Stauffer Run Watershed TMDL

Westmoreland County, Pennsylvania

Prepared by:

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

December 31, 2008

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Introduction

This Total Maximum Daily Load (TMDL) calculation has been prepared for segments in the Stauffer Run Watershed (Attachment A). The TMDL was completed to address the impairments noted on the 1996 Pennsylvania 303(d) list, required under the Clean Water Act, and covers the listed segments shown in Table 1. Metals and acidity in discharge water from abandoned coalmines cause the impairment. The TMDL addresses the three primary metals associated with abandoned mine drainage (iron, manganese, aluminum) and pH.

Table 1. 303(d) and Integrated Water Quality Report Listed Segments

State Water Plan (SWP) Subbasin: 19D

HUC: 05020006 Youghiogheny. Maryland, Pennsylvania, West Virginia

Year	Miles	Use Designation	Assessment ID	Segment ID	DEP Stream Code	Stream Name	Desig-nated Use	Data Source	Source	EPA 305(b) Cause Code
1996	1.4	*	*	4733	37927	Stauffer Run	WWF	303 (d) List	Resource Extraction	Metals
1998	1.42	*	*	4733	37927	Stauffer Run	WWF	303 (d) List	AMD	Metals
2002	1.42	*	*	990102-1030-TVP	37927	Stauffer Run	WWF	SWMP	AMD	Metals
2002	1.42	*	*	990102-1030-TVP	37927	Stauffer Run	WWF	SWMP	AMD	pH
2004	0.5	Aquatic Life	*	20040708-0900-ALF	37927	Stauffer Run	WWF	SWMP	AMD	pH
2004	0.5	Aquatic Life	*	20040708-0900-ALF	37927	Stauffer Run	WWF	SWMP	AMD	Metals
2004	1.8	Aquatic Life	*	990102-1030-TVP	37927	Stauffer Run	WWF	SWMP	AMD	pH
2004	1.8	Aquatic Life	*	990102-1030-TVP	37927	Stauffer Run	WWF	SWMP	AMD	Metals
2004	3.5	Aquatic Life	*	20040708-1100-ALF	37927	Stauffer Run	WWF	SWMP	AMD	pH
2004	3.5	Aquatic Life	*	20040708-1100-ALF	37928	Stauffer Run	WWF	SWMP	AMD	Metals
2004	0.7	Aquatic Life	*	20040708-0900-ALF	37928	UNT 37928 Stauffer Run	WWF	SWMP	AMD	pH
2004	0.7	Aquatic Life	*	20040708-0900-ALF	37928	UNT 37928 Stauffer Run	WWF	SWMP	AMD	Metals
2006	2.25	Aquatic Life	6851	20040708-1100-ALF	37927	Stauffer Run	WWF	SWMP	AMD	Metals
2006	2.25	Aquatic Life	6851	20040708-1100-ALF	37927	Stauffer Run	WWF	SWMP	AMD	pH

2006	1.78	Aquatic Life	10054	990102-1030-TVP	37927	Stauffer Run	WWF	SWMP	AMD	Metals
2006	1.78	Aquatic Life	10054	990102-1030-TVP	37927	Stauffer Run	WWF	SWMP	AMD	pH
2006	0.66	Aquatic Life	6845	20040708-0900-ALF	37928	UNT 37928 Stauffer Run	WWF	SWMP	AMD	pH
2006	0.66	Aquatic Life	6845	20040708-0900-ALF	37928	UNT 37928 Stauffer Run	WWF	SWMP	AMD	Metals
2006	0.66	Aquatic Life	6845	20040708-0900-ALF	37928	UNT 37928 Stauffer Run	WWF	SWMP	Habitat Modification	Siltation
2006	1.06	Aquatic Life	6856	20040708-1300-ALF	37930	UNT 37930 Stauffer Run	WWF	SWMP	AMD	Metals
2006	1.48	Aquatic Life	6859	20040708-1400-ALF	37931	UNT 37931 Stauffer Run	WWF	SWMP	AMD	Metals
2006	0.34	Aquatic Life	6859	20040708-1400-ALF	37932	UNT 37932 Stauffer Run	WWF	SWMP	AMD	Metals
2008	2.25	Aquatic Life	6851	*	37927	Stauffer Run	WWF	SWMP	AMD	Metals
2008	2.25	Aquatic Life	6851	*	37927	Stauffer Run	WWF	SWMP	AMD	pH
2008	1.78	Aquatic Life	10054	*	37927	Stauffer Run	WWF	SWMP	AMD	pH
2008	1.78	Aquatic Life	10054	*	37927	Stauffer Run	WWF	SWMP	AMD	Metals
2008	0.66	Aquatic Life	6845	*	37928	UNT 37928 Stauffer Run	WWF	SWMP	AMD	Metals
2008	0.66	Aquatic Life	6845	*	37928	UNT 37928 Stauffer Run	WWF	SWMP	AMD	pH
2008	0.66	Aquatic Life	6845	*	37928	UNT 37928 Stauffer Run	WWF	SWMP	Habitat Modification	Siltation
2008	1.16	Aquatic Life	6851	*	37929	UNT 37929 Stauffer Run	WWF	SWMP	AMD	Metals
2008	1.16	Aquatic Life	6851	*	37929	UNT 37929 Stauffer Run	WWF	SWMP	AMD	pH
2008	1.06	Aquatic Life	6856	*	37930	UNT 37930 Stauffer Run	WWF	SWMP	AMD	Metals
2008	1.48	Aquatic Life	6859	*	37931	UNT 37931 Stauffer Run	WWF	SWMP	AMD	Metals
2008	0.34	Aquatic Life	6859	*	37932	UNT 37932 Stauffer Run	WWF	SWMP	AMD	Metals
2008	0.49	Aquatic Life	6851	*	37933	UNT 37933 Stauffer Run	WWF	SWMP	AMD	Metals
2008	0.49	Aquatic Life	6851	*	37933	UNT 37933 Stauffer Run	WWF	SWMP	AMD	pH

Pennsylvania's 1996, 1998, and 2002 Section 303(d) lists and the 2004 and 2006 Integrated Water Quality Report were approved by the Environmental Protection Agency (EPA). The 1996 Section 303(d) list provides the basis for measuring progress under the 1997 lawsuit settlement of *American Littoral Society and Public Interest Group of Pennsylvania v. EPA.*
AMD = Abandoned Mine Drainage
RE = Resource Extraction
SWMP = Surface Water Monitoring Program
WWF = Warm Water Fisheries
The use designations for the stream segments in this TMDL can be found in PA Title 25 Chapter 93.
See Attachment D, *Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists and the 2004 and 2006 Integrated Water Quality Report.*

Directions to the Stauffer Run Watershed

Stauffer Run is a tributary to Jacobs Creek and their confluence is located at the town of Scottdale, Pennsylvania. Jacobs Creek flows to the Youghiogheny River. Scottdale is located in Westmoreland County, southwestern Pennsylvania about 50 miles southeast of Pittsburgh. Scottdale can be accessed from the north or south via United States Route 119. Take 119 to the Scottdale exit and follow Route 819 south approximately 4 miles to Scottdale. From 119 north take the Everson exit and travel north on Service Road 1029 for approximately 4 miles to Scottdale.

Scottdale is located at 40.10 N lat and 79.59 W long and can be located on the Connellsville USGS 7.5 minute quadrangle topographic map.

Segments addressed in this TMDL

The Stauffer Run Watershed is affected by pollution from AMD. The most significant portion of this pollution enters in the headwaters on the main stem, but has caused high levels of metals and acidity throughout the main stem of the Stauffer Run Watershed. Table 1 and Attachment A give an explanation and locations of the AMD allocation points.

There are currently one mining permit and one industrial permit issued in the Stauffer Run Watershed. All of the other discharges in the watershed are from abandoned mines and will be treated as non-point sources. The distinction between non-point and point sources in this case is determined on the basis of whether or not there is a responsible party for the discharge. These TMDLs will be expressed as long-term, average loadings. Due 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. See Attachment C for TMDL calculations.

Waste allocations for the Sosko Coal Co. Inc. existing mining operation were incorporated into the calculations at SR 6. Waste allocations for the Summerill Tube Corp. existing industrial operation were incorporated into the calculations at SR 1. These are the first downstream monitoring points that receive all the potential flow of treated water from the two treatment sites Sosko 001 and Summerill 001. No required reductions of these permits are necessary at this time because there are upstream non-point sources that when reduced will meet the TMDL or there is available assimilation capacity. All necessary reductions are assigned to non-point sources.

Although a TMDL for aluminum is not necessary at SR 6 because the water quality standard is met, WLAs are assigned to the 001 discharge of the Sosko Coal Co. permit. Because the standard is met for aluminum at SR 6, the actual allowed load is the water quality standard times the flow and a conversion factor at the point. For SR 6 this equals 5.57 lbs/day for aluminum. Thus, the aluminum WLA of 0.28 lbs/day for the above segment is acceptable and will not have a negative impact on water quality within the segment.

Although a TMDL for iron is not necessary at SR 1 because the water quality standard is met, WLAs are assigned to the 001 discharge of the Summerill Tube Corp. permit. Because the standard is met for iron at SR 1, the actual allowed load is the water quality standard times the flow and a conversion factor at the point. For SR 1 this equals 53.67 lbs/day for iron. Thus, the iron WLA of 1.13 lbs/day for the above segment is acceptable and will not have a negative impact on water quality within the segment.

This AMD TMDL document contains two future mining Waste Load Allocations (WLA). These WLA(s) were requested by the District Mining Office (DMO) to accommodate one or more future mining operations. The District Mining Office determined the number of and location of the future mining WLAs. This will allow faster approval of future mining permits without the time-consuming process of amending this TMDL document. All comments and questions concerning the future mining WLAs in this TMDL are to be directed to the Greensburg DMO. Future wasteload allocations are calculated using the method described for quantifying pollutant load in Attachment C.

The following are examples of what is or is not intended by the inclusion of future mining WLAs. This list is by way of example and is not intended to be exhaustive or exclusive:

1. The inclusion of one or more future mining WLAs is not intended to exclude the issuance of future non-mining NPDES permits in this watershed or any waters of the Commonwealth.
2. The inclusion of one or more future mining WLAs in specific segments of this watershed is not intended to exclude future mining in any segments of this watershed that does not have a future mining WLA.
3. The inclusion of future mining WLAs does not preclude the amending of this AMD TMDL to accommodate additional NPDES permits.

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 two 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) List and Integrated Water Quality Report 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 and/or the Integrated Water Quality Report. 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 are documented. An impaired stream must be listed on the state's 303(d) list and/or the Integrated Water Quality Report 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.

Watershed History

The Scottdale area was first settled in the late 1700s by Scottish and Irish immigrants. In the mid-1800s the area had a distillery and a large flour mill. By the 1870s, the town was incorporated and two major railroads had branches through Scottdale. The majority of the land use at that time was agricultural. The railroads were brought in to support coal mining which was just beginning to be a major industry in the area. There were large reserves of the Pittsburgh coal located around Scottdale. In the early1900s, Scottdale became a center for the production of coke for the steel industry located in Pittsburgh. The H. C. Frick Coke Company was headquartered in Scottdale and several supporting industries developed nearby. By the late 1900s, Scottdale went the way of many surrounding communities during the decline of industry in the infamous “Rust Belt”. Today, there is little industry or mining near Scottdale. The economy is supported mostly by agriculture and commerce.

Stauffer Run is a small watershed covering 5.06 sq miles. The stream is listed as a warm water fishery (WWF) in 25 PA code Chapter 93.

The watershed is located on the Allegheny Plateau in the foothills of the Appalachian Mountain Range. The topography consists of gently rolling hills. Elevations range from approximately 1300 ft. MSL in the upper watershed to 1030 ft at the confluence with Jacobs Creek.

There are no major geologic structures that influence the watershed. It is located on a small structural high area that has limited the presence of the Pittsburgh Coal to the upper edges of the watershed. Generally the strata dip from west to east at 1 degree or less.

The stratigraphy of the watershed is mostly upper Conemaugh Series, below the base of the Pittsburgh coal. This section of the Conemaugh series is barren of mineable coals for a thickness of several hundred feet. As noted above, there is a small portion of the watershed which contains abandoned Pittsburgh Coal underground mines. That is the extent of any significant coal mining in the watershed.

There are 6 sample points assigned to the Stauffer Run TMDL (see attached map). There is significant AMD entering Stauffer Run above Sample point SR 8. This is the upper most sample point sampled by the Greensburg Mining Office staff. The source/s of the AMD is abandoned Pittsburgh coal deep mines. They can be located in the "Coal Resources of Westmoreland Co. PA.". Discharges from these abandoned mines degrade Stauffer Run for most of its length. The severity of degradation lessens going downstream due to dilution, buffering capacity and precipitation of metals. The most significant discharge of AMD entering the stream seems to be limited to source/s above sample point SR 8. There is one AML discharge point listed in the inventory for this watershed.

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 described 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*

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

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 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. 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	Total Recoverable
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).

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 3 presents the estimated reductions identified for all points in the watershed. Attachment C gives detailed TMDLs by segment analysis for each allocation point.

Table 3. Summary Table– Stauffer 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 %***
SR 8	SR 8 Stauffer Run Headwaters 37927						
	Al	136.90	2.74	-	2.74	134.16	98%
	Fe	71.01	3.55	-	3.55	67.46	95%
	Mn	22.27	5.12	-	5.12	17.15	77%
	Acidity	930.99	9.31	-	9.31	921.68	99%
SR 6	SR 6 Mouth of Unnamed Tributary 37931						
	Al	ND	NA	*0.28*	NA	NA	NA
	Fe	7.04	3.94	*1.13*	2.81	3.10	44%
	Mn	11.05	4.09	*0.75*	3.34	6.96	63%
	Acidity	ND	NA	*0.00*	NA	NA	NA
SR 5	SR 5 Stauffer Run Main Stem Downstream of Confluence with SR 6						
	Al	152.40	6.10	*0.56*	5.54	12.14*	67%*
	Fe	90.51	9.96	*2.26*	7.70	10.00*	50%*
	Mn	32.91	11.19	*1.5*	9.69	0.00*	0%*
	Acidity	560.83	50.48	*0.00*	50.48	0.00*	0%*
SR 4	SR 4 Mouth of Unnamed Tributary 37930						
	Al	ND	NA	NA	NA	NA	NA
	Fe	1.24	NA	NA	NA	NA	NA
	Mn	0.55	0.48	-	0.48	0.07	12%
	Acidity	ND	NA	NA	NA	NA	NA

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
SR 2	SR 2 Mouth of Unnamed Tributary 37928						
	Al	ND	NA	NA	NA	NA	NA
	Fe	0.8	NA	NA	NA	NA	NA
	Mn	0.2	NA	NA	NA	NA	NA
	Acidity	ND	NA	NA	NA	NA	NA
SR 1	SR 1 Stauffer Run Mouth 37927						
	Al	12.0	8.4	-	8.4	0.00*	0%*
	Fe	13.0	13.0	*5.37*	7.63	0.00*	0%*
	Mn	17.0	14.7	-	14.7	0.00*	0%*
	Acidity	ND	NA	*0.00*	NA	0.00*	0%*

*Takes into account load reductions from upstream sources.
Items in italics are future waste load allocations for that stream segment.

Recommendations

The discharge/s contributing to the stream degradation above sample point SR 8 are acidic with metals and could be collected and treated chemically, passively or by a combination of the two. There is ample space available to construct treatment systems. Remediation of the most significant impacts to Stauffer Run will likely take place post construction and operation of a treatment system upstream of sample point SR 8.

There is currently no watershed group focused on the Stauffer Run Watershed area. 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.

Various methods to eliminate or treat pollutant sources and to provide a reasonable assurance that the proposed TMDLs can be met exist in Pennsylvania. These methods include PADEP's primary efforts to improve water quality through reclamation of abandoned mine lands (for abandoned mining) and through the National Pollution Discharge Elimination System (NPDES) permit program (for active mining). Funding sources available that are currently being used for projects designed to achieve TMDL reductions include the Environmental Protection Agency (EPA) 319 grant program and Pennsylvania's Growing Greener Program. Federal funding is through the Department of the Interior, Office of Surface Mining (OSM), for reclamation and mine drainage treatment through the Appalachian Clean Streams Initiative and through Watershed Cooperative Agreements.

OSM reports that nationally, of the $8.5 billion of high priority (defined as priority 1&2 features or those that threaten public health and safety) coal related AML problems in the AML inventory, $6.6 billion (78%) have yet to be reclaimed; $3.6 billion of this total is attributable to Pennsylvania watershed costs. Almost 83 percent of the $2.3 billion of coal related environmental problems (priority 3) in the AML inventory are not reclaimed.

The Bureau of Abandoned Mine Reclamation (BAMR) is Pennsylvania's primary bureau in dealing with abandoned mine reclamation (AMR) issues. BAMR has established a comprehensive plan for AMR throughout the Commonwealth. The plan prioritizes and guides reclamation efforts throughout the state and makes the most of available funds. For more information please visit (www.dep.state.pa.us/dep/deputate/minres/bamr/complan1.htm).

In developing and implementing a comprehensive plan for abandoned mine reclamation, the resources (both human and financial) of the participants must be coordinated to insure cost-effective results. The following set of principles is intended to guide this decision making process:

- Partnerships between the DEP, watershed associations, local governments, environmental groups, other state agencies, federal agencies and other groups organized to reclaim abandoned mine lands are essential to achieving AMR and abating AMD in an efficient and effective manner.

- Partnerships between AML interests and active mine operators are important and essential in reclaiming abandoned mine lands.

- Preferential consideration for the development of AML reclamation or AMD abatement projects will be given to watersheds or areas for which there is an approved rehabilitation plan. (guidance is given in Appendix B to the Comprehensive Plan).

- Preferential consideration for the use of designated reclamation moneys will be given to projects that have obtained other sources or means to partially fund the project or to projects that need the funds to match other sources of funds.

- Preferential consideration for the use of available moneys from federal and other sources will be given to projects where there are institutional arrangements for any necessary long-term operation and maintenance costs.

- Preferential consideration for the use of available moneys from federal and other sources will be given to projects that have the greatest worth.

- Preferential consideration for the development of AML projects will be given to AML problems that impact people over those that impact property.

- No plan is an absolute; occasional deviations are to be expected.

A detailed decision framework is included in the plan that outlines the basis for judging projects for funding, giving high priority to those projects whose cost/benefit ratios are most favorable and those in which stakeholder and landowner involvement is high and secure.

In addition to the abandoned mine reclamation program, regulatory programs also are assisting in the reclamation and restoration of Pennsylvania’s land and water. PADEP has been effective in implementing the NPDES program for mining operations throughout the Commonwealth. This reclamation was done through the use of remining permits that have the potential for reclaiming abandoned mine lands, at no cost to the Commonwealth or the federal government. Long-term treatment agreements were initialized for facilities/operators that need to assure treatment of post-mining discharges or discharges they degraded which will provide for long-term treatment of discharges. According to OSM, "PADEP is conducting a program where active mining sites are, with very few exceptions, in compliance with the approved regulatory program".

The Commonwealth is exploring all options to address its abandoned mine problem. During 2000-2006, many new approaches to mine reclamation and mine drainage remediation have been explored and projects funded to address problems in innovative ways. These include:

- Project XL - The Pennsylvania Department of Environmental Protection ("PADEP") has proposed this XL Project to explore a new approach to encourage the remining and reclamation of abandoned coal mine sites. The approach would be based on compliance with in-stream pollutant concentration limits and implementation of best management practices ("BMPs"), instead of National Pollutant Discharge Elimination System ("NPDES") numeric effluent limitations measured at individual discharge points. This XL project would provide for a test of this approach in up to eight watersheds with significant abandoned mine drainage ("AMD") pollution. The project will collect data to compare in-stream pollutant concentrations versus the loading from individual discharge points and provide for the evaluation of the performance of BMPs and this alternate strategy in PADEP's efforts to address AMD.

- Awards of grants for 1) proposals with economic development or industrial application as their primary goal and which rely on recycled mine water and/or a site that has been made suitable for the location of a facility through the elimination of existing Priority 1 or 2 hazards, and 2) new and innovative mine drainage treatment technologies that will provide waters of higher purity that may be needed by a particular industry at costs below conventional treatment costs as in common use today or reduce the costs of water treatment below those of conventional lime treatment plants. Eight contracts totaling $4.075 M were awarded in 2006 under this program.

- Projects using water from mine pools in an innovative fashion, such as the Shannopin Deep Mine Pool (in southwestern Pennsylvania), the Barnes & Tucker Deep Mine Pool (the Susquehanna River Basin Commission into the Upper West Branch Susquehanna River), and the Wadesville Deep Mine Pool (Excelon Generation in Schuylkill County).

Candidate or federally-listed threatened and endangered species may occur in or near the watershed. While implementation of the TMDL should result in improvements to water quality, they could inadvertently destroy habitat for candidate or federally-listed species. TMDL implementation projects should be screened through the Pennsylvania Natural Diversity Inventory (PNDI) early in their planning process, in accordance with the Department's policy titled Policy for Pennsylvania Natural Diversity Inventory (PNDI) Coordination During Permit Review and Evaluation (Document ID# 400-0200-001).

Public Participation

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on December 22, 2008 and the draft on December 23, 2008 to foster public comment on the allowable loads calculated. A public meeting was held on January 22, 2009 beginning at 11AM at the Greensburg District Mining Office in Greensburg, PA to discuss the proposed TMDL.

Future TMDL Modifications

In the future, the Department may adjust the load and/or wasteload allocations in this TMDL to account for new information or circumstances that are developed or discovered during the implementation of the TMDL when a review of the new information or circumstances indicate that such adjustments are appropriate. Adjustment between the load and wasteload allocation will only be made following an opportunity for public participation. A wasteload allocation adjustment will be made consistent and simultaneous with associated permit(s) revision(s)/reissuances (i.e., permits for revision/reissuance in association with a TMDL revision will be made available for public comment concurrent with the related TMDLs availability for public comment). New information generated during TMDL implementation may include among other things, monitoring data, BMP effectiveness information, and land use information. All changes in the TMDL will be tallied and once the total changes exceed 1% of the total original TMDL allowable load, the TMDL will be revised. The adjusted TMDL, including its LAs and WLAs, will be set at a level necessary to implement the applicable WQS and any adjustment increasing a WLA will be supported by reasonable assurance demonstration that load allocations will be met. The Department will notify EPA of any adjustments to the TMDL within 30 days of its adoption and will maintain current tracking mechanisms that contain accurate loading information for TMDL waters.

Changes in TMDLs That May Require EPA Approval

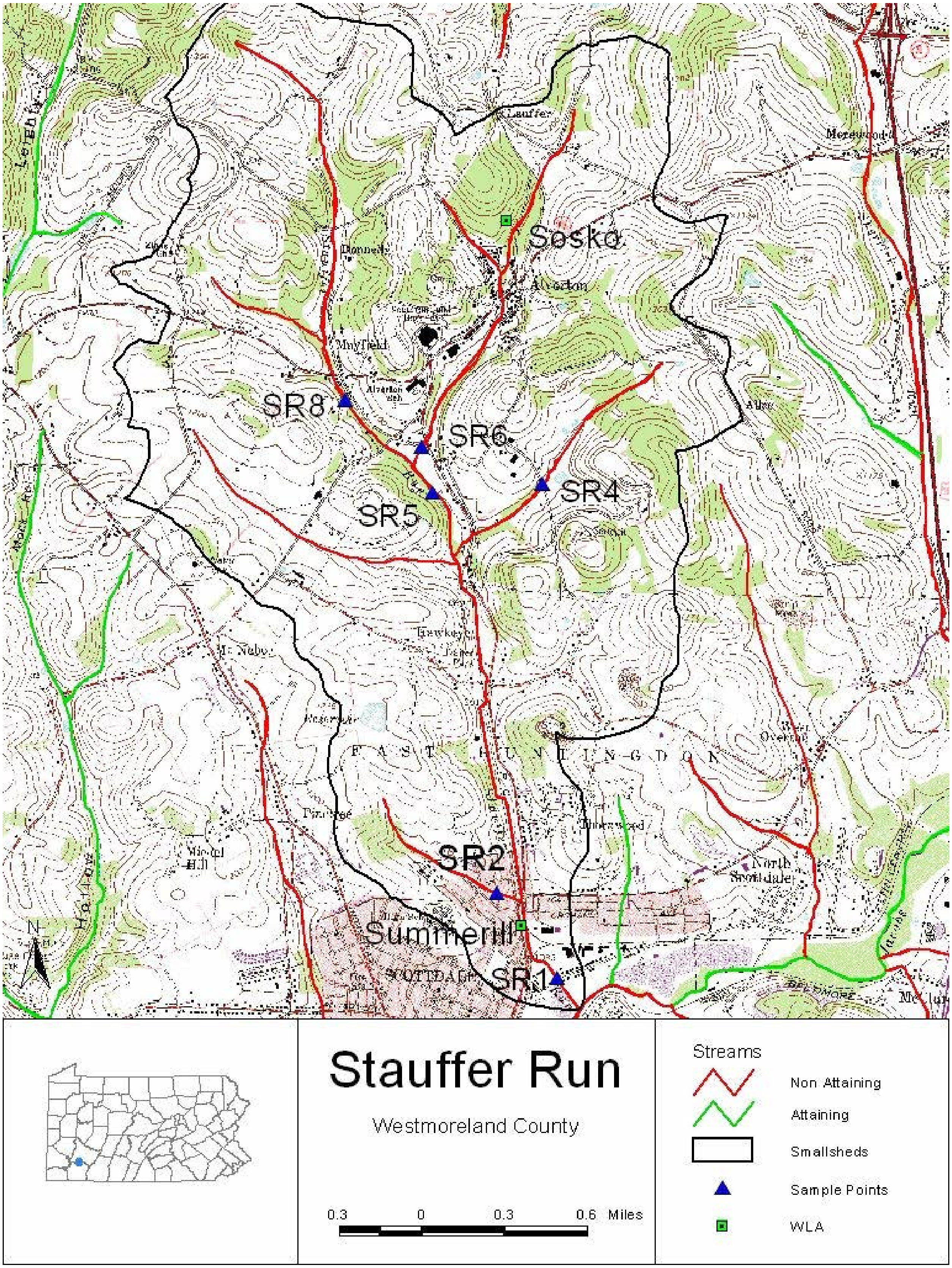
- Increase in total load capacity.
- Transfer of load between point (WLA) and nonpoint (LA) sources.
- Modification of the margin of safety (MOS).
- Change in water quality standards (WQS).
- Non-attainment of WQS with implementation of the TMDL.
- Allocations in trading programs.

Changes in TMDLs That May Not Require EPA Approval

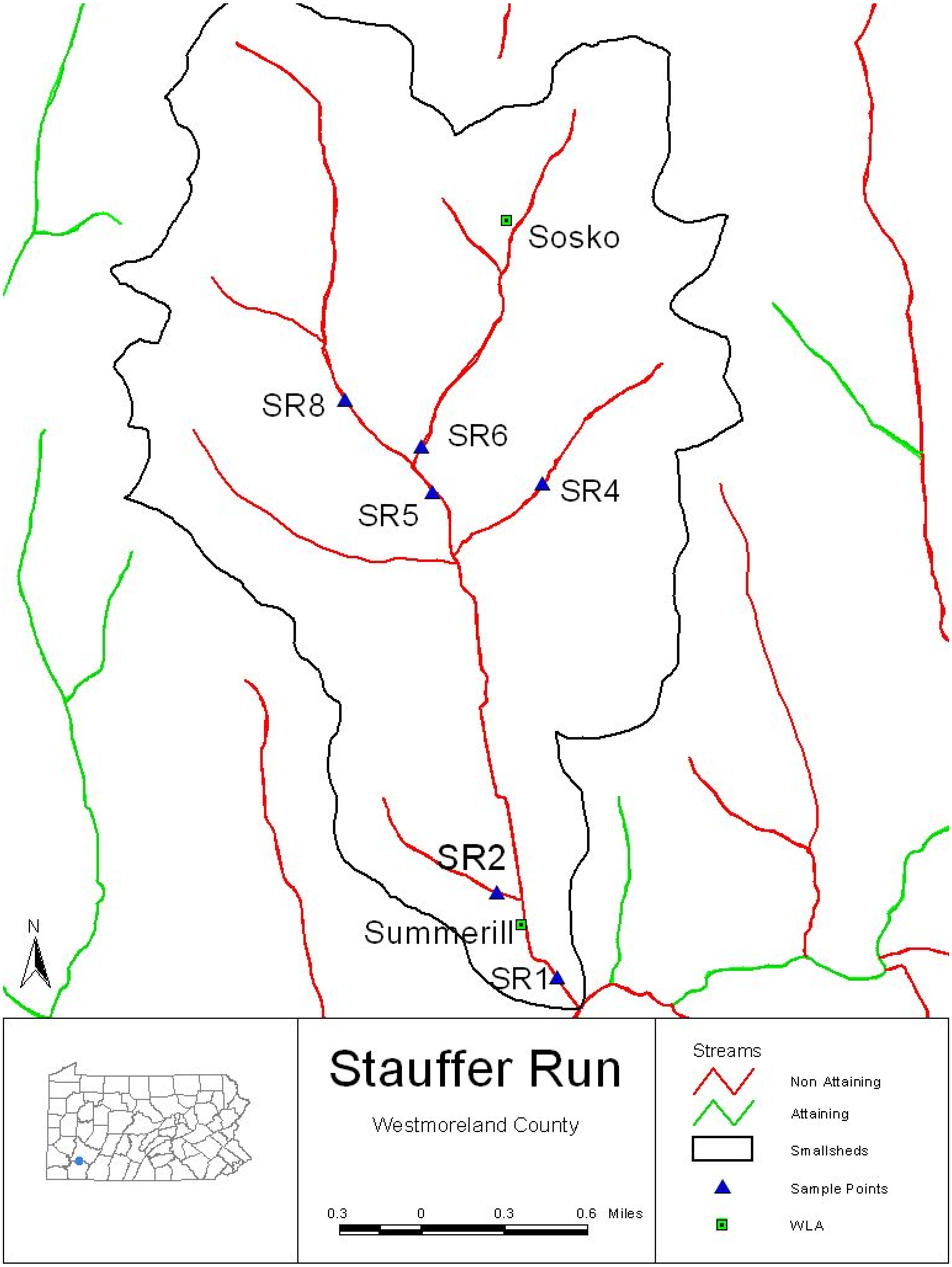
- Total loading shift less than or equal to 1% of the total load.
- Increase of WLA results in greater LA reductions provided reasonable assurance of implementation is demonstrated (a compliance/implementation plan and schedule).
- Changes among WLAs with no other changes; TMDL public notice concurrent with permit public notice.
- Removal of a pollutant source that will not be reallocated.
- Reallocation between LAs.
- Changes in land use.

Attachment A

Stauffer Run Watershed Maps



Sosko
SR8
SR6
SR5
SR4
SR2
Summerhill
SR1
Stauffer Run
Westmoreland County
0.3
0
0.3
0.6 Miles
Streams
Non Attaining
Attaining
Smallsheds
Sample Points
WLA


Sosko
SR8
SR6
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SR2
Summerill
SR1
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Stauffer Run
Westmoreland County
0.3 0 0.3 0.6 Miles
Streams
Non Attaining
Attaining
Smallsheds
Sample Points
WLA

Attachment B

Method for Addressing 303(d) List and/or Integrated Water Quality Report Listings for pH

Method for Addressing 303(d) List and/or Integrated Water Quality Report Listings for pH

Potenz hydrogen (pH) is a measurement of hydrogen ion concentration presented as a negative logarithm. As such, pH measurements are not conducive to standard statistics. Additionally, pH does not measure latent acidity and 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 that would result from the treatment of abandoned mine drainage.

Research published by the Pa. Department of Environmental Protection demonstrates that by plotting net alkalinity (alkalinity minus acidity) vs. pH for 794 mine sample points, the 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. Thus, it is required that the acid load in streams with pH impairments shall be reduced so that net alkalinity is greater than zero 99% of the time.

Based on the above information, Pennsylvania is using the following approach to address the stream impairments noted on the 303(d) List and/or Integrated Water Quality Report due to pH. Net alkalinity will be used to evaluate pH in TMDL calculations. 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 measured in units of milligrams per liter (mg/l) $CaCO_3$ by titration. The same statistical procedure that has been described for use in the evaluation of the metals that have numeric water quality criteria 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 of six to 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 also assures that Pennsylvania's standard for pH is attained when the acid concentration reduction is attained.

There are, however, several documented cases of free stone streams in Pennsylvania having a natural background pH below six. If the natural pH of a stream on the 303(d) List and/or Integrated Water Quality Report 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. It is required that the acid load in all other streams shall be reduced so that net alkalinity is greater than zero 99% of the 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.*

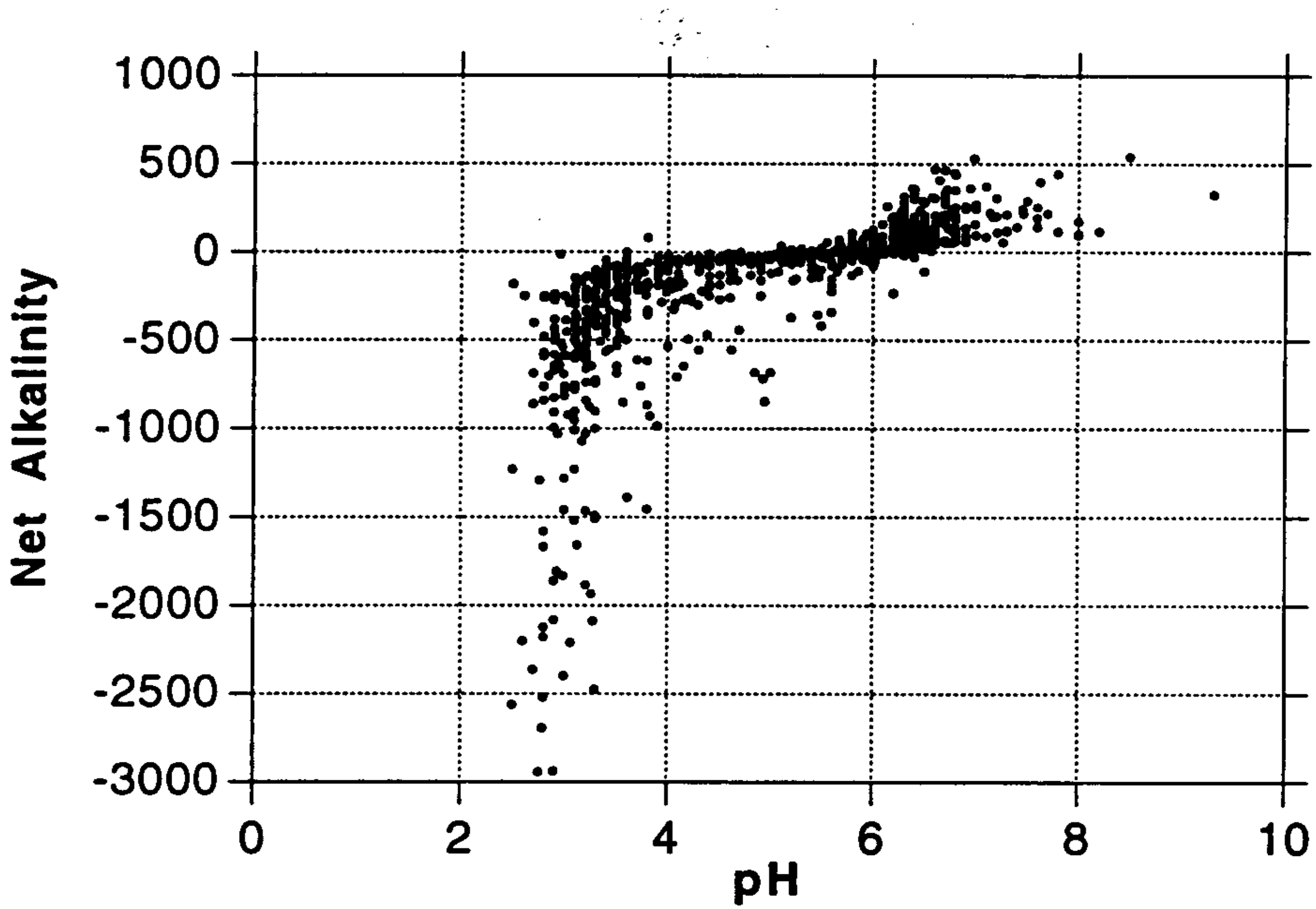
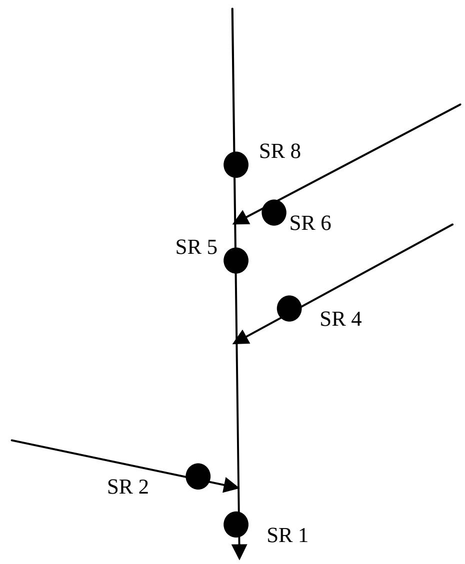


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Attachment C

TMDLs By Segment

Stauffer Run Sampling Stations Diagram
Arrows represent direction of flow
Diagram not to scale



Stauffer Run

The TMDL for Stauffer Run consists of load allocations for six sampling sites along Stauffer Run and its tributaries.

Stauffer Run and Unnamed Tributaries 37928, 37929 and 37933 are listed for metals and pH from AMD as being the cause of the degradation to the streams. The method and rationale for addressing pH is contained in Attachment B. Unnamed Tributaries 37930, 37931 and 37932 are listed for metals from AMD as being the cause of the degradation to the streams. Unnamed Tributary 37928 is also listed for siltation from habitat modification as being the cause of the degradation to the stream; however, the siltation listing will be addressed in a future TMDL as this TMDL is specific to the 1996 Pennsylvania 303(d) list.

An allowable long-term average in-stream concentration was determined at the points below for aluminum, iron, manganese and acidity by using a Monte Carlo simulation analysis. This analysis is designed to produce a long-term average concentration that, when met, will be protective of the water-quality criterion for that parameter 99% of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean (average) 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 ensure 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.

SR 8 Stauffer Run Headwaters

The TMDL for this sample point on Stauffer Run consists of a load allocation to the segment upstream to the source. The load allocation for this segment was computed using water-quality sample data collected at point SR 8. The average annual flow, derived using the US Geological Survey Streamstats Tool at SR 8 (1.11 MGD), is used for these computations.

The 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 C1. Load Allocations for Point SR 8

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	14.79	136.90	0.30	2.74
Fe	7.67	71.01	0.38	3.55
Mn	2.41	22.27	0.55	5.12
Acid	100.57	930.99	1.01	9.31
Alk	3.60	33.3		

Table C2. Calculation of Load Reductions Necessary at Point SR 8

	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	136.90	71.01	22.27	930.99
Allowable Load = TMDL	2.74	3.55	5.12	9.31
Load Reduction	134.16	67.46	17.15	921.68
% Reduction required at SR 8	98	95	77	99

SR 6 Mouth of Unnamed Tributary 37931

The TMDL for this sample point on consists of a load allocation to the segment upstream to the source. The load allocation for this segment was computed using water-quality sample data collected at point SR 6. The average annual flow, derived using the US Geological Survey Streamstats Tool at SR 6 (0.89 MGD), is used for these computations.

The 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 for Point SR 6				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	ND	ND	NA	NA
Fe	0.95	7.04	0.53	3.94
Mn	1.49	11.05	0.55	4.09
Acid	ND	ND	NA	NA
Alk	142.20	1055.5		

Table C4. Calculation of Load Reductions Necessary at Point SR 6		
	Fe (lbs/day)	Mn (lbs/day)
Existing Load	7.04	11.05
Allowable Load = TMDL	3.94	4.09
Load Reduction	3.10	6.96
% Reduction required at SR 6	44	63

Waste Load Allocation – Sosko Coal Co. (SMP65060104, NPDES#PA0250945)

Sosko Coal Co. has two mine drainage treatment facilities requiring treatment. The following table shows the waste load allocation for the discharges that flow into UNT 37931 upstream of SR 6.

Table C5. Waste load allocations for future mining operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow	Allowable Load
		(MGD)	(lbs/day)
Al	0.75	0.045	0.28
Fe	3.0	0.045	1.13
Mn	2.0	0.045	0.75

SR 5 Stauffer Run Main Stem Downstream of Confluence with SR 6

The TMDL for this sample point on Stauffer Run consists of a load allocation to the watershed area between sample points SR 8, SR 6 & SR 5. The load allocation for this segment was computed using water-quality sample data collected at point SR 5. The average annual flow, derived using the US Geological Survey Streamstats Tool at SR 5 (2.112 MGD), is used for these computations.

Table C6. Load Allocations for Point SR 5				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	8.62	152.40	0.34	6.10
Fe	5.12	90.51	0.56	9.96
Mn	1.86	32.91	0.63	11.19
Acid	31.72	560.83	2.85	50.48
Alk	9.60	169.74		

The calculated load reductions for all the loads that enter point SR 5 must be accounted for in the calculated reductions at sample point SR 5 shown in Table C6.

Table C7. Calculation of Load Reduction at Point SR 5				
	Al	Fe	Mn	Acidity
Existing Load	152.40	90.51	32.91	560.83
Difference in Existing Load between SR 8, SR 6 & SR 5	13.65	12.46	-0.41	-370.15
Load tracked from SR 8 & SR 6	4.59	7.49	9.21	9.31
Total Load tracked from SR 8 & SR 6	18.24	19.95	9.10	5.61
Allowable Load at SR 5	6.10	9.96	11.19	50.48
Load Reduction at SR 5	12.14	10.00	0.00	0.00
% Reduction required at SR 5	66.58	50.11	0.00	0.00

A waste load allocation for future mining was included for this segment of Stauffer Run allowing for two operations with up to 0.045 MGD discharge each to be permitted in the future on this segment.

Table C8. Waste load allocations for each future mining operation			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.045	0.28
Fe	3.0	0.045	1.13
Mn	2.0	0.045	0.75

SR 4 Mouth of Unnamed Tributary 37930

The TMDL for this sample point on consists of a load allocation to the segment upstream to the source. The load allocation for this segment was computed using water-quality sample data collected at point SR 4. The average annual flow, derived using the US Geological Survey Streamstats Tool at SR 4 (0.45 MGD), is used for these computations.

The 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 for Point SR 4

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	ND	ND	NA	NA
Fe	0.33	1.24	NA	NA
Mn	0.15	0.55	0.13	0.48
Acid	ND	ND	NA	NA
Alk	276.87	1039.08		

Table C10. Calculation of Load Reductions Necessary at Point SR 4

	Mn (lbs/day)
Existing Load	0.55
Allowable Load = TMDL	0.48
Load Reduction	0.07
% Reduction required at SR 4	12

SR 2 Mouth of Unnamed Tributary 37928

No reductions are necessary for this segment because water quality standards are being attained. Because water quality standards are being attained, no TMDL is necessary.

SR 1 Stauffer Run Mouth

The TMDL for this segment of Stauffer Run consists of a load allocation to the area between sample points SR 5, SR 4, SR 2 & SR 1. The load allocation for this segment was computed using water-quality sample data collected at point SR 1. The average annual flow, derived using the US Geological Survey Streamstats Tool at SR 1 (4.29 MGD), is used for these computations.

Table C11. Load Allocations for Point SR 1

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.33	12.0	0.23	8.4
Fe	0.36	13.0	NA	NA
Mn	0.48	17.0	0.41	14.7
Acid	ND	ND	NA	NA
Alk	85.40	3055.5		

The calculated load reductions for all the loads that enter point SR 1 must be accounted for in the calculated reductions at sample point SR 1 shown in Table C14.

Table C12. Calculation of Load Reduction at Point SR 1

	Al	Mn
Existing Load	11.96	17.05
Difference in Existing Load between SR 5, SR 4, SR 2 & SR 1	-141.88	-16.61
Load tracked from SR 5, SR 4, & SR 2	7.53	11.88
Total Load tracked from SR 5, SR 4, & SR 2	0.59	6.01
Allowable Load at SR 1	8.37	14.66
Load Reduction at SR 1	0.00	0.00
% Reduction required at SR 1	0.00	0.00

Waste Load Allocation –Summerill Tube Corp.

The Summerill Tube Corporation (NPDES PA0002593) has one treatment facility requiring treatment. Outfall 001 discharges from the treatment facility. This discharge does not have effluent limits for aluminum, manganese, or acidity currently; a maximum daily allowable concentration of 7.0 mg/L was assigned to the discharge for iron in the effluent. The following table shows the waste load allocation for this discharge.

Table C13. Waste Load Allocations at Summerill Tube Corp.

Parameter	Maximum Daily Allowable Concentration (mg/L)	Average Flow	Allowable Load
		(MGD)	(lbs/day)
001			
Fe	7.0	0.092	5.37

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:

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

Method for Calculating Loads from Mine Drainage Treatment Facilities from Surface Mines

Method to Quantify Treatment Pond Pollutant Load

Calculating Waste Load Allocations for Active Mining in the TMDL Stream Segment.

The end product of the TMDL report is to develop Waste Load Allocations (WLA) and Load Allocations (LA) that represent the amount of pollution the stream can assimilate while still achieving in-stream limits. The LA is the load from abandoned mine lands where there is no NPDES permit or responsible party. The WLA is the pollution load from active mining that is permitted through NPDES.

In preparing the TMDL, calculations are done to determine the allowable load. The actual load measured in the stream is equal to the allowable load plus the reduced load.

Total Measured Load = Allowed Load + Reduced Load

If there is active mining or anticipated mining in the near future in the watershed, the allowed load must include both a WLA and a LA component.

Allowed Load (lbs/day) = WLA (lbs/day) + LA (lbs/day)

The following is an explanation of the quantification of the potential pollution load reporting to the stream from permitted pit water treatment ponds that discharge water at established effluent limits.

Surface coalmines remove soil and overburden materials to expose the underground coal seams for removal. After removal of the coal the overburden is replaced as mine spoil and the soil is replaced for revegetation. In a typical surface mining operation the overburden materials is removed and placed in the previous cut where the coal has been removed. In this fashion, an active mining operation has a pit that progresses through the mining site during the life of the mine. The pit may have water reporting to it, as it is a low spot in the local area. Pit water can be the result of limited shallow groundwater seepage, direct precipitation into the pit, and surface runoff from partially regarded areas that have been backfilled but not yet revegetated. Pit water is pumped to nearby treatment ponds where it is treated to the required treatment pond effluent limits. The standard effluent limits are as follows, although stricter effluent limits may be applied to a mining permit’s effluent limits to insure that the discharge of treated water does not cause in-stream limits to be exceeded.

Standard Treatment Pond Effluent Limits:
Alkalinity > Acidity
6.0 <= pH <= 9.0
Fe < 3.0 mg/l
Mn < 2.0 mg/l

Discharge from treatment ponds on a mine site is intermittent and often varies as a result of precipitation events. Measured flow rates are almost never available. If accurate flow data are available, they can be used to quantify the WLA. The following is an approach that can be used to determine a waste load allocation for an active mining operation when treatment pond flow rates are not available. The methodology involves quantifying the hydrology of the portion of a surface mine site that contributes flow to the pit and then calculating waste load allocation using NPDES treatment pond effluent limits.

The total water volume reporting to ponds for treatment can come from two primary sources: direct precipitation to the pit and runoff from the unregraded area following the pit's progression through the site. Groundwater seepage reporting to the pit is considered negligible compared to the flow rates resulting from precipitation.

In an active mining scenario, a mine operator pumps pit water to the ponds for chemical treatment. Pit water is often acidic with dissolved metals in nature. At the treatment ponds, alkaline chemicals are added to increase the pH and encourage dissolved metals to precipitate and settle. Pennsylvania averages 41.4 inches of precipitation per year (Mid-Atlantic River Forecast Center, National Weather Service, State College, PA, 1961-1990, http://www.dep.state.pa.us/dep/subject/hotopics/drought/PrecipNorm.htm). A maximum pit dimension without special permit approval is 1500 feet long by 300 feet wide. Assuming that 5 percent of the precipitation evaporates and the remaining 95 percent flows to the low spot in the active pit to be pumped to the treatment ponds, results in the following equation and average flow rates for the pit area.

41.4 in. precip./yr x 0.95 x 1 ft./12/in. x 1500'x300'/pit x 7.48 gal/ft^3 x 1yr/365days x 1day/24hr. x 1hr./60 min. =

= 21.0 gal/min average discharge from direct precipitation into the open mining pit area.

Pit water can also result from runoff from the unregraded and revegetated area following the pit. In the case of roughly backfilled and highly porous spoil, there is very little surface runoff. It is estimated that 80 percent of precipitation on the roughly regarded mine spoil infiltrates, 5 percent evaporates, and 15 percent may run off to the pit for pumping and potential treatment (Jay Hawkins, Office of Surface Mining, Department of the Interior, Personal Communications 2003). Regrading and revegetation of the mine spoil is conducted as the mining progresses. DEP encourages concurrent backfilling and revegetation through its compliance efforts and it is in the interest of the mining operator to minimize the company's reclamation bond liability by keeping the site reclaimed and revegetated. Experience has shown that reclamation and revegetation is accomplished two to three pit widths behind the active mining pit area. DEP uses three pit widths as an area representing potential flow to the pit when reviewing the NPDES permit application and calculating effluent limits based on best available treatment technology and insuring that in-stream limits are met. The same approach is used in the following equation, which represents the average flow reporting to the pit from the unregraded and unrevegetated spoil area.

41.4 in. precip./yr x 3 pit areas x 1 ft./12/in. x 1500'x300'/pit x 7.48 gal/ft^3 x 1yr/365days x 1day/24hr. x 1hr./60 min. x 15 in. runoff/100 in. precipitation =

= 9.9 gal./min. average discharge from spoil runoff into the pit area.

The total average flow to the pit is represented by the sum of the direct pit precipitation and the water flowing to the pit from the spoil area as follows:

Total Average Flow = Direct Pit Precipitation + Spoil Runoff

Total Average Flow = 21.0 gal./min + 9.9 gal./min. = 30.9 gal./min.

The resulting average waste load from a permitted treatment pond area is as follows.

Allowable Iron Waste Load Allocation:
30.9 gal./min. x 3 mg/l x 0.01202 = 1.1 lbs./day

Allowable Manganese Waste Load Allocation:
30.9 gal./min. x 2 mg/l x 0.01202 = 0.7 lbs./day

Allowable Aluminum Waste Load Allocation:
30.9 gal./min. x 0.75 mg/l x 0.01202 = 0.3 lbs./day

(Note: 0.01202 is a conversion factor to convert from a flow rate in gal/min. and a concentration in mg/l to a load in units of lbs./day.)

There is little or no documentation available to quantify the actual amount of water that is typically pumped from active pits to treatment ponds. Experience and observations suggest that the above approach is very conservative and overestimates the quantity of water, creating a large margin of safety in the methodology. County specific precipitation rates can be used in place of the long-term state average rate, although the margin of safety is greater than differences from individual counties. It is common for many mining sites to have very “dry” pits that rarely accumulate water that would require pumping and treatment.

Also, it is the goal of DEP’s permit review process to not issue mining permits that would cause negative impacts to the environment. As a step to insure that a mine site does not produce abandoned mine drainage, it is common to require the addition of alkaline materials (waste lime, baghouse lime, limestone, etc.) to the backfill spoil materials to neutralize any acid-forming materials that may be present. This practice of ‘alkaline addition’ or the incorporation of naturally occurring alkaline spoil materials (limestone, alkaline shale or other rocks) may produce alkaline pit water with very low metals concentrations that does not require treatment. A comprehensive study in 1999 evaluated mining permits issued since 1987 and found that only 2.2 percent resulted in a post-mining pollution discharge (Evaluation of Mining Permits Resulting in Abandoned mine drainage 1987-1996: A Post Mortem Study, March 1999). As a result of efforts to insure that abandoned mine drainage is prevented, most mining operations have alkaline pit water that often meets effluent limits and requires little or no treatment.

While most mining operations are permitted and allowed to have a standard, 1500’ x 300’ pit, most are well below that size and have a corresponding decreased flow and load. Where pit dimensions are greater than the standard size or multiple pits are present, the calculations to define the potential pollution load can be adjusted accordingly. Hence, the above calculated

Waste Load Allocation is very generous and likely high compared to actual conditions that are generally encountered. A large margin of safety is included in the WLA calculations.

The allowable load for the stream segment is determined by modeling of flow and water quality data. The allowable load has a potential Waste Load Allocation (WLA) component if there is active mining or anticipated future mining and a Load Allocation (LA). So, the sum of the Load Allocation and the Waste Load Allocation is equal to the allowed load. The WLA is determined by the above calculations and the LA is determined by the difference between the allowed load and the WLA.

Allowed Load = Waste Load Allocation + Load Allocation
Or
Load Allocation = Allowed Load – Waste Load Allocation

This is an explanation of the quantification of the potential pollution load reporting to the stream from permitted pit water treatment ponds that discharge water at established effluent limits. This allows for including active mining activities and their associated Waste Load in the TMDL calculations to more accurately represent the watershed pollution sources and the reductions necessary to achieve in-stream limits. When a mining operation is concluded its WLA is available for a different operation. Where there are indications that future mining in a watershed may be greater than the current level of mining activity, an additional WLA amount may be included in the allowed load to allow for future mining.

Attachment E

Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists and Integrated Report/List (2004, 2006)

The following are excerpts from the Pennsylvania DEP Section 303(d) narratives that justify changes in listings between the 1996, 1998, and 2002 303(d) Lists and the 2004 and 2006 Integrated Water Quality Report. The Section 303(d) listing process has undergone an evolution in Pennsylvania since the development of the 1996 list.

In the 1996 Section 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 Section 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 Section 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).

Migration to National Hydrography Data (NHD)

New to the 2006 report is use of the 1/24,000 National Hydrography Data (NHD) streams GIS layer. Up until 2006 the Department relied upon its own internally developed stream layer. Subsequently, the United States Geologic Survey (USGS) developed 1/24,000 NHD streams layer for the Commonwealth based upon national geodatabase standards. In 2005, DEP contracted with USGS to add missing streams and correct any errors in the NHD. A GIS contractor transferred the old DEP stream assessment information to the improved NHD and the old DEP streams layer was archived. Overall, this marked an improvement in the quality of the streams layer and made the stream assessment data compatible with national standards but it necessitated a change in the Integrated Listing format. The NHD is not attributed with the old DEP five digit stream codes so segments can no longer be listed by stream code but rather only by stream name or a fixed combination of NHD fields known as reachcode and ComID. The NHD is aggregated by Hydrologic Unit Code (HUC) watersheds so HUCs rather than the old State Water Plan (SWP) watersheds are now used to group streams together. A more basic

change was the shift in data management philosophy from one of “dynamic segmentation” to “fixed segments”. The dynamic segmentation records were proving too difficult to mange from an historical tracking perspective. The fixed segment methods will remedy that problem. The stream assessment data management has gone through many changes over the years as system requirements and software changed. It is hoped that with the shift to the
NHD and OIT’s (Office of Information Technology) fulltime staff to manage and maintain SLIMS the systems and formats will now remain stable over many Integrated Listing cycles.

Attachment F

Water Quality Data Used In TMDL Calculations

Monitoring Point: SR 8 — Stauffer Run Headwaters 37927

Date Collected	HOT A MG/L	ALK MG/L	Al MG/L	Fe MG/L	Mn MG/L
6/17/2008	108.0	0.0	14.906	9.344	2.094
7/9/2008	122.2	0.0	13.193	10.302	1.768
7/10/2008	136.0	0.0	16.043	12.645	2.065
8/8/2008	102.2	3.8	17.264	9.702	2.354
8/27/2008	102.6	8.6	17.6	2.464	2.624
10/23/2008	32.4	9.2	9.756	1.565	3.528
avg=	100.57	3.60	14.79	7.67	2.41
stdev=	35.87		2.94	4.54	0.62

Monitoring Point: SR 6 — Mouth of Unnamed Tributary 37931

Date Collected	HOT A MG/L	ALK MG/L	Al MG/L	Fe MG/L	Mn MG/L
6/17/2008	-116.8	136.0	0.250	0.750	1.926
7/9/2008	-112.4	129.4	0.250	0.567	1.157
7/10/2008	-99.6	125.8	0.250	0.815	1.541
8/8/2008	-135.0	151.2	0.250	0.660	1.340
8/27/2008	-134.6	156.4	0.250	0.954	0.974
10/23/2008	-132.8	154.4	0.250	1.942	1.992
avg=	-121.87	142.20	0.25	0.95	1.49
stdev=	14.60		0.00	0.50	0.41

Monitoring Point: SR 5 — Stauffer Run Main Stem 37927 Downstream of Confluence with SR 6

Date Collected	HOT A MG/L	ALK MG/L	Al MG/L	Fe MG/L	Mn MG/L
6/17/2008	27.2	9.0	8.676	5.354	1.845
7/9/2008	15.8	12.2	7.680	5.682	1.391
7/10/2008	67.6	8.6	11.481	7.492	1.788
8/8/2008	22.6	9.2	9.823	5.814	1.854
8/27/2008	25.4	9.0	5.438	1.253	2.428
6/17/2008	31.72	9.60	8.62	5.12	1.86
avg=	20.52		2.27	2.31	0.37
stdev=	27.2	9.0	8.676	5.354	1.845

Monitoring Point:	SR 4	Mouth of Unnamed Tributary 37930			
Date Collected	HOT A MG/L	ALK MG/L	Al MG/L	Fe MG/L	Mn MG/L
6/17/2008	-194.6	210.0	0.250	0.411	0.174
7/9/2008	-204.6	222.6	0.250	0.310	0.142
7/10/2008	-101.8	258.6	0.250	0.150	0.138
8/8/2008	-287.2	301.2	0.250	0.807	0.264
8/27/2008	-298.2	309.2	0.250	0.150	0.092
10/23/2008	-347.6	359.6	0.250	0.150	0.066
avg=	-239.00	276.87	0.25	0.33	0.15
stdev=	88.99		0.00	0.26	0.07

Monitoring Point:	SR 2	Mouth of Unnamed Tributary 37928			
Date Collected	HOT A MG/L	ALK MG/L	Al MG/L	Fe MG/L	Mn MG/L
6/17/2008	-107.6	123.2	0.250	0.392	0.106
7/9/2008	-99.4	114.0	0.250	0.417	0.109
7/10/2008	-93.8	118.0	0.250	0.362	0.077
8/8/2008	-128.0	139.8	0.250	0.150	0.080
8/27/2008	-122.8	133.4	0.250	0.150	0.025
10/23/2008	-123	136.2	0.250	0.997	0.216
avg=	-112.43	127.43	0.25	0.41	0.10
stdev=	14.16		0.00	0.31	0.06

Monitoring Point:	SR 1	Stauffer Run Mouth 37927			
Date Collected	HOT A MG/L	ALK MG/L	Al MG/L	Fe MG/L	Mn MG/L
6/17/2008	-64.4	79.0	0.250	0.353	0.675
7/9/2008	-59.4	74.4	0.250	0.479	0.593
7/10/2008	-45.8	62.8	0.756	0.610	0.670
8/8/2008	-76.6	89.8	0.250	0.150	0.440
8/27/2008	-73.8	84.8	0.250	0.150	0.334
10/23/2008	-104	121.6	0.250	0.443	0.147
avg=	-70.67	85.40	0.33	0.36	0.48
stdev=	19.70		0.21	0.19	0.21

Attachment G
Comment and Response

No public comments were received for the Stauffer Run Watershed TMDL.

Attachment H

TMDLs and NPDES Permitting Coordination

NPDES permitting is unavoidably linked to TMDLs through waste load allocations and their translation, through the permitting program, to effluent limits. Primary responsibility for NPDES permitting rests with the District Mining Offices (for mining NPDES permits) and the Regional Offices (for industrial NPDES permits). Therefore, the DMOs and Regions will maintain tracking mechanisms of available waste load allocations, etc. in their respective offices. The TMDL program will assist in this effort. However, the primary role of the TMDL program is TMDL development and revision/amendment (the necessity for which is as defined in the Future Modifications section) at the request of the respective office. All efforts will be made to coordinate public notice periods for TMDL revisions and permit renewals/reissuances.

Load Tracking Mechanisms

The Department has developed tracking mechanisms that will allow for accounting of pollution loads in TMDL watersheds. This will allow permit writers to have information on how allocations have been distributed throughout the watershed in the watershed of interest while making permitting decisions. These tracking mechanisms will allow the Department to make minor changes in WLAs without the need for EPA to review and approve a revised TMDL. Tracking will also allow for the evaluation of loads at downstream points throughout a watershed to ensure no downstream impairments will result from the addition, modification or movement of a permit.

Options for Permittees in TMDL Watersheds

The Department is working to develop options for mining permits in watersheds with approved TMDLs.

Options identified

- Build excess WLA into the TMDL for anticipated future mining. This could then be used for a new permit. Permittee must show that there has been actual load reduction in the amount of the proposed permit or must include a schedule to guarantee the reductions using current data referenced to the TMDL prior to permit issuance.
- Use WLA that is freed up from another permit in the watershed when that site is reclaimed. If no permits have been recently reclaimed, it may be necessary to delay permit issuance until additional WLA becomes available.
- Re-allocate the WLA(s) of existing permits. WLAs could be reallocated based on actual flows (as opposed to design flows) or smaller than approved pit/spoil areas (as opposed to default areas). The "freed-up" WLA could be applied to the new permit. This option would require the simultaneous amendment of the permits involved in the reallocation.
- Non-discharge alternative.

Other possible options

The following two options have also been identified for use in TMDL watersheds. However, before recommendation for use as viable implementation options, a thorough regulatory (both state and federal) review must be completed. These options should not be implemented until the completion of the regulatory review and development of any applicable administrative mechanisms.

- Issue the permit with in-stream water quality criteria values as the effluent limits. The in-stream criteria value would represent the monthly average, with the other limits adjusted accordingly (e.g., for Fe, the limits would be 1.5 mg/L monthly average, 3.0 mg/L daily average and 4.0 instantaneous max mg/L).

- The applicant would agree to treat an existing source (point or non-point) where there is no responsible party and receive a WLA based on a portion of the load reduction to be achieved. The result of using these types of offsets in permitting is a net improvement in long-term water quality through the reclamation or treatment of an abandoned source.