DAGUSCAHONDA RUN WATERSHED TMDL

Elk County, Pennsylvania

Prepared for:

Pennsylvania Department of Environmental Protection

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Introduction

This Total Maximum Daily Load (TMDL) calculation has been prepared for a segment in the Daguscahonda Run Watershed (Attachment A). It was done to address the impairments noted on the 1996 Pennsylvania 303(d) list, required under the Clean Water Act, and covers the one listed segment shown in Table 1. Metals in acidic discharge water from abandoned coal mines causes the impairment. The TMDL addresses the three primary metals associated with acid mine drainage (iron, manganese, aluminum), and pH.

Table 1. 303(d) Sub-List

State Water Plan (SWP) Subbasin: 17A

Year	SWP	Miles	Segment ID	DEP Stream Code	Stream Name	Desig-nated Use	Data Source	Source	EPA 305(b) Cause Code
1996	17-A	6	5443	50473	Daguscahonda Run	CWF	303 (d) List	Resource Extraction	Metals
1998	17-A	5.64	5443	50473	Daguscahonda Run	CWF	SWMP	AMD	Metals
2002	17-A	5.65	20011130-1245-JJM	50473	Daguscahonda Run	CWF	SWMP	AMDe	Metals
2002	17-A	1.5	20011130-1245-JJM	50483	Unt Daguscahonda Run	CWF	SWMP	AMD	Metals
2004	17_A	5.6	20011130-1245-JJM	50473	Daguscahonda Run	CWF	SWMP	AMD	Metals
2004	17-A	1.5	20011130-1245-JJM	50483	Unt Daguscahonda Run	CWF	SWMP	AMD	Metals

Cold Water Fishes=CWF
Surface Water Monitoring Program = SWMP
Abandoned Mine Drainage = AMD

Directions to the Daguscahonda Run Watershed

The Daguscahonda Watershed is approximately 12.4 square miles in area. It is located in central Elk County, between Ridgway and St. Mary's, Pennsylvania and can be found on the 71/2 Minute Kersey, Brandy Camp, Ridgway and St. Marys quadrangle. Daguscahonda Run flows approximately 7 miles from its headwaters near Dagus in Fox Township, Elk County to its confluence with Elk Creek just east of Daguscahonda in St. Mary's Township, Elk County.

Daguscahonda Run can be reached from exit 97 North (Route 219) of Interstate 80. To reach the headwaters of Daguscahonda Run, take Rt. 219 North for approximately 21 miles to Rt. 948. Travel approximately 4.1 miles on Route 948 south to Earlyville. The headwaters of Daguscahonda Run flow under Rt. 948 in-between Earlyville and Dagus. The mouth of Daguscahonda Run can be reached by traveling approximately 24 miles North on Rt. 219 to the town of Ridgway. In Ridgway follow route 120 East (towards St. Mary's) for approximately 4.9 miles to the town of Daguscahonda. Daguscahonda Run flows under Rt. 120 and into Elk Creek approximately 0.7 miles east past the town of Daguscahonda.

Segments addressed in this TMDL

The segment identified as impaired (ID# 5443) is 5.65 miles in length and flows through central Elk County and is classified as a cold-water fishery (CWF). Daguscahonda Run enters Elk Creek 0.7 miles east of the town of Daguscahonda. It is located on the Kersey, Ridgway and St. Mary's 71/2 minute series topographic maps (Attachment A). The impairment associated with metals is the result of an acidic discharge from an abandoned coal mine northwest of the town of Dagus. Several smaller acidic discharges along this segment of Daguscahonda Run also contribute to the impairment.

The Daguscahonda Run watershed is affected by pollution from AMD. This pollution has caused high levels of metals and a low pH in the mainstem of Daguscahonda Run. Daguscahonda Run above Beaver Run, is negatively impacted by AMD from a deep mine discharge approximately 1 mile southeast of the town of Dagus. Several AMD seeps from the hillside have a minor affect on Daguscahonda Run between the deep mine discharge and Beaver Run. The headwaters of Beaver Run are affected by pollution from AMD. Several discharges enter the headwater tributaries, causing high levels of metals and a low pH in the mainstem of Beaver Run.

There are no active mining operations in the watershed. All of the discharges in the watershed are from abandoned mines and will be treated as non-point sources. Each segment on the 303(d) list will be addressed as a separate TMDL. These TMDLs will be expressed as long-term, average loadings. Do to the nature and complexity of mining effects on the watershed, expressing the TMDL as a long-term average gives a better representation of the data used for the calculations. All of Daguscahonda Run, including the stream segment evaluated in this TMDL, has the designation of a Cold Water Fishes (CWF). The designation for this stream segment can be found in PA Title 25 Chapter 93.

Clean Water Act Requirements

Section 303(d) of the 1972 Clean Water Act requires states, territories, and authorized tribes to establish water quality standards. The water quality standards identify the uses for each waterbody and the scientific criteria needed to support that use. Uses can include designations for drinking water supply, contact recreation (swimming), and aquatic life support. Minimum goals set by the Clean Water Act require that all waters be "fishable" and "swimmable."

Additionally, the federal Clean Water Act and the U.S. Environmental Protection Agency's (USEPA) implementing regulations (40 CFR 130) require:

- States to develop lists of impaired waters for which current pollution controls are not stringent enough to meet water quality standards (the list is used to determine which streams need TMDLs);

- States to establish priority rankings for waters on the lists based on severity of pollution and the designated use of the waterbody; states must also identify those waters for which TMDLs will be developed and a schedule for development;

- States to submit the list of waters to USEPA every four years (April 1 of the even numbered years);

- States to develop TMDLs, specifying a pollutant budget that meets state water quality standards and allocate pollutant loads among pollution sources in a watershed, e.g., point and nonpoint sources; and

- USEPA to approve or disapprove state lists and TMDLs within 30 days of final submission.

Despite these requirements, states, territories, authorized tribes, and USEPA have not developed many TMDLs since 1972. Beginning in 1986, organizations in many states filed lawsuits against the USEPA for failing to meet the TMDL requirements contained in the federal Clean Water Act and its implementing regulations. While USEPA has entered into consent agreements with the plaintiffs in several states, many lawsuits still are pending across the country.

In the cases that have been settled to date, the consent agreements require USEPA to backstop TMDL development, track TMDL development, review state monitoring programs, and fund studies on issues of concern (e.g., AMD, implementation of nonpoint source Best Management Practices (BMPs), etc.).

303(d) Listing Process

Prior to developing TMDLs for specific waterbodies, there must be sufficient data available to assess which streams are impaired and should be on the Section 303(d) list. With guidance from the USEPA, the states have developed methods for assessing the waters within their respective jurisdictions.

The primary method adopted by the Pennsylvania Department of Environmental Protection (Pa. DEP) for evaluating waters changed between the publication of the 1996 and 1998 303(d) lists. Prior to 1998, data used to list streams were in a variety of formats, collected under differing protocols. Information also was gathered through the 305(b) reporting process. Pa. DEP is now using the Unassessed Waters Protocol (UWP), a modification of the USEPA Rapid Bioassessment Protocol II (RPB-II), as the primary mechanism to assess Pennsylvania's waters. The UWP provides a more consistent approach to assessing Pennsylvania's streams.

The assessment method requires selecting representative stream segments based on factors such as surrounding land uses, stream characteristics, surface geology, and point source discharge locations. The biologist selects as many sites as necessary to establish an accurate assessment for a stream segment; the length of the stream segment can vary between sites. All the biological surveys included kick-screen sampling of benthic macroinvertebrates, habitat surveys, and measurements of pH, temperature, conductivity, dissolved oxygen, and alkalinity. Benthic macroinvertebrates are identified to the family level in the field.

After the survey is completed, the biologist determines the status of the stream segment. The decision is based on the performance of the segment using a series of biological metrics. If the stream is determined to be impaired, the source and cause of the impairment is documented. An impaired stream must be listed on the state's 303(d) list with the documented source and cause. A TMDL must be developed for the stream segment. A TMDL is for only one pollutant. If a stream segment is impaired by two pollutants, two TMDLs must be developed for that stream segment. In order for the process to be more effective, adjoining stream segments with the same source and cause listing are addressed collectively, and on a watershed basis.

Basic Steps for Determining a TMDL

Although all watersheds must be handled on a case-by-case basis when developing TMDLs, there are basic processes or steps that apply to all cases. They include:

1. Collection and summarization of pre-existing data (watershed characterization, inventory contaminant sources, determination of pollutant loads, etc.);
2. Calculate TMDL for the waterbody using USEPA approved methods and computer models;
3. Allocate pollutant loads to various sources;
4. Determine critical and seasonal conditions;
5. Submit draft report for public review and comments; and
6. USEPA approval of the TMDL.

This document will present the information used to develop the Daguscahonda Run Watershed TMDL.

Watershed History

Underground mining practices occurred in the watershed until surface mining took over in the 1950's. The Lower, Middle and Upper Kittanning and Lower and Upper Freeport coals have been mined in the watershed by both strip and auger mining. Companies that have mined within this watershed include Tamburlin Coal Co., Permit No. 3069BSM17, 4670BSM4; Owens Coal Co., Permit No. 4674SM4, 4675SM8, 4674SM11, 4674SM17, 4674SM18, 4674SM29; Glen Irvan Corp., Permit No. 4675SM1, 4676SM13, 24830101; and Floyd Mottern, 24870105, 24900101.

Deep mining has been documented in the Daguscahonda Run watershed. The Northwest Mining and Exchange Company operated a drift mine in the late 1940's. No specific information regarding this deep mine was located; however, several slumped over deep mine entrances were observed along the mainstem of Daguscahonda Run.

After being identified as a Priority Water Body by the Bureau of Water Quality in 1986, a study was conducted in order to determine the physical and chemical quality of Elk Creek and its tributaries (Pennsylvania Department of Environmental Resources Bureau of Water Quality Management (Pa. DER BWQM) 1986). Results from this study indicated that AMD exerts a significant impact in the Elk Creek Watershed. Approximately 6 miles of Daguscahonda Run were impaired by low pH and elevated metals concentrations, resulting in severely depressed biological communities. This study concluded that Daguscahonda Run is a significant contributor of abandoned mine drainage Elk Creek. Water quality data from this report has been incorporated into the TMDL.

A large pile of abandoned coal refuse, known as a gob pile, was located upstream from UNT01A. The gob pile was the result of down dip deep clay mine believed to have been mined by N W Mining Company and was seeded and mulched by the Bureau of Abandoned Mines during the late 1980's.

AMD Methodology

A two-step approach is used for the TMDL analysis of AMD impaired stream segments. The first step uses a statistical method for determining the allowable instream concentration at the point of interest necessary to meet water quality standards. This is done at each point of interest (sample point) in the watershed. The second step is a mass balance of the loads as they pass through the watershed. Loads at these points will be computed based on average annual flow.

The statistical analysis describes below can be applied to situations where all of the pollutant loading is from non-point sources as well as those where there are both point and non-point sources. The following defines what are considered point sources and non-point sources for the purposes of our evaluation; point sources are defined as permitted discharges, non-point sources are then any pollution sources that are not point sources. For situations where all of the impact is due to nonpoint sources, the equations shown below are applied using data for a point in the stream. The load allocation made at that point will be for all of the watershed area that is above that point. For situations where there are point-source impacts alone, or in combination with nonpoint sources, the evaluation will use the point-source data and perform a mass balance with the receiving water to determine the impact of the point source.

Allowable loads are determined for each point of interest using Monte Carlo simulation. Monte Carlo simulation is an analytical method meant to imitate real-life systems, especially when other analyses are too mathematically complex or too difficult to reproduce. Monte Carlo simulation calculates multiple scenarios of a model by repeatedly sampling values from the probability distribution of the uncertain variables and using those values to populate a larger data set. Allocations were applied uniformly for the watershed area specified for each allocation point. For each source and pollutant, it was assumed that the observed data were log-normally distributed. Each pollutant source was evaluated separately using @Risk[1] by performing 5,000 iterations to determine the required percent reduction so that the water quality criteria, as defined in the *Pennsylvania Code. Title 25 Environmental Protection, Department of Environmental Protection, Chapter 93, Water Quality Standards,* will be met instream at least 99 percent of the time. For each iteration, the required percent reduction is:

PR = maximum {0, (1-Cc/Cd)} where (1)

PR = required percent reduction for the current iteration

Cc = criterion in mg/l

Cd = randomly generated pollutant source concentration in mg/l based on the observed data

Cd = RiskLognorm(Mean, Standard Deviation) where (1a)

Mean = average observed concentration

Standard Deviation = standard deviation of observed data

The overall percent reduction required is the 99th percentile value of the probability distribution generated by the 5,000 iterations, so that the allowable long-term average (LTA) concentration is:

LTA = Mean * (1 – PR99) where (2)

LTA = allowable LTA source concentration in mg/l

Once the allowable concentration and load for each pollutant is determined, mass-balance accounting is performed starting at the top of the watershed and working down in sequence. This mass-balance or load tracking is explained below.

Load tracking through the watershed utilizes the change in measured loads from sample location to sample location, as well as the allowable load that was determined at each point using the @Risk program.

There are two basic rules that are applied in load tracking; rule one is that if the sum of the measured loads that directly affect the downstream sample point is less than the measured load at the downstream sample point it is indicative that there is an increase in load between the points being evaluated, and this amount (the difference between the sum of the upstream and downstream loads) shall be added to the allowable load(s) coming from the upstream points to give a total load that is coming into the downstream point from all sources. The second rule is

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[1] @Risk – Risk Analysis and Simulation Add-in for Microsoft Excel, Palisade Corporation, Newfield, NY, 1990-1997.

that if the sum of the measured loads from the upstream points is greater than the measured load at the downstream point this is indicative that there is a loss of instream load between the evaluation points, and the ratio of the decrease shall be applied to the load that is being tracked (allowable load(s)) from the upstream point.

Tracking loads through the watershed gives the best picture of how the pollutants are affecting the watershed based on the information that is available. The analysis is done to insure that water quality standards will be met at all points in the stream. The TMDL must be designed to meet standards at all points in the stream, and in completing the analysis, reductions that must be made to upstream points are considered to be accomplished when evaluating points that are lower in the watershed. Another key point is that the loads are being computed based on average annual flow and should not be taken out of the context for which they are intended, which is to depict how the pollutants affect the watershed and where the sources and sinks are located spatially in the watershed.

In Low pH TMDLs, acidity is compared to alkalinity as described in Attachment B. Each sample point used in the analysis of pH by this method must have measurements for total alkalinity and total acidity. Net alkalinity is alkalinity minus acidity, both in units of milligrams per liter (mg/**l**) $CaCO_3$. Statistical procedures are applied, using the average value for total alkalinity at that point as the target to specify a reduction in the acid concentration. By maintaining a net alkaline stream, the pH value will be in the range between six and eight. This method negates the need to specifically compute the pH value, which for streams affected by low pH may not a true reflection of acidity. This method assures that Pennsylvania's standard for pH is met when the acid concentration reduction is met.

Information for the TMDL analysis performed using the methodology described above is contained in the "TMDLs by Segment" section of this report.

TMDL Endpoints

One of the major components of a TMDL is the establishment of an instream numeric endpoint, which is used to evaluate the attainment of acceptable water quality. An instream numeric endpoint, therefore, represents the water quality goal that is to be achieved by implementing the load reductions specified in the TMDL. The endpoint allows for comparison between observed instream conditions and conditions that are expected to restore designated uses. The endpoint is based on either the narrative or numeric criteria available in water quality standards.

Because of the nature of the pollution sources in the watershed, the TMDLs component makeup will be load allocations that are specified above a point in the stream segment. All allocations will be specified as long-term average daily concentrations. These long-term average daily concentrations are expected to meet water quality criteria 99 percent of the time. Pennsylvania Title 25 Chapter 96.3(c) specifies that a minimum 99 percent level of protection is required. All metals criteria evaluated in this TMDL are specified as total recoverable. Pennsylvania does have dissolved criteria for iron; however, the data used for this analysis report iron as total recoverable. Table 2 shows the water quality criteria for the selected parameters.

Table 2 Applicable Water Quality Criteria

Parameter	*Criterion Value (mg/l)*	*Total Recoverable/Dissolved*
Aluminum (Al)	0.75	Total Recoverable
Iron (Fe)	1.50 0.3	Total Recoverable Dissolved
Manganese (Mn)	1.00	Total Recoverable
pH *	6.0-9.0	N/A

*The pH values shown will be used when applicable. In the case of freestone streams with little or no buffering capacity, the TMDL endpoint for pH will be the natural background water quality. These values are typically as low as 5.4 (Pennsylvania Fish and Boat Commission).

TMDL Elements (WLA, LA, MOS)

A TMDL equation consists of a wasteload allocation, load allocation and a margin of safety. The wasteload allocation is the portion of the load assigned to point sources. The load allocation is the portion of the load assigned to nonpoint sources. The margin of safety is applied to account for uncertainties in the computational process. The margin of safety may be expressed implicitly (documenting conservative processes in the computations) or explicitly (setting aside a portion of the allowable load).

TMDL Allocations Summary

Analyses of data for metals for points BR01B and BR01A indicate that there is no single critical flow condition for pollutant sources, and further, that there was no significant correlation between source flows and pollutant concentrations (Table 3). The other points in this TMDL and aluminum at BR01B and BR01A did not have enough paired flow/parameter data to calculate correlations (fewer than 15 paired observations).

Table 3 Correlation Between Metals and Flow for Selected Points

Point Identification	*Flow vs.*			*Number of Samples*
	Iron	*Manganese*	*Aluminum*	
BR01B	0.1541	0.3990	*	16
BR01A	0.0032	0.0582	*	13

*Not enough paired data available.

Allocation Summary

This TMDL will focus remediation efforts on the identified numerical reduction targets for each watershed. As changes occur in the watershed, the TMDL may be re-evaluated to reflect current conditions. Table 5 presents the estimated reductions identified for all points in the watershed. Attachment F gives detailed TMDLs by segment analysis for each allocation point.

Table 4. Summary Table–Daguscahonda Run Watershed

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
DAG02	Daguscahonda Run						
	Al	ND	NA	-	-	0.0	0
	Fe	ND	NA	-	-	0.0	0
	Mn	0.2	0.2	0.0	0.2	0.0	0
	Acidity	ND	NA	-	-	0.0	0
UNT01A	UNT, 50483, to Daguscahonda Run, Upstream of UNT01						
	Al	4.5	0.8	0.0	0.8	3.7	83
	Fe	7.5	3.3	0.0	3.3	4.2	56
	Mn	4.0	3.5	0.0	3.5	0.5	11
	Acidity	87.7	68.4	0.0	68.4	19.3	22
UNT01	UNT, 50483, to Daguscahonda Run						
	Al	5.5	1.1	0.0	1.1	0.7	41
	Fe	38.5	2.3	0.0	2.3	32.0	93
	Mn	40.1	2.0	0.0	2.0	37.6	95
	Acidity	121.4	0.0	0.0	0.0	102.1	100
UNT02	UNT, 50480, to Daguscahonda Run downstream of UNT01						
	Al	ND	NA	-	-	0.0	0
	Fe	1.2	1.2	0.0	1.2	0.0	0
	Mn	1.6	1.6	0.0	1.6	0.0	0
	Acidity	131.9	33.0	0.0	33.0	98.9	75
DAG04	Daguscahonda Run down stream of UNT02						
	Al	102.3	10.2	0.0	10.2	87.6	90
	Fe	226.0	20.3	0.0	20.3	169.5	89
	Mn	211.2	12.7	0.0	12.7	160.5	93
	Acidity	2328.3	302.7	0.0	302.7	1805.3	86
UNT06	UNT, 50479, to Dasuscahonda Run						
	Al	ND	NA	-	-	0.0	0
	Fe	ND	NA	-	-	0.0	0
	Mn	0.5	0.5	0.0	0.5	0.0	0
	Acidity	66.7	22.7	0.0	22.7	44.0	66
DAG07	Daguscahonda Run upstream of BR04						
	Al	98.2	5.9	0.0	5.9	3.9	40
	Fe	84.0	31.9	0.0	31.9	0.0	0
	Mn	223.9	6.7	0.0	6.7	18.6	73
	Acidity	1791.3	53.7	0.0	53.7	189.6	78
BR01B	Most Upstream Sample Point on Beaver Run, 50476						
	Al	0.4	0.2	0.0	0.2	0.2	51
	Fe	1.0	0.8	0.0	0.8	0.2	22
	Mn	0.5	0.5	0.0	0.5	0.0	0
	Acidity	5.6	5.6	0.0	5.6	0.0	0
BR01A	First Sample Point Downstream of BR01B						
	Al	0.9	0.2	0.0	0.2	0.5	72
	Fe	1.9	0.4	0.0	0.4	1.3	79
	Mn	1.2	0.3	0.0	0.3	0.9	74
	Acidity	8.9	6.0	0.0	6.0	2.9	33
BR02	Beaver Run Upstream of Confluence with UNT 50477						
	Al	ND	NA	-	-	0.0	0.0

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Fe	17.8	12.1	0.0	12.1	4.2	26
	Mn	6.9	6.9	0.0	6.9	0.0	0
	Acidity	480.9	57.7	0.0	57.7	420.3	88
BR01	UNT, 50477, to Beaver Run (from Balsam Swamp)						
	Al	3.7	2.0	0.0	2.0	1.7	47
	Fe	3.8	1.4	0.0	1.4	2.4	62
	Mn	1.7	1.7	0.0	1.7	0.0	0
	Acidity	289.3	23.1	0.0	23.1	266.2	92
BR03	UNT, 50477, to Beaver Run Upstream of Confluence with Beaver Run						
	Al	1.3	0.8	0.0	0.8	0.0	0
	Fe	2.4	2.3	0.0	2.3	0.0	0
	Mn	2.2	2.2	0.0	2.2	0.0	0
	Acidity	456.6	27.4	0.0	27.4	163.0	86
BR04	Beaver Run, 50476, Upstream of Confluence with Daguscahonda Run						
	Al	ND	NA	-	-	0.0	0
	Fe	17.8	13.0	0.0	13.0	32.7	72
	Mn	10.4	10.4	0.0	10.4	37.5	78
	Acidity	1595.8	143.6	0.0	143.6	688.8	83
DAG05	Daguscahonda Run Upstream of Sample Point UNT03						
	Al	78.6	11.8	0.0	11.8	0.0	0
	Fe	81.5	44.8	0.0	44.8	0.0	0
	Mn	184.8	12.9	0.0	12.9	0.5	4
	Acidity	2894.6	173.7	0.0	173.7	0.0	0
UNT03	UNT, 50475, to Daguscahonda Run						
	Al	1.6	1.4	0.0	1.4	0.2	14
	Fe	0.9	0.9	0.0	0.9	0.0	0
	Mn	2.2	2.2	0.0	2.2	0.0	0
	Acidity	137.9	55.0	0.0	55.0	82.9	60
DAG08	Daguscahonda Run Upstream of Decker Run						
	Al	218.5	24.0	0.0	24.0	127.5	84
	Fe	104.6	70.1	0.0	70.1	0.0	0
	Mn	530.1	31.8	0.0	31.8	326.4	91
	Acidity	8033.2	723.0	0.0	723.0	4506.7	86
DR	Decker Run, 50474, Upstream of Confluence with Daguscahonda Run						
	Al	2.8	2.5	0.0	2.5	0.3	10
	Fe	ND	NA	-	-	0.0	0
	Mn	3.9	3.9	0.0	3.9	0.0	0
	Acidity	388.2	132.0	0.0	132	256.2	66
DAG09	Daguscahonda Run Upstream of Confluence with Elk Creek						
	Al	165.3	11.6	0.0	11.6	8.3	42
	Fe	90.6	87.9	0.0	87.9	0.0	0
	Mn	586.2	11.7	0.0	11.7	76.2	87
	Acidity	5888.2	294.4	0.0	294.4	303.4	51

Recommendations

Currently, there is not a watershed organization in the Daguscahonda Run watershed. It is recommended that agencies work with local interests to form a watershed organization. This watershed organization could then work to implement projects to achieve the reductions recommended in this TMDL document.

Two primary programs that provide reasonable assurance for maintenance and improvement of water quality in the watershed are in effect. The PADEP's efforts to reclaim abandoned mine lands, coupled with its duties and responsibilities for issuing NPDES permits, will be the focal points in water quality improvement.

Additional opportunities for water quality improvement are both ongoing and anticipated. Historically, a great deal of research into mine drainage has been conducted by PADEP's Bureau of Abandoned Mine Reclamation, which administers and oversees the Abandoned Mine Reclamation Program in Pennsylvania, the United States Office of Surface Mining, the National Mine Land Reclamation Center, the National Environmental Training Laboratory, and many other agencies and individuals. Funding from EPA's 319 Grant program, and Pennsylvania's Growing Greener program have been used extensively to remedy mine drainage impacts. These many activities are expected to continue and result in water quality improvement.

The PA DEP Bureau of Mining and Reclamation administers an environmental regulatory program for all mining activities, mine subsidence regulation, mine subsidence insurance, and coal refuse disposal; conducts a program to ensure safe underground bituminous mining and protect certain structures form subsidence; administers a mining license and permit program; administers a regulatory program for the use, storage, and handling of explosives; provides for training, examination, and certification of applicants for blaster's licenses; and administers a loan program for bonding anthracite underground mines and for mine subsidence. Administers the EPA Watershed Assessment Grant Program, the Small Operator's Assistance Program (SOAP), and the Remining Operators Assistance Program (ROAP).

Mine reclamation and well plugging refers to the process of cleaning up environmental pollutants and safety hazards associated with a site and returning the land to a productive condition, similar to DEP's Brownfields program. Since the 1960's, Pennsylvania has been a national leader in establishing laws and regulations to ensure reclamation and plugging occur after active operation is completed.

Pennsylvania is striving for complete reclamation of its abandoned mines and plugging of its orphaned wells. Realizing this task is no small order, DEP has developed concepts to make abandoned mine reclamation easier. These concepts, collectively called Reclaim PA, include legislative, policy land management initiatives designed to enhance mine operator, volunteer land DEP reclamation efforts. Reclaim PA has the following four objectives.

- To encourage private and public participation in abandoned mine reclamation efforts
- To improve reclamation efficiency through better communication between reclamation partners
- To increase reclamation by reducing remining risks

- To maximize reclamation funding by expanding existing sources and exploring new sources.

There is no watershed group in the Daguscahonda Run watershed. The North Central PA Regional Planning and Development Commission, located in Ridgway, PA has worked with the Elk County Fishermen, located in the East Branch Lake Watershed (north of the area discussed in this report) to obtain Growing Greener monies to remediate AMD. However, the Elk County Fishermen are dedicated to fixing the problems in the Lake watershed. The NCPRPDC is currently working on a grant application for treating AMD on a stream in Elk County, north of the Elk Creek Watershed. These two groups may be willing to work, in the future, on some of the problems in the Elk Creek Watershed.

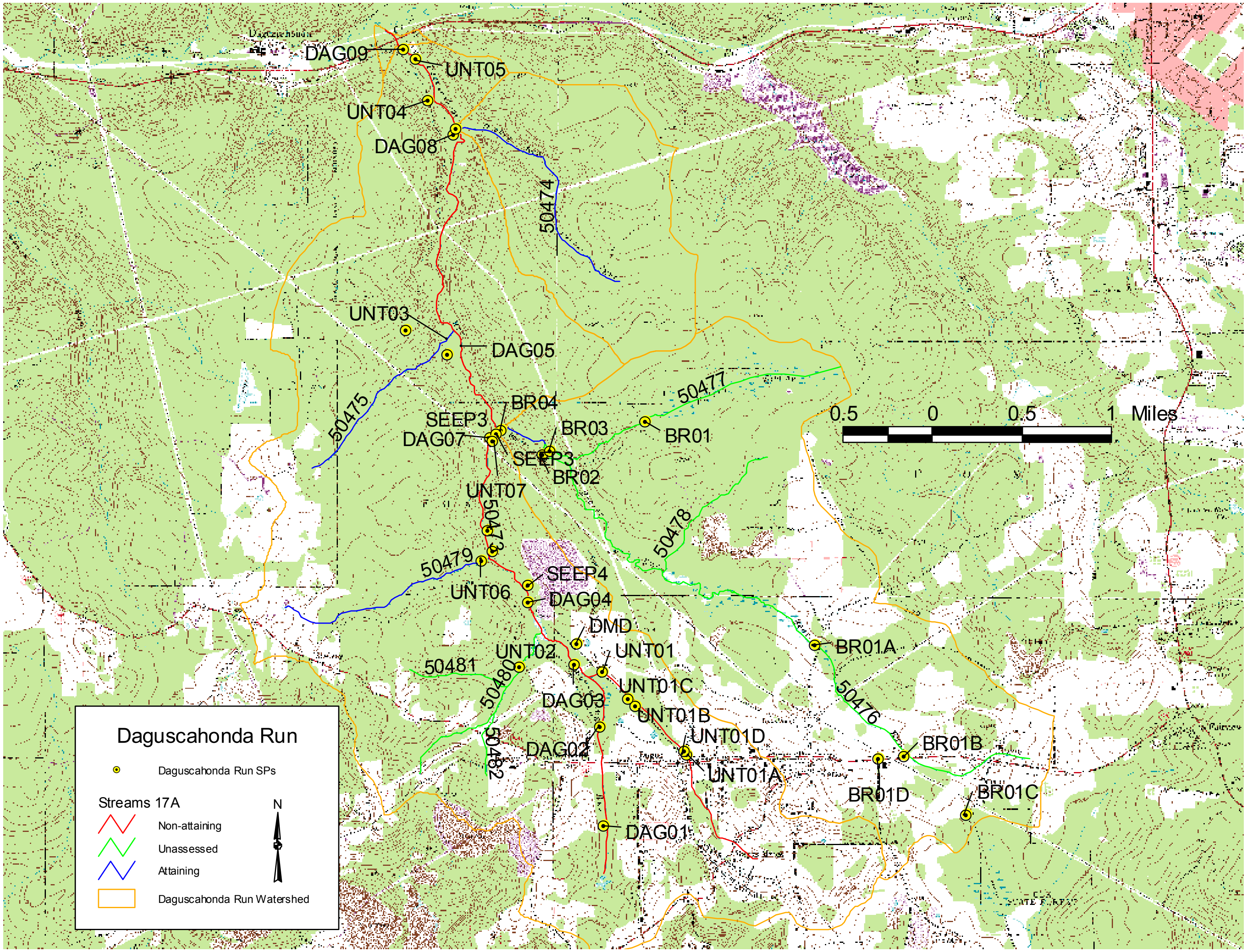
Recently Fox Township has been working with Keller Engineering to further expand and develop their industrial park, which is located in the headwaters of Beaver Run, in the area of sample point BR01C. Fox Township and Keller want to treat the low flow AMD discharge, BR01C, with a passive treatment system as part of the development of the industrial park. Currently Keller Engineering is working on the wetland delineation and mitigation with Pennsylvania Department of Environmental Protection and the Army Corps of Engineers.

Public Participation

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* and the Ridgway Record on December 7 & 8, 2004 to foster public comment on the allowable loads calculated. A public meeting was held on December 15, 2004 beginning at 6:00 p.m., at the Elk County Court House Annex in Ridgway, PA, to discuss the proposed TMDL.

Attachment A

Daguscahonda Run Watershed Map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SEEP3
BR03
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BR02
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UNT06
DAG04
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UNT01C
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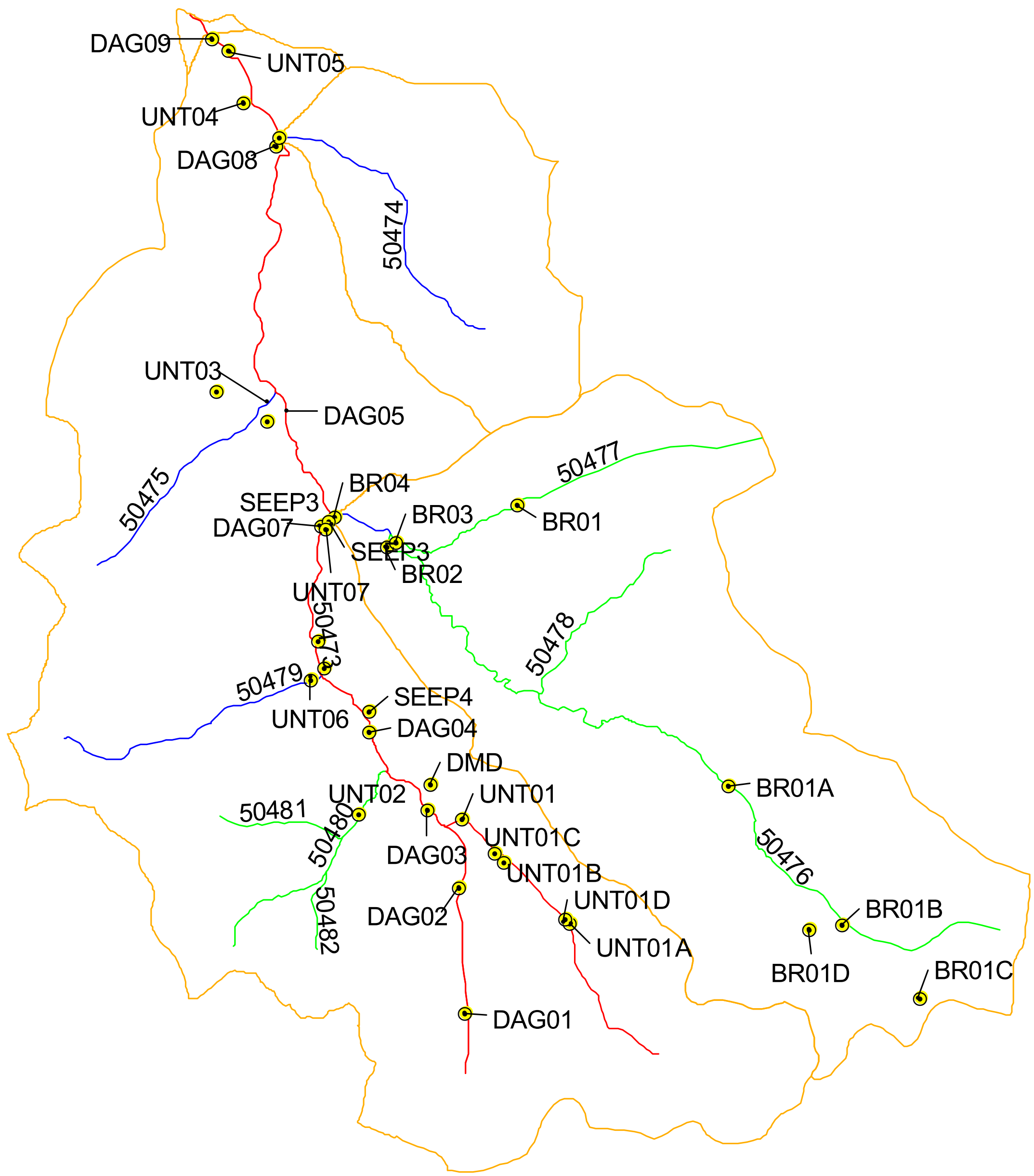
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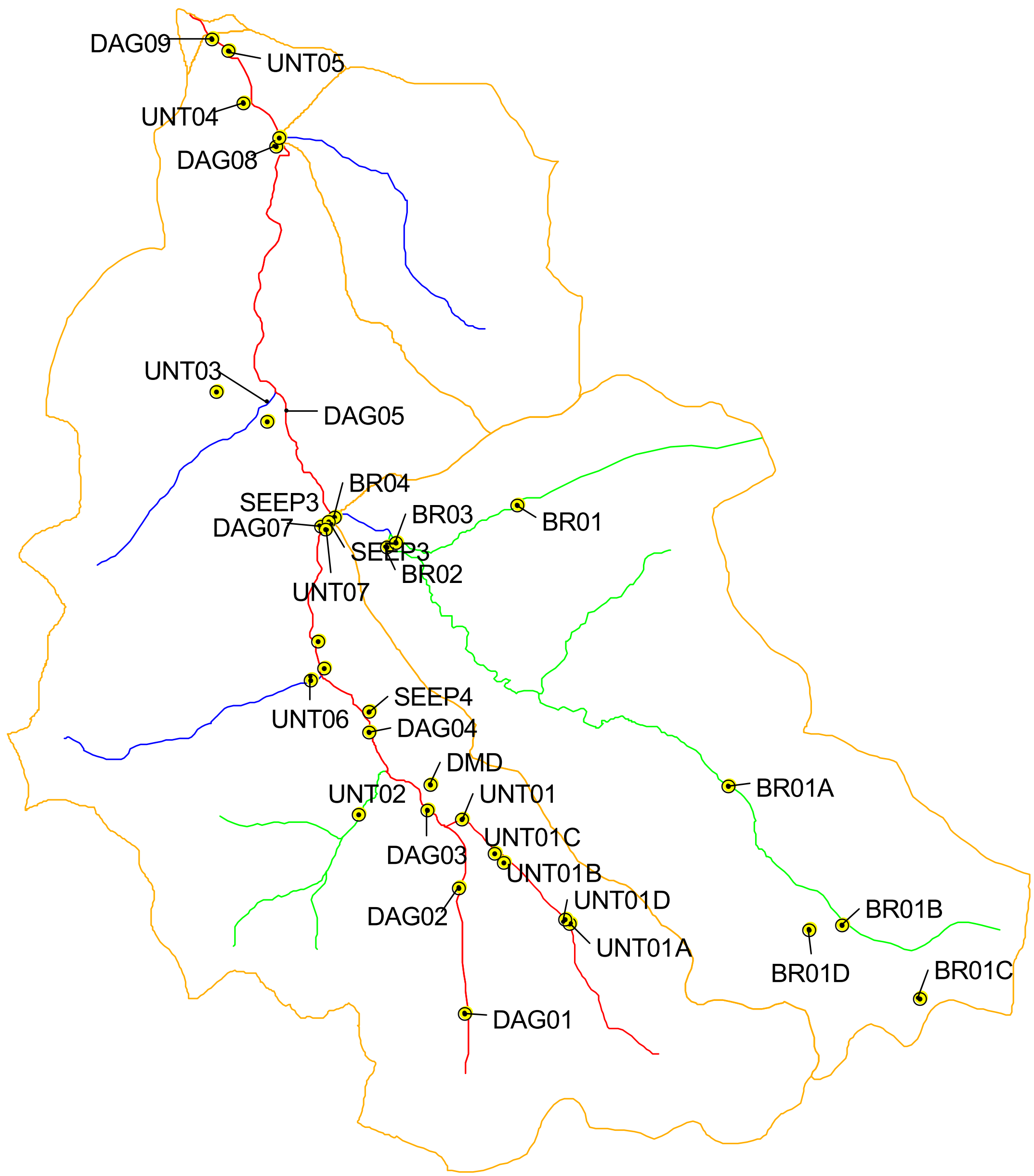
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UNT01B
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DAG02
UNT01A
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Attachment B

Method for Addressing Section 303(d) Listings for pH

Method for Addressing 303(d) Listings for pH

There has been a great deal of research conducted on the relationship between alkalinity, acidity, and pH. Research published by the Pa. Department of Environmental Protection demonstrates that by plotting net alkalinity (alkalinity-acidity) vs. pH for 794 mine sample points, the resulting pH value from a sample possessing a net alkalinity of zero is approximately equal to six (Figure 1). Where net alkalinity is positive (greater than or equal to zero), the pH range is most commonly six to eight, which is within the USEPA's acceptable range of six to nine and meets Pennsylvania water quality criteria in Chapter 93.

The pH, a measurement of hydrogen ion acidity presented as a negative logarithm, is not conducive to standard statistics. Additionally, pH does not measure latent acidity. For this reason, and based on the above information, Pennsylvania is using the following approach to address the stream impairments noted on the 303(d) list due to pH. The concentration of acidity in a stream is at least partially chemically dependent upon metals. For this reason, it is extremely difficult to predict the exact pH values, which would result from treatment of abandoned mine drainage. Therefore, net alkalinity will be used to evaluate pH in these TMDL calculations. This methodology assures that the standard for pH will be met because net alkalinity is a measure of the reduction of acidity. When acidity in a stream is neutralized or is restored to natural levels, pH will be acceptable. Therefore, the measured instream alkalinity at the point of evaluation in the stream will serve as the goal for reducing total acidity at that point. The methodology that is applied for alkalinity (and therefore pH) is the same as that used for other parameters such as iron, aluminum, and manganese that have numeric water quality criteria.

Each sample point used in the analysis of pH by this method must have measurements for total alkalinity and total acidity. Net alkalinity is alkalinity minus acidity, both being in units of milligrams per liter (mg/l) $CaCO_3$. The same statistical procedures that have been described for use in the evaluation of the metals is applied, using the average value for total alkalinity at that point as the target to specify a reduction in the acid concentration. By maintaining a net alkaline stream, the pH value will be in the range between six and eight. This method negates the need to specifically compute the pH value, which for mine waters is not a true reflection of acidity. This method assures that Pennsylvania's standard for pH is met when the acid concentration reduction is met.

There are several documented cases of streams in Pennsylvania having a natural background pH below six. If the natural pH of a stream on the 303(d) list can be established from its upper unaffected regions, then the pH standard will be expanded to include this natural range. The acceptable net alkalinity of the stream after treatment/abatement in its polluted segment will be the average net alkalinity established from the stream's upper, pristine reaches added to the acidity of the polluted portion in question. Summarized, if the pH in an unaffected portion of a stream is found to be naturally occurring below six, then the average net alkalinity for that portion (added to the acidity of the polluted portion) of the stream will become the criterion for the polluted portion. This "natural net alkalinity level" will be the criterion to which a 99 percent confidence level will be applied. The pH range will be varied only for streams in which a natural unaffected net alkalinity level can be established. This can only be done for streams that have upper segments that are not impacted by mining activity. All other streams will be required to reduce the acid load so the net alkalinity is greater than zero 99% of time.

Reference: *Rose, Arthur W. and Charles A. Cravotta, III 1998. Geochemistry of Coal Mine Drainage. Chapter 1 in Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania. Pa. Dept. of Environmental Protection, Harrisburg, Pa.*

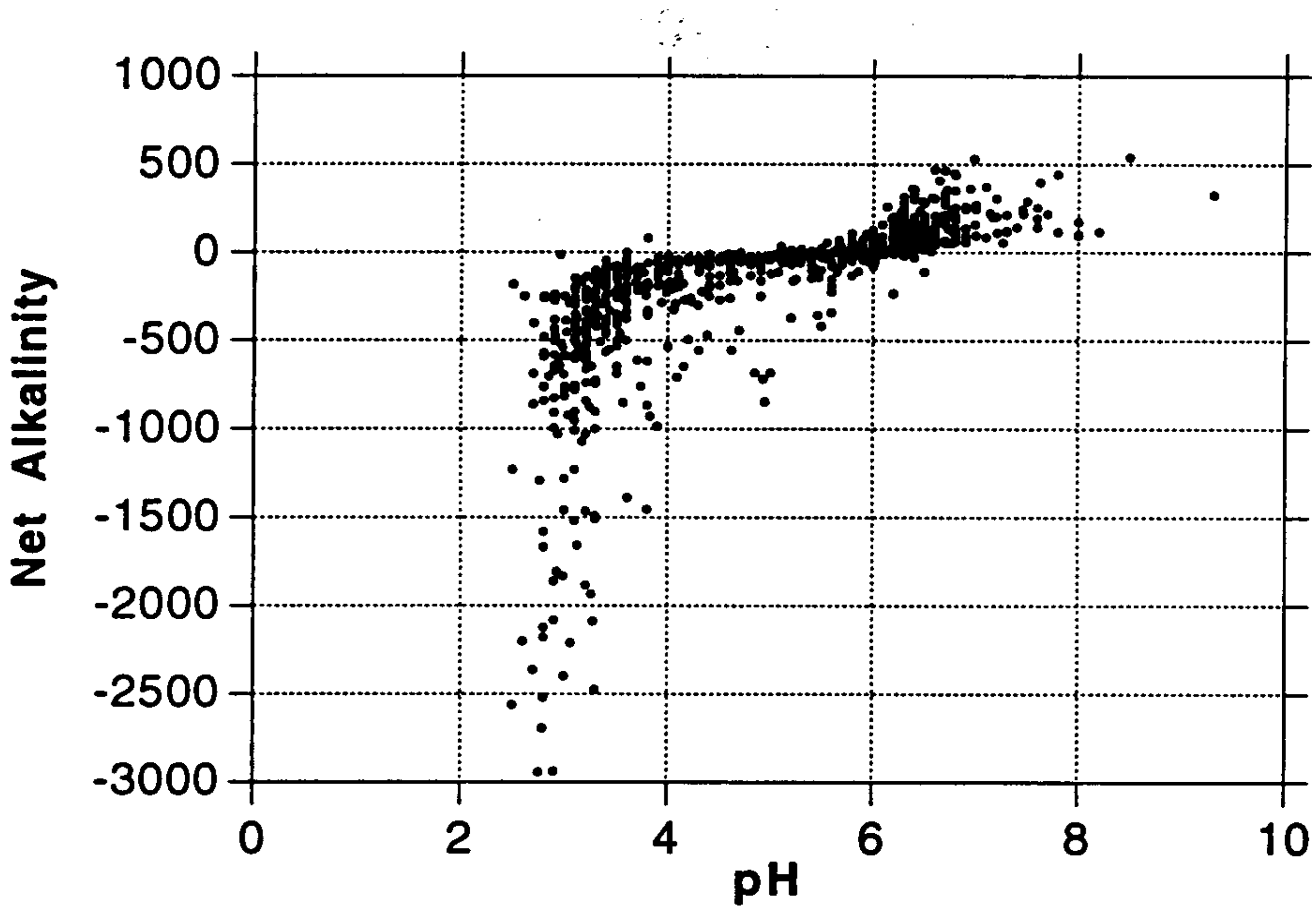

Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Attachment C

TMDLs By Segment

Daguscahonda Run

The TMDL for Daguscahonda Run consists of load allocations for eighteen sampling sites along Daguscahonda Run, Beaver Run and various unnamed tributaries.

Daguscahonda Run is listed for metals from AMD as being the cause of the degradation to the stream. The method and rationale for addressing pH is contained in Attachment B.

An allowable long-term average in-stream concentration was determined at the points below for aluminum, iron, manganese and acidity. The analysis is designed to produce an average value that, when met, will be protective of the water-quality criterion for that parameter 99% of the time. An analysis was performed using Monte Carlo simulation to determine the necessary long-term average concentration needed to attain water-quality criteria 99% of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and standard deviation of the data set, 5000 iterations of sampling were completed, and compared against the water-quality criterion for that parameter. For each sampling event a percent reduction was calculated, if necessary, to meet water-quality criteria. A second simulation that multiplied the percent reduction times the sampled value was run to insure that criteria were met 99% of the time. The mean value from this data set represents the long-term average concentration that needs to be met to achieve water-quality standards.

BRO1C and BR01D Headwaters of Beaver Run (50476)

TMDLs were not calculated for these sample points. These are two seeps in the headwaters of Beaver Run, a tributary to Daguscahonda Run, and are included in the allocation at the next downstream sample point BR01B.

BR01B Beaver Run Downstream of the Seeps in the Headwaters

The TMDL for this sample point on Beaver Run consists of a load allocation to the segment upstream. The load allocation for this segment was computed using water-quality sample data collected at point BR01B. The average flow, measured at the sampling point BR01A (0.24 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BR01B shows pH ranging between 6.8 and 8.6, pH will not be addressed in this TMDL because this segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Table C1. Load Allocations for Point BR01B				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day
Aluminum	0.20	0.4	0.10	0.2
Iron	0.49	1.0	0.38	0.8
Manganese	0.23	0.5	0.23	0.5
Acidity	2.76	5.6	2.76	5.6
Alkalinity	69.0	138.6		

Table C2. Calculation of Load Reduction Necessary at Point BR01B				
	Al	Fe	Mn	Acidity
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
Existing Load	0.4	1.0	0.5	5.6
Allowable Load=TMDL	0.2	0.8	0.5	5.6
Load Reduction	0.2	0.2	0.0	0.0
Total % Reduction	51	22	0	0

BR01A Beaver Run (50476) Downstream of Sample Point BR01B

The TMDL for this segment of Beaver Run consists of a load allocation to all of the watershed area upstream of sample point BR01A. The load allocation for this segment was computed using water-quality sample data collected at point BR01A. The average flow, measured at the sampling point BR01A (0.20 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BR01A shows pH ranging between 5.4 and 7.3, pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C3. Load Allocations at Point BR01A				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.55	0.9	0.12	0.2
Iron	1.14	1.9	0.22	0.4
Manganese	0.73	1.2	0.19	0.3
Acidity	5.38	8.9	3.60	6.0
Alkalinity	30.49	50.5		

The calculated load reductions for all the loads that enter point BR0IA must be accounted for in the calculated reductions at sample point BR0IA shown in Table C4. A comparison of measured loads between points BR0IB, and BR0IA shows that there is additional loading entering the segment for aluminum, iron, manganese and acidity. The total segment aluminum, iron, manganese, and acidity load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C4 Calculation of Load Reduction at Point BR01A				
	Al	Fe	Mn	Acidity
Existing Load	0.9	1.9	1.2	8.9
Difference in Existing Load between BR01B & BR01A	0.5	0.9	0.8	3.4
Load tracked from BR01B	0.2	0.8	0.5	5.6
Total Load tracked between points BR01B & BR01A	0.7	1.7	1.2	8.9
Allowable Load at BR01A	0.2	0.4	0.3	6.0
Load Reduction at BR01A	0.5	1.3	0.9	2.9
% Reduction required at BR01A	72	79	74	33

BR02 Beaver Run Upstream of Confluence with Unnamed Tributary (50477) to Beaver Run

The TMDL for sampling point BR02 consists of a load allocation of the area between sample points BR01A and BR02. The load allocation for this tributary was computed using water-quality sample data collected at point BR02. The average flow, measured at the sampling point BR02 (4.25 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BR02 shows pH ranging between 5.5 and 6.8, pH will be addressed in this TMDL because or the affects of mining. The method and rationale for addressing pH is contained in Attachment B.

Table C5. Load Allocations at Point BR02				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.50	17.8	0.34	12.1
Manganese	0.19	6.9	0.19	6.9
Acidity	13.57	480.9	1.63	57.7
Alkalinity	11.29	399.9		

The calculated load reductions for all the loads that enter point BR02 must be accounted for in the calculated reductions at sample point BR02 shown in Table C6. A comparison of measured loads between points BR0IA, and BR02 shows that there is no additional loading entering the segment for aluminum and manganese. For aluminum and manganese the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is an increase in iron and acidity loading within the segment. The total segment load for iron and acidity is the sum on the upstream allocated loads and any additional loading within the segment.

Table C6. Calculation of Load Reduction at Point BR02				
	Al	Fe	Mn	Acidity
Existing Load	ND	17.8	6.9	480.9
Difference in Existing Load between BR01A & BR02	-	15.9	5.7	472.0
Load tracked from BR01A	-	0.4	0.3	6.0
Percent loss due to instream process	-	-	-	-
Percent load tracked from BR01A	-	-	-	-
Total Load tracked from BR01A	-	16.3	6.0	478.0
Allowable Load at BR02	NA	12.1	6.9	57.7
Load Reduction at BR02	0.0	4.2	0.0	420.3
% Reduction required at BR02	0.0	26	0	88

BR01 Unnamed Tributary (50477) to Beaver Run

The TMDL for this unnamed tributary of Beaver Run consists of a load allocation to the segment upstream. The load allocation for this segment was computed using water-quality sample data collected at point BR01. The average flow, measured at the sampling point BR01 (0.85 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BR01 shows pH ranging between 4.4 and 4.7, pH will be addressed in this TMDL because of the mining impacts. The method and rationale for addressing pH is contained in Attachment B.

Table C7. Load Allocations for Point BR01				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.53	3.7	0.28	2.0
Iron	0.53	3.8	0.20	1.4
Manganese	0.24	1.7	0.24	1.7
Acidity	40.73	289.3	3.26	23.1
Alkalinity	5.57	39.5		

Table C8. Calculation of Load Reduction Necessary at Point BR01				
	Al	Fe	Mn	Acidity
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
Existing Load	3.7	3.8	1.7	289.3
Allowable Load=TMDL	2.0	1.4	1.7	23.1
Load Reduction	1.7	2.4	0.0	266.2
Total % Reduction	47	62	0	92

BR03 Mouth of Unnamed Tributary (50477) Upstream of Confluence with Beaver Run

The TMDL for this unnamed tributary of Beaver Run consists of a load allocation to all of the watershed area upstream of sample point BR03. The load allocation for this segment was computed using water-quality sample data collected at point BR03. The average flow, measured at the sampling point BR03 (1.21 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BR03 shows pH ranging between 4.1 and 4.4, pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C9. Load Allocations at Point BR03				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.13	1.3	0.08	0.8
Iron	0.24	2.4	0.23	2.3
Manganese	0.21	2.2	0.21	2.2
Acidity	45.12	456.6	2.71	27.4
Alkalinity	3.80	38.5		

The calculated load reductions for all the loads that enter point BR03 must be accounted for in the calculated reductions at sample point BR03 shown in Table C10. A comparison of measured loads between points BR01, and BR03 shows that there is no additional loading entering the segment for aluminum, iron and manganese. For aluminum, iron and manganese the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is an increase in acidity loading within the segment. The total segment acidity load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C10. Calculation of Load Reduction at Point BR03				
	Al	Fe	Mn	Acidity
Existing Load	1.3	2.4	2.2	456.6
Difference in Existing Load between BR01 & BR03	-2.4	-1.3	0.5	167.3
Load tracked from BR01	2.0	1.4	1.7	23.1
Percent loss due to instream process	65	35	-	-
Percent load tracked from BR01	35	65	-	-
Total Load tracked between points BR01	0.7	0.9	2.2	190.4
Allowable Load at BR03	0.8	2.3	2.2	27.4
Load Reduction at BR03	0.0	0.0	0.0	163.0
% Reduction required at BR03	0	0	0	86

BR04 Unnamed Tributary (50477) Upstream of Confluence with Beaver Run

The TMDL for sampling point BR04 consists of a load allocation of the area between sample points BR02, BR03, and BR04. The load allocation for this tributary was computed using water-quality sample data collected at point BR04. The average flow, measured at the sampling point BR04 (6.58 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BR04 shows pH ranging between 5.2 and 6.6, pH will be addressed in this TMDL because of the affects of mining. The method and rationale for addressing pH is contained in Attachment B.

Table C11. Load Allocations at Point BR04				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.32	17.8	0.24	13.0
Manganese	0.19	10.4	0.19	10.4
Acidity	29.09	1595.8	2.62	143.6
Alkalinity	8.63	473.4		

The calculated load reductions for all the loads that enter point BR04 must be accounted for in the calculated reductions at sample point BR04 shown in Table C12. A comparison of measured loads between points BR02, BR03, and BR04 shows that there is no additional loading entering the segment for aluminum. For aluminum the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is an increase in iron, manganese and acidity loading within the segment. The total segment iron, manganese and acidity load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C12. Calculation of Load Reduction at Point BR04				
	Al	Fe	Mn	Acidity
Existing Load	ND	17.8	10.3	1595.9
Difference in Existing Load between BR02, BR03 & BR04	-	-2.4	1.3	658.3
Load tracked from BR02 & BR03	-	51.9	46.5	174.1
Percent loss due to instream process	-0	12	-	-
Percent load tracked from BR02 & BR03	-	88	-	-
Total Load tracked between points BR02 & BR03	-	45.7	47.9	832.4
Allowable Load at BR04	NA	13.0	10.4	143.6
Load Reduction at BR04	0.0	32.7	37.5	688.8
% Reduction required at BR04	0	72	78	83

DAG01 Headwaters of Daguscahonda Run

An allocation was not calculated for this segment of Daguscahonda Run because only two samples were collected, there was no flow data collected and the metals data were all below Detection.

DAG02 First Sample Point Downstream of DAG01

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point DAG02 shows pH ranging between 6.0 and 6.9, pH will not be addressed in this TMDL because this segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

The TMDL for this segment of Daguscahonda Run consists of a load allocation to all of the watershed area upstream of sample point DAG02. The load allocation for this segment was computed using water-quality sample data collected at point DAG02. The average flow, measured at the sampling point DAG02 (0.54 MGD), is used for these computations.

Table C13. Load Allocations for Point DAG02

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	ND	ND	NA	NA
Manganese	0.04	0.2	0.04	0.2
Acidity	ND	ND	NA	NA
Alkalinity	20.30	91.9		

Table C14. Calculation of Load Reduction Necessary at Point DAG02

	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	ND	ND	0.2	ND
Allowable Load=TMDL	NA	NA	0.2	NA
Load Reduction	0.0	0.0	0.0	0.0
Total % Reduction	0	0	0	0

UNT01A Most Upstream Sample Point on Unnamed Tributary (50483) to Daguscahonda Run

The TMDL for this segment of the Unnamed Tributary to Daguscahonda Run consists of a load allocation to all of the watershed area upstream of sample point UNT01A. The load allocation for this segment was computed using water-quality sample data collected at point UNT01A. The average flow, measured at the sampling point UNT01A (0.87 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point UNT01A shows pH ranging between 6.2 and 7.4, pH will be addressed in this TMDL because the mining impacts. The method and rationale for addressing pH is contained in Attachment B.

Table C15. Load Allocations for Point UNT01A				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.63	4.5	0.11	0.8
Iron	1.03	7.5	0.45	3.3
Manganese	0.55	4.0	0.49	3.5
Acidity	12.09	87.7	9.43	68.4
Alkalinity	56.89	412.8		

Table C16. Calculation of Load Reduction Necessary at Point UNT01A				
	Al	Fe	Mn	Acidity
	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)
Existing Load	4.5	7.5	4.0	87.7
Allowable Load=TMDL	0.8	3.3	3.5	68.4
Load Reduction	3.7	4.2	0.5	19.3
Total % Reduction	83	56	11	22

UNT01D, UNT01B, and UNT01C

No allocations were calculated for these sample points because one sample was collected at each. The next downstream sample point. UNT01, includes these seeps.

UNT01 Unnamed Tributary (50483) to Daguscahonda Run

The TMDL for this segment of the Unnamed Tributary to Daguscahonda Run consists of a load allocation to all of the watershed area upstream of sample point UNT01. The load allocation for this segment was computed using water-quality sample data collected at point UNT01. The average flow, measured at the sampling point UNT01 (1.32 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point UNT01 shows pH ranging between 5.7 and 7.0, pH will not be addressed in this TMDL because of the variability of the acidity. The acidity varied from zero to 61.8 but five of the eight samples were zero. The method and rationale for addressing pH is contained in Attachment B.

Table C17. Load Allocation at Point UNT01				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.50	5.5	0.10	1.1
Iron	3.49	38.5	0.21	2.3
Manganese	3.63	40.1	0.18	2.0
Acidity	11.00	121.4	0.00	0.0
Alkalinity	47.83	527.9		

The calculated load reductions for all the loads that enter point UNT01 must be accounted for in the calculated reductions at sample point UNT01 shown in Table C18. A comparison of measured loads between points UNT01A and UNT01 shows that there is additional loading entering the segment for aluminum, iron, manganese and acidity. The total segment aluminum, iron, manganese, and acidity loads are the sum of the upstream allocated loads and any additional loading within the segment.

Table C18. Calculation of Load Reduction at Point UNT01				
	Al	Fe	Mn	Acidity
Existing Load	5.5	38.5	40.1	121.4
Difference in Existing Load between UNT01A & UNT01	1.0	31.0	36.1	33.7
Load tracked from UNT01A	0.8	3.3	3.5	68.4
Total Load tracked between points UNT01A	1.8	34.3	39.6	102.1
Allowable Load at UNT01	1.1	2.3	2.0	0.0
Load Reduction at UNT01	0.7	32.0	37.6	102.1
% Reduction required at UNT01	41	93	95	100

DAG03 Downstream of the Confluence of UNT 50483 with Daguscahonda Run

No allocations were calculated for this sample point because these samples were collected from a bridge between two wetlands and flow could not be measured.

UNT02 Near the confluence of the Unnamed Tributary 50480 with Daguscahonda Run

The TMDL for this segment of the unnamed tributary 50480 with Daguscahonda Run consists of a load allocation to all of the watershed area upstream of sample point UNT02. The load allocation for this segment was computed using water-quality sample data collected at point UNT02. The average flow, measured at the sampling point UNT02 (0.70 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point UNT02 shows pH ranging between 5.8 and 6.5, pH will be addressed in this TMDL because of the mining impacts. The method and rationale for addressing pH is contained in Attachment B.

Table C19. Load Allocations for Point UNT02				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.21	1.2	0.21	1.2
Manganese	0.28	1.6	0.28	1.6
Acidity	22.69	131.9	5.67	33.0
Alkalinity	15.37	89.3		

Table C20. Calculation of Load Reduction Necessary at Point UNT02				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	ND	1.2	1.6	131.9
Allowable Load=TMDL	NA	1.2	1.6	33.0
Load Reduction	0.0	0.0	0.0	98.9
Total % Reduction	0	0	0	75

DMD An Abandoned Mine Opening

Allocations were not calculated at this sample point because out of 37 samples only four had flow data collected.

DAG04 First Sample Point on Daguscahonda Run Downstream of UNT02

The TMDL for this unnamed tributary of Iron Run consists of a load allocation to all of the watershed area upstream of sample point DAG04. The load allocation for this segment was computed using water-quality sample data collected at point DAG04. The average flow, measured at the sampling point DAG04 (5.64 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point DAG04 shows pH ranging between 4.7 and 6.1, pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C21. Load Allocations at Point DAG04				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	2.17	102.3	0.22	10.2
Iron	4.80	226.0	0.43	20.3
Manganese	4.49	211.2	0.27	12.7
Acidity	49.47	2328.3	6.43	302.7
Alkalinity	12.43	585.2		

The calculated load reductions for all the loads that enter point DAG04 must be accounted for in the calculated reductions at sample point DAG04 shown in Table C22. A comparison of measured loads between points DAG02, UNT01, UNT02, and DAG04 shows that there is additional loading entering the segment for aluminum, iron, manganese and acidity. The total segment aluminum, iron, manganese, and acidity loads are the sum of the upstream allocated loads and any additional loading within the segment.

Table C22. Calculation of Load Reduction at Point DAG04				
	Al	Fe	Mn	Acidity
Existing Load	102.3	226.0	211.2	2328.3
Difference in Existing Load between DAG02, UNT01, UNT02 & DAG04	96.8	186.3	169.3	2073.2
Load tracked from DAG02, UNT01 & UNT02	1.1	3.5	3.8	34.8
Total Load tracked between points DAG02, UNT01 & UNT02	97.9	189.8	173.2	2108.0
Allowable Load at DAG04	10.2	20.3	12.7	302.7
Load Reduction at DAG04	87.6	169.5	160.5	1805.3
% Reduction required at DAG04	90	89	93	86

Seep4 Downstream of DAG04 on Daguscahonda Run

Allocations were not calculated at this sample point because only one sample was collected.

UNT06 Unnamed Tributary (50479) to Daguscahonda Run

The TMDL for this segment of the unnamed tributary, 50479, to Daguscahonda Run consists of a load allocation to all of the watershed area upstream of sample point UNT06. The load allocation for this segment was computed using water-quality sample data collected at point UNT06. The average flow, measured at the sampling point UNT06 (1.08 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point UNT06 shows pH ranging between 5.5 and 6.5, pH will be addressed in this TMDL because of the mining impacts. The method and rationale for addressing pH is contained in Attachment B.

Table C23. Load Allocations for Point UNT06				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	ND	ND	NA	NA
Manganese	0.05	0.5	0.05	0.5
Acidity	7.40	66.7	2.52	22.7
Alkalinity	10.13	91.3		

Table C24. Calculation of Load Reduction Necessary at Point UNT06				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	ND	ND	0.5	66.7
Allowable Load=TMDL	NA	NA	0.5	22.7
Load Reduction	0.0	0.0	0.0	44.0
Total % Reduction	0	0	0	66

Seep1 AND Seep2 Downstream of UNT06

No allocations were calculated for this sample point because only two samples were collected.

UNT07 Low Flow Seep from the Hillside Upstream of BR04

No allocations were calculated for this sample point because only four samples were collected.

DAG07 Daguscahonda Run Upstream of the Confluence with Beaver Run

The TMDL for sampling point DAG07 consists of a load allocation of the area between sample points UNT06, DAG04 and DAG07. The load allocation for this tributary was computed using water-quality sample data collected at point DAG07. The average flow, measured at the sampling point DAG07 (3.67 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point DAG07 shows pH ranging between 3.5 and 5.8, pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C25. Load Allocations at Point DAG07				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	3.21	98.2	0.19	5.9
Iron	2.75	84.0	1.04	31.9
Manganese	7.32	223.9	0.22	6.7
Acidity	58.60	1791.3	1.76	53.7
Alkalinity	5.15	157.4		

The calculated load reductions for all the loads that enter point DAG07 must be accounted for in the calculated reductions at sample point DAG07 shown in Table C26. A comparison of measured loads between points UNT06, DAG04 and DAG07 shows that there is no additional loading entering the segment for iron. For iron the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is an increase in loading entering the segment for aluminum, manganese and acidity. To determine the total segment aluminum, manganese and acidity loads is the sum of the upstream allocated loads and any additional loading within the segment.

Table C26. Calculation of Load Reduction at Point DAG07				
	Al	Fe	Mn	Acidity
Existing Load	98.2	84.0	223.9	1791.3
Difference in Existing Load between UNT06, DAG04 & DAG07	-4.1	-142.0	12.1	-603.7
Load tracked from UNT06 & DAG04	10.2	20.3	13.2	325.4
Percent loss due to instream process	4	63	-	25
Percent load tracked from BR02 & BR03	96	37	-	75
Total Load tracked between points UKNT06 & DAG04	9.8	7.6	25.3	243.3
Allowable Load at DAG07	5.9	31.9	6.7	53.7
Load Reduction at DAG07	3.9	0.0	18.6	189.6
% Reduction required at DAG07	40	0	73	78

SEEP3 Daguscahonda Run Upstream of the Confluence with Beaver Run and Downstream of DAG07

No allocations were calculated at this sample point because only two samples were collected.

DAG05 Daguscahonda Run Upstream of Sample Point UNT03 on Unnamed Tributary 50475

The TMDL for sampling point DAG05 consists of a load allocation of the area between sample points BR04, DAG07 and DAG05. The load allocation for this tributary was computed using water-quality sample data collected at point DAG05. The average flow, measured at the sampling point DAG05 (7.80 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point DAG05shows pH ranging between 3.8 and 5.5, pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C27. Load Allocations at Point DAG05

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	1.21	78.6	0.18	11.8
Iron	1.25	81.5	0.69	44.8
Manganese	2.84	184.8	0.20	12.9
Acidity	44.51	2894.6	2.67	173.7
Alkalinity	5.83	379.0		

The calculated load reductions for all the loads that enter point DAG05 must be accounted for in the calculated reductions at sample point DAG05 shown in Table C28. A comparison of measured loads between points BR04, DAG07 and DAG05 shows that there is no additional loading entering the segment for aluminum, iron, and acidity. For aluminum, iron, and acidity the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is an increase in loading entering the segment for manganese. To determine the total segment manganese load is the sum of the upstream allocated load and any additional loading within the segment.

Table C28. Calculation of Load Reduction at Point DAG05				
	Al	Fe	Mn	Acidity
Existing Load	78.6	81.5	184.8	2894.6
Difference in Existing Load between BR04, DAG07 & DAG05	-19.7	-20.3	-49.4	-492.5
Load tracked from BR04 & DAG07	5.9	44.9	17.1	197.4
Percent loss due to instream process	20	20	21	15
Percent load tracked from BR04 & DAG07	80	80	79	85
Total Load tracked between points BR04, DAG07 & DAG05	4.71	35.9	13.58	168.7
Allowable Load at DAG05	11.8	44.8	12.9	173.7
Load Reduction at DAG05	0.0	0.0	0.5	0.0
% Reduction required at DAG05	0	0	4	0

UNT03 Unnamed Tributary, 50475, Upstream of Confluence with Daguscahonda Run and Downstream of DAG05

The TMDL for sampling point UNT03 consists of a load allocation to the area upstream of sample point UNT03. The load allocation for this tributary was computed using water-quality sample data collected at point UNT03. The average flow, measured at the sampling point UNT03 (2.20 MGD), is used for these computations.

There currently is no entry for this segment on the Section Pa 303(d) list for impairment due to pH. Sample data at point UNT03 shows pH ranging between 4.9 and 6.5; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C29. Load Allocations at Point UNT03				
	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.09	1.6	0.07	1.4
Iron	0.05	0.9	0.05	0.9
Manganese	0.12	2.2	0.12	2.2
Acidity	7.51	137.6	3.01	55.0
Alkalinity	8.29	151.7		

Table C30. Calculation of Load Reduction Necessary at Point UNT03				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	1.6	0.9	2.2	137.6
Allowable Load=TMDL	1.4	0.9	2.2	55.0
Load Reduction	0.2	0.0	0.0	82.6
Total % Reduction	14	0	0	60

DAG08 Daguscahonda Run Upstream of the Confluence of the Unnamed Tributary 50474

The TMDL for sampling point DAG08 consists of a load allocation of the area between sample points UNT03, DAG05 and DAG08. The load allocation for this segment was computed using water-quality sample data collected at point DAG08. The average flow, measured at the sampling point DAG08 (20.44 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point DAG08 shows pH ranging between 4.3 and 5.6, pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C31. Load Allocations at Point DAG08				
	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	1.28	218.5	0.14	24.0
Iron	0.61	104.6	0.41	70.1
Manganese	3.11	530.1	0.19	31.8
Acidity	47.11	8033.2	4.24	723.0
Alkalinity	6.17	1052.3		

The calculated load reductions for all the loads that enter point DAG08 must be accounted for in the calculated reductions at sample point DAG08 shown in Table C32. A comparison of measured loads between points BR04, DAG07 and DAG05 shows that there is no additional loading entering the segment for iron. For iron the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is an increase in loading entering the segment for aluminum, manganese and acidity. To determine the total segment aluminum, manganese and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

Table C32. Calculation of Load Reduction at Point DAG08				
	Al	Fe	Mn	Acidity
Existing Load	218.5	104.6	530.1	8033.2
Difference in Existing Load between DAG05, UNT03 & DAG08	138.4	22.2	343.1	5000.9
Load tracked from DAG05, & UNT03	13.1	45.7	15.2	228.7
Total Load tracked between points DAG05, UNT03 & DAG08	151.5	67.9	358.2	5229.6
Allowable Load at DAG08	24.0	70.1	31.8	723.0
Load Reduction at DAG08	127.5	0.0	326.4	4506.7
% Reduction required at DAG08	84	0	91	86

DR Decker Run (50474), a Tributary to Daguscahonda Run, Downstream of DAG08

The TMDL for Decker Run consists of a load allocation to all of the watershed area upstream of sample point DR. The load allocation for this segment was computed using water-quality sample data collected at point DR. The average flow, measured at the sampling point DR (3.69 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point DR shows pH ranging between 4.8 and 6.0, pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C33. Load Allocations at Point DR				
	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.09	2.8	0.08	2.5
Iron	ND	ND	NA	NA
Manganese	0.13	3.9	0.13	3.9
Acidity	12.60	388.2	4.28	132.0
Alkalinity	6.70	206.4		

Table C34. Calculation of Load Reduction Necessary at Point DR				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	2.8	ND	3.9	388.2
Allowable Load=TMDL	2.5	NA	3.9	132.0
Load Reduction	0.3	0.0	0.0	256.2
Total % Reduction	10	0	0	66

UNT04 and UNT05 Unnamed Tributaries to Daguscahonda Run

Allocations were not calculated for these Unts because insufficient flow data were collected at each sample point.

DAG09 Daguscahonda Run Upstream of the Confluence with Elk Creek

The TMDL for this segment of Daguscahonda Run consists of a load allocation to all of the watershed area between sample points DAG08, DR, and DAG09. The load allocation for this segment was computed using water-quality sample data collected at point DAG09. The average flow, measured at the sampling point DA09 (12.97 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point DAG09 shows pH ranging between 3.7 and 5.6, pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C35. Load Allocations at Point DAG09				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	1.53	165.3	0.11	11.6
Iron	0.84	90.6	0.81	87.9
Manganese	5.42	586.2	0.11	11.7
Acidity	54.45	5888.2	2.72	294.4
Alkalinity	5.63	608.3		

The calculated load reductions for all the loads that enter point DAG08 must be accounted for in the calculated reductions at sample point DAG09 shown in Table C36. A comparison of measured loads between points DAG08. DR, and DAG09 show that there is no additional iron loading entering the segment. For and iron the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is additional loading entering the segment for aluminum, manganese and acidity. The total segment aluminum, manganese and acidity load is the sum of the upstream allocated loads and any additional loading within the segment.

Table C36 Calculation of Load Reduction at Point DAG09				
	Al	Fe	Mn	Acidity
Existing Load	165.3	90.6	586.2	5888.2
Difference in Existing Load between DR, DAG08 & DAG09	-56.0	-14.0	52.2	-2533.2
Load tracked from DR & DAG08	26.5	70.1	35.7	855.0
Percent loss due to instream process	25	13	-	30
Percent load tracked from BR & DAG08	75	87	-	70
Total Load tracked between points DR & DAG08	19.82	60.7	87.9	597.8
Allowable Load at DAG09	11.6	87.9	11.7	294.4
Load Reduction at DAG09	8.3	0.0	76.2	303.4
% Reduction required at DAG09	42	0	87	51

Margin of Safety (MOS)

PADEP used an implicit MOS in these TMDLs derived from the Monte Carlo statistical analysis. The Water-Quality standard states that water-quality criteria must be met at least 99% of the time. All of the @Risk analyses results surpass the minimum 99% level of protection. Another margin of safety used for this TMDL analysis results from:

- Effluent variability plays a major role in determining the average value that will meet water-quality criteria over the long-term. The value that provides this variability in our analysis is the standard deviation of the dataset. The simulation results are based on this variability and the existing stream conditions (an uncontrolled system). The general assumption can be made that a controlled system (one that is controlling and stabilizing the pollution load) would be less variable than an uncontrolled system. This implicitly builds in a margin of safety.

- A MOS is added when the calculations were performed with a daily iron average instead of the 30-day average.

Seasonal Variation

Seasonal variation is implicitly accounted for in these TMDLs because the data used represent all seasons.

Critical Conditions

The reductions specified in this TMDL apply at all flow conditions. A critical flow condition could not be identified from the data used for this analysis.

Attachment D

Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists

The following are excerpts from the Pennsylvania DEP 303(d) narratives that justify changes in listings between the 1996, 1998, draft 2000, and Draft 2002 list. The 303(d) listing process has undergone an evolution in Pennsylvania since the development of the 1996 list.

In the 1996 303(d) narrative, strategies were outlined for changes to the listing process. Suggestions included, but were not limited to, a migration to a Global Information System (GIS), improved monitoring and assessment, and greater public input.

The migration to a GIS was implemented prior to the development of the 1998 303(d) list. As a result of additional sampling and the migration to the GIS, some of the information appearing on the 1996 list differed from the 1998 list. Most common changes included:

1. mileage differences due to recalculation of segment length by the GIS;
2. slight changes in source(s)/cause(s) due to new EPA codes;
3. changes to source(s)/cause(s), and/or miles due to revised assessments;
4. corrections of misnamed streams or streams placed in inappropriate SWP subbasins; and
5. unnamed tributaries no longer identified as such and placed under the named watershed listing.

Prior to 1998, segment lengths were computed using a map wheel and calculator. The segment lengths listed on the 1998 303(d) list were calculated automatically by the GIS (ArcInfo) using a constant projection and map units (meters) for each watershed. Segment lengths originally calculated by using a map wheel and those calculated by the GIS did not always match closely. This was the case even when physical identifiers (e.g., tributary confluence and road crossings) matching the original segment descriptions were used to define segments on digital quad maps. This occurred to some extent with all segments, but was most noticeable in segments with the greatest potential for human errors using a map wheel for calculating the original segment lengths (e.g., long stream segments or entire basins).

The most notable difference between the 1998 and Draft 2000 303(d) lists are the listing of unnamed tributaries in 2000. In 1998, the GIS stream layer was coded to the named stream level so there was no way to identify the unnamed tributary records. As a result, the unnamed tributaries were listed as part of the first downstream named stream. The GIS stream coverage used to generate the 2000 list had the unnamed tributaries coded with the DEP's five-digit stream code. As a result, the unnamed tributary records are now split out as separate records on the 2000 303(d) list. This is the reason for the change in the appearance of the list and the noticeable increase in the number of pages. After due consideration of comments from EPA and PADEP on the Draft 2000 Section 303(d) list, the Draft 2002 Pa Section 303(d) list was written in a manner similar to the 1998 Section 303(d) list.

Attachment E

Water Quality Data Used In TMDL Calculations

Project ID: Daguscahonda			Mine Seep at Headwaters of Beaver Run above BR01B					
Monitoring Point: BR01C								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 296	3/25/2003	32	3.4	0	91	5.01	1.78	6.69
4251 433	6/10/2003	15	2.9	0	176.6	10.6	3.42	11.8
4251 730	10/10/2003	20	2.9	0	235.4	19.1	4.58	16
4251 824	12/18/2003	8.5	3	0	269	27.1	6.01	20.1
4251 839	3/9/2004	27	3.4	0	66.6	3.98	1.74	4.59
	avg=	20.50	3.12	0.00	167.72	13.16	3.51	11.84
	stdev=				88.07	9.83	1.84	6.42

Project ID: Daguscahonda			Unt to Beaver Run @ Rt 948, above confluence with BR01B - Mine Seep					
Monitoring Point: BR01D								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 732	10/10/2003	60	2.8	0	225.8	14.3	5.84	14.3
4251 823	12/18/2003	105	3	0	151.6	7.6	4.94	11.2
4251 838	3/9/2004	277	3.3	0	79.6	3.04	3.32	6.04
4251 013	5/25/2004	153	3.1	0	122.6	4.06	4.41	8.64
	avg=	148.75	3.05	0	144.9	7.25	4.6275	10.045
	stdev=				61.51	5.09	1.05	3.53

Project ID: Daguscahonda			Beaver Run where it crosses Route 948					
Monitoring Point: BR01B								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
	2/7/1987	4	8.2	112	0	0.17	0.29	
	3/19/1987	25	7.8	70	0	0.07	0.09	
	4/8/1987	50	7.6	48	2	0.23	0.12	
	5/27/1987	30	7.6	86	0	0.92	0.35	
	6/25/1987		7.7	80	0	0.48	0.26	
	7/1/1987	6	8	82	0	0.29	0.18	
	8/1/1987	8	8.1	92	0	0.29	0.15	
	2/7/1990	22	7.3	50	1	0.07	0.02	
	6/6/1990	20	8	76	0	0.27	0.06	
	9/5/1990	12	6.6	92	0	0.11	0.14	
	12/10/1990	17	7.5	56	0	0.43	0.06	
	3/20/1990	22	7.6	70	0	0.23	0.08	
	6/5/1991	7	7.6	194	0	0.92	0.38	
	12/4/1991		7	64	0	0.38	0.14	
4251 140	8/13/2002		7.1	72	0	1.24	0.606	0
4251 222	11/13/2002		6.9	32	0	0	0.081	0
4251 287	3/18/2003		6.3	21.2	25.2	0.887	0.297	0.773
4251 432	6/10/2003	694	7.2	51.8	0	0.496	0.223	0
4251 731	10/10/2003	256	6.8	45	0	1.21	0.303	0
4251 825	12/18/2003	380	7	30.8	0	0.821	0.423	0
4251 837	3/9/2004	1125	6.8	23.6	29.8	0.788	0.494	0.626
	avg=	167.375	7.366667	68.971 43	2.76190 5	0.4905 71	0.2260 48	0.1998 57
	stdev=				8.27009 5	0.3824 79	0.1585 34	0.3439 49

Project ID: Daguscahonda			Headwaters of Beaver Run (upstream of LR 24012)						
Monitoring Point: BR01A & 26			Headwaters of Beaver Run (upstream of LR 24012)						
Monitoring Point	Coll ID Seq	Date Collected	Initial Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
26		2/7/1987	50	7.7	38	0	0.17	0.79	
		3/19/1987	200	6.3	6	4	0.82	0.77	
		4/8/1987	300	6.8	12	4	0.38	0.48	
		5/27/1987	250	7	20	4	0.66	0.77	
		6/25/1987		7.2	30	4	0.27	0.47	
		7/1/1987	50	7.7	34	2	0.44	0.66	
		8/1/1987	60	7.8	36	0	0.39	0.65	
		7/7/1987		5.8	8	32	2.07	1.24	1.5
		8/16/1988		6.7	46	0	0.597	0.34	1.05
		10/26/1988		6.4	19	0	0.551	0.596	1.05
		1/23/1989		6.4	14	16	2.1	0.823	2.15
		8/7/1989		7.3	50	0	0.645	0.66	0.808
		2/7/1990	75	5.4	8	8	0.35	0.48	
		3/20/1990	295	6.3	10	0	0.61	0.71	
		6/5/1990		6.8	24	0	0.504	0.627	0
		6/6/1990	62	7.2	20	2	0.28	0.15	
		7/24/1990		6.5	16	0	0.972	0.469	0.604
		9/5/1990	50	6.6	40	2	0.62	0.39	
		9/19/1990	50	7.3	54	0	0.01	0.07	
		12/10/1990	327	6.5	14	3	0.45	0.26	
		6/5/1991	25	6.8	62	0	1.59	0.56	
		12/4/1991		6	10	0	0.28	0.62	
BR01A	4251 130	7/25/2002		7	98	0	7.64	3.73	0
	4251 139	8/13/2002		7	104	0	5.92	2.98	0
	4251 223	11/13/2002		6.4	19.4	39.2	1.22	0.352	0
	4251 288	3/18/2003		6.1	14	30.4	0.344	0.307	0
	4251 431	6/10/2003		6.7	24.6	0	1.05	0.235	0
	4251 739	10/16/2003		6.7	22.8	0	1.07	0.269	0
		avg=	138.0	6.7	30.5	5.4	1.1	0.7	0.6
		stdev=				10.6802	1.69015	0.7870	0.7159

Project ID: Daguscahonda			Beaver Run Above BR03					
Monitoring Point: BR02								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 075	5/22/2002	2640	5.9	7.4	45.8	0.56	0.24	0
4251 141	8/13/2002		6.7	14.2	0	0.425	0.141	0
4251 159	8/28/2002		6.4	15	8	0	0.18	0
4251 225	11/13/2002	1518	6.7	11	0	0	0.078	0
4251 310	4/2/2003	3962	5.5	6.2	41.2	0.369	0.298	0
4251 436	6/11/2003	2358	6.8	11.4	0	1.15	0.207	0
4251 734	10/16/2003	4276	6.8	13.8	0	1.01	0.214	0
	avg=	2950.8	6.4	11.285	13.57	0.502	0.194	0
	stdev=				20.695	0.448	0.0706	0

Project ID: Daguscahonda			Unnamed Tributary to Beaver Run (from Balsam Swamp					
Monitoring Point: BR01			)					
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 131	7/25/2002		4.7	6.6	34.4	2.23	0.289	0
4251 224	11/13/2002	99	4.5	6.2	42.2	0	0.216	0.704
4251 295	3/19/2003	1617	4.4	4	26.8	0	0.234	0.69
4251 441	6/11/2003	226	4.4	4.6	49	0.3	0.169	0.626
4251 733	10/16/2003	474	4.6	6	50	0.638	0.254	0.596
4251 840	3/9/2004	541	4.6	6	42	0	0.264	0.538
	avg=	591.4	4.53333	5.5666 7	40.7333	0.528	0.2376	0.525
	stdev=				8.85679	0.8714	0.0419	0.264

Project ID: Daguscahonda			Unnamed Tributary to Beaver Run from Balsam Swamp					
Monitoring Point: BR03								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 074	5/22/2002	548	4.2	3.4	35	0	0.168	0
4251 226	11/13/2002	387	4.1	3.8	45.6	0	0.464	0.638
4251 311	4/2/2003	1189	4.2	2.6	38.4	0	0.198	0
4251 437	6/11/2003	801	4.3	3.8	50.8	0.517	0.125	0
4251 735	10/16/2003	1288	4.4	5.4	55.8	0.679	0.111	0
	avg=	842.6	4.24	3.8	45.12	0.2392	0.2132	0.127
	stdev=				8.57508	0.3325	0.1443	0.285

Project ID: Daguscahonda			Beaver Run above confluence with Daguscahonda Run					
Monitoring Point: BR04								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 024	3/6/2002		5.2	6.6	22.6	0	0.263	0
4251 073	5/22/2002	3850	5.5	6.8	49	0.407	0.201	0
4251 158	8/28/2002		6.1	11.4	13.8	0	0.136	0
4251 229	11/13/2002	1881	6.2	9.2	36.4	0	0.13	0
4251 312	4/2/2003	6480	5	5.8	35.4	0	0.265	0
4251 440	6/11/2003	3397	6.3	9	46.4	0.956	0.149	0
4251 738	10/16/2003	7235	6.6	11.6	0	0.906	0.179	0
	avg=	4568.6	5.842857	8.6285	29.0857	0.3241	0.189	0
	stdev=				17.8486	0.4406	0.0568	

Project ID: Daguscahonda			Headwaters of Daguscahonda Run					
Monitoring Point: DAG01								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 007	2/27/2002		6.4	17.8	2.6	<.3	<.05	<.5
4251 052	5/21/2002		6.3	24	0	<.3	<.05	<.5
	8/28/2002	Dry						

Project ID: Daguscahonda			Daguscahonda Run					
Monitoring Point: DAG02								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/ L
4251 008	2/27/2002		6.5	17.6	0	0	0	0
4251 053	5/21/2002	724	6.3	20	0	0	0	0
4251 215	11/13/2002		6.6	19.2	0	0	0.094	0
4251 280	3/18/2003		6	14.2	2.4	0	0.063	0
4251 435	6/10/2003	366	6.9	22.2	0	0	0.094	0
4251 728	10/10/2003	41	6.6	28.6	0	0	0	0
	avg=	377.0	6.48	20.30	0.40	0.00	0.042	0.00
	stdev=						0.043	

Project ID: Daguscahonda			Unnamed tributary to Daguscahonda Run Above UNT01					
Monitoring Point: UNT01A								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 137	8/13/2002		7.4	144	0	0.583	0.396	0
4251 214	11/13/2002		6.9	48	0	0	0.578	0
4251 279	3/18/2003	1523	6.2	22.6	26.2	0.858	0.278	0.919
4251 434	6/10/2003	371	7	53.8	0	0.97	0.629	0
4251 727	10/10/2003	21	6.8	71.2	0	1.16	0.877	0
4251 835	3/9/2004	711	6.3	18.4	33.8	2.01	0.563	2.53
4251 012	5/25/2004	395	6.9	40.2	24.6	1.63	0.499	0.935
	avg=	604.2	6.79	56.89	12.09	1.03	0.55	0.63
	stdev=				15.34	0.66	0.19	0.95

Project ID: Daguscahonda			Mine Drainage Seep into UNT01 Downstream from UNT01A					
Monitoring Point: UNT01D								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 834	3/9/2004	118	3.8	0	82.4	1.82	4.72	8.72

Project ID: Daguscahonda			**Seep Upstream UNT01C**					
Monitoring Point: UNT01B								
Coll	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
ID Seq	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
4251 476	10/20/2003	10	4.9	6.8	28.2	0.909	0.122	<.5

Project ID: Daguscahonda			**Seep Upstream from UNT01**					
Monitoring Point: UNT01C								
Coll	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
ID Seq	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
4251 745	10/20/2003	15	5	7.2	28	<.3	0.322	<.5

Project ID: Daguscahonda			**Unnamed tributary to Daguscahonda Run**					
Monitoring Point: UNT01								
Coll	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
ID Seq	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
4251 009	2/27/2002	566	6.6	50	0	2.57	2.98	0.565
4251 055	5/21/2002	1272	5.7	22	61.8	16.2	12.5	2.43
4251 155	8/27/2002		7	88	0	1.04	0.57	0
4251 218	11/13/2002		6.8	52	0	0	0.324	0
4251 282	3/18/2003		6.1	23.2	15.2	1.71	1.17	0.52
4251 442	6/11/2003		6.6	41.8	0	1.68	5.59	0
4251 744	10/20/2003		6.8	57.8	0	1.2	2.28	0
	avg=	919.0	6.5	47.8	11.0	3.49	3.63	0.50
	stdev=					5.66	4.30	0.89

Project ID: Daguscahonda			Daguscahonda Run below UNT01					
Monitoring Point: DAG03								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/ L
4251 010	2/27/2002		6.2	24	29	0.321	1.52	0
4251 056	5/21/2002		5.7	14.8	34.2	1.37	4.59	0
4251 221	11/13/2002		6.4	26	30.2	0.833	0.299	0
4251 283	3/18/2003		5.9	12	23.2	0	0.357	0
4251 443	6/11/2003		6.4	33.6	26.2	1.28	2.8	0
4251 743	10/20/2003		6.4	27.2	22.2	0	1.09	0

Project ID: Daguscahonda			Unnamed tributary to Daguscahonda Run					
Monitoring Point: UNT02								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/ L
4251 011	2/27/2002		6.1	11.6	35.6	0	0.398	0
4251 054	5/21/2002	846	5.8	11.8	21.2	0	0.362	0
4251 154	8/27/2002		6.5	28	0	0.628	0.22	0
4251 216	11/13/2002	211	6.4	14.6	31.6	0	0.253	0
4251 281	3/18/2003	654	5.8	10.8	20	0	0.324	0
4251 445	6/11/2003	418	6.2	15	26.4	0.501	0.231	0
4251 729	10/10/2003	291	6.4	15.8	24	0.323	0.196	0
	avg=	484.0	6.2	15.4	22.69	0.21	0.28	0.0
	stdev=				11.44	0.27	0.08	0.00

Project ID: Daguscahonda			Deep Mine Discharge below DAG03						
Monitoring Point: DMD			Tamburlin Bros. Coal Co. Inc. (247030046)						
Monitoring	Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
Point	ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
6	4213 695	2/2/1989		3.3	0	746	128	82.9	56.3
	4213 763	4/6/1989		3.2	0	1460	103	119	97.9
	4213 833	7/19/1989		3.1	0	726	99.5	105	86.6
	4213 899	10/10/1989		2.9	0	744	153	99	67.5
	4213 988	2/7/1990		3.2	0	530	48.4	73.3	57.1
	4213 036	4/10/1990		3.1	0	766	119	101	79.4
	4213 102	7/10/1990		3	0	744	114	104	77.8
	4213 164	10/1/1990		3.1	0	694	117	84.2	67.2
	4213 378	1/14/1991		3.2	0	782	77.9	104	86.2
	4213 517	4/16/1991		3.1	0	506	88.4	73.6	52.1
	4213 591	7/1/1991		3.1	0	580	124	77.7	49.8
	4213 693	10/15/1991		3.3	0	546	139	60.3	28.7
	4213 828	3/16/1992		3.3	0	710	103	78.6	64.1
	4213 938	6/8/1992		3.1	0	672	107	89.9	69.9
	4213 958	7/13/1992		2.8	0	606	124	78.1	56.2
	4213 048	10/7/1992		3.1	0	672	91.9	75.1	60.8
	4213 128	1/6/1993		3.5	0	710	76.5	101	94.4
	4213 246	4/26/1993		3.5	0	406	39.1	51.5	46.3
	4213 319	9/22/1993		3.2	0	496	81.2	58.3	42
	4213 329	10/5/1993		3.3	0	488	80.5	54.5	37.4
	4213 405	4/4/1994		3.5	0	650	26.9	66.1	66.1
	4213 538	7/14/1994		3.4	0	560	95.7	69.3	52.8
	4213 628	10/3/1994		3.2	0	564	75	67.9	50.9
	4213 765	4/18/1995		4.3	15	428	64	43	31
	4213 856	9/5/1995		3.2	0	710	131	63.1	38.5
	4213 932	11/2/1995		3.2	0	484	93.9	49.4	26.1
	4213 060	5/15/1996		3.5	0	608	50	65.3	61
	4213 283	4/3/1997		3.4	0	622	39.9	60.3	57.7
Monitoring	Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
Point	ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
DMD	4251 025	3/6/2002	187	3.3	0	420.4	53.9	47.8	44.7
	4251 057	5/21/2002		3.5	0	599	32	53.8	64.7
	4251 138	8/13/2002		3.1	0	558.8	76.5	56.7	46.4
	4251 156	8/27/2002		3.1	0	615.4	100	56.3	38.6
	4251 219	11/13/2002		3.2	0	391.4	65.9	37.7	25.5

	4251 284	3/18/2003		3.9	0	233	21.8	26.5	22.3
	4251 444	6/11/2003	129	3.3	0	542.6	37.2	49.9	45.2
	4251 742	10/20/2003	95	3.4	0	412.6	48.4	46.3	38.1
	4251 836	3/9/2004	217	3.6	0	309.8	22	40.8	36.6

Project ID: Daguscahonda			**Daguscahonda Run below UNT02**					
Monitoring Point: DAG04								
Coll	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
ID Seq	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
4251 012	2/27/2002		4.8	12.6	64.4	4.92	4.85	3.66
4251 160	8/28/2002	125	6.1	24	65.8	10.2	10.2	1.07
4251 220	11/13/2002	902	6	12.6	25.6	3.06	1.64	0.948
4251 286	3/18/2003	13058	5.8	10.4	35.2	0.928	0.958	0.609
4251 447	6/11/2003	2452	4.9	7	52.8	4.29	4.12	2.82
4251 740	10/20/2003	3059	4.7	8	53	5.41	5.16	3.94
	avg=	3919.2	5.4	12.4	49.47	4.80	4.49	2.17
	stdev=				16.04	3.09	3.28	1.48

Project ID: Daguscahonda			**Seep into Daguscahonda Run Below DAG04**					
Monitoring Point: SEEP4								
Coll	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
ID Seq	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
4251 058	5/21/2002		4.4	7.2	47.6	<.3	2.47	4.84

Project ID: Daguscahonda			**Unnamed tributary to Daguscahonda Run**					
Monitoring Point: UNT06								
Coll	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
ID Seq	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
4251 018	3/6/2002		5.5	10	6	0	0.052	0
4251 059	5/21/2002	1018	5.9	9.2	8.6	0	0	0
4251 217	11/13/2002	454	6.4	10	2.2	0	0	0
4251 285	3/18/2003	811	5.7	9.6	11.8	0	0.169	0
4251 446	6/11/2003	368	5.8	11.8	15.8	0	0.107	0
4251 741	10/20/2003	1102	6.5	10.2	0	0	0	0
	avg=	750.6	5.97	10.13	7.40	0	0.055	0
	stdev=				5.92	0.00	0.07	0.00

Project ID: Daguscahonda			Mine Seep into Daguscahonda Below DAG06					
Monitoring Point: SEEP1								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 020	3/6/2002		4.4	7.2	64.4	0.45	3.55	3.01
4251 061	5/21/2002	87	4.1	4	63.8	<.3	2.46	2.6

Project ID: Daguscahonda			Low Flow Seep from hillside upstream BR04					
Monitoring Point: UNT07								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 070	5/22/2002		4.5	5.6	11.8	<.3	2.85	<.5
4251 227	11/13/2002		4.4	6.4	44.4	<.3	13.5	0.927
4251 439	6/11/2003		4.5	5.2	21	<.3	3.97	<.5
4251 737	10/16/2003	349	4.6	6.4	20.6	<.3	6.27	<.5

Project ID: Daguscahonda			Daguscahonda Run above BR04					
Monitoring Point: DAG07								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 022	3/6/2002		4.7	7.6	46.8	3.03	3.14	1.94
4251 072	5/22/2002	4182	4.4	6	57.8	2.83	6.12	4.66
4251 142	8/13/2002	252	3.5	0	114.8	3.09	22.1	9.3
4251 157	8/28/2002	122	3.6	0	90.6	2.53	14.4	3.07
4251 228	11/13/2002	1530	5.2	8	40	2.92	2.43	0.76
4251 313	4/2/2002	4163	4.5	5	48.6	2.1	4.7	2.62
4251 438	6/11/2003	3181	4.8	6.4	43.8	3.34	3.55	2.14
4251 736	10/16/2003	4387	5.8	8.2	26.4	2.15	2.15	1.22
	avg=	2545.3	4.6	5.15	58.60	2.75	7.32	3.21
	stdev=				29.34	0.45	7.16	2.73

Project ID: Daguscahonda			Mine Seep below DAG07					
Monitoring Point: SEEP3								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 023	3/6/2002		5.8	20	76.2	9.67	6.76	<.5
4251 071	5/22/2002		4.7	6.6	24.2	<.3	2.41	<.5

Project ID: Daguscahonda			Daguschaonda Run above UNT03					
Monitoring Point: DAG05								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 014	2/28/2002		4.7	6.8	50.6	1.56	1.87	1.12
4251 069	5/22/2002	11194	4.6	6.4	36.2	1.49	2.81	2.21
4251 153	8/27/2002	358	3.8	0	77.2	0.423	9.75	2.87
4251 236	11/14/2002	3087	5	5.8	27	1.45	1.67	0
4251 290	3/18/2003		5.5	8.4	46.4	0.777	0.587	0.53
4251 430	6/10/2003	8721	5.5	7.2	38.8	1.42	1.34	0.79
4251 726	10/8/2003	3713	5.2	6.2	35.4	1.65	1.87	0.936
	avg=	5414.6	4.9	5.8285 7	44.514 3	1.2528 6	2.8424 3	1.208
	stdev=				16.332	0.4637	3.1178	0.995

Project ID: Daguscahonda			Unnamed tributary to Daguscahonda Run					
Monitoring Point: UNT03								
Coll	Date	Initial	pH	ALK	HOT A	FE	MN	AL
ID Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
4251 013	2/28/2002		5.1	6.8	6.4	0	0.103	0
4251 068	5/22/2002	848	4.9	6.6	10.2	0	0.097	0
4251 152	8/27/2002	4	6.5	19.8	0	0	0.146	0
4251 235	11/14/2002	216	5	5.6	6.4	0	0.099	0
4251 289	3/18/2003	7169	4.9	7.6	12	0.326	0.212	0.603
4251 429	6/10/2003	587	5	6.2	8.2	0	0.087	0
4251 725	10/8/2003	325	5	5.4	9.4	0	0.107	0
	avg=	1524.8	5.2	8.2857	7.51428	0.046	0.1215	0.086
	stdev=				3.87961	0.123	0.0440	0.227

Project ID: Daguscahonda			Daguscahonda Run above Decker Run					
Monitoring Point: DAG08								
Coll	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
ID Seq	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
4251 067	5/22/2002	14451	4.7	6.8	56	1.04	2.26	1.78
4251 143	8/13/2002	317	4.3	5.4	58.8	0	9.05	3.65
4251 151	8/27/2002	255	4.4	6.2	49.8	0	6.31	2.41
4251 234	11/14/2002	4452	5.2	5.8	38.2	0.685	1.25	0
4251 294	3/19/2003	63241	5.2	6	42.2	0.678	0.554	0
4251 428	6/10/2003	11402	5.6	7	41	0.969	1.03	0.548
4251 724	10/8/2003	5263	5.4	6	43.8	0.921	1.31	0.583
	avg=	14197.29	4.971429	6.1714	47.1143	0.613	3.1091	1.281
	stdev=				7.90262	0.440	3.261	1.381

Project ID: Daguscahonda			**Decker Run**					
Monitoring Point: DR								
Coll	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
ID Seq	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
4251 066	5/22/2002	2088	4.8	6.8	13.4	0	0.129	0
4251 150	8/27/2002		6	9.6	15.4	0	0.075	0
4251 233	11/14/2002	496	5.2	5.6	8.4	0	0.157	0
4251 293	3/19/2003	7889	4.6	5.2	14.8	0	0.165	0.543
4251 427	6/10/2003	1659	5.1	7.4	9.8	0	0.103	0
4251 723	10/8/2003	696	5.1	5.6	13.8	0	0.126	0
	avg=	2565.6	5.13333	6.7	12.6	0	0.1258	0.090
	stdev=				2.58972	0	0.0306	0.202

Project ID: Daguscahonda			**Unnamed tributary to Daguscahonda Run**					
Monitoring Point: UNT04								
Coll	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
ID Seq	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
4251 015	2/28/2002		6.5	19.8	0	0	0	0
4251 063	5/22/2002	57	5.6	7.6	8.6	0	0	0
4251 148	8/27/2002		7.1	42	0	0	0	0
4251 230	11/14/2002		6.7	17.2	0	0	0	0
4251 291	3/19/2003	404	5.6	6.6	19.4	0	0.285	0
4251 424	6/10/2003		6.7	13.2	0	0.361	0.055	0
4251 720	10/8/2003	25	6.5	14	0	0	0.05	0

Project ID: Daguscahonda			Unnamed tributary to Daguscahonda Run					
Monitoring Point: UNT05								
Coll	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
ID Seq	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
4251 017	2/28/2002		5.8	8.8	22	0.479	0.259	0
4251 065	5/22/2002		6	9.2	33.8	0	0.297	0
4251 149	8/27/2002		4.5	6.8	55.4	0	5.95	2.34
4251 232	11/14/2002	523	5.3	5.8	50.2	0.457	1.12	0
4251 426	6/10/2003		5.7	7.6	46.4	0.755	0.788	0
4251 722	10/8/2003	140	5.7	7.2	50.8	0.578	0.922	0

Project ID: Daguscahonda									
Monitoring Point: DAG09			Daguscahonda Run above confluence with Elk Creek						
		EC19	Daguscahonda Run (Elk Cr. Primary Waterbody Survey Report, 1986)						
Monitoring	**Coll**	**Date**	**Initial**	**pH**	**ALK**	**HOT A**	**FE**	**MN**	**AL**
Point	**ID Seq**	**Collected**	**Flow**	**pH units**	**MG/L**	**MG/L**	**MG/L**	**MG/L**	**MG/L**
EC19		9/22/1986		3.7	0	100	1.14	30.6	7.29
DAG09	4251 016	2/28/2002		4.9	7	45.2	0.998	1.4	0.886
	4251 064	5/22/2002	18922	4.9	6.6	48.4	0.834	1.88	1.51
	4251 147	8/27/2002	373	4.4	6.4	57.4	1.14	5.86	2.54
	4251 231	11/14/2002	5510	5.3	5.8	46.2	0.47	1.16	0
	4251 292	3/19/2003		5.2	6	38.6	0.67	0.518	0
	4251 425	6/10/2003	13656	5.6	7	44.8	0.767	0.879	0
	4251 721	10/8/2003	6561	5.5	6.2	55	0.684	1.07	0
		avg=	9004.4	4.9375	5.625	54.45	0.837	5.420	1.52
		stdev=				19.340	0.239	10.31	2.50

Attachment F

Comment and Response

Comments form Knox District Mining Office

Daguscahonda Run TMDL

Page 6, Watershed History

First Paragraph, First Line: Change the word "continued" to "occurred."

First Paragraph, Third Line: Remove the work "Known"

First Paragraph, Seventh Line: Delete the sentence: "All of these mining permits are inactive or abandoned and bonds have been forfeited."

Page 7, Watershed History

Fourth Paragraph, First Line: Change the first sentence to: "A large pile of abandoned coal refuse, known as a gob pile, was located upstream from UNT01A. The gob pile was the result of a down dip clay mined believed to have been mined by the N W Mining Company and was seeded and mulched by the Bureau of Abandoned Mines during the late 1980's.

Page 12, Recommendations

Second to last paragraph, Fifth Line: Change "Lakes watershed" to "Lake watershed."

Response:

Changes made.