and acidity in the entire 28-square mile Aultmans Run Watershed.

A Growing Greener (GG) Grant was awarded to AWARE and Stream Restoration Incorporated (SRI) in 2004 to assess the site and develop a design. Through an evaluation of surface mine permit data and aerial photographs, it is believed that the discharge is most likely the result of water from existing (~1¼-acre) settling ponds flowing through buried coal refuse within the western bank of Reeds Run. The partnership effort, which includes, AWARE, BioMost, Inc., Stream Restoration Inc., US Environmental Research Service (USERS), and the PA DEP, has focused on developing an economical, long-term, low-maintenance, and effective site restoration plan utilizing and reconfiguring existing site features to substantially eliminate the majority of the recharge to the coal refuse. The plan includes draining, excavating, and lowering the water level in the existing ponds not only to eliminate recharge from the ponds to RD0-D1 but also to intercept possible degraded subsurface flow. The plan also includes installing, at the outlet end of the settling pond, a passive alkalinity generator. A ½-acre aerobic wetland (planted with native species of high diversity for wildlife value) will also be created to receive the effluent from the alkalinity generator prior to entering Reeds Run. The excess alkalinity issuing from the constructed wetlands will add much needed buffering capacity to Reeds Run, enabling neutralization of small downstream degraded seepage.

Partial funding has been received from the County Environmental Initiative grant program. The county grant will cover the costs of some of the permit applications, notices, etc. and a portion of the construction, including the ½-acre aerobic wetland. An additional Growing Greener grant has been applied for in the 2007 round of the Growing Greener program to fill the gap in funding to complete the entire project.

With remediation of this discharge, over 18,000 lbs/yr (9 tons/yr) of acidity and 10,000 lbs/yr (5 tons/yr) of metals will no longer enter Reeds Run, improving 3½ miles of stream.

REGIONAL MINING HISTORY

The town of McIntyre, like most of the other residential areas in the Aultman Run watershed, was established in 1910 by the Jefferson and Clearfield Coal and Iron Company, a subsidiary of Rochester and Pittsburgh Coal and Iron Company (R&P), to support underground mining operations. McIntyre was named after H. Barclay McIntire, a merchant and coal speculator from Jacksonville who had controlled thousands of acres of leases in the area.

In 1910, the Buffalo, Rochester, and Pittsburgh Railroad, which was also owned by R&P, extended a railroad spur from Parkwood to Jacksonville. This railroad transported the coal from the mines and brought goods to the company store. Ownership of the railroad enabled R&P to quickly, cheaply, and efficiently, transport coal to Buffalo, Rochester, and other northern markets. In addition, R&P obtained track rights between Indiana and Pittsburgh over the Baltimore and Ohio rail lines, enabling expansion operations south to Pittsburgh's growing iron and steel industries.

In 1928 the town consisted of 55 double and 17 single houses. Other structures included a doctor's office, school, Catholic Church, union hall, tennis courts, and dance hall. The population of McIntyre peaked at 800 in 1940. Electricity was provided by R&P to McIntyre at no cost using two, 25-cycle generators from a power plant at Lucerne. By 1947, R&P had sold its remaining coal towns, including McIntyre, and water rights to Kovalchick Salvage Company for \$890,000. Surface mining had become the preferred method of mining in the area and did not require company owned homes. Underground mining operations in the area, however, did continue until 1963 when the Kent No. 2 mine closed.

SITE LOCATION

The Reeds Run Remediation Area is located south of Locust Road and west of Reeds Run in Armstrong Township, Indiana County, about 1 mile east of the town of McIntyre. The site is approximately 30 acres in size and on private property owned by Central Blair Electric Company. A large gas line operated by T.W. Phillips Oil and Gas Co. crosses the site on the southern edge of the property. The site is on the 7 ½' USGS McIntyre topographic map at latitude 40° 34' 40" and longitude 79° 16' 36".

(See Figure 1: Location Map.)

SITE DESCRIPTION AND HISTORY

The site is characterized by a valley with a series of wetlands followed by a large sediment basin at the southern end of the site. This pond is known as Sediment Pond A and is approximately 1 ¼ acres in size. To the east of the wetlands and pond is a sizeable embankment bordering Reeds Run. The eastern side of the embankment is well vegetated with numerous trees and shrubs growing, while the western side of the embankment is vegetated with grasses. No coal refuse is visible on the surface. Three

additional sediment ponds exist on site: two ponds named Sediment Pond B1 and B2 are upslope and to the west of Sediment Pond A and the other, Sediment Pond C, is located at the northern portion of the site and feeds an unnamed tributary to Reeds Run.

The RD0-D1 discharge is characterized as a diffuse seep zone that originates within Reeds Run on the southern portion of the project site. As no specific discharge point could be found, RD0-D1 is sampled within Reeds Run downstream of all known impacts. During low flow conditions, the discharge is highly visual as bright-orange and white precipitates accumulate and coat the substrate and becomes the major or sole contributor of streamflow to Reeds Run. According to an assessment prepared by the Aultman Watershed Association for Restoring the Environment (AWARE) and Skelly & Loy, Inc., this discharge was determined to be a major cause of degradation to Reeds Run and is the second greatest source of AMD pollution in the entire Aultmans Run Watershed. The Management Recommendations Matrix from the assessment report lists RD0-D1 as a high priority for treatment.

The PA DEP Bureau of Abandoned Mine Reclamation includes this site within Problem Area 4407. This area consists of a coal refuse pile and AMD drainage and has an OSM Priority 3 designation.

Mining History

An extensive review of historical information, aerial photos, and permit data from the Cambria District Mining Office and the R&P Archives at the Indiana University of Pennsylvania revealed that a very large coal refuse pile, approximately 12 acres in size and 50' thick, was located at the site. This refuse pile, according to local residents, consisted of fine coal that was produced as a result of coal being washed at the tipple in McIntyre. It is not known how this material was transported and deposited at this site. In addition, underground operations at the Kent No. 2-A mine complex could have contributed to the refuse pile (See Appendix C: Underground Mine Map). This room and pillar mine was in operation between 1952 and 1959 by the Kent Coal Mining Company (Kent Coal), a subsidiary of Rochester and Pittsburgh Coal Company. Aerial photography shows the black-colored pile was completely unvegetated prior to reclamation (See Appendix D: Aerial Photography). In October 1979, Kent Coal conducted background monitoring of several discharges emanating from the refuse pile (See Water Quality Section and Appendix F: Water Monitoring). These discharges were located in the same location of the seeps today.

In 1980, the PA DEP issued Surface Mine Permit (SMP) No. 32800103 to Kent Coal to affect 919 acres and surface mine 202 acres of coal in Armstrong and Young Townships. This SMP included the Kent 2-A Refuse Pile. On February 10, 1981, Kent Coal received permission from the PA DEP to remove the coal refuse. Over the next several years, approximately 800,000 tons of marketable refuse was removed from the site according to an inspection report from 7/7/1988 (See Appendix B: Various Surface Mine Permit Documents). In November 1986, Kent Coal ceased recovery efforts as markets for the quality of refuse remaining in the pile had expired.

The reclamation plan for the site consisted of the following (See Proposed Reclamation Plan – Kent 2-A Refuse Pile plan in Appendix B: Various Surface Mine Permit Documents):

- Remaining refuse was graded toward and banked against the existing dike to create a drainage swale.
- A sediment pond was constructed at the southern end of the drainage swale.
- The remaining refuse was relocated from the southern end of the site to higher elevations to the north and east along the embankment next to Reeds Run.
- 12” of topsoil from the exposed bottom and pond excavation used for final cover over the refuse.

The resulting reclamation greatly improved the aesthetics of the site, transforming it from a black, sterile refuse pile to a well vegetated valley with wetlands and a pond. The inspection report from 7/7/1988 indicated Kent Coal received a reclamation award for this site. After reclamation, Kent Coal sought to release the bonds for this site. This process continued for the next 14 years as they addressed the need for adequate vegetative cover over some areas of the former refuse pile and water quality issues associated with a small AMD seep. All bonds were finally released on 2/21/01.

Table 1: Brief Timeline of Events for the Kent 2-A Refuse Pile

Date	Description
ca. 1952	Kent Coal, a subsidiary of Rochester and Pittsburgh Coal Company, begins Kent 2-A underground mine operation.
5/1959	Underground mine ceases operation.
6/4/1980	Permit 32800103 issued to Kent Coal to affect 919 acres and surface mine 202 acres in Armstrong and Young Townships. The Surface Mine Permit (SMP) boundary includes the Kent 2-A Refuse Pile.
2/10/1981	PA DEP approves request to remove coal refuse from Kent 2-A Pile.
3/8/1983	Kent Coal receives variance to mine within 100 feet of Reeds Run near Kent 2-A Refuse Pile.
6/1984	SMP No. 32800103 re-permitted (PA DEP required entire mining industry to re-permit due to tighter regulations after the state received primacy). New SMP. No. issued is 32803037.
11/26/1986	Kent Coal terminates coal refuse recovery operations due to lack of markets and submits reclamation plan for Kent 2-A Refuse Pile area.
7/7/1988	Mine inspector reports that “there are fewer discharges with less volume than before the “2A” refuse area was reclaimed.” In addition, the inspector said the following: The operator removed approximately 800,000 tons of refuse from the 25.7 acre reclaimed area. The operator received a reclamation award this year for doing such a nice job in reclaiming the area.

4/23/1997	According to letter from Kent Coal to P.J. Shah, PADEP, Williamette Industries, Inc. and Johnsonburg Mill's wastewater treatment sludge was utilized and dramatically improved the raw water quality of sample point MS-29.
9/22/1998	Consolidation Coal Company acquires Rochester & Pittsburgh Coal Co.
2/21/2001	Final bonds released for SMP No. 32803037.

Aerial Photos

A series of four aerial photos have been collected for the project site dating from 1939 to 2006 illustrating the changes that have occurred over time. Below is a summary of each photo:

Table 2: Aerial Photo Interpretation

Photo Date	Interpretation
5/12/1939	Reeds Run site prior to any mining disturbances. The area appears to have been farmed. Locust Road crosses the northern part of the photo and a power line is noticeable on the southern end of the project site. Do not confuse the power line with the existing gas line. Reeds Run is located in the center of the photo with riparian vegetation.
4/21/1962	Large refuse pile covers the majority of the project site. The refuse pile is unvegetated and very dark in color. Reeds Run has been moved to the east to make room for the refuse. No active underground mining operations are visible. Power line clearing is wider and the gas line is now visible. Do not confuse the power line with the existing gas line.
4/11/1993	The large refuse pile no longer is visible. A sediment pond, Sediment Pond A, has been constructed in the valley for the refuse recovery operation conducted in the 1980's. Wetlands are visible to the north of Sediment Pond A. Two other sediment ponds have been constructed upgradient of Sediment Pond A. Power line clearing is no longer visible.
Spring 2006	No significant changes between the aerial photos taken in 1993 and 2006. This photo is higher resolution and is color. The RD0-D1 discharge is visible. Notice the bluish, white precipitates near the gas line. The water elevation of the Sediment Pond A is higher.

SITE ASSESSMENT

Water Monitoring

Monitoring has been conducted within the area by various companies and organizations over the last several decades. A significant amount of monitoring has been completed by Kent Coal and the PA DEP for a large surface mine permit affecting a significant portion of the Reeds Run watershed (see Site Description and History for more information). SMP No. 32800103/32803037 is a bountiful resource of water quality data for the Reeds Run watershed. Although it is beyond the scope of this grant to include all of the data from this report, pertinent monitoring points have been entered into a

database and a location map and Exhibit V from the permit have been included in Appendix F. These points provide historic, baseline data that would have been prohibitively expensive to complete otherwise.

Twelve months of monitoring was conducted for the RD0-D1 discharge during AWARE's initial watershed assessment in 2001. At each sample event, flow measurements were made taking a cross-section of the stream.

For this project, three weirs were installed at the beginning of the monitoring period within Reeds Run with the assistance of students from the Indiana University of Pennsylvania and Tom Clark, former Indiana County Conservation District Watershed Specialist. Unfortunately, due to high stream flows dislodging the weirs on several occasions and persistent beavers, few flow measurements were made. Attempts were made to breach the dam; however, the beavers proved to be competent engineers, repairing and enlarging the dam at each attempt. Measurements were also made with a flow meter. Samples were collected at each of the weirs and two additional monitoring points downstream, one upstream of the influent of the sediment pond water, RD0-D1, and another downstream of the sediment pond and below a beaver dam, SW-33. Due to several beaver dams within the stream, samples RD0-D1 and SW-33 were taken in lentic conditions (beaver pond) rather than a lotic stream environment.

Below is a table summarizing the multiple names given to the same monitoring point from the various organizations.

Table 3: Key to Water Sample Location Names

Name Used	SRI/AWARE 11/2005-3/2007	AWARE 1/2002-12/2002	Kent Coal/DEP 1979-2001	Description
851-1	851-1			Upstream weir
851-2	851-2			Middle weir
851-3	851-3			Downstream Weir
RD0-D1	851-4	RD0-D1		AMD within Reeds Run
SW-32		RD0-MP1	SW-32	Upstream project site
SW-33	851-5		SW-33	Downstream AMD & beaver dam
MS-29			MS-29	Seeps above wetland area
MS-30		RD0-MP2	MS-30	Sediment Pond
A			A	Seep from refuse pile
B			B	Seep from refuse pile
C			C	Seep from refuse pile
F			F	Reeds Run ~1 mile downstream
R			R	Unnamed trib
V			V	Reeds Run ~1 mile upstream
SP-B			SP-B	Settling pond effluent
SP-C			SP-C	Settling pond effluent

Note: A discrepancy occurs in the AWARE assessment report on Figure 6: Sampling Points. RD0-D1 and RD0-MP2 are reversed. In the SMP water quality data, SW-29 and SW-30 assumed to be the same as MS-29 and MS-30, respectively.

Timeline

A timeline has been compiled to document the important events of this project (See Table 4 below).

Table 4: Comprehensive Timeline of Project Events

Date	Description
10/24/2003	Property search concluded Central Blair Electric Company owns the Kent 2-A refuse pile
2/20/2004	Site investigation/meeting with AWARE members, DEP, and Quality Aggregates
4/5/2004	Reeds Run AMD Remediation Design proposal submitted
11/8/2004	Notification of GG Grant award of \$30,000.00 for Reeds Run AMD Remediation Design
11/18/2004	DEP presents check to AWARE for Reeds Run project
1/21/2005	PA Environmental Digest Article about AWARE and Reeds Run project
2/8/2005	Quote requested for topographic map generation from Land and Mapping
5/17/2005	Notification of executed Grant Agreement with DEP to end on June 30, 2007
7/12/2005	Apr. - June 2005 Quarterly Report submitted
8/15/2005	Site investigation/meeting with local resident and AWARE member Don Burkett; first time beaver activity was noticed and stream was impounded.
9/19/2005	Site investigation/water sampling with Brian Okey (AWARE President) and Malcolm Crittenden (PADEP)
9/21/2005	Jack Lucas (PGC) provided recommendations addressing beaver issues
9/30/2005	BMI & USERS conduct permit review at Cambria District Mining Office
10/14/2005	Installation of two weirs with AWARE, USERS, BMI, and eight IUP students
10/14/2005	July - Sept. 2005 Quarterly Report submitted
11/4/2005	Field water sampling at 50' increments in stream - removed beaver dam
11/18/2005	Site investigation, water sampling, and weir construction with John Foreman (USERS) and Tom Clark (ICCD)
11/21/2005	BMI & USERS conduct permit review at Cambria District Mining Office
12/17/2005	Water sampling and training, BMI and Brian Okey (AWARE)
1/20/2006	Oct. - Dec. 2005 Quarterly Report submitted
2/25/2006	AWARE water sampling
4/7/2006	Jan. - Mar. 2006 Quarterly Report submitted
4/29/2006	AWARE water sampling
5/26/2006	AWARE water sampling
6/28/2006	AWARE water sampling
7/5/2006	Apr. - June 2006 Quarterly Report submitted
7/27/2006	AWARE water sampling
8/21/2006	BMI weir repair and site investigation
8/26/2006	AWARE water sampling
9/29/2006	AWARE water sampling
10/11/2006	July - Sept. 2006 Quarterly Report submitted
10/27/2006	AWARE water sampling

1/15/2007	Oct. - Dec. 2006 Quarterly Report submitted
2/24/2007	AWARE water sampling
3/31/2007	AWARE water sampling
4/27/2007	Jan. - Mar. 2007 Quarterly Report submitted

Abbreviations: PA Department of Environmental Protection (**PA DEP**); Aultman Watershed Association for Restoring the Environment (**AWARE**); Indiana County Conservation District (**ICCD**); PA Game Commission (**PGC**); BioMost, Inc. (**BMI**); Stream Restoration Inc. [non-profit] (**SRI**); US Environmental Research Service (**USERS**)

WATER QUALITY

Upstream of AMD Seep Zone

The water quality of Reeds Run upstream of the RD0-D1 discharge can be characterized as a slightly buffered stream with little or no metals. Samples have been collected by Kent Coal, PA DEP, and AWARE downstream of Locust Road at SW-32 and by AWARE and Stream Restoration Inc. at 851-1, which is approximately 300' downstream of Locust Road. These sample points are above all known AMD. Below is a table summarizing the results of these analyses of Reeds Run upstream of the project area from various time periods. Samples taken between 1998 and 2001 at monitoring point SW-32 did not correlate well with all other samples. As a result, this data was separated from the other data (See Table 5 and Figure 2).

Table 5: Summary of Water Monitoring Data of Reeds Run Upstream of AMD Seep Zone

Organization/ Time Period	Point Name	pH	Alk.	Acidity	Fe	Mn	Al	SO4
Kent Coal & PA DEP 4/1983-9/1998	SW-32	6.7	36	4	<1	<1	2	78
Kent Coal & PA DEP 11/1998-5/2001	SW-32	6.1	23	196	47	2	<1	249
AWARE 1/2002-12/2002	SW-32	6.6	38	0	1	<1	<1	36
AWARE/SRI 11/2005-3/2007	851-1	6.8	28	-18	1	<1	<1	50

See location map and Exhibit V in Appendix F; concentrations in mg/L; Total metal concentrations; Average pH values not determined from H-ion concentrations; AWARE/SRI sample point 851-1 taken approximately 300' downstream of Locust Road and includes flow from the unnamed tributary to Reeds Run; Net acidities were not reported by the labs analyzing for Kent Coal, PA DEP, or AWARE See location map and Exhibit V in Appendix F; concentrations in mg/L; Total metal concentrations

The reason of the discrepancy between samples taken between 11/1998 and 5/2001 and all other data for this point is not known. Some possibilities could be sampling at a different location, mislabeled bottles, rapid changes in environmental conditions, etc. For this project, the spurious data is not considered to be an accurate representation of upstream water quality.

Several water samples were also collected by Kent Coal in the very headwaters of Reeds Run at sample point V and are similar to samples taken at SW-32 and 851-1 (See Table 6 and Appendix F).

Table 6: Water Quality of Reeds Run Approximately 1 Mile Upstream of Project Site

Point Name	pH	Alk.	Acidity	Fe	Mn	SO ₄
V	6.8	18	1	<1	<1	20

See location map and Exhibit V in Appendix F; concentrations in mg/L; Total metal concentrations; Average pH values not determined from H-ion concentrations

Downstream of AMD Seep Zone

Background Monitoring Points

AMD was originally documented at the project site in 1979 as several background monitoring points for a surface mine permit application. These monitoring points were small seeps flowing into Reeds Run; however, Reeds Run was not sampled in the project area at this time. As Table 7 shows, sample points A and B are low-flow, highly acidic and metal-laden discharges, while sample point C is slightly acidic with some iron.

Table 7: Drainage Characteristics in 1979 - Pre-Reclamation of Refuse Pile

Point Name	Flow	pH	Acidity	Fe	Mn	SO ₄
A	2-3	3.8	2000	750+	0.8	3750
B	3-5	6.1	16	22.5	0.3	61
C	2	3.6	2000	750	0.8	4500

See location map and Exhibit V in Appendix F; Flow rates in gpm; concentrations in mg/L; Total metal concentrations

Sample Points SW-33 and RD0-D1

Sample points A, B, and C were not sampled again; however, stream monitoring continued downstream of the AMD throughout the next two decades. Two sample points depict the quality of Reeds Run downstream of the AMD, SW-33 and RD0-D1 (See Water Sample Location Map in Appendix F). RD0-D1 is located upstream of where the effluent of a settling pond (MS-30) enters Reeds Run while SW-33 is located downstream of this effluent. Table 8 summarizes water quality of these points. Comparing the average and worst case water quality of these points is beneficial since they are both stream samples. During higher flows, the AMD becomes extremely diluted and does not represent actual water quality conditions of the seeps.

Table 8: Summary of All Water Monitoring Data of Reeds Run Downstream of AMD Seep Zone (Average/Worst Case)

Point Name	pH	Alk.	Acidity	Fe	Mn	Al	SO ₄
SW-33	5.2/2.9	10/0	517/7395	114/3463	6.5/101	42/451	607/14401
RD0-D1	5.3/2.9	16/0	344/5329	104/1649	3.9/51	19/294	433/5581

Concentrations in mg/L; Total metal concentrations; Average pH values not determined from H-ion concentrations; Kent Coal sample point SW-33 taken approximately 100' downstream of RD0-D1 and includes the effluent of settling pond (MS-30).

The downstream water sample analyses can be further compared by time period based on the conditions of the project site including before and after refuse removal. As stated previously, Kent Coal received approval from the PA DEP to remove refuse in 1984.

After termination of their operations in 1986, water quality at SW-33 improved (See Table 9 and Figures 3-5).

Before sampling began for this project, another change in site conditions occurred when beavers moved into the stream valley. These beaver dams created a series of large pools that have allowed AMD to mix with water from upstream and the effluent of the Settling Ponds A and B (MS-30 and SP-B). As a result, large quantities of iron and aluminum precipitates are accumulating within the stream (See Table 9, Figures 3-5, and Appendix E: Photos). The concentrations of metals and acidity appear lower due to the fact that we were unable to sample base flow conditions during the summer months, which has historically produced the highest concentrations.

Table 9: Summary of Water Monitoring Data of Reeds Run at SW-33 During Different Time Periods (Average/Worst Case)

Time Period	pH	Alk.	Acidity	Fe	Mn	Al	SO ₄
Kent Coal 4/1983-7/1986	3.4/3.1	<1/0	1663/5300	205/300	5/17	127/451	1039/4229
Kent Coal 12/1986-5/2001	5.4/2.9	12/0	459/7395	123/3463	8/101	35/393	655/14401
SRI/AWARE 11/2005-3/2007	5.7/3.4	8/0	15/47	10/16	2/13	2/9	99/264

Concentrations in mg/L; Total metal concentrations; Average pH values not determined from H-ion concentrations

Using available flow data for sample points SW-33 and RD0-D1, approximate loadings have been calculated in Table 10. Most flows documented by Kent Coal and PA DEP for SW-33 were estimated, so the accuracy is questionable. In addition, flows for RD0-D1 were calculated based on the cross-section methodology, which is not ideal for measuring the turbulent, non-uniform flows of streams.

Table 10: Summary of Acidity and Metal Loadings at RD0-D1 and SW-33

Point Name	Loadings (lbs/yr)			
	Acidity	Fe	Mn	Al
SW-33	18,169	8,324	2,113	--
RD0-D1	30,495	18,760	1,186	3,144

Sample Point F

Sample point F was collected approximately 1 mile downstream of the project site. This point was collected by Kent Coal as part of their quarterly monitoring required under Surface Mine Permit #32803037. This sample point is severely degraded containing elevated levels of iron, manganese, and aluminum (See Table 11, Figure 6, and Appendix F); however, this point contains on average a quarter of the iron and aluminum and half the manganese of sample point SW-33. In addition, sample point F contains half the concentration of acidity compared to sample point SW-33.

Table 11: Water Quality of Reeds Run Approximately 1 Mile Downstream of Project Site

Point Name	pH	Alk.	Acidity	Fe	Mn	Al	SO ₄
F	4.9	3	153	25	4	13	391

See location map and Exhibit V in Appendix F; concentrations in mg/L; Total metal concentrations

Other Water Monitoring

Several other sample points are related to this project including MS-29, MS-30, SP-B, SP-C, and R. Below is a table of average data for each of these points (See Table 12, Figures 7-8, and Appendix F).

Table 12: Water Quality of Various Sample Points (Average Values)

Point Name	pH	Alk.	Acidity	Fe	Mn	Al	SO ₄
MS-29	5.5	49	77	4	21	2	346
MS-30	7.1	56	3	<1	1	1	228
SP-B	7.7	90	0	1	1	--	70
SP-C	7.8	48	0	<1	<1	--	30
R	7.2	70	0	3	2	2	49

See location map and Exhibit V in Appendix F; concentrations in mg/L; Total metal concentrations; For sample point MS-29, negative alkalinities within SMP water quality data were reported as 0.

MS-29 is an AMD seep that feeds Sediment Pond A. An extensive amount of data was collected for this sample point since Kent Coal could not have their bonds released without correcting this seep. This seep feeds a wetland that was planted with cattails by Kent Coal as part of their reclamation plan and Sediment Pond A. MS-30 is the effluent of Sediment A and is characterized as alkaline with low metals. This sediment pond is suitable for fish as hundreds of goldfish have been observed by AWARE members (See Appendix E: Photos).

Sediment Pond B1 and B2 are located on the western edge of the project site. Pond B1 flows into B2 and the final effluent of Pond B2 is known as SP-B. Although it appears that several small seeps flow into Pond B, by the time the water leaves Pond B2, the water quality is good with 90 mg/l of alkalinity and nearly no metals.

SP-C is the effluent of Sediment Pond C, which is located in the headwaters of the unnamed tributary to Reeds Run. Sample point R is located shortly downstream of SP-C. Both of these sampling points contain alkalinity and low metals.

CHEMICAL AND PHYSICAL HYDROGEOLOGY

As part of this project, John Foreman, a professional geologist and principal at USERS, compiled a report focusing on the chemical and physical hydrogeology of the site (See Appendix A). Portions of the USERS report have been summarized in the following sections:

Physical Hydrogeology

The project site is positioned on the eastern flank of the Grapeville-Kinter Hill Anticline with the strata dipping eastward approximately 2-4%. Kent Coal extracted reserves from the Upper Freeport coalbed (Glenn Richey Formation, Allegheny Group) at the Kent 2A mine. In addition, surface operations immediately upgradient from the project site mined the Lower Freeport coalbed (Glenn Richey Formation, Allegheny Group) and possibly some Upper Freeport “crop coal”.

The coal refuse pile was situated at (or near) the valley floor and Reeds Run appears to have been relocated in order to “make room” for the refuse material (See Appendix D: Aerial Photography).

Examination of the impacted reach of Reeds Run indicated that the western stream bank was heavily armored with precipitate, while no discernable precipitate was observed on the eastern bank. The correlation between the precipitate zone and the progressive degradation of Reeds Run was evident. Beneath the precipitate, the stream bank consisted of a thick (4' minimum) claystone unit. The USERS report also states the following:

The claystone serves to confine downward flow – perching local infiltration such that any shallow groundwater was redirected along the top of the claystone. Since the dip in the area is to the east, the groundwater accumulating in the refuse reclamation (pit floor) area is directed west to the Reeds Run.

This claystone unit was evident in the stream channel base, where the stream flows over the claystone. Since the current channel is constructed (made when Reeds Run was relocated by Kent Coal), it seems apparent that Kent Coal used the claystone as a marker bed for determining cut depth.

Chemical Hydrogeology

An analysis of water quality data is included in the USERS report. This includes a description and interpretation of monitoring points. Additional data from the surface mine permit files have been entered into the water quality database since completion of this report. As a result, the interpretation of SW-32 and 851-1 differs slightly from the previous Water Quality section.

A loading analysis could not be conducted due to the lack of flow data. Consequently, no determination could be made whether direct baseflow enters Reeds Run between monitoring points 851-2 and 851-3 or if all of the degradation is due to seepage along the stream banks.

RESTORATION STRATEGY

The most likely source of degradation to Reeds Run is refuse remaining along the stream bank. Piezometers could be installed to verify the quality of the shallow groundwater at the site and gauge the potential for this groundwater to flow laterally through the refuse.

The removal of the refuse material and addition of alkalinity-generating material are recommended to remedy the AMD; however, the quality and quantity of the remaining refuse are uncertain. As stated previously, Kent Coal had removed all marketable material for that time period. If economical, Robindale Energy Services, the current supplier of fuel to Reliant Energy's Seward power plant, could potentially remove this pile and incorporate alkaline material at the site.

Due to the uncertainty of if or when the refuse could be removed and the possibility of additional degraded base flow to Reeds Run unrelated to the refuse, the following are recommended (See also Appendix A: Reeds Run – Kent #2A Refuse Pile Abatement Plan and Appendix G: Design Plan):

1. Draining, excavating, and lowering the water level in the existing ponds not only to eliminate recharge from the ponds to RD0-D1 but also to intercept possible degraded subsurface flow.
2. Installing, at the outlet end of Sediment Pond A, a passive alkalinity generator (3,000 T Horizontal Flow Limestone Bed).
3. Creating a ½-acre aerobic wetland (planted with native species with high diversity for wildlife value) to settle solids and provide oxygenation and carbon dioxide degassing in the riprap-lined spillways prior to entering Reeds Run.
4. Directing the effluent of Sediment Ponds B1 and B2 into the influent of the wetland to provide additional alkalinity.

This plan has been developed to first minimize the amount of mine drainage being generated and second treat any remaining polluted seeps or base flow. The alkalinity generator was sized assuming that a degraded discharge will remain after draining Sediment Pond A and wetlands. Water quality was assumed to be similar to RD0-D1 with lower flow. If the water quality is not degraded and similar to the current conditions of MS-30, USERS has provided a matrix of potential designs (See Appendix A: Reeds Run – Kent #2A Refuse Pile Abatement Plan). The project team is dedicated to an innovative and flexible approach. The quantity and type of treatment media can be revised dependent on the actual water quality encountered during excavation of the pond bottom. Any excess alkalinity generated at this site will be greatly beneficial to Reeds Run as the stream has low concentrations of alkalinity upstream of the site and many smaller mine discharges occur downstream.

CURRENT STATUS

This project has been the first step for the remediation of the Reeds Run headwaters area. Using preliminary information from the site assessment, a proposal was submitted to the Growing Greener Grant Program in March 2006 for the remediation of the RD0-D1 discharge. The proposal was not funded; however, in July 2006, the Indiana County Commissioners approved funding a portion of the construction phase of the project through the County Environmental Initiative Grant Program, which is a part of Growing Greener 2. Additional funding was requested in a proposal to the Growing Greener Grant Program in April 2007. A proposal will also be sent to the Office of Surface Mining in 2007 as match for construction. See Table 13 below for a summary of funding sources.

Table 13: Summary of Funding Sources

Program	Organization	Amount	Status	Description
Growing Greener	PADEP	\$30,000	Received	Site Assessment & Design Plan
County Environmental Initiative Grant	Indiana County & PADEP	\$121,000	Received	Permitting, construction oversight, & construction of treatment wetland
Growing Greener	PADEP	\$290,583	Applied	Funding to complete remaining construction oversight, permitting, & construction
Watershed Cooperative Agreement	OSM	\$50,000	To be applied for	Match funding for construction

PUBLIC-PRIVATE PARTNERSHIP EFFORT

This project has been completed as a public-private partnership effort. Team members have donated numerous hours and resources to this project and other restoration efforts in the watershed. Thanks to everyone for making this project possible!

Grant Oversight and State Administration

PA Department of Environmental Protection, District Mining Operations, Cambria Office,
286 Industrial Park Road, Ebensburg, PA 15931
CRITTENDEN, Malcolm, Watershed Manager (814) 472-1900

Landowner Support

Central Blair Electric Company, 101 Lakemont Park Blvd, Altoona, PA 16602
DEVORRIS, Don, Owner (814) 949-8280

Public Outreach, Environmental Education, Volunteer Effort

Aultman Watershed Association for Restoring the Environment,
PO Box 27, Kent, PA 15752
OKEY, Brian, President; CALVETTI, Paul, Vice-President; MARSHALL, Ken, Treasurer;
CUMMINS, Carol, Secretary

Site Evaluation and Restoration Plan

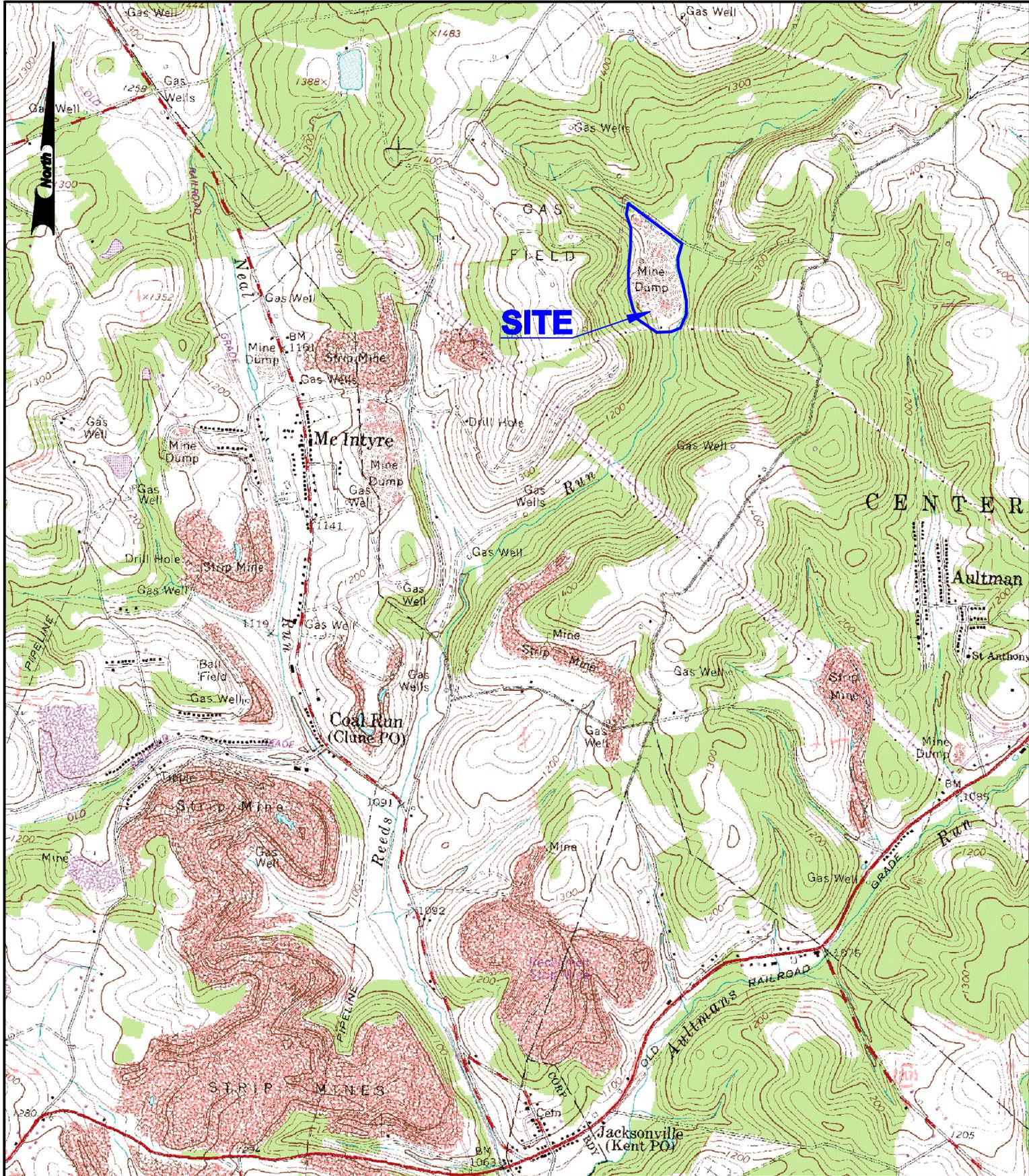
BioMost, Inc., 3016 Unionville Rd., Cranberry Twp., PA 16066
DANEHY, Timothy, QEP; DUNN, Margaret, PG; BUSLER, Shaun, Biologist, GISP;
DENHOLM, Cliff, Environmental Scientist; DURRETT, Kyle, Geotechnician
(724) 776-0161

US Environmental Research Service

1111 East Walton Ave., Indian Village Plaza, Altoona, PA 16602
FOREMAN, John, PG, President (814) 943-6979

Grant Administration and Volunteer Effort

Stream Restoration Incorporated, 3016 Unionville Rd., Cranberry Twp., PA 16066
DANEHY, Timothy, QEP; DUNN, Margaret, PG; BUSLER, Shaun, Biologist, GISP;
DENHOLM, Cliff, Environmental Scientist; DURRETT, Kyle, Geotechnician
(724) 776-0161



**FIGURE 1: PROJECT LOCATION - USGS 7.5' MCINTYRE, PA (PR1981)
REEDS RUN AMD REMEDIATION DESIGN**

Approximate Center of Project (deg-min-sec)
40-34-40 latitude 79-16-36 longitude

Aultmans Run Watershed
Armstrong Township, Indiana County, PA
AWARE & Stream Restoration Incorporated
June 2007, Scale 1" = 2000'



Figure 2: Comparison of Iron and pH Values at SW-32 Over Time

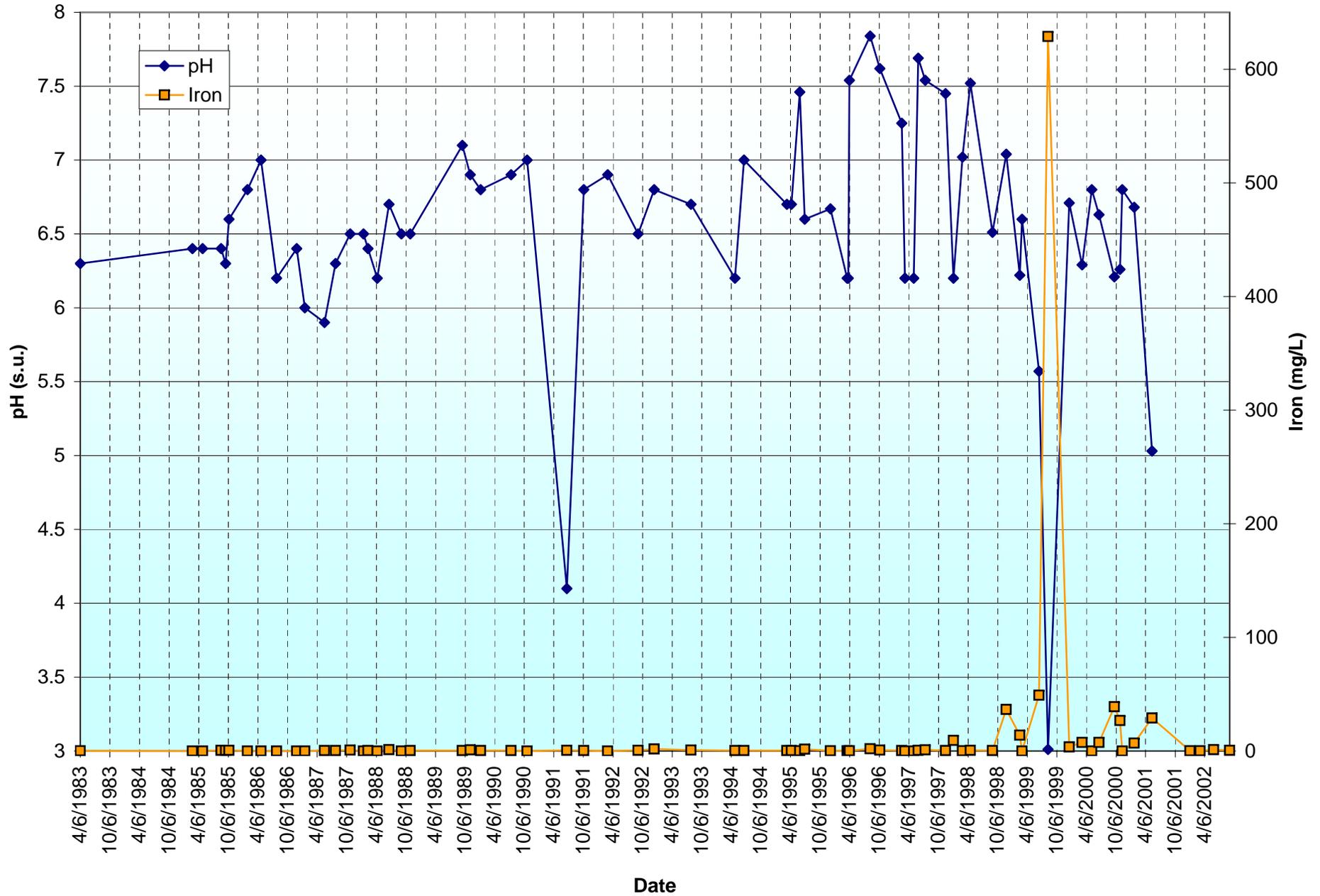


Figure 3: Comparison of pH and Iron Values at SW-33 Over Time

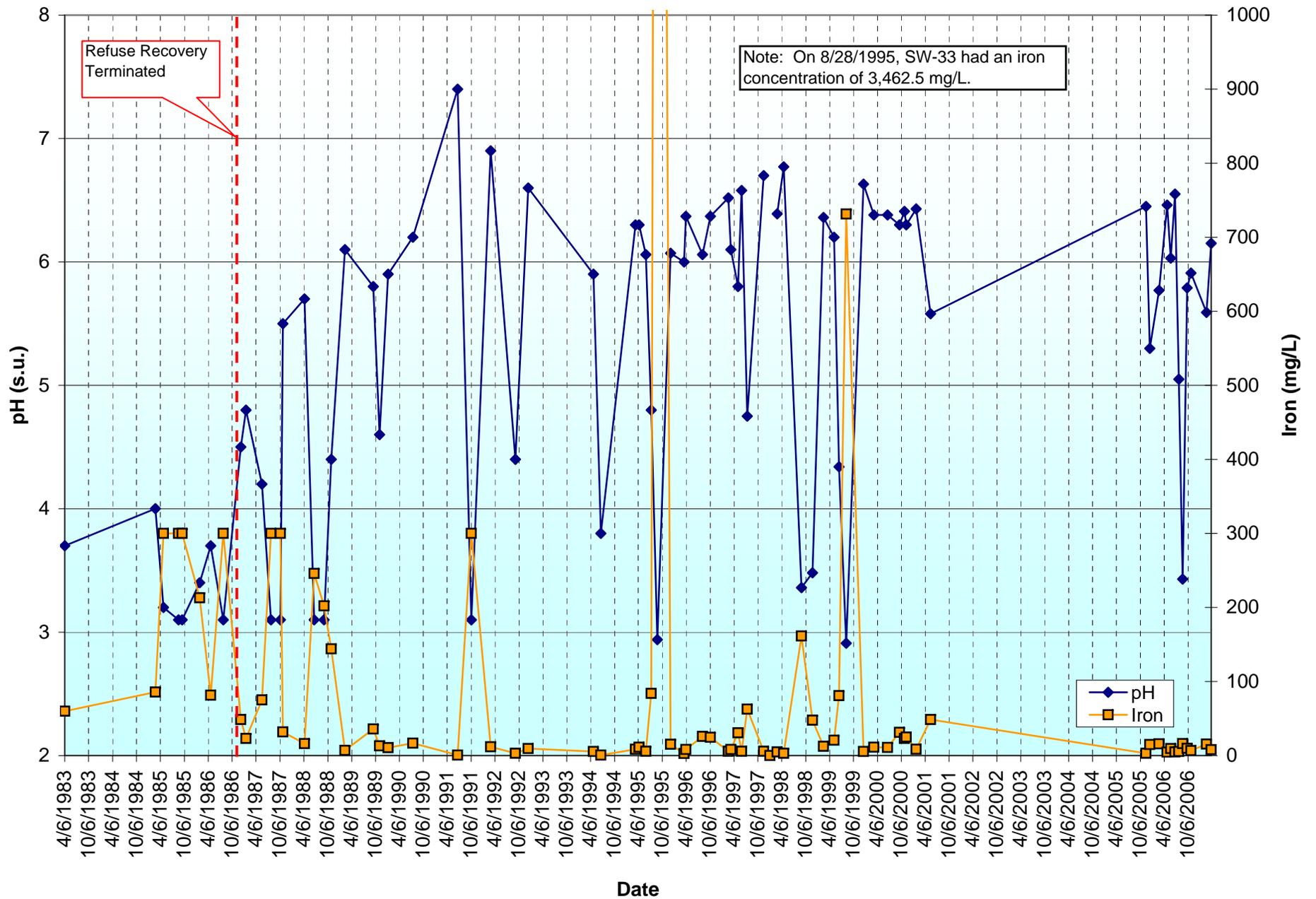


Figure 4: Comparison of Manganese Concentrations at SW-33 Over Time

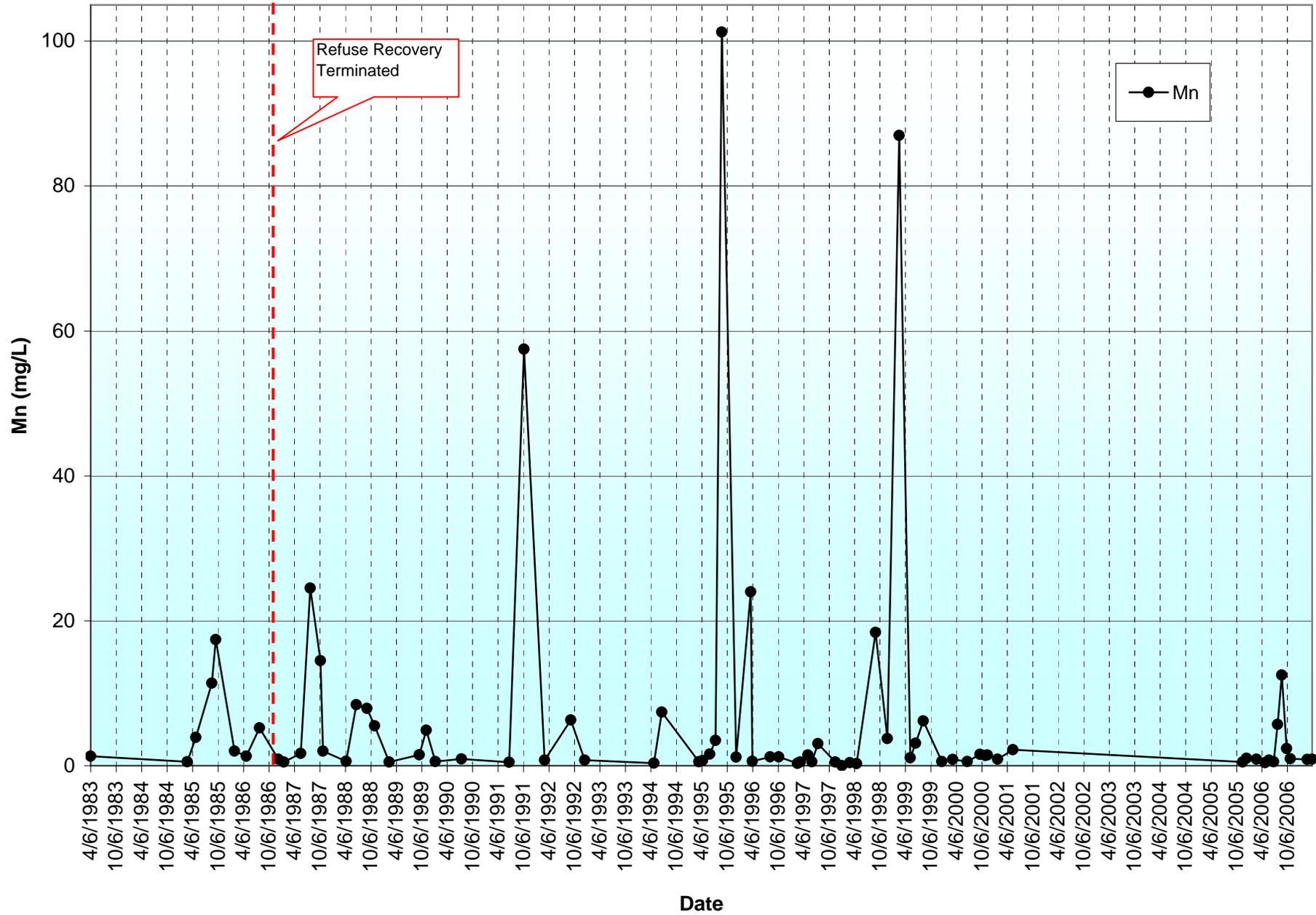


Figure 5: Comparison of Aluminum Concentrations at SW-33 Over Time

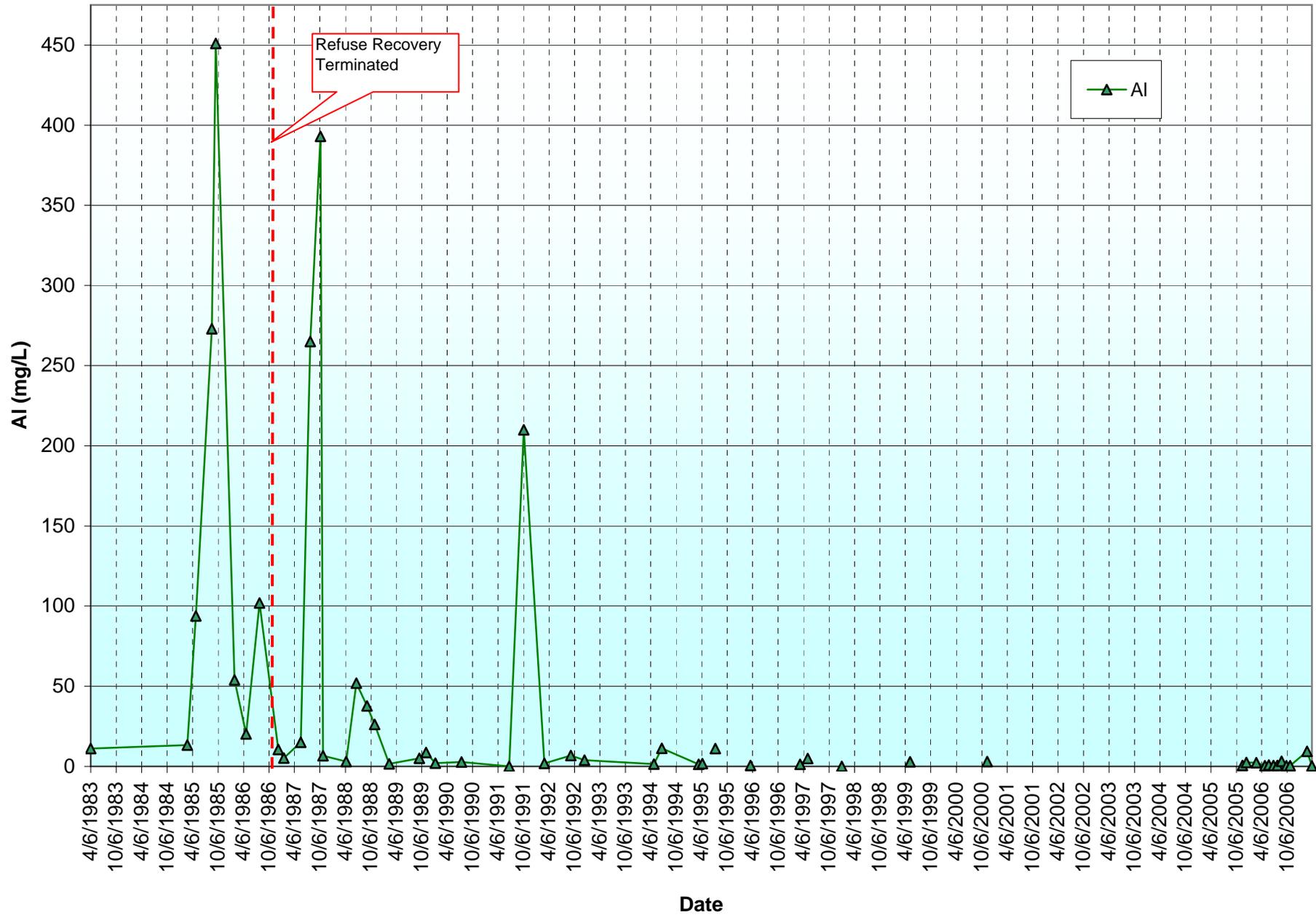


Figure 6: Comparison of Iron and pH Values at Sample Point F Over Time

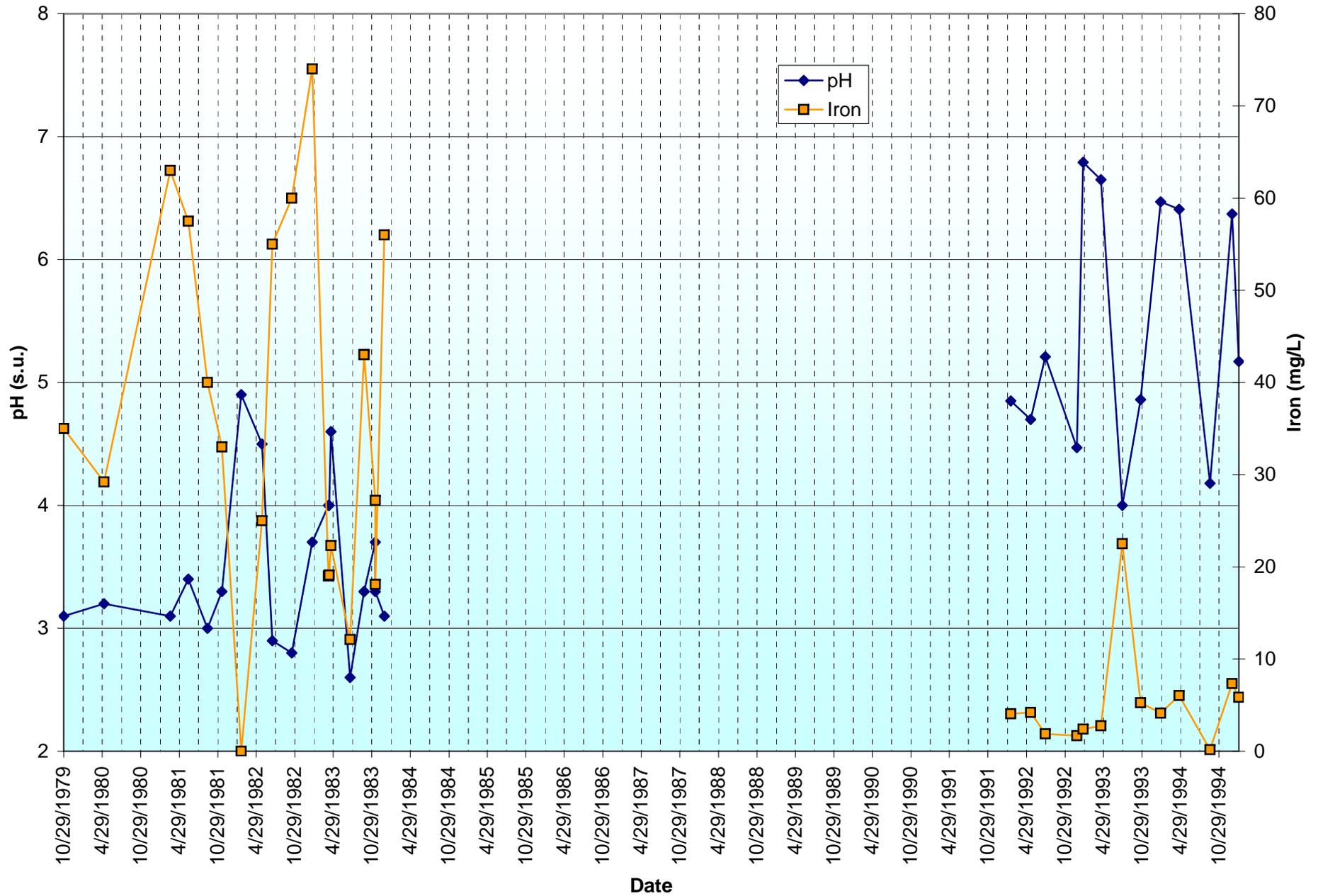


Figure 7: Comparison of pH and Iron Values at MS-29 Over Time

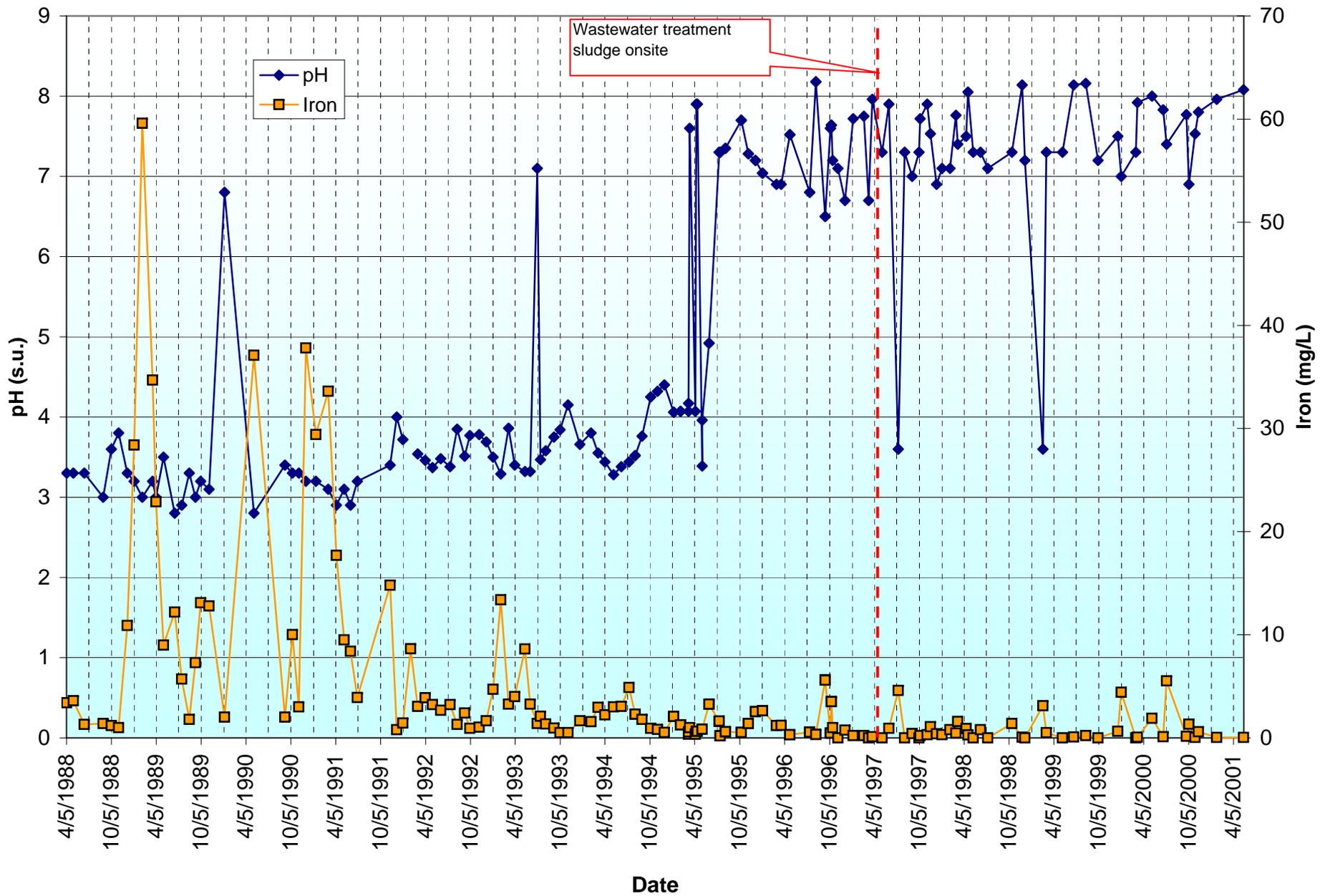
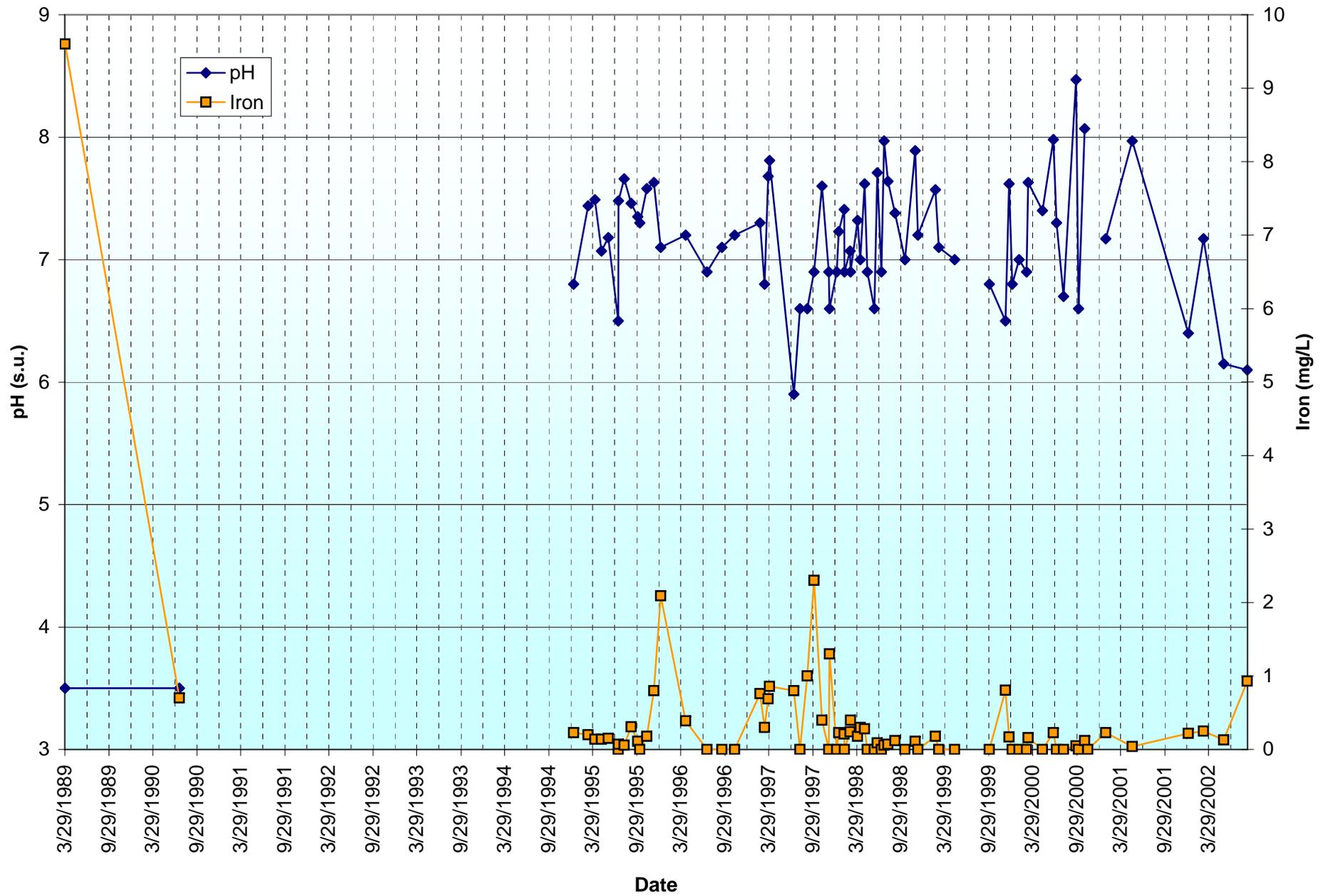


Figure 8: Comparison of pH and Iron Values at MS-30 Over Time





Ron Schwartz, Assistant Regional Director of the Southwest Regional Office of the PA DEP, presented a check to AWARE to complete an assessment of the project site.



RD0-D1 is a diffuse discharge flowing directly into the headwaters of Reeds Run. The banks of Reeds Run consist of a layer of iron precipitates.



Brian Okey stands next to the RD0-D1 discharge. The maximum flow measured was approximately 1730 gpm.



Significant amounts of iron accumulate on the substrate of Reeds Run during periods of low flow.



Aluminum can also be seen precipitating on the substrate of Reeds Run.



Numerous barren areas are located along the banks of Reeds Run. These barren areas consist of iron precipitates.



Beavers moved into the project site damming Reeds Run. Kyle Durrett, BioMost, Inc., attempted to breach the dam; however, the beavers patched the hole and enlarged the dam within a few days.





Students from the Indiana University of PA and volunteers from AWARE help to construct a weir on Reeds Run at sample point 851-2. Only three of the four weirs could be constructed due to the damming of the water.



Tom Clark, the former Indiana County Watershed Specialist, watches as John Foreman measures the flow from the newly installed weir at 851-1.



Beavers even attempted to dam the weirs.



An old sediment pond on-site, known as Sediment Pond A, could be providing hydrology to the discharge.



Over an acre of wetlands potentially exist behind Sediment Pond A. The wetlands will need delineated and permitted prior to construction.





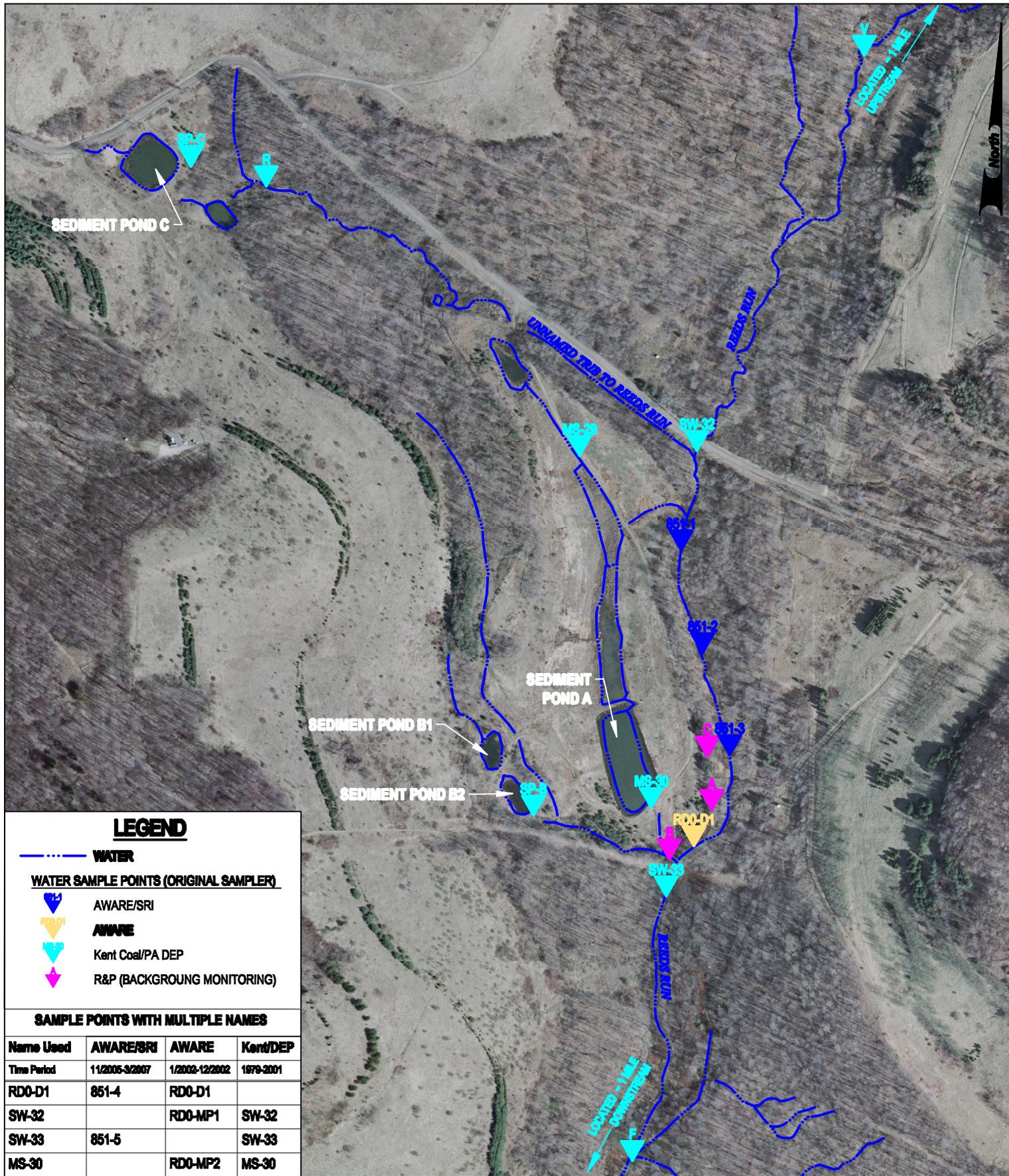
A series of old sediment ponds, known as Sediment Pond B1 and B2, will provide additional alkalinity to the aerobic wetland during Phase I of the construction project.



Upstream of the discharge, Reeds Run supports a variety of macroinvertebrates including stoneflies, mayflies, and caddisflies. Brian Okey and Leanne Avery, IUP professors, have sampled these sites with their students.



Goldfish live in Sediment Pond A, which indicates that the water quality of the pond is good.



LEGEND

- · — · — WATER
- WATER SAMPLE POINTS (ORIGINAL SAMPLER)**
- ▲ AWARE/SRI
- ▲ AWARE
- ▲ Kent Coal/PA DEP
- ▲ R&P (BACKGROUND MONITORING)

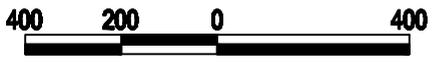
SAMPLE POINTS WITH MULTIPLE NAMES

Name Used	AWARE/SRI	AWARE	Kent/DEP
Time Period	11/2005-3/2007	1/2002-12/2002	1979-2001
RD0-D1	851-4	RD0-D1	
SW-32		RD0-MP1	SW-32
SW-33	851-5		SW-33
MS-30		RD0-MP2	MS-30

Note: Sample point locations based on the interpretation of available information.

**WATER SAMPLE LOCATION MAP
REEDS RUN AMD REMEDIATION CONSTRUCTION**

Aultmans Run Watershed
Armstrong Township, Indiana County, PA
AWARE & Stream Restoration Incorporated
June 2007, Scale 1" = 400'



Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
851-1	11/18/2005	Weir	377	7.0	7.0	160	5	22	21	-15	0.6	0.5	0.2	0.2	0.3	0.1	40	2
851-1	12/17/2005			6.3	7.1	316	2	19	41	-28	1.2	0.7	0.5	0.3	0.2	0.2	91	3
851-1	2/25/2006			6.0	6.5	175	4	18	20	-13	1.6	1.1	0.3	0.3	0.6	0.2	45	1
851-1	4/29/2006			6.3	7.2	155	16	13	19	-6	0.5	0.4	0.2	0.2	0.1	0.1	36	9
851-1	5/26/2006			7.0	6.6	168	15	35	23	-14	2.9	0.5	0.3	0.3	0.5	0.1	69	3
851-1	6/28/2006			6.9	7.0	156	20	27	27	-16	0.6	0.2	0.3	0.2	0.2	0.0	27	1
851-1	7/27/2006			6.4	6.8	240	22	56	53	-39	1.1	0.1	0.6	0.6	0.3	0.1	48	7
851-1	8/26/2006			6.5	7.0	280	19	43	35	-25	1.8	1.0	1.8	1.8	0.1	0.0	79	2
851-1	9/29/2006			6.7	6.8	213	14	35	38	-25	0.9	0.6	0.4	0.4	0.3	0.1	42	3
851-1	10/27/2006			6.1	6.4	176	10	31	24	-15	0.9	0.5	0.3	0.3	0.3	0.1	38	4
851-1	2/24/2007			6.3	6.3	157	1	42	15	-6	1.0	0.7	0.3	0.3	0.3	0.3	42	2
851-1	3/31/2007	Meter	4309	6.4	6.5	182	9	20	18	-10	1.5	0.5	0.3	0.2	0.4	0.2	40	5
Min			377	6.0	6.3	155	1	13	15	-39	0.5	0.1	0.2	0.2	0.1	0.0	27	1
Max			4309	7.0	7.2	316	22	56	53	-6	2.9	1.1	1.8	1.8	0.6	0.3	91	9
Avg			2343	6.5	6.8	198	11	30	28	-18	1.2	0.6	0.4	0.4	0.3	0.1	50	4
Range			3932	1.0	0.9	161	21	43	38	33	2.4	1.1	1.6	1.6	0.5	0.3	65	8

Description: Reeds Run at upstream weir; AWARE/SRI sample point

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
851-2	11/18/2005	Weir	377	6.5	6.9	161	5	22	19	-10	0.5	0.4	0.3	0.3	0.2	0.0	38	3
851-2	12/17/2005			6.3	7.0	208	5	22	22	-10	1.0	0.5	0.4	0.2	0.2	0.1	55	3
851-2	2/25/2006			5.9	6.4	177	4	16	19	-13	1.6	1.2	0.4	0.4	0.4	0.2	47	5
851-2	4/29/2006			6.1	6.4	170	14	16	13	-1	5.0	3.5	0.3	0.3	0.8	0.1	48	8
851-2	5/26/2006			7.0	6.6	173	14	18	24	-13	1.1	0.3	0.3	0.2	0.3	0.0	71	3
851-2	6/28/2006			6.4	6.6	166	20	27	17	-10	3.9	3.3	0.4	0.3	0.8	0.1	41	1
851-2	7/27/2006			5.4	4.3	430	22	22	0	86	50.5	37.5	1.9	1.8	7.1	0.1	199	11
851-2	8/26/2006			6.1	6.9	302	19	20	28	-20	0.7	0.6	1.5	1.4	0.5	0.2	79	12
851-2	9/29/2006			6.6	7.3	214	14	36	38	-26	0.8	0.4	0.4	0.4	0.2	0.1	39	2
851-2	10/27/2006	Weir	187	6.1	6.3	172	11	30	24	-16	0.6	0.4	0.3	0.3	0.2	0.1	38	4
851-2	2/24/2007			6.2	6.3	152	1	48	18	-8	1.2	0.7	0.3	0.3	0.5	0.2	40	9
851-2	3/31/2007			6.2	6.5	168	9	20	19	-11	1.1	0.5	0.3	0.2	0.3	0.0	42	4
Min			187	5.4	4.3	152	1	16	0	-26	0.5	0.3	0.3	0.2	0.2	0.0	38	1
Max			377	7.0	7.3	430	22	48	38	86	50.5	37.5	1.9	1.8	7.1	0.2	199	12
Avg			282	6.2	6.5	208	11	25	20	-4	5.7	4.1	0.6	0.5	1.0	0.1	61	5
Range			191	1.6	2.9	278	21	32	38	112	50.1	37.2	1.6	1.6	6.9	0.2	161	11

Description: Reeds Run at middle weir; AWARE/SRI sample point

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
851-3	11/18/2005	Weir	377	6.3	6.9	162	5	22	20	-12	1.0	0.8	0.3	0.3	0.3	0.0	37	7
851-3	12/17/2005			5.9	6.8	212	1	19	22	-12	2.3	2.1	0.5	0.5	0.5	0.2	94	7
851-3	2/25/2006			5.6	5.9	206	4	12	9	13	9.3	6.5	0.8	0.6	1.5	0.3	75	12
851-3	4/29/2006	Weir	354	6.1	6.5	178	13	14	11	2	6.0	5.5	0.3	0.3	1.0	0.0	51	13
851-3	5/26/2006			6.6	6.0	207	15	26	8	8	10.5	9.7	0.5	0.5	1.6	0.1	80	26
851-3	6/28/2006			6.4	6.3	179	19	22	9	3	8.1	7.8	0.5	0.5	1.6	0.0	42	6
851-3	7/27/2006			5.0	3.5	529	21	0	0	93	57.4	53.0	2.2	2.2	4.7	0.4	219	9
851-3	8/26/2006			4.0	3.1	1607	19	0	0	677	275.0	275.0	6.8	6.4	31.1	30.8	823	4
851-3	9/29/2006			6.4	6.2	241	14	27	18	-2	9.0	7.6	0.7	0.6	1.1	0.1	76	12
851-3	10/27/2006			5.9	6.0	191	11	24	12	0	5.6	4.9	0.5	0.5	1.0	0.1	51	2
851-3	2/24/2007			6.2	6.1	167	1		13	0	3.4	3.3	0.4	0.4	1.1	0.3	49	4
851-3	3/31/2007	Meter	5386	6.2	6.3	180	9	16	14	-4	9.9	4.4	0.5	0.3	0.7	0.3	36	4
Min			354	4.0	3.1	162	1	0	0	-12	1.0	0.8	0.3	0.3	0.3	0.0	36	2
Max			5386	6.6	6.9	1607	21	27	22	677	275.0	275.0	6.8	6.4	31.1	30.8	823	26
Avg			2039	5.9	5.8	338	11	17	11	64	33.1	31.7	1.2	1.1	3.8	2.7	136	9
Range			5032	2.6	3.8	1445	20	27	22	689	274.0	274.2	6.5	6.1	30.9	30.8	787	24

Description: Reeds Run at downstream weir; AWARE/SRI sample point

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
F	10/29/1979			3.1		1350			0	136	35.0		5.4				650	
F	10/29/1979			2.9	3.1	1350				304	35.0		5.4				650	1
F	5/7/1980				3.2				0	250	29.2		5.3		18.0		385	
F	3/17/1981				3.1	1277			0	148	63.0		7.2				690	5
F	6/10/1981				3.4	720			0	40	57.5		3.1				337	81
F	9/9/1981				3.0	1298			0	120	40.0		6.4				650	
F	11/17/1981				3.3	1420			0	108	33.0		9.0				550	1
F	2/17/1982				4.9	370			0	72	0.0		2.1				100	
F	5/26/1982				4.5	455			4	108	25.0		1.2				200	24
F	7/14/1982				2.9	1835			0	528	55.0		8.2				700	13
F	10/14/1982	Estimated	30		2.8	2220			0	560	60.0		17.5				750	1
F	1/19/1983				3.7	329			0	329	74.0		8.2				550	3
F	4/6/1983				4.0				3	128	19.0		0.7		8.4		165	
F	4/9/1983				4.0				3	128	19.1		0.7		8.4		165	
F	4/18/1983		500		4.6	440			4	92	22.3		1.7				110	27
F	7/18/1983	Estimated	50		2.6	3200			0	943	12.1		2.1				1900	3
F	9/22/1983				3.3				0	104	43.0		5.3		16.7		465	
F	9/22/1983				3.3				0	104	43.0		5.3		16.7		465	
F	11/14/1983		300		3.7	675			0	150	27.2		3.6				320	4
F	11/14/1983				3.3				0	186	18.1		3.1		10.5		200	
F	12/27/1983				3.1				0	262	56.0		2.8				370	
F	2/14/1992	Cross-section	1150	5.0	4.9	521	4		2	32	4.1		2.9				278	8
F	5/18/1992	Cross-section	175	4.5	4.7	594	18		1	38	4.2		3.5				278	8
F	7/27/1992	Estimated	1000	5.0	5.2	343	20		3	10	1.9		2.1				159	5
F	12/23/1992	Estimated	650	4.0	4.5	734	8		0	40	1.7		7.6				384	12
F	1/22/1993	Estimated	1500	6.0	6.8	287	4		17	0	2.4		0.9				92	1
F	4/16/1993	Estimated	1200	6.5	6.7	265	14		16	0	2.8		0.7				82	10
F	7/27/1993	Estimated	60	4.0	4.0	922	20		0	127	22.5		7.4				471	1
F	10/22/1993	Estimated	550	5.0	4.9	500	12		2	26	5.3		3.4				208	5

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
F	1/25/1994	Estimated	1000	6.0	6.5	341	2		18	3	4.1		1.5				137	4
F	4/22/1994	Estimated	850	6.5	6.4	321	8		9	9	6.0		1.3				149	8
F	9/16/1994	Estimated	500	4.0	4.2	780	18		0	59	0.2		6.2				371	3
F	12/29/1994	Estimated	800	6.0	6.4	447	4		9	22	7.3		2.3				168	13
F	1/30/1995	Estimated	500	5.5	5.2	438	2		3	35	5.8		1.7				150	13
Min			30	2.9	2.6	265	2		0	0	0.0		0.7		8.4		82	1
Max			1500	6.5	6.8	3200	20		18	943	74.0		17.5		18.0		1900	81
Avg			636	4.9	4.2	868	10		3	153	24.6		4.3		13.1		391	11
Range			1470	3.6	4.2	2935	18		18	943	74.0		16.8		9.6		1818	80

Description: Reeds Run approximately 1 mile downstream of project site; located directly upstream of Willow Road; R&P Coal Company sample point (data from Surface Mine Permit # 32803037)

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
MS-29	4/5/1988		12		3.3				0	203	3.4		20.8				710	3
MS-29	5/2/1988		2		3.3				0	238	3.6		22.0				760	6
MS-29	6/16/1988		0		3.3				0	258	1.3		29.0				920	3
MS-29	9/1/1988				3.0				0	286	1.4		26.8				800	
MS-29	10/4/1988		0		3.6				0	278	1.2		33.2				850	8
MS-29	11/3/1988		5		3.8				0	293	1.0		28.2				860	6
MS-29	12/8/1988		3		3.3				0	404	10.9		28.6				580	3
MS-29	1/5/1989		5		3.2				0	504	28.4		31.0				1180	3
MS-29	2/7/1989		10		3.0				0	575	59.6		34.6				1250	15
MS-29	3/21/1989		30		3.2				0	300	34.7		16.7				700	29
MS-29	4/4/1989		30		3.0				0	263	22.9		12.5				580	7
MS-29	5/4/1989		20		3.5				0	311	9.0		29.7				960	9
MS-29	6/19/1989		50		2.8				0	404	12.2		26.6				790	3
MS-29	7/17/1989		30		2.9				0	229	5.7		11.9				500	3
MS-29	8/17/1989		15		3.3				0	146	1.8		15.8				550	7
MS-29	9/11/1989		30		3.0				0	206	7.3		14.8				540	3
MS-29	10/2/1989		25		3.2				0	191	13.1		13.9				530	8
MS-29	11/6/1989		15		3.1				0	305	12.8		24.4				760	5
MS-29	1/8/1990		50		6.8				27	-14	2.0		0.9				72	10
MS-29	5/7/1990		18		2.8				0	377	37.1		19.7				770	3
MS-29	9/10/1990		5		3.4				0	114	2.0		12.0				440	10
MS-29	10/11/1990		200		3.3				0	112	10.0		7.0				295	13
MS-29	11/6/1990		30		3.3				0	145	3.0		12.7				510	3
MS-29	12/4/1990		25		3.2				0	270	37.8		16.2				660	11
MS-29	1/14/1991		25		3.2				0	179	29.4		10.5				440	6
MS-29	3/5/1991		30		3.1				0	233	33.6		11.7				470	4
MS-29	4/8/1991		0		2.9				0	267	17.7		15.6				610	4
MS-29	5/9/1991		0		3.1				0	197	9.5		13.6				540	3
MS-29	6/4/1991		1		2.9				0	270	8.4		21.8				828	6

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
MS-29	7/2/1991		2		3.2				0	124	3.9		13.8				550	22
MS-29	11/12/1991		3		3.4				0	208	14.8		15.7				680	4
MS-29	12/9/1991		5		4.0				4	41	0.8		6.2				280	3
MS-29	1/3/1992		25		3.7				0	188	1.4		17.5				719	4
MS-29	2/4/1992		20	3.4					0	252	8.7		18.2				720	1
MS-29	3/3/1992		20		3.5				0	163	3.1		16.5				691	2
MS-29	4/3/1992		25		3.5				0	98	3.9		10.5				420	3
MS-29	5/3/1992		0		3.4				0	161	3.2		2095.0				924	2
MS-29	6/5/1992		0		3.5				0	156	2.7		21.7				650	9
MS-29	7/13/1992		75		3.4				0	128	3.2		24.3				570	5
MS-29	8/11/1992		50		3.9				0	34	1.3		5.6				151	7
MS-29	9/10/1992		30		3.5				0	86	2.4		13.3				299	10
MS-29	10/2/1992		25		3.8				0	80	0.9		14.0				346	1
MS-29	11/9/1992		5		3.8				0	80	1.0		14.4				392	1
MS-29	12/7/1992		20		3.7				0	117	1.7		16.2				493	4
MS-29	1/4/1993		90		3.5				0	167	4.7		9.4				378	7
MS-29	2/5/1993		30		3.3				0	196	13.4		12.9				540	5
MS-29	3/8/1993		20		3.9				0	64	3.3		30.7				50	6
MS-29	4/2/1993		125		3.4				0	102	4.0		7.6				190	4
MS-29	5/14/1993		20		3.3				0	136	8.6		10.7				372	14
MS-29	6/4/1993		30		3.3				0	112	3.3		109.0				385	4
MS-29	7/3/1993				7.1				103	0	1.4		0.3		1.0		206	8
MS-29	7/16/1993		5		3.5				0	87	2.1		11.2				368	20
MS-29	8/6/1993		5		3.6				0	71	1.4		10.6				382	1
MS-29	9/9/1993		10		3.8				0	40	0.9		8.0				340	19
MS-29	10/4/1993		10		3.8				0	41	0.5		7.4				301	6
MS-29	11/5/1993		20		4.2				0	51	0.5		9.7				357	10
MS-29	12/23/1993		30		3.7				0	89	1.7		11.8		8.3		410	6
MS-29	2/7/1994		30		3.8				0	110	1.6		10.3		13.2		363	1

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
MS-29	3/7/1994		25		3.6				0	76	3.0		5.1		5.8		266	4
MS-29	4/4/1994		25		3.4				0	134	2.2		11.6		12.7		347	2
MS-29	5/9/1994		25		3.3				0	101	3.0		6.6		6.9		305	4
MS-29	6/10/1994		15		3.4				0	91	3.1		7.8		6.3		422	3
MS-29	7/11/1994		25		3.4				0	66	4.9		6.9		3.6		346	3
MS-29	8/5/1994		10		3.5				0	55	2.3		7.1		2.1		314	6
MS-29	8/5/1994		10		3.5				0	55	2.3		7.1		2.1		314	6
MS-29	9/2/1994		10		3.8				0	20	1.8		4.4		0.8		215	7
MS-29	10/7/1994		10		4.3				0	22	0.9		4.6		0.8		265	8
MS-29	11/4/1994		10		4.3				0	11	0.8		4.1		0.7		256	2
MS-29	12/2/1994		20		4.4				0	31	0.5		5.0		2.7		274	3
MS-29	1/9/1995	Estimated	15	4.0	4.1	940	4		0	50	2.1		8.5				443	5
MS-29	1/9/1995		15		4.1				0	50	2.1		8.5		4.2		443	5
MS-29	2/6/1995		15		4.1				0	38	1.3		7.5		4.1		400	2
MS-29	2/6/1995	Estimated	15	4.0	4.1	836	2		0	38	1.3		7.5				400	2
MS-29	3/10/1995		25		4.2				0	23	0.6		6.5		7.1		364	4
MS-29	3/10/1995	Estimated	25	4.0	4.1	725	8		0	41	0.4		5.2				364	4
MS-29	3/15/1995				7.6				78	0	1.0		0.7		0.0		199	
MS-29	4/7/1995		15		4.1				0	41	0.4		6.3		3.0		345	2
MS-29	4/11/1995				7.9				90	0	0.6		0.3				180	14
MS-29	4/15/1995				7.9				90	0	0.6		0.3		0.0		180	14
MS-29	5/5/1995	Estimated	30	4.0	3.4	734	10		0	28	0.8		5.2				337	4
MS-29	5/5/1995		30		4.0				0	28	0.8		5.2		2.4		337	4
MS-29	6/2/1995		10		4.9				2	14	3.3		6.4		0.3		309	8
MS-29	6/2/1995	Estimated	10	5.0	4.9	364	18		2	14	3.3		6.4				309	8
MS-29	7/13/1995				7.3				164	0	1.6		0.2		1.0		160	
MS-29	7/13/1995				7.3				164	0	1.6		0.2		1.0		160	
MS-29	7/17/1995	Estimated	1	6.5	7.3	542	2		39	0	0.2		0.4				211	8
MS-29	7/17/1995		1		7.3				39	0	0.2		0.4		0.1		211	8

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
MS-29	8/7/1995	Estimated	3	6.0	7.4	465	20		103	0	0.6		0.5				72	4
MS-29	8/7/1995		3		7.4				103	0	0.6		0.5		1.7		72	4
MS-29	10/11/1995				7.7				164	0	0.5		0.5				106	
MS-29	10/11/1995				7.7				164	0	0.5		0.5		0.0		106	
MS-29	11/9/1995		10		7.3				125	0	1.4		4.6		0.2		448	16
MS-29	11/9/1995	Estimated	10	7.0	7.3	1100	2		126	0	1.4		4.6				448	16
MS-29	12/8/1995	Estimated	5	7.0	7.2	1029	2		145	0	2.5		2.9				448	14
MS-29	12/8/1995		5		7.2				145	0	2.5		2.9		0.2		448	14
MS-29	1/5/1996	Estimated	5	6.5	7.0	874	2		116	0	2.6		2.8				308	20
MS-29	1/5/1996		5		7.0				116	0	2.6		2.8		0.3		308	20
MS-29	3/2/1996				6.9				84	0	1.2		0.6		0.0		94	
MS-29	3/21/1996				6.9				84	0	1.2		0.6				94	
MS-29	4/26/1996	Measured	1	7.4	7.5	693	6		112	0	0.3		0.3				204	3
MS-29	4/26/1996		1		7.5				112	0	0.3		0.3		0.0		204	3
MS-29	7/15/1996				6.8				96	0	0.6		2.0				192	
MS-29	7/15/1996				6.8				96	0	0.6		1.9		0.0		192	
MS-29	8/9/1996		5		8.2				109	0	0.3		0.4		0.2		156	2
MS-29	8/9/1996	Estimated	5		8.2	632			109	0	0.3		0.4				156	2
MS-29	9/16/1996				6.5				40	0	5.6		2.3		2.0		365	
MS-29	9/16/1996				6.5				40	0	5.6		2.2		2.0		365	
MS-29	10/8/1996		3		7.6				52	0	0.5		1.1		0.2		244	4
MS-29	10/8/1996	Estimated	3	6.5	7.6	595			52	0	0.5		1.1				244	4
MS-29	10/11/1996	Estimated	2		7.6	604			63	0	3.5		1.2				228	5
MS-29	10/11/1996		2		7.6				63	0	3.5		1.2		1.4		228	5
MS-29	10/17/1996				7.2				72	0	1.0		0.8		0.0		212	
MS-29	11/7/1996				7.1				82	0	0.0		1.0		0.0		237	
MS-29	12/6/1996				6.7				64	0	0.8		1.0		0.0		176	10
MS-29	1/8/1997	Estimated	4	7.3	7.7	567	6		56	0	0.2		0.8				166	2
MS-29	2/21/1997	Estimated	10		7.8	447			68	0	0.2		0.8				166	2

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
MS-29	3/12/1997				6.7				58	0	0.0		0.6		0.0		156	
MS-29	3/27/1997	Estimated	5		8.0	456			59	0	0.1		0.2				120	1
MS-29	5/6/1997				7.3				102	0	0.0		0.1		0.0		210	
MS-29	6/3/1997	Estimated	1	6.9	7.9	475			95	0	0.9		0.8				112	3
MS-29	7/11/1997				3.6				0	144	4.6		5.8		16.4		499	
MS-29	8/6/1997				7.3				184	0	0.0		0.7		0.0		97	4
MS-29	9/5/1997				7.0				146	0	0.4		0.5		0.0		325	
MS-29	10/3/1997				7.3				126	0	0.0		0.2		0.0		220	
MS-29	10/8/1997		4		7.7				56	0	0.2		0.8		0.2		166	2
MS-29	11/5/1997				7.9				106	0	0.3		0.3		0.0		210	
MS-29	11/18/1997	Estimated	3	7.2	7.5	611			63	0	1.1		1.0				252	10
MS-29	12/13/1997				6.9				74	0	0.4		0.9		0.0		234	
MS-29	1/5/1998				7.1				88	0	0.3		0.4		0.0		125	
MS-29	2/6/1998				7.1				80	0	0.8		0.3		0.0		159	
MS-29	3/2/1998	Estimated	7		7.8	495			78	0	0.5		0.3				138	2
MS-29	3/10/1998				7.4				86	0	1.6		0.6		0.6		119	
MS-29	4/13/1998				7.5				100	0	0.9		0.5		0.0		175	
MS-29	4/20/1998	Estimated	7		8.1	353			77	0	0.3		0.2				82	6
MS-29	5/12/1998				7.3				100	0	0.0		0.2		0.0		124	
MS-29	6/10/1998				7.3				150	0	0.8		36.0		0.0		165	
MS-29	7/10/1998				7.1				128	0	0.0		0.8		0.0		154	
MS-29	10/16/1998				7.3				160	0	1.4		0.6		0.0		113	
MS-29	11/27/1998	Estimated	2	7.8	8.1	542	9		109	0	0.1		0.2				132	4
MS-29	12/8/1998				7.2				126	0	0.0		0.3		0.0		190	
MS-29	2/19/1999	Estimated	1	4.5	3.6	2223	4		0	305	3.1		14.0				1255	10
MS-29	3/5/1999				7.3				76	0	0.5		0.3		0.0		130	
MS-29	5/10/1999				7.3				110	0	0.0		0.1		0.0		219	
MS-29	6/24/1999	Estimated	0	8.6	8.1	451	28		113	0	0.1		0.0				98	3
MS-29	8/12/1999	Estimated	0	7.9	8.2	386	30		117	0	0.2		0.1				72	5

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
MS-29	10/1/1999				7.2				114	0	0.0		0.1				169	
MS-29	12/21/1999	Estimated	5	7.7	7.5	494	4		55	0	0.6		0.4				204	7
MS-29	1/4/2000				7.0				72	0	4.4		0.5		2.5		135	4
MS-29	3/3/2000		20		7.3				92	0	0.0		0.1				102	151
MS-29	3/10/2000	Estimated	2	8.2	7.9	489	9		103	0	0.1		0.1				127	2
MS-29	5/8/2000				8.0				142	0	1.9		0.4		1.0		102	16
MS-29	6/22/2000	Estimated	2	7.8	7.8	327	24		110	0	0.1		0.4				61	6
MS-29	7/6/2000				7.4				122	0	5.5		0.9		2.9		65	48
MS-29	9/25/2000	Estimated	2	7.4	7.8	413	14		108	0	0.2		1.6				82	1
MS-29	10/5/2000				6.9				112	0	1.3		2.4		0.8		102	16
MS-29	10/30/2000	Estimated	2	7.8	7.5	462	9		103	0	0.0		0.1				109	1
MS-29	11/13/2000				7.8				114	0	0.6		0.2		0.0		124	8
MS-29	1/26/2001	Estimated	2	7.7	8.0	505	0		130	0	0.0		0.0				149	6
MS-29	5/16/2001	Estimated	2	7.7	8.1	450	16		137	0	0.1		0.2				136	2
Min			0	3.4	2.8	327	0		0	-14	0.0		0.0		0.0		50	1
Max			200	8.6	8.2	2223	30		184	575	59.6		2095.0		16.4		1255	151
Avg			17	6.5	5.5	634	10		49	77	4.0		21.2		1.9		346	8
Range			200	5.2	5.4	1896	29		184	589	59.6		2095.0		16.4		1205	150

Description: Kent 2-A bog area; located north of Sediment Pond A; R&P Coal Company sample point (data from Surface Mine Permit #32803037)

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
MS-30	3/29/1989				3.5				0	146	9.6		10.2		16.5		320	
MS-30	7/17/1990				3.5				0	66	0.7		12.5		9.1		317	
MS-30	1/9/1995			6.5	6.8	787	2		31	0	0.2		5.2				338	1
MS-30	3/10/1995			7.0	7.4	727	2		43	0	0.2		3.7				243	4
MS-30	4/7/1995			7.0	7.5	695	6		33	0	0.1		2.3				305	6
MS-30	5/5/1995			7.0	7.1	644	12		19	1	0.1		1.4				285	7
MS-30	6/2/1995			7.0	7.2	646	20		17	0	0.2		0.8				255	4
MS-30	7/13/1995				6.5				34	0	0.0		0.1				246	
MS-30	7/14/1995			7.0	7.5	555	20		28	0	0.1		0.1				205	7
MS-30	8/7/1995			7.0	7.7	563	20		42	0	0.1		0.1				173	2
MS-30	9/5/1995			7.0	7.5	500	20		42	0	0.3		0.0				158	4
MS-30	10/2/1995			7.0	7.4	554	18		48	0	0.1		0.0				178	11
MS-30	10/11/1995				7.3				64	0	0.0		0.1				176	
MS-30	11/9/1995			7.0	7.6	780	2		72	0	0.2		0.3				267	3
MS-30	12/8/1995			7.5	7.6	940	0		135	0	0.8		2.0				377	3
MS-30	1/5/1996	Measured	15	7.0	7.1	806	2		108	0	2.1		3.1				266	8
MS-30	4/18/1996				7.2				106	0	0.4		0.4				185	
MS-30	7/15/1996				6.9				74	0	0.0		0.1				272	
MS-30	9/16/1996				7.1				72	0	0.0		0.1		0.0		369	
MS-30	11/7/1996				7.2				70	0	0.0		0.1		0.0		348	
MS-30	2/21/1997	Estimated	35		7.3	456			52	0	0.8		0.9				160	6
MS-30	3/12/1997				6.8				64	0	0.3		0.5		0.0		198	
MS-30	3/27/1997	Estimated	65		7.7	387			44	0	0.7		0.6				229	9
MS-30	4/1/1997	Estimated	40		7.8	595			51	0	0.9		0.6				207	10
MS-30	7/11/1997				5.9				7	11	0.8		1.2		0.6		108	
MS-30	8/6/1997				6.6				66	0	0.0		0.2		0.0		150	
MS-30	9/5/1997				6.6				58	0	1.0		0.6		0.8		259	
MS-30	10/3/1997		8		6.9				62	0	2.3		0.1		0.0		259	
MS-30	11/5/1997		15		7.6				70	0	0.4		0.2		0.0		234	

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
MS-30	12/3/1997		12		6.9				66	0	0.0		0.5		0.0		288	
MS-30	12/6/1997				6.6				58	0	1.3		1.0		0.0		203	
MS-30	1/5/1998				6.9				66	0	0.0		1.0		0.0		302	
MS-30	1/14/1998	Estimated	45	7.0	7.2	630			61	0	0.2		0.5				254	2
MS-30	2/5/1998	Estimated	85		7.4	650			54	0	0.2		0.6				271	6
MS-30	2/6/1998		20		6.9				64	0	0.0		0.5		0.0		281	
MS-30	3/2/1998	Estimated	75		7.1	614			48	0	0.2		0.6				237	5
MS-30	3/4/1998				6.9				50	0	0.4		0.7		0.0		237	
MS-30	4/2/1998	Estimated	60		7.3	628			56	0	0.2		0.4				234	5
MS-30	4/13/1998		20		7.0				54	0	0.3		0.3		0.0		261	
MS-30	5/1/1998	Estimated	60		7.6	917			52	0	0.3		0.2				127	4
MS-30	5/12/1998		30		6.9				62	0	0.0		0.3		0.0		222	
MS-30	6/10/1998		45		6.6				38	0	0.0		0.1				177	
MS-30	6/23/1998	Estimated	15		7.7	502	24		54	0	0.1		0.1				168	6
MS-30	7/10/1998		12		6.9				60	0	0.0		0.0				157	
MS-30	7/21/1998	Measured	2		8.0	416	26		49	0	0.1		0.1				137	6
MS-30	8/6/1998	Estimated	1		7.6	411			40	0	0.1		0.1				124	3
MS-30	9/4/1998	Estimated	1	8.0	7.4	438	23		44	0	0.1		0.1				143	4
MS-30	10/16/1998		2		7.0				70	0	0.0		0.0				157	
MS-30	11/27/1998	Estimated	4	7.8	7.9	559	10		73	0	0.1		0.0				185	3
MS-30	12/8/1998		4		7.2				86	0	0.0		0.0				189	
MS-30	2/19/1999	Estimated	15	7.3	7.6	673	6		53	0	0.2		0.2				275	5
MS-30	3/5/1999		30		7.1				56	0	0.0		0.6				204	
MS-30	5/10/1999		20		7.0				54	0	0.0		0.2				393	
MS-30	6/18/1999	No Flow	0															
MS-30	8/12/1999	No Flow	0															
MS-30	10/1/1999		10		6.8				56	0	0.0		0.3				142	4
MS-30	12/7/1999		20		6.5				66	0	0.8		0.5				165	4
MS-30	12/22/1999	Estimated	45	7.3	7.6	628	3		52	0	0.2		0.5				305	5

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
MS-30	1/4/2000		20		6.8				68	0	0.0		0.7				272	
MS-30	2/1/2000		3		7.0				96	0	0.0		0.3				383	
MS-30	3/3/2000		27		6.9				68	0	0.0		0.7				276	
MS-30	3/10/2000	Estimated	17	8.0	7.6	655	11		94	0	0.2		0.3				287	5
MS-30	5/8/2000	Measured	12		7.4				50	0	0.0		0.1				255	4
MS-30	6/22/2000	Estimated	74	8.1	8.0	418	26		55	0	0.2		0.1				158	4
MS-30	7/6/2000		4		7.3				48	0	0.0		0.1				126	
MS-30	8/4/2000		200		6.7				56	0	0.0		0.2				122	
MS-30	9/25/2000	Estimated	7	8.6	8.5	407	16		42	0	0.1		0.1				130	3
MS-30	10/5/2000		4		6.6				42	0	0.0		0.1				156	
MS-30	10/30/2000	Estimated	7	8.1	8.1	472	11		51	0	0.1		0.0				168	1
MS-30	11/13/2000		6			8			64	0	0.0		0.1				233	
MS-30	1/26/2001	Estimated	12	6.8	7.2	689	1		80	0	0.2		1.8				314	1
MS-30	5/16/2001	Estimated	3	9.2	8.0	518	18		30	0	0.0		0.0				254	12
MS-30	1/4/2002		20		6.4	663	1		76	1	0.2		0.4		0.1		221	
MS-30	3/8/2002		12		7.2	592	16		54	1	0.3		0.4		0.2		256	
MS-30	5/31/2002		9		6.2	479	27		39	1	0.1		0.4		0.2		183	
MS-30	9/6/2002				6.1	295	28		63	1	0.9		0.2		0.8		181	
Min			0	6.5	3.5	8	0		0	0	0.0		0.0		0.0		108	1
Max			200	9.2	8.5	940	28		135	146	9.6		12.5		16.5		393	12
Avg			25	7.4	7.1	576	13		56	3	0.4		0.8		1.3		228	5
Range			200	2.7	5.0	932	28		135	146	9.6		12.5		16.5		285	11

Description: Effluent from Sediment Pond A; South of Kent 2-A bog area; R&P Coal Co. sample point (data from SMP#32803037); Same as AWARE sample point RD0-MP2 (Note: RD0-D1 and RD0-MP2 are reversed on Figure 6: Sampling Points in the AWARE assessment report.)

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
R	12/27/1979			6.9	7.0	150			16		1.2		0.0				31	50
R	4/6/1983				6.5				32	0	4.3		1.2		1.5		45	
R	2/14/1992	Estimated	25	6.5	7.4	346	2		45	0	0.3		0.5				77	7
R	5/18/1992	JRFACE FLOW	30	7.0	7.3	445	18		96	0	3.6		2.4				70	8
R	12/23/1992	Estimated	3	6.5	7.0	477	10		120	0	5.5		6.3				62	11
R	1/22/1993	Estimated	50	6.5	7.4	248	4		38	0	0.3		0.2				30	2
R	4/16/1993	Estimated	350	6.5	7.3	189	13		36	0	0.5		0.1				30	1
R	7/27/1993	Estimated	5	6.5	7.3	419	20		133	0	11.6		5.3				49	10
R	10/22/1993	Estimated	10	7.0	7.5	407	12		97	0	0.2		0.3				56	5
R	1/25/1994	Estimated	50	6.5	7.0	304	4		58	0	0.6		0.5				54	1
R	4/22/1994	Estimated	200	7.0	7.7	235	11		49	0	0.7		0.6				42	1
R	9/16/1994	Estimated	5	6.5	7.4	446	18		151	0	4.6		6.5				49	2
R	12/29/1994	Estimated	30	7.0	7.2	338	6		58	0	1.2		0.9				47	10
R	1/30/1995	Estimated	90	6.5	7.4	315	2		54	0	0.5		0.7				42	4
Min			3	6.5	6.5	150	2		16	0	0.2		0.0		1.5		30	1
Max			350	7.0	7.7	477	20		151	0	11.6		6.5		1.5		77	50
Avg			71	6.7	7.2	332	10		70	0	2.5		1.8		1.5		49	9
Range			347	0.5	1.2	327	18		135	0	11.4		6.5		0.0		47	49

Description: Headwaters of an unnamed trib to Reeds Run; located downstream of settling ponds; R&P Coal Company sample point (data from Surface Mine Permit # 32803037)

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
RD0-D1	1/4/2002	Cross-section	620		5.6	301	1		2	13	12.0		1.0		1.9		90	
RD0-D1	2/8/2002	Cross-section	442		5.7	200	7		12	3	4.5		0.4		0.7		54	
RD0-D1	3/8/2002	Cross-section	410		7.0	225	13		12	4	7.7		0.6		1.3		56	
RD0-D1	4/6/2002	Cross-section	986		5.9	210	10		10	7	6.6		0.4		1.1		51	
RD0-D1	5/3/2002	Cross-section	1731		6.3	180	13		14	1	5.0		0.4		0.9			
RD0-D1	5/31/2002	Cross-section	263		6.1	282	22		5	52	18.8		0.9		3.1		106	
RD0-D1	7/9/2002	Cross-section	26		4.0	737	22		2	328	116.9		4.2		19.3		456	
RD0-D1	8/2/2002	Cross-section			3.3	1186	27		2	1184	256.6		9.8		49.4		1041	
RD0-D1	9/5/2002	Cross-section			3.3	1690	21		2	5329	1649.0		51.1		293.6		5581	
RD0-D1	10/4/2002	Cross-section	34		3.4	337	23		2	183	55.3		2.3		10.1		289	
RD0-D1	11/8/2002	Cross-section	339		4.9	300	10		2	51	20.9		1.1		3.1		109	
RD0-D1	12/11/2002	Cross-section	387		5.6	125	2		9	30	12.5		0.9		2.2		82	
RD0-D1	11/18/2005			6.5	6.5	175	4	18	13	-4	3.1	2.7	0.4	0.4	0.7	0.1	53	16
RD0-D1	12/17/2005	Frozen																
RD0-D1	2/25/2006			5.2	5.8	234	4	9	6	24	14.3	13.4	0.9	0.9	2.4	0.5	93	5
RD0-D1	4/29/2006			6.0	6.6	233	11	20	12	5	5.3	4.2	0.5	0.4	0.8	0.0	74	7
RD0-D1	5/26/2006			6.3	6.0	209	15	26	8	10	9.9	9.6	0.6	0.6	1.1	0.0	75	19
RD0-D1	6/28/2006			6.4	6.3	176	21	20	11	2	6.5	5.6	1.1	0.6	1.0	0.0	39	15
RD0-D1	7/27/2006			3.4	3.2	569	507	0	0	61	21.3	16.3	2.3	2.3	2.2	2.2	194	1
RD0-D1	8/26/2006			3.0	2.9	1196	21	0	0	250	36.5	30.9	5.3	4.9	20.3	19.8	419	10
RD0-D1	9/29/2006			6.3	6.1	281	14	29	13	6	12.1	10.8	1.2	1.2	0.6	0.0	81	2
RD0-D1	10/27/2006			5.8	5.9	228	10	27	11	6	7.2	6.9	0.7	0.7	1.5	0.1	76	7
RD0-D1	2/24/2007	Frozen																
RD0-D1	3/31/2007			6.2	6.0	209	8	12	8	15	10.2	10.1	0.5	0.5	1.4	0.2	77	12

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
Min			26	3.0	2.9	125	1	0	0	-4	3.1	2.7	0.4	0.4	0.6	0.0	39	1
Max			1731	6.5	7.0	1690	507	29	14	5329	1649.0	30.9	51.1	4.9	293.6	19.8	5581	19
Avg			524	5.5	5.3	422	36	16	7	344	104.2	11.1	3.9	1.2	19.0	2.3	433	9
Range			1705	3.5	4.1	1565	506	29	14	5333	1645.9	28.2	50.7	4.6	293.0	19.8	5542	18

Description: Reeds Run downstream of discharge and upstream of where pond effluent (MS-30) enters Reeds Run; Same as SRI/AWARE sample point 851-4

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
SP-B	1/3/1994			6.5	7.0	469	2		125	0	1.5		1.2				150	10
SP-B	2/7/1994	Measured	6	6.5	7.3	340	2		86	0	0.9		0.8				80	10
SP-B	3/7/1994			6.5	7.5	240	1		46	0	0.1		0.5				49	14
SP-B	4/4/1994	Measured	2	7.0	8.0	340	10		78	0	0.5		0.5				85	4
SP-B	5/9/1994			7.0	7.8	367	11		98	0	0.3		0.3				78	2
SP-B	6/10/1994			7.5	7.7	351	18		101	0	0.3		0.3				78	1
SP-B	7/11/1994			8.5	8.7	236	20		61	0	0.1		0.1				56	3
SP-B	8/5/1994			7.5	7.6	207	22		62	0	0.1		0.2				40	6
SP-B	9/2/1994			7.0	7.7	272	16		91	0	0.3		0.1				40	3
SP-B	10/7/1994			7.0	7.9	308	12		114	0	0.4		0.1				47	5
SP-B	11/4/1994			7.5	8.0	346	12		119	0	0.5		0.9				55	15
SP-B	12/2/1994			7.0	7.3	285	4		73	0	0.7		0.3				52	8
SP-B	1/9/1995			7.0	7.6	383	2		92	0	0.6		0.6				78	13
SP-B	2/6/1995			7.0	7.7	365	2		101	0	0.5		0.4				83	8
SP-B	3/10/1995			7.0	7.8	393	2		105	0	0.6		0.6				83	13
Min			2	6.5	7.0	207	1		46	0	0.1		0.1				40	1
Max			6	8.5	8.7	469	22		125	0	1.5		1.2				150	15
Avg			4	7.1	7.7	327	9		90	0	0.5		0.5				70	8
Range			4	2.0	1.7	262	21		78	0	1.4		1.1				110	14

Description: Effluent of Sediment Pond B2 located on the western edge of the project site; R&P Coal Company sample point (data from Surface Mine Permit #32803037)

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
SP-C	2/7/1994	Estimated	25	6.5	7.0	166	2		18	0	0.2		0.0				27	20
SP-C	3/7/1994	Measured	30	6.5	7.1	155	4		18	0	0.1		0.0				24	20
SP-C	4/4/1994	Measured	12	6.5	7.6	138	8		24	0	0.2		0.0				24	12
SP-C	5/9/1994	Measured	9	7.0	7.6	179	11		45	0	0.3		0.1				27	11
SP-C	6/10/1994			9.0	8.8	183	20		61	0	0.4		0.4				21	1
SP-C	7/11/1994			7.5	7.9	3	21		100	0	0.9		1.3				22	7
SP-C	8/9/1994			7.5	7.9	322	19		108	0	0.7		1.4				28	17
SP-C	9/2/1994			7.5	7.7	338	18		86	0	0.3		0.4				34	9
SP-C	10/7/1994			9.5	9.3	400	12		44	0	0.1		0.1				46	4
SP-C	11/4/1994			9.5	9.1	410	12		49	0	0.2		0.1				39	1
SP-C	12/1/1994	Measured	12	7.0	7.5	406	4		35	0	0.4		0.1				32	9
SP-C	1/9/1995			6.5	7.3	233	2		29	0	0.2		0.1				27	2
SP-C	2/6/1995			7.0	7.3	249	2		33	0	0.2		0.1				37	12
SP-C	3/10/1995	Measured	24	6.5	7.5	223	2		27	0	0.2		0.1				30	4
Min			9	6.5	7.0	3	2		18	0	0.1		0.0				21	1
Max			30	9.5	9.3	410	21		108	0	0.9		1.4				46	20
Avg			19	7.4	7.8	243	10		48	0	0.3		0.3				30	9
Range			21	3.0	2.3	407	19		90	0	0.8		1.4				25	19

Description: Effluent of Sediment Pond C located at the headwaters of an unnamed tributary of Reeds Run; R&P Coal Company sample point (data from Surface Mine Permit #32803037)

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
SW-32	4/6/1983				6.3				14	20	0.2		0.1		0.2		25	
SW-32	2/26/1985				6.4				17	6	0.0		0.0				72	
SW-32	4/29/1985				6.4				26	4	0.0		0.0		0.5		72	
SW-32	8/22/1985				6.4				38	2	0.5		0.2				72	
SW-32	9/19/1985				6.3				42	0	0.6		0.5				20	
SW-32	10/9/1985				6.6				38	0	0.5		0.5				1212	
SW-32	1/31/1986				6.8				22	0	0.0		0.1				41	
SW-32	4/25/1986				7.0				20	0	0.0		0.5				53	
SW-32	7/30/1986				6.2				38	0	0.0		0.3				99	
SW-32	12/1/1986				6.4				18	0	0.0		0.0				48	
SW-32	1/20/1987				6.0				19	10	0.0		0.5				20	
SW-32	5/21/1987				5.9				28	0	0.3		0.0				41	
SW-32	7/29/1987				6.3				66	0	0.4		0.3				102	
SW-32	10/28/1987				6.5				42	0	0.8		0.4				61	
SW-32	1/18/1988				6.5				24	0	0.0		0.0				54	
SW-32	2/14/1988				6.4				20	0	0.3		0.1				75	
SW-32	4/11/1988				6.2				24	62	0.0		0.1				51	
SW-32	6/23/1988				6.7				50	0	1.2		0.3				53	
SW-32	9/7/1988				6.5				48	0	0.0		0.5				81	
SW-32	11/1/1988				6.5				40	0	0.4		0.3				97	
SW-32	9/18/1989				7.1				30	0	0.4		0.1				80	
SW-32	11/6/1989				6.9				36	0	0.9		0.2				88	
SW-32	1/10/1990				6.8				18	0	0.3		0.0				41	
SW-32	7/17/1990				6.9				30	0	0.3		0.1				40	
SW-32	10/24/1990				7.0				26	0	0.0		0.1				20	2
SW-32	6/25/1991				4.1				2	78	0.7		8.8		11.7		500	2
SW-32	10/8/1991				6.8				52	0	0.4		0.3				44	2
SW-32	3/4/1992				6.9				17	0	0.0		0.1				31	2
SW-32	9/8/1992				6.5				46	0	0.6		0.5				47	16

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
SW-32	12/16/1992				6.8				20	0	1.8		0.2		1.3		28	40
SW-32	7/30/1993				6.7				44	0	0.9		0.4				76	
SW-32	4/28/1994				6.2				16	0	0.4		0.0				28	18
SW-32	6/23/1994				7.0				40	0	0.4		0.2				10	3
SW-32	3/15/1995				6.7				26	0	0.4		0.1				34	
SW-32	4/11/1995	Estimated			6.7				24	0	0.3		0.1		0.0		39	
SW-32	6/2/1995	Estimated	125	7.0	7.5	214	16		39	0	0.2		0.1				47	4
SW-32	7/3/1995				6.6				106	0	1.5		0.4		1.0		39	
SW-32	12/8/1995	Estimated	350	6.5	6.7	223	2		22	0	0.1		0.2				40	1
SW-32	3/21/1996	Estimated			6.2				16	6	0.3		0.0		0.0		30	2
SW-32	3/27/1996				6.2				16	6	0.0		0.0				30	
SW-32	4/3/1996	Estimated	25		7.5	259	5		41	0	0.2		0.2				47	2
SW-32	8/9/1996	Estimated	25		7.8	355			106	0	1.9		0.1				34	2
SW-32	10/8/1996	Estimated	20		7.6	343			91	0	0.8		1.1				48	2
SW-32	2/21/1997	Estimated	70		7.3	180			31	0	0.4		0.1				31	2
SW-32	3/12/1997				6.2				22	5	0.0		0.0		0.0		32	
SW-32	5/6/1997				6.2				36	0	0.0		0.0				32	0
SW-32	6/3/1997	Estimated	60		7.7	246			53	0	0.5		0.4				33	5
SW-32	7/16/1997	Estimated	20		7.5	396			114	0	1.1		1.5				34	7
SW-32	11/18/1997	Estimated	75	6.9	7.5	242			45	0	0.5		0.4				31	9
SW-32	1/5/1998				6.2				20	17	9.4		0.7		1.4		78	0
SW-32	3/2/1998	Estimated	135		7.0	206			37	0	0.3		0.2				45	5
SW-32	4/20/1998	Estimated	250		7.5	162			36	0	0.6		0.2				28	5
SW-32	9/4/1998	Estimated	2	6.0	6.5	215	16		36	0	0.4		0.2				43	3
SW-32	11/27/1998	Estimated	35	6.8	7.0	234	8		37		36.6		0.1				55	1
SW-32	2/19/1999	Estimated	75	6.1	6.2	250	4		9	28	13.9		0.8				77	6
SW-32	3/5/1999				6.6				19	0	0.0		0.0				0	4
SW-32	6/18/1999	Estimated	35	5.1	5.6	477	14		5	112	49.0		1.9				229	5
SW-32	8/12/1999	Estimated	3	2.8	3.0	2700	21			2134	628.8		21.5				2215	17

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
SW-32	12/21/1999	Estimated	375	7.1	6.7	192	3		13	5	3.5		0.4				66	6
SW-32	3/10/2000	Estimated	200	6.7	6.3	240	8		13	35	7.6		0.7				78	5
SW-32	5/8/2000				6.8				36	0	0.0		0.5				37	6
SW-32	6/22/2000	Estimated	275	6.4	6.6	209	20		20	7	7.6		0.5				73	7
SW-32	9/25/2000	Estimated	60	5.9	6.2	408	12		18	75	39.1		1.6				184	14
SW-32	10/30/2000	Estimated	160	6.5	6.3	344	8		16	51	26.8		1.5				146	12
SW-32	11/13/2000				6.8				42	0	0.0		0.1				36	4
SW-32	1/26/2001	Estimated	150	6.2	6.7	212	0		15		7.0		0.6				74	6
SW-32	5/16/2001	Estimated	70	5.3	5.0	452	13		5	108	29.1		1.8				219	18
SW-32	1/4/2002	Cross-section	620	6.6		180	2		14	0	0.2		0.1		0.0		37	
SW-32	3/8/2002	Cross-section	410	7.2		189	12		22		0.2		0.1		0.1		36	
SW-32	5/31/2002	Cross-section	203	6.4		180	22		33		1.1		0.1		1.0		41	
SW-32	9/6/2002	Cross-section		6.1		89	19		83		0.6		1.0		0.2		31	
Min			2	2.8	3.0	89	0		2	0	0.0		0.0		0.0		0	0
Max			620	7.2	7.8	2700	22		114	2134	628.8		21.5		11.7		2215	40
Avg			147	6.2	6.6	348	11		33	42	12.4		0.8		1.3		110	7
Range			618	4.4	4.8	2611	22		112	2134	628.8		21.5		11.7		2215	40

Description: Reeds Run upstream of discharge; located just downstream of Locust Road (T-425) and upstream of unnamed trib; R&P Coal Company sample point (data from Surface Mine Permit #32803037); Same as AWARE sample point RD0-MP1

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
SW-33	4/6/1983				3.7				0	212	60.0		1.3		11.2		200	
SW-33	2/26/1985				4.0				2	226	85.8		0.6		13.3		276	
SW-33	4/29/1985				3.2				0	1204	300.0		3.9		93.9		1152	
SW-33	8/22/1985				3.1				0	3760	300.0		11.4		273.0		4229	
SW-33	9/19/1985				3.1				0	5300	300.0		17.4		451.0		304	
SW-33	1/31/1986				3.4				0	724	213.0		2.0		54.0		732	
SW-33	4/25/1986				3.7				0	230	81.6		1.3		20.3		255	
SW-33	7/30/1986				3.1				0	1646	300.0		5.2		102.0		1164	
SW-33	12/11/1986				4.5				8	148	48.7		0.9		10.6		188	
SW-33	1/20/1987				4.8				8	76	23.0		0.5		5.2		77	
SW-33	5/21/1987				4.2				5	212	75.0		1.7		15.0		281	
SW-33	7/29/1987				3.1				0	3060	300.0		24.5		265.0		2940	
SW-33	10/9/1987				3.1				0	4140	300.0		14.5		393.0		3402	
SW-33	10/28/1987				5.5				13	72	31.8		2.0		6.6		176	
SW-33	4/11/1988				5.7				14	96	16.1		0.6		3.0		91	
SW-33	6/23/1988				3.1				0	776	246.0		8.4		51.9		690	
SW-33	9/7/1988				3.1				0	550	202.0		7.9		37.7		484	
SW-33	11/1/1988				4.4				10	412	144.0		5.5		26.2		449	
SW-33	2/14/1989				6.1				19	10	7.1		0.5		1.6		71	
SW-33	9/18/1989				5.8				10	80	35.9		1.5		5.1		109	
SW-33	11/6/1989				4.6				8	98	13.0		4.9		8.7		268	
SW-33	1/10/1990				5.9				10	32	10.7		0.6		2.0		51	
SW-33	7/17/1990				6.2				22	20	16.6		0.9		2.8		117	
SW-33	6/25/1991				7.4				58	0	0.7		0.5		0.0		67	
SW-33	10/8/1991				3.1				0	3820	300.0		57.5		210.0		3631	
SW-33	3/4/1992				6.9				15	28	12.0		0.8		1.9		73	
SW-33	9/8/1992				4.4				12	38	2.9		6.3		6.8		306	
SW-33	12/16/1992				6.6				22	0	9.3		0.8		3.9		41	
SW-33	4/28/1994				5.9				15	8	5.5		0.4		1.4		51	

Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
SW-33	6/23/1994				3.8				0	90	0.5		7.4		11.3		364	
SW-33	3/15/1995				6.3				18	4	8.4		0.5		1.3		47	
SW-33	4/11/1995				6.3				22	15	11.1		0.7		1.7		71	
SW-33	6/2/1995	Estimated	125	6.0	6.1	364	16		8	47	5.7		1.6				152	6
SW-33	7/13/1995				4.8				8	168	84.0		3.5		11.2		331	
SW-33	8/28/1995	Estimated	1	4.0	2.9	7154	20		0	7395	3462.5		101.3				14401	
SW-33	12/8/1995	Estimated	350	6.5	6.1	317	2		7	28	15.1		1.2				97	15
SW-33	3/21/1996				6.0				16	14	2.8		24.0		0.6		41	
SW-33	4/3/1996	Estimated	30		6.4	224	5		8	15	8.3		0.6				82	4
SW-33	8/9/1996	Estimated	35		6.1	337			7	50	25.9		1.2				120	7
SW-33	10/8/1996	Estimated	35		6.4	336			13	38	24.6		1.2				139	18
SW-33	2/21/1997	Estimated	75		6.5	166			9	4	5.8		0.3				47	4
SW-33	3/12/1997				6.1				22	20	8.1		0.5		1.3		1	4
SW-33	5/6/1997				5.8				16	70	30.6		1.5		4.9		151	20
SW-33	6/3/1997	Estimated	75		6.6	238			15	4	5.8		0.5				67	8
SW-33	7/16/1997	Estimated	25		4.8	643			2	175	62.5		3.0				403	4
SW-33	11/18/1997	Estimated	120	6.5	6.7	237			15	0	5.7		0.5				67	10
SW-33	1/5/1998			6.4			22		0	0	0.0		0.0		0.0		28	10
SW-33	3/2/1998	Estimated	225		6.4	200			13	0	4.8		0.4				57	4
SW-33	4/20/1998	Estimated	300		6.8	156			13	0	2.9		0.3				44	11
SW-33	9/4/1998	Estimated	3	4.5	3.4	1489	16		0	405	161.3		18.4				739	9
SW-33	11/27/1998	Estimated	40	4.7	3.5	750	7			143	47.7		3.7				546	10
SW-33	2/19/1999	Estimated	100	6.3	6.4	299	4		13	26	12.5		87.0				96	9
SW-33	5/10/1999				6.2				22	32	20.8		1.1		2.9		136	
SW-33	6/18/1999	Estimated	40	5.1	4.3	555	14			212	80.8		3.1				298	3
SW-33	8/12/1999	Estimated	3	2.6	2.9	2970	26			2364	731.3		6.2				2832	6
SW-33	12/22/1999	Estimated	400	7.4	6.6	255	3		14	5	5.4		0.6				97	9
SW-33	3/10/2000	Estimated	225	7.0	6.4	318	8		15	20	11.3		0.9				102	10
SW-33	6/22/2000	Estimated	350	6.7	6.4	272	21		22	14	10.9		0.6				106	7

Aultmans Run Water Quality Database

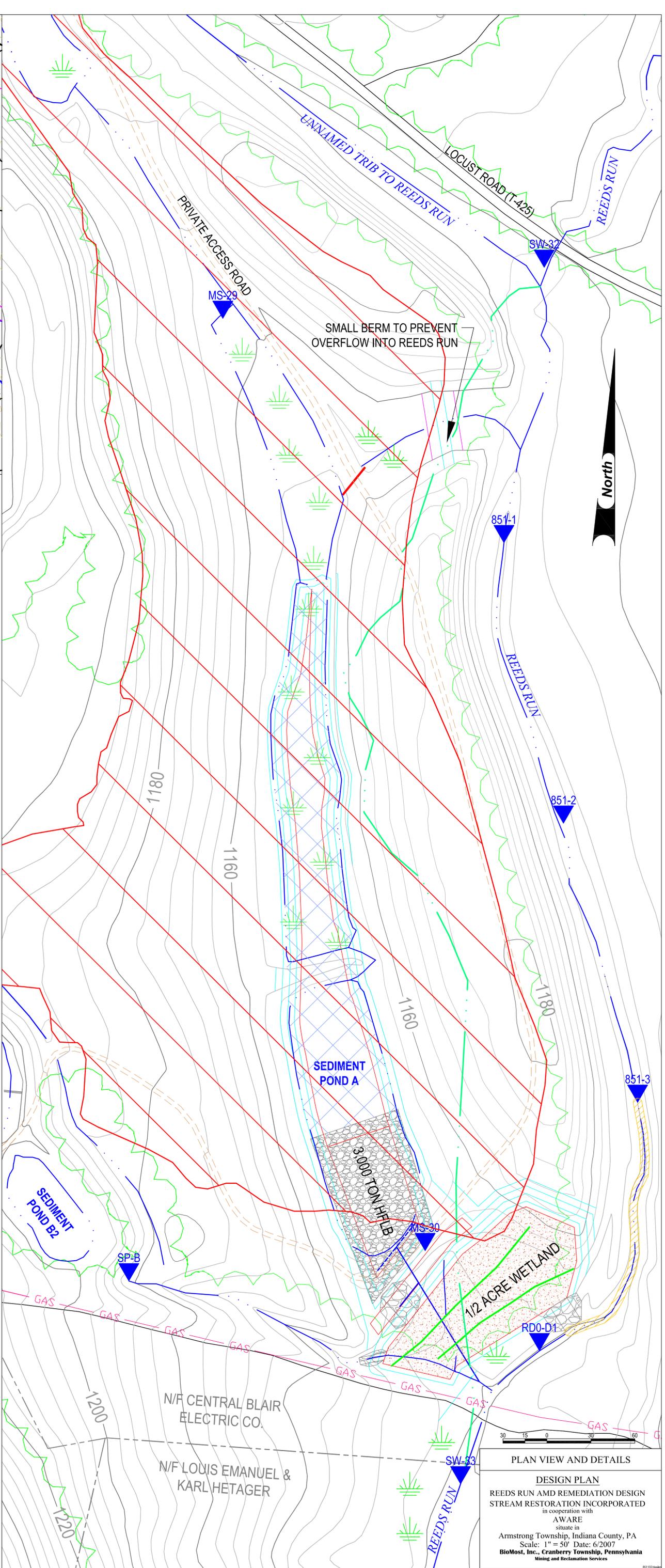
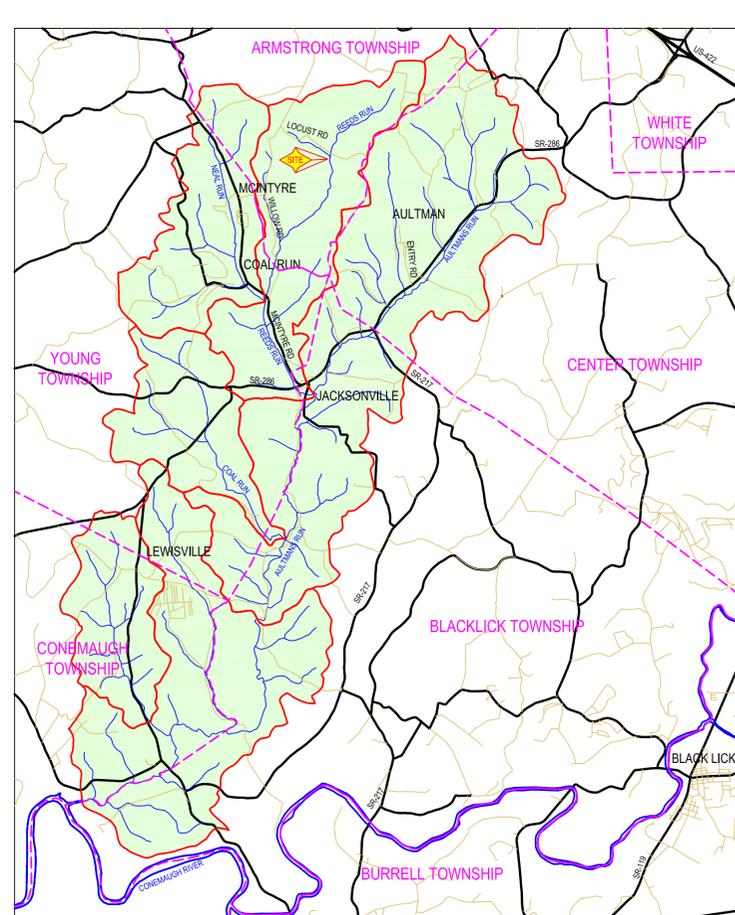
Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
SW-33	9/22/2000	Estimated	75	6.5	6.3	414	12		24	50	31.5		1.6				179	2
SW-33	10/30/2000	Estimated	150	6.8	6.4	364	8		19	35	23.0		1.4				157	10
SW-33	11/13/2000				6.3				32	34	24.8		1.5		3.0		100	24
SW-33	1/26/2001	Estimated	175	6.3	6.4	271	0		18	6	8.6		0.9				107	5
SW-33	5/16/2001	Estimated	85	5.5	5.6	486	13		4	106	48.5		2.2				241	10
SW-33	11/18/2005			6.5	6.5	175	5	14	12	0	2.9	2.7	0.5	0.5	0.5	0.1	57	3
SW-33	12/17/2005			5.9	5.3	225	1	16	2	22	14.9	13.9	1.0	0.9	2.5	0.4	86	11
SW-33	2/25/2006			6.0	5.8	238	5	8	6	29	15.9	15.0	0.9	0.9	2.3	0.1	95	8
SW-33	4/29/2006			6.1	6.5	195	12	6	10	3	4.6	4.5	0.4	0.4	0.5	0.1	65	11
SW-33	5/26/2006			5.9	6.0	205	15	6	9	12	9.4	4.4	0.8	0.5	0.9	0.2	77	12
SW-33	6/28/2006			6.7	6.6	189	21	17	16	-6	4.8	3.7	0.5	0.5	0.5	0.1	48	4
SW-33	7/27/2006			5.4	5.1	366	22	8	3	11	5.5	4.6	5.7	5.7	0.6	0.2	167	4
SW-33	8/26/2006			3.7	3.4	711	21	0	0	47	16.0	9.2	12.5	12.2	3.2	3.2	264	5
SW-33	9/29/2006			6.1	5.8	294	14		9	9	9.7	8.8	2.4	2.4	0.4	0.1	82	1
SW-33	10/27/2006			5.6	5.9	222	10	6	10	5	6.7	6.2	1.0	0.9	0.4	0.0	66	5
SW-33	2/24/2007			6.3	5.6	242	1	17	4	35	15.6	15.3	0.9	0.7	9.4	0.3	95	11
SW-33	3/31/2007			6.1	6.2	239	9	18	14	9	8.0	7.4	0.9	0.9	0.4	0.2	90	4
Min			1	2.6	2.9	156	0	0	0	-6	0.0	2.7	0.0	0.4	0.0	0.0	1	1
Max			400	7.4	7.4	7154	26	18	58	7395	3462.5	15.3	101.3	12.2	451.0	3.2	14401	24
Avg			127	5.8	5.2	614	11	11	10	517	114.0	8.0	6.5	2.2	41.9	0.4	607	8
Range			399	4.8	4.5	6998	25	18	58	7401	3462.5	12.6	101.3	11.8	451.0	3.1	14400	23

Description: Reeds Run downstream of discharge; located approximately 75' downstream of gas line and directly downstream of beaver dam; R&P Coal Company sample point (data from Surface Mine Permit # 32803037); Same as SRI/AWARE sample point 851-5

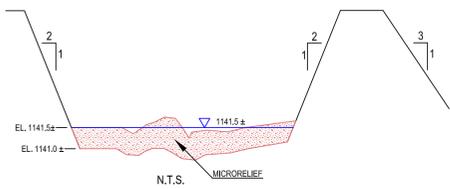
Aultmans Run Water Quality Database

Sample Point	Date	Method of Flow Meas.	Flow (gpm)	Field pH	Lab pH	Spec. cond. (umhos/cm)	Field Temp (C)	Alk. (F) (mg/L)	Alk. (L) (mg/L)	Acid. (mg/L)	T. Fe (mg/L)	D. Fe (mg/L)	T. Mn (mg/L)	D. Mn (mg/L)	T. Al (mg/L)	D. Al (mg/L)	Sulfate (mg/L)	Susp. Solids (mg/L)
V	12/20/1979			6.3	6.4	80			12	4	0.1		0.0				17	1
V	1/25/1994	Estimated	40	6.5	6.7	228	2		22	0	0.3		0.3				24	11
V	4/22/1994	Estimated	20	6.5	7.1	133	8		19	0	0.1		0.0				24	1
V	12/29/1994	Estimated	15	6.5	7.0	152	6		22	0	0.1		0.0				19	9
V	1/30/1995	Estimated	20	6.5	6.8	121	2		17	0	0.1		0.0				18	3
Min			15	6.3	6.4	80	2		12	0	0.1		0.0				17	1
Max			40	6.5	7.1	228	8		22	4	0.3		0.3				24	11
Avg			24	6.5	6.8	143	5		18	1	0.2		0.1				20	5
Range			25	0.2	0.7	148	6		10	4	0.2		0.3				7	10

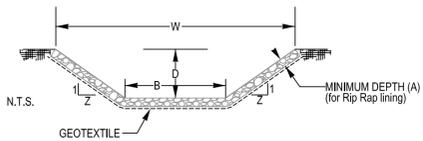
Description: Reeds Run approximately 1 mile upstream of project site in the headwaters of Reeds Run; R&P Coal Company sample point (data from Surface Mine Permit #32803037)



AEROBIC WETLAND DETAIL



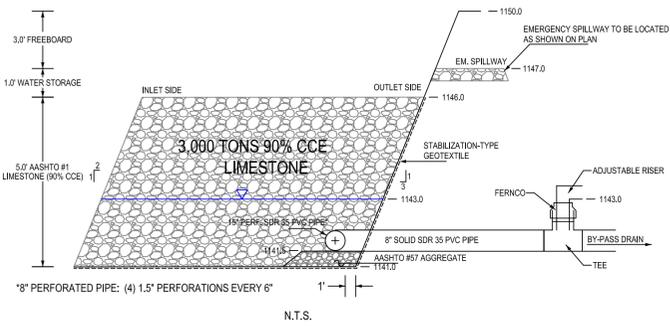
RIP RAP CHANNEL DETAIL



NCSA No.	AVG. STONE SIZE (d50)	MIN. DEPTH A
R-2	1 1/2"	3"
R-3	3"	6"
R-4	6"	12"
R-5	9"	18"
R-6	12"	24"
R-7	18"	36"
R-8	24"	48"

CHANNEL TYPE	W	B	D	Z	A	LINING
HFLB SPILLWAY	44'	20'	3'	4'	1'	R-4
WL INFLUENT (FROM POND)	16'	8'	2'	2'	1'	R-4
WL SPILLWAY	46'	22'	3'	4'	1'	R-4

HORIZONTAL FLOW LIMESTONE BED DETAIL



LEGEND

- EXISTING CONTOUR - INDEX
- EXISTING CONTOUR - INTERMEDIATE
- WATER
- HISTORIC STREAM CHANNEL
- PROPOSED CONTOUR - INDEX
- PROPOSED CONTOUR - INTERMEDIATE
- PROPERTY LINE
- PASSIVE TREATMENT SYSTEM COMPONENT
- WILLOW WATTLE
- CONSTRUCTED WETLANDS (KENT COAL)
- AMD SEEP ZONE
- REFUSE PILE (HISTORIC LOCATION)
- ROAD
- UNIMPROVED ROAD
- GAS
- UNDERGROUND GAS LINE
- 8" PERFORATED SDR 35 PVC PIPE
- 8" SOLID SDR 35 PVC PIPE
- 24" N-12 CULVERT
- WETLAND SUBSTRATE
- EXCAVATION AREA
- R-4 RIPRAP
- AASHTO #1 LIMESTONE AGGREGATE (90% CCE)
- WATER SAMPLE POINT

Notes:
 Base map prepared by aerial survey completed by Land and Mapping Services (Clearfield, PA) from aerial photographs taken 4/25/01. Additional information from site inspections provided by BioMost, Inc.
 This design plan is part of an on-going design build effort of Stream Restoration Inc. and AWARE. Modifications to this design plan will be made as needed based on field and other conditions.
 Location map based on USGS 7.5' Montyre, PA (PR1961), National Agricultural Imagery Program color infrared (CIR) aerial photography, and from vector data downloaded from Pennsylvania Spatial Data Access (PASDA).
 Existing wetlands have not been delineated. All necessary permits and approvals necessary prior to construction.
 Bottom elevation of wetlands varies due to microrelief to enhance treatment performance and wildlife value.
 Property lines approximate based on Indiana County Tax Maps. This is not a property survey. Property owner of project area: Central Blair Electric Company.
 Location of historic stream channel based on aerial photo (not orthorectified) taken on 5/12/39 by United States Department of Agriculture, Agricultural Adjustment Administration (Roll 63, Photo 59).
 Location of refuse pile based on aerial photo (not orthorectified) taken on 4/21/1962 by United States Geological Survey (Entity ID: AR1VALU0001066).
 Location of MS-29 approximate based on PA DEP inspector report description.
 PA One Call contacted during design phase. Location of gas line approximate.
 Utilities:
 T.W. Phillips Gas and Oil Co.

CALL BEFORE YOU DIG!
 PENNSYLVANIA LAW REQUIRES
 3 WORKING DAYS NOTICE FOR
 CONSTRUCTION PHASE AND 10 WORKING
 DAYS IN DESIGN STAGE--STOP CALL

PA1 POCS SERIAL NUMBER
 SYSTEM, INC. 1557059
 1-800-242-1776

PLAN VIEW AND DETAILS

DESIGN PLAN
 REEDS RUN AMD REMEDIATION DESIGN
 STREAM RESTORATION INCORPORATED
 in cooperation with
 AWARE
 situate in
 Armstrong Township, Indiana County, PA
 Scale: 1" = 50' Date: 6/2007
 BioMost, Inc., Cranberry Township, Pennsylvania
 Mining and Reclamation Services