FINAL

LUTHERSBURG BRANCH AND LABORDE BRANCH

Clearfield County, Pennsylvania

Prepared by:

Pennsylvania Department of Environmental Protection

February 12, 2007

TABLE OF CONTENTS

TABLES

ATTACHMENTS

FINAL TMDL
Luthersburg Branch and Laborde Branch Watershed
Clearfield County, Pennsylvania

Introduction

This Total Maximum Daily Load (TMDL) calculation has been prepared for a segment in the Luthersburg Branch and Laborde Branch 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 coalmines 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 Allegheny River

State Water Plan (SWP) Subbasin: 17C

Year	SWP	Miles	Segment ID	DEP Stream Code	Stream Name	Designated Use	Data Source	Source	EPA 305(b) Cause Code
1996	17C	3.9	7209	48803	Laborde Branch	CWF	303 (d) Report	Resource Extraction	Metals
1998	17C	5.01	7209	48803	Laborde Branch	CWF	SWMP	AMD	Metals
2002	17C		20010413-1400-JJM	48803	Laborde Branch	CWF	SWMP	Attaining	
2004	17C			48803	Laborde branch	CWF	No Listing in 2004		
1996	17C	1.3	7210	48807	Luthersburg Branch	CWF	SWMP	AMD	Metals & *Other Inorganics
1998	17C	3.64	7210	48807	Luthersburg Branch	CWF	SWMP	AMD	Metals & *Other Inorganics
2002	17C	3.64	7210	48807	Luthersburg Branch	CWF	SWMP	AMD	Metals & *Other Inorganics
2004	17C	3.7	7210	48807	Luthersburg Branch	CWF	SWMP	AMD	Metals & *Other Inorganics

*Other inorganics listing is not included on the 2006 Integrated List and will not be addressed in this TMDL.

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

Directions to the Luthersburg branch and Laborde Branch Watershed

The Luthersburg Branch and Laborde Branch Watershed is located in North Central Pennsylvania, occupying a northwestern portion of Clearfield County in Brady, Sandy and Union Townships. The watershed area is found on United States Geological Survey maps covering 7.5-

Minute Quadrangles. Land uses within the watershed include abandoned mine lands, active mining operations, forestlands, homes scattered throughout the watershed and the city of Dubois near the confluence of Laborde Branch and Sandy Creek.

Laborde Branch flows beneath several roads and can be easily reached from Dubois or Rockton. State Route 322 passes near the headwaters of Laborde Branch in Rockton. From Rockton one can travel on the Rockton/Dubois Highway north towards Dubois. This highway crosses over Sugarcamp Run and Luthersburg Branch, both tributaries to Laborde Branch. Closer to Dubois the highway runs parallel to Laborde Branch. Laborde Branch flows into Sandy Lick Creek just inside the Dubois city limits near the Dubois Mall. Dubois can be reached by exiting Interstate 80 at the Dubois exit.

Hydrology of Laborde Branch Watershed

The area within the watershed consists of 16.6 square miles. The Laborde Branch Watershed consists of a main stem and the following named tributaries: Stony Run, Chestnut Run, Luthersburg Branch and Sugarcamp Run. Sugarcamp Run is a tributary to the Luthersburg Branch. Laborde Branch and Luthersburg Branch flow together approximately one mile before Laborde Branch meets Sandy Lick Creek. Laborde Branch flows from an elevation of 1800 feet above sea level in its headwaters to an elevation of 1350 feet above sea level at its confluence with Sandy Lick Creek. Laborde Branch flows from the southeast to the northwest. Laborde Branch is part of the Allegheny River watershed.

Geology of Laborde Branch Watershed

The Laborde Branch watershed lies within the Appalachian Plateaus Physiographic Province. The watershed area is comprised of Pennsylvanian aged rocks. The watershed lies just north of the Chestnut Ridge Anticline. The axial bearing of the anticline is N55°E. The strata in the watershed generally have a northeast-southwest trend and dip to the north or northwest.

Older Pennsylvanian rocks of the Pottsville Group are exposed in the valleys of the watershed and the younger Pennsylvanian aged rocks of the Allegheny Group are on the hilltops and ridges surrounding the watershed. The coals are confined to the Allegheny Group.

Segments addressed in this TMDL

The Luthersburg Branch Watershed is affected by pollution from AMD. This pollution has caused high levels of manganese (and in one case aluminum) and low pH in the main stem of Luthersburg Branch and in a Sugarcamp Run, a tributary. The sources of the AMD are seeps and discharges from areas disturbed by surface mining or refuse piles associated with them. Some of the discharges are considered to be nonpoint sources of pollution because they are from abandoned Pre-Act mining operations or from coal companies that have settled their bond forfeitures with the Pennsylvania Department of Environmental Protection (PADEP).

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 Luthersburg Branch and Laborde Branch Watershed TMDL.

Watershed History

Underground mining was conducted from the 1800's into the early 1900's. Many of these mines were left abandoned. In the mid 1900's strip mining became the prevalent method of mining. Mining companies whose names have long ago been forgotten mined the land with little or no reclamation. All of the abandoned mines in the watershed have led to the degradation of the Laborde Branch watershed. Today many of these sites are being remined and reclaimed which helps reduce the amount of spoils exposed to the weather and reduces the numbers of deep mines in the watershed.

Active Mining

The RAMM Coal Company, Nelson Operation (SMP17030901, NPDES PA0243523) was issued on February 17, 2004. This permit was a continuation of the RAMM Coal Company GFCC 17-01-05. RAMM Coal left the pit open from the GFCC and obtained a mining permit to continue coal removal in this area. The Nelson Operation total permit area is 3.7 acres with 2.6 total acres to be affected. The coal seams to be mined are the Lower Kittanning coal (2.6 acres) and the Middle Kittanning coal (<1 acre). Alkaline material is to be applied to this site at a rate of 1400 tons per acre to aid in neutralizing any acidity generated during weathering of the spoil materials. One WLA is required.

The Waroquier Coal Company, Kimble Operation (41-04-11/78-42-08, NPDES PA 0238261) (17990105) was issued on August 4, 1999. The total permit area is 75 acres with 63 acres affected. The coal seams being mined are the Upper Kittanning (2.0 acres), Middle Kittanning (15.0 acres), Luthersburg (13.0 acres) and Shale associated with Upper Kittanning coal. Mining commenced on the site in November of 1997 and continues today (April 2005). One WLA is required for the two treatment basins on the permit.

The RAMM Coal, Inc., Laurel Ridge #1 Operation (SMP 17020110, NPDES PA 02433311)(41-05-56/78-42-10) was issued on august 7, 2003. The total permit area is 143.6 acres with 55 acres to be affected. The Upper Kittanning (22.3 acres surface mined and 8.5 acres auger mined) and Lower Freeport (12.2 acres) coal seams are to be mined. Mining of this permit has not yet been started. There are three treatment ponds on this permit but only one WLA is needed because only one treatment pond will be in operation as mining procedes.

The Strishock Coal Company, Huey Mine Operation (41-04-59/78-40-38)(17860135, NPDES PA0115622) was issued on August 14, 2002. The total permit area is 348.0 acres with 321.9 acres to be affected. The Upper Kittanning (84.8 acres), Luthersburg (73.7 acres), Middle Kittanning (121.3 acres) and Lower Kittanning (112.4 acres) coal seams are being mined. Although there are eight treatment ponds on this permit only one WLA is required because as the mining progresses treatment ponds are built and removed. There are four Subchapter F discharges that were created by previous mining on the Lower Kittanning coal seam. On a map in Attachment A they are SHM-6, SHM-9, SHM10, and SHM-24.

COMPLETED MINING

The Strishock Coal Company, Bailey Mine Operation (41-04-26/78-40-53) (SMP17793123, PA 0089603) was issued on February 3, 1984. The total permit area is 188.7 acres with 102.8 acres to be affected. The Lower Freeport (6.0 acres), Upper Kittanning (25.0 acres), Middle Kittanning (20.5 acres) and Lower Kittanning (18.5 acres) coal seams were mined. Mining was completed in the fall of 2004. This site is currently backfilled.

The Larry D. Baumgardner Coal Company, Inc., Resco Operation (41-03-49/78-42-47)(SMP17960114) was issued on December 20, 1996. The total permit area is 101.3 acres with 101.3 acres to be affected. The coal seams being mined are the Upper Kittanning (< 1 acre if encountered), Luthersburg (37.9 acres), Middle Kittanning (9.5 acres) and Lower Kittanning (28.7 acres). This mining operation, once completed, will have reclaimed 28.7 acres of abandoned mine lands and 28.7 acres of abandoned underground mines. Mining commenced in July of 1999 and backfilling was completed in November 2004.

The RAMM Coal Company, Matco/Nelson Operation (GFCC 17-01-05) reclamation site reclaimed 560 feet of abandoned highwall and 560 feet of spoil. This site is a Government Financed Construction Contract (GFCC) and required a strip of Lower Kittanning (1.5 acres) crop coal to be removed during the reclamation process. The reclamation process was started in September of 2002 and completed in October of 2004. In addition to the reclamation, alkaline material (1800 tons) was into the backfill of the 1.5-acre mining area to aid in neutralizing any acidity generated during the weathering of the spoil material.

The Pentz Coal Company, Smith #1 Operation (SMP17820105) was issued on March 9, 1984. The total permit area was 211 acres with 184 acres affected. The coal seams to be mined were the Upper Kittanning (32 acres), Middle Kittanning (74 acres), Lower Kittanning #2 (102 acres) and the Lower Kittanning #1 (128 acres). Much of the permit area went unmined. Mining was completed and the site backfilled in 1987. Over 100 acres were left unmined. On July 1, 1999, this permit was transferred to Hepburnia Coal Company (SMP 17823101) (41-05-00/78-38-45). The total permit area for Hepburnia was reduced to 128 acres with 120 acres to be affected. Mining at this site has not started as of January 2006. One WLA is required.

The Laurel Run Reclamation Company, Inc., Laurel Ridge Mine (SMP 17941301) was issued on July 18, 1995. The underground mine plan included 671 acres of Lower Kittanning coal and the surface area around the portal includes 76 acres, which was used for coal cleaning and storage. In November of 2002 the mining company requested a sixty-day shutdown due to unfavorable conditions in the coal market. During this shutdown mine openings were sealed. The mining company has since gone bankrupt. The bond has been forfeited for the site. Currently the site is in the surety reclamation process for the reclamation of exposed bony and refuse piles.

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)

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

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. 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 be 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.

Method to Quantify Treatment Pond Pollutant Load

Surface Coal Mines 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 are 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 revegated. 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 instream 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
Al < 2.0

When a treatment plant has an NPDES permit a Waste Load Allocation (WLA) must be calculated. When there is flow data available this is used along with the permit Best Available Technology (BAT) limits for one or more of the following: aluminum, iron, and manganese. The following formula is used:

Flow (MGD) X BAT limit (mg/l) X 8.34 = lbs/day

When site specific flow data is unavailable to determine a waste load allocation for an active mining operation, an average flow rate must be determined. This is done by investigating and quantifying the hydrology of a surface mine site. 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 when site specific flow data is unavailable.

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 40 inches of precipitation per year. A maximum pit dimension without special permit approval is 1500 feet long by 300 feet wide. Assuming 100 percent runoff of the precipitation to be pumped to the treatment ponds results in the following equation and average flow rates for the pit area.

40 in. precip./yr x 1 ft/12/in. x 1500'x 300'/pit x 7.48 gal/ft3 x 1yr/365days x 1day/24hr. x 1hr/60mins. =

21.3 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. DEP compliance efforts encourage that backfilling, topsoiling, and revegetation be as prompt and concurrent as mining conditions and weather conditions allow. Generally the revegatation follows about three pit widths behind the active mining area.

In the case of roughly backfilled land highly porous spoil; there is very little surface runoff. It is estimated that 80 percent of precipitation on the roughly regraded mine spoil infiltrates, 5 percent evaporates, and 15 percent may run off to the pit for pumping and potential treatment. The following equation represents the average flow reporting to the pit from the unregraded and unrevegatated spoil area.

40 in. precip./yr x 3 pit areas x 1 ft/12/in. x 1500'x 300'/pit x 7.48 gal/ft3 x 1yr/365days x 1day/24hr. x 1hr/60mins. x 15 in. runoff/100 in. precipitation =

= 9.6 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 = 21.3 gal./min. + 9.6 gal./min. = 30.9 gal./min.

The resulting average load from a permitted treatment pond area 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 2 mg/l x 0.01202 = 0.7 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.)

Field experience shows that the average flow rate of 30.9 gal./min. is excessively high. 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 enviroment. As a step to insure that a mine site does not produce acid drainage, it is common to require the addition of alkaline materials (limestone, alkaline shale or other rocks) may produce alkaline pit water with very low metals concentrations that does not require treatment. Also, while most mining operations are permitted 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 that the standard size is present, the calculations to define the potential pollution load are adjusted accordingly. Hence, the above calculated Waste Load Allocation is very generous and likely high compared to actual conditions that are generally encountered.

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

There was not enough paired data available to Analyze for critical flow conditions for pollutant sources.

Allocation Summary

This TMDL will focus remediation efforts on the identified numerical reduction targets for each watershed. The reductions in Table 3 for each segment are based on the assumption that all upstream allocations are achieved and take into account all upstream reductions. Attachment C contains the TMDLs by segment analysis for each allocation point in a detailed discussion. 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. An implicit MOS based on conservative assumptions in the analysis is included in the TMDL calculations.

The allowable LTA concentration in each segment is calculated using Monte Carlo Simulation as described previously. The allowable load is then determined by multiplying the allowable concentration by the flow and a conversion factor at each sample point. The allowable load is the TMDL.

Each permitted discharge in a segment is assigned a waste load allocation and the total waste load allocation for each segment is included in this table. There are currently five active permits in the watershed; and each requires a WLA. The RAMM Coal Co. Laurel Ridge #1 Operation requires one WLA. The remaining four permitted sites each require only one WLA each; although these four have between two and eight permitted treatment ponds. These four sites will never have more than one treatment pond in operation at any time. The difference between the TMDL and the WLA at each point is the load allocation at the point. The LA at each point includes all loads entering the segment, including those from upstream allocation points. The percent reduction is calculated to show the amount of load that needs to be reduced within a segment in order for water quality standards to be met at the point.

In some instances, instream processes, such as settling are taking place within a stream segment. These processes are evidenced by a decrease in measured loading between consecutive sample points. It is appropriate to account for these losses when tracking upstream loading through a segment. The calculated upstream load lost within a segment is proportional to the difference in the measured loading between the sampling points.

Table 3. Summary Table–Luthersburg Branch and Laborde Branch Watershed

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
LUB05	LUB05 (48813) UNT to Luthersburg Branch						
	Al	ND	NA	0.7	-	0.0	0
	Fe	ND	NA	1.1	-	0.0	0
	Mn	9.6	9.6	0.7	-	0.0	0
	Acidity	251.8	85.6	0.0	85.6	166.2	66
LUB04	LUB04 (48817) Headwaters of Luthersburg Branch						
	Al	ND	NA	-	-	0.0	0
	Fe	2.5	2.5	0.0	0.0	0.0	0
	Mn	1.3	1.3	0.0	0.0	0.0	0
	Acidity	ND	NA	-	-	0.0	0
LUB03	LUB03 (48811) UNT to Luthersburg Branch Downstream of LUB05 and LUB04						
	Al	ND	NA	-	-	0.0	0
	Fe	ND	NA	-	-	0.0	0
	Mn	0.8	0.8	0.0	0.0	0.0	0
	Acidity	ND	NA	-	-	0.0	0
LUB02	Luthersburg Branch upstream of confluence with Sugarcamp Run						
	Al	ND	NA	0.7	-	0.0	0
	Fe	ND	NA	1.1	-	0.0	0
	Mn	36.5	24.1	0.7	23.4	12.4	34
	Acidity	240.2	160.9	0.0	160.9	0.0	0
SCR03	SCR03 (48810) UNT to Sugarcamp Run						
	Al	0.9	0.7	0.0	0.0	0.2	22
	Fe	ND	NA	-	-	0.0	0
	Mn	2.1	0.9	0.0	0.9	1.2	55
	Acidity	21.1	5.3	0.0	5.3	15.8	75
SCR02	SCR02 (48809) Sugarcamp Run upstream of SCR03						
	Al	ND	NA	0.7	-	0.0	0
	Fe	ND	NA	1.1	-	0.0	0
	Mn	1.0	0.4	0.7	0.4	0.6	65
	Acidity	ND	NA	-	-	0.0	0
SCR01	SCR01 (48809) Sugarcamp Run at the mouth						
	Al	ND	NA	-	-	0.0	0
	Fe	6.5	6.5	0.0	0.0	0.0	0
	Mn	15.0	4.6	0.0	4.6	8.5	65
	Acidity	174.1	57.4	0.0	57.4	100.8	64
LUB01	LUB01 (48807) Luthersburg Branch at the mouth						
	Al	ND	NA	-	-	0.0	0
	Fe	17.2	17.2	0.0	17.2	0.0	0
	Mn	55.0	30.2	0.0	30.2	0.0	45
	Acidity	336.4	262.4	0.0	262.4	0.0	22
SMH16	Most Upstream Sample Point on Laborde Branch						
	Al	0.0	0.0	0.0	0.0	0.0	0
	Fe	1.5	0.7	0.0	0.7	0.8	57
	Mn	2.2	1.2	0.0	1.2	1.0	45
	Acidity	0.0	0.0	0.0	0.0	0.0	0
SMH12	Laborde Branch Sample Point Downstream of Unt 48823						
	Al	0.0	0.0	0.0	0.0	0.0	0
	Fe	3.4	3.4	0.0	3.4	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 %
	Mn	10.0	2.6	0.0	2.6	6.4	71
	Acidity	0.0	0.0	0.0	0.0	0.0	0
SP8	Laborde Branch Sample Point Downstream of Unt 48819						
	Al	0.5	0.5	0.0	0.5	0.0	0
	Fe	0.9	0.9	0.0	0.9	0.0	0
	Mn	1.0	1.0	0.0	1.0	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
LAB01	LAB01 (48803) Laborde Branch at the mouth						
	Al	ND	NA	2.8	-	0.0	0
	Fe	ND	NA	4.4	-	0.0	0
	Mn	15.4	15.4	2.8	12.6	0.0	0
	Acidity	251.8	219.1	0.0	219.1	32.7	13
SP1	Most Downstream Sample Point on Laborde Branch						
	Al	2.1	2.1	0.0	2.1	0.0	0
	Fe	6.9	6.9	0.0	6.9	0.0	0
	Mn	13.7	12.1	0.0	12.1	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0

All waste load allocations were calculated using the methodology explained previously in the Method to Quantify Treatment Pond Pollutant Load section of the report.

Waste allocations for the existing mining operation were incorporated into the calculations at LUB03, LUB05, SCR02, and LAB01. These are the first downstream monitoring points that receive all the potential flow of treated water from the five permitted sites. No required reductions of these permits are necessary at this time because there are upstream non-point sources that when reduced will met the TMDL or there is available assimilation capacity. All necessary reductions are assigned to non-point sources.

Although TMDLs for aluminum and iron are not necessary at LUB05 because the water quality standard is met, WLAs are assigned to the WAR2 discharge of the Waroquier Coal Company, Kinble Operation permit. Because the standards are met for aluminum and iron at LUB05, the actual allowed loads are the water quality standards times the flow and a conversion factor at the point. For LUB05 this equals 6.37 lbs/day for aluminum and 12.76 lbs/day for iron. The aluminum WLA of 0.7 lbs/day and iron WLA of 1.1 lbs/day for the above segment is acceptable and will not have a negative impact on water quality within the segment.

There is no need for TMDLs for aluminum and iron at LUB02 because the water quality standard is met, WLAs are assigned to the WAR1 discharge of the Waroquier Coal Company, Kinble Operation permit. Because the standards are met for aluminum and iron at LUB02, the actual allowed loads are the water quality standards times the flow and a conversion factor at the point. For LUB02 this equals 20.95 lbs/day for aluminum and 41.91 lbs/day for iron. The aluminum WLA of 0.7 lbs/day and iron WLA of 1.1 lbs/day for the above segment is acceptable and will not have a negative impact on water quality within the segment.

TMDLs for aluminum and iron are not necessary at SCR02 because the water quality standard is met, WLAs are assigned to the 001-A, 216-A1, and 018-H discharges of the Strishock Coal Company, Huey Operation permit. One WLA is allocated here because only one treatment pond will be in operation at any time. Because the standards are met for aluminum and iron at SCR02, the actual allowed loads are the water quality standards times the flow and a conversion factor at the point. For SCR02 this equals 1.31 lbs/day for aluminum and 2.62 lbs/day for iron. The aluminum WLA of 0.7 lbs/day and iron WLA of 1.1 lbs/day for the above segment is acceptable and will not have a negative impact on water quality within the segment. A reduction in load for manganese is required; three of the four samples were less than criteria but one sample was greater than criteria. This increased the standard deviation and thus a reduction. The manganese WLA for this segment will not have a negative impact on water quality. This segment has assimilation capacity available.

The LAB01 sample point sees the affects of four WLAs in the segment upstream of LAB01. TMDLs for aluminum, iron and manganese are not necessary at LAB01 because the water quality standard is met, one WLA for each of aluminum, iron and manganese are assigned to the 002-B, 003-C, 004-D, and 007-E discharges of the Strishock Coal Company, Huey Operation permit. One WLA for each of aluminum, iron and manganese are assigned to the RMMN discharge of the RMM Coal Company, Nelson Operation. One WLA for each of aluminum, iron and manganese are assigned to the T8 discharge of the Pentz Coal Company, Smith #1 Operation. One WLA for each of aluminum, iron and manganese are assigned to the TF01, TF02 and TF03 discharges of the RMM Coal Company, Laurel Ridge #1 Operation. One WLA is allocated to each of the above mining operations that have more than one permitted treatment pond because only one treatment pond will be in operation at any time. Because the standards are met for aluminum and iron at LAB01, the actual allowed loads are the water quality standards times the flow and a conversion factor at the point. For LAB01 this equals 32.59 lbs/day for aluminum, 65.52 lbs/day for iron and 43.45 lbs/day for manganese. The total aluminum WLA of 2.8 lbs/day, iron WLA of 4.4 lbs/day and manganese WLA of 2.8 lbs/day for the above segment is acceptable and will not have a negative impact on water quality within the segment.

Table 4. Waste Load Allocation of Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
RAMMN	RAMM Coal Co. Nelson Operation		
Al	2.0	0.0445	0.7
Fe	3.0	0.0445	1.1
Mn	2.0	0.0445	0.7
WARQ	Waroquier Coal Co. Kimble Operation		
Al	2.0	0.0445	0.7
Fe	3.0	0.0445	1.1
Mn	2.0	0.0445	0.7

RAMML	RAMM Coal Co. Laurel Ridge Operation		
Al	2.0	0.0445	0.7
Fe	3.0	0.0445	1.1
Mn	2.0	0.0445	0.7
STRHK	Strishock Coal Co. Huey Mine Operation		
Al	2.0	0.0445	0.7
Fe	3.0	0.0445	1.1
Mn	2.0	0.0445	0.7
PENTZ	Pentz Coal Co. Smith Operation		
Al	2.0	0.0445	0.7
Fe	3.0	0.0445	1.1
Mn	2.0	0.0445	0.7

Recommendations

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.

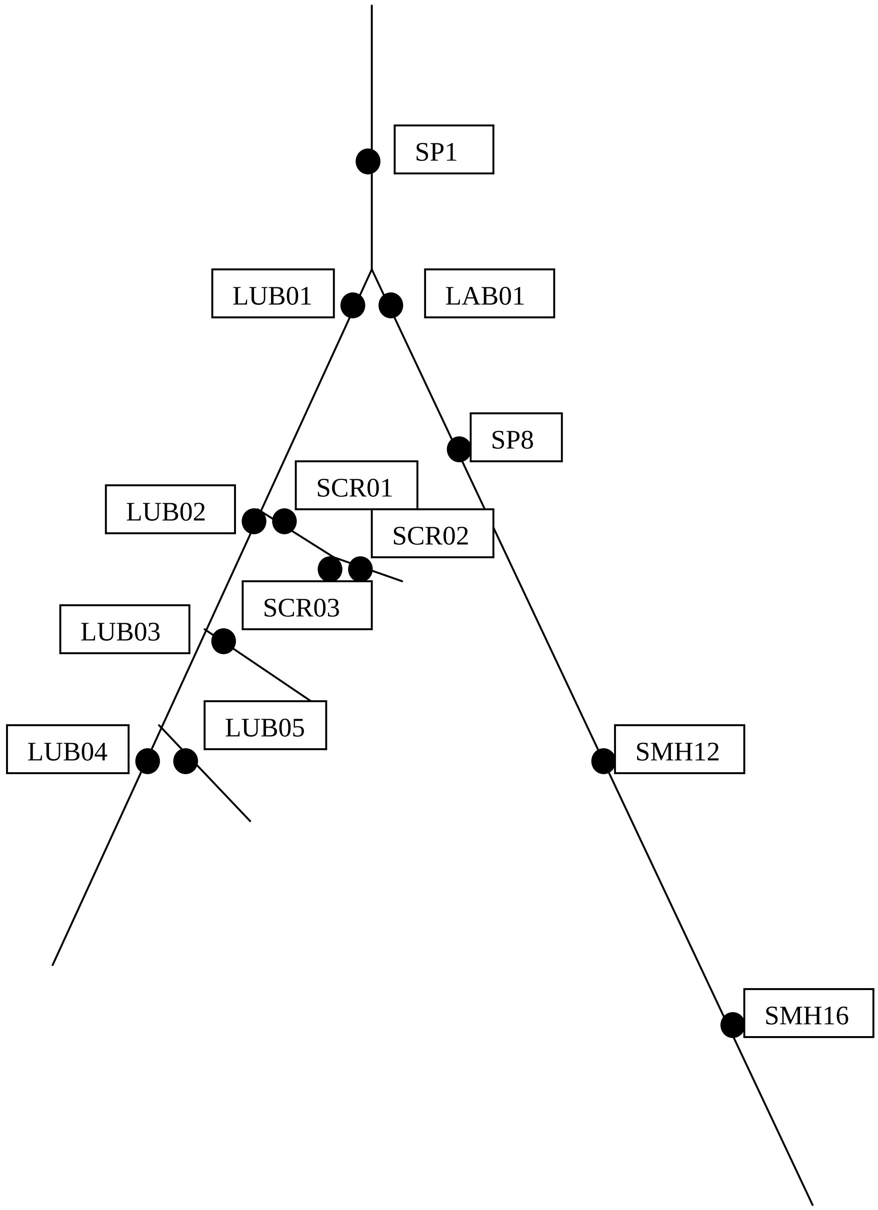
Pennsylvania is striving for complete reclamation of its abandoned mines and plugging of its orphaned wells. Realizing this task is no small order, DEP has developed concepts to make abandoned mine reclamation easier. These concepts, collectively called Reclaim PA, include legislative, policy land management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

All of the abandoned mines in the watershed have led to the degradation of the Laborde Branch watershed. Today many of these sites are being remined and reclaimed which helps reduce the amount of spoils exposed to the weather and reduces the numbers of deep mines in the watershed.

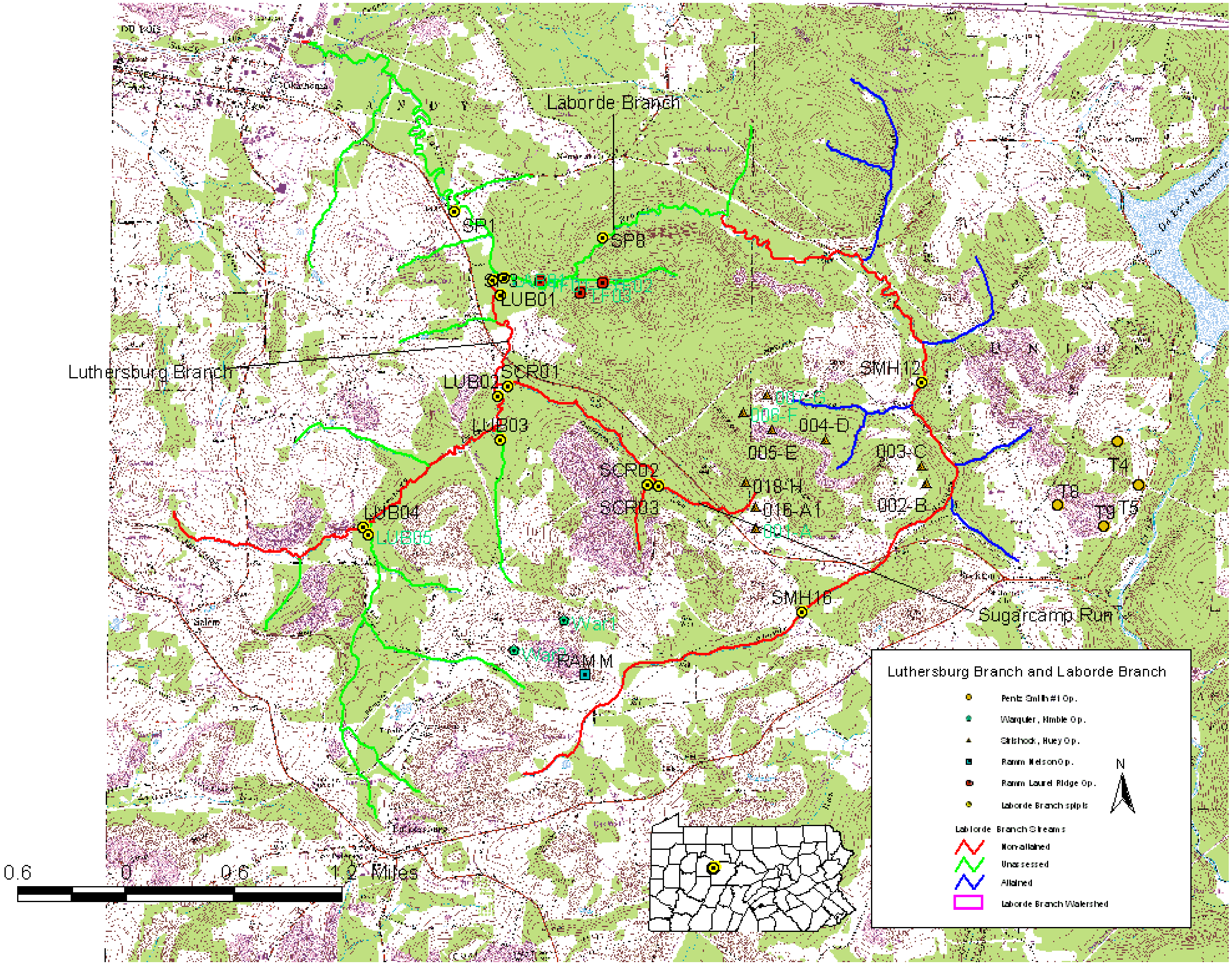
Public Participation

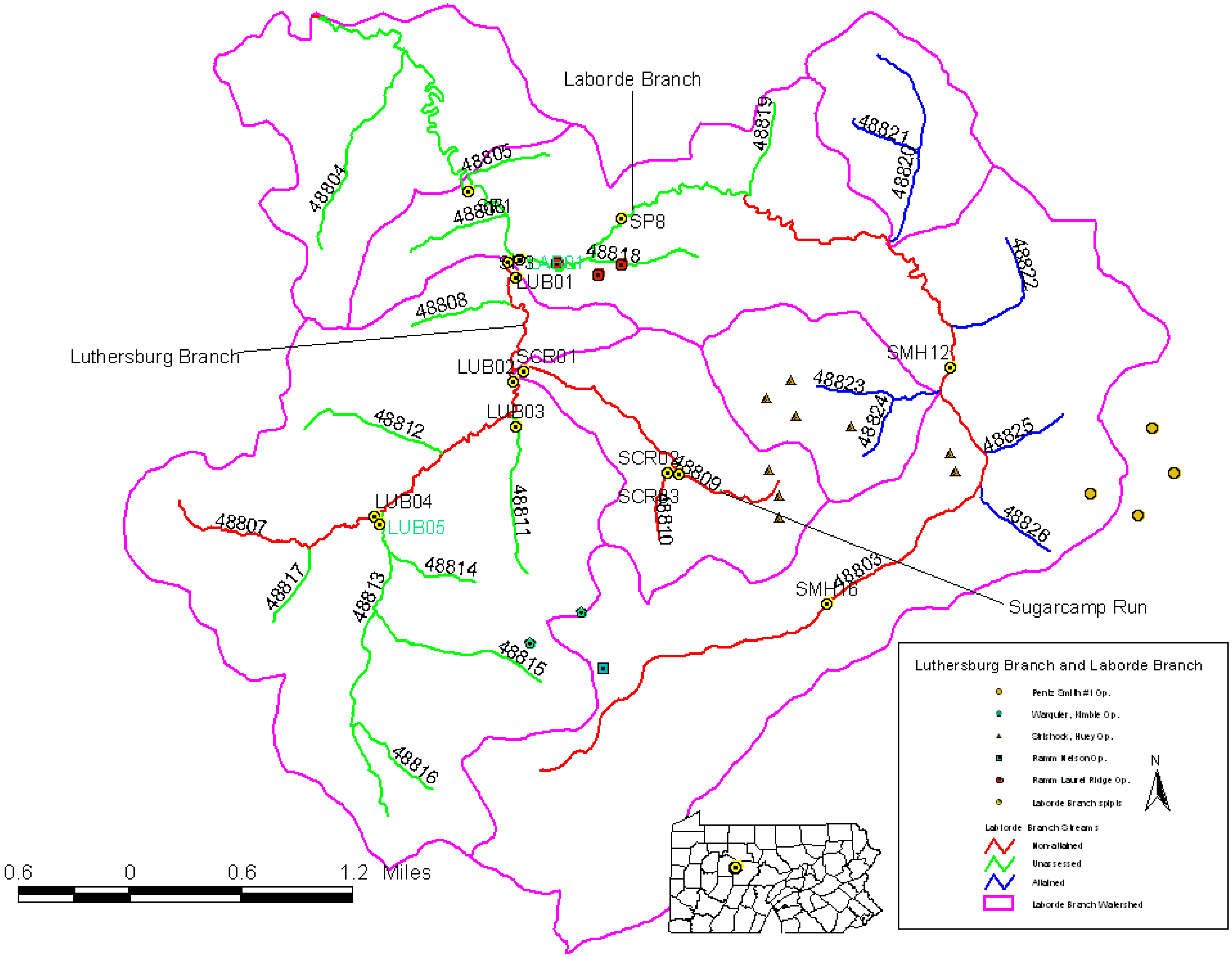
Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on December 30, 2006 and the The Progress, Clearfield, PA, on January 24 and 31, 2007 to foster public comment on the allowable loads calculated. A public meeting was held on February 7, 2007 beginning at 2:00 p.m., at Moshannon District Mining Office, in Philipsburg, PA, to discuss the proposed TMDL.

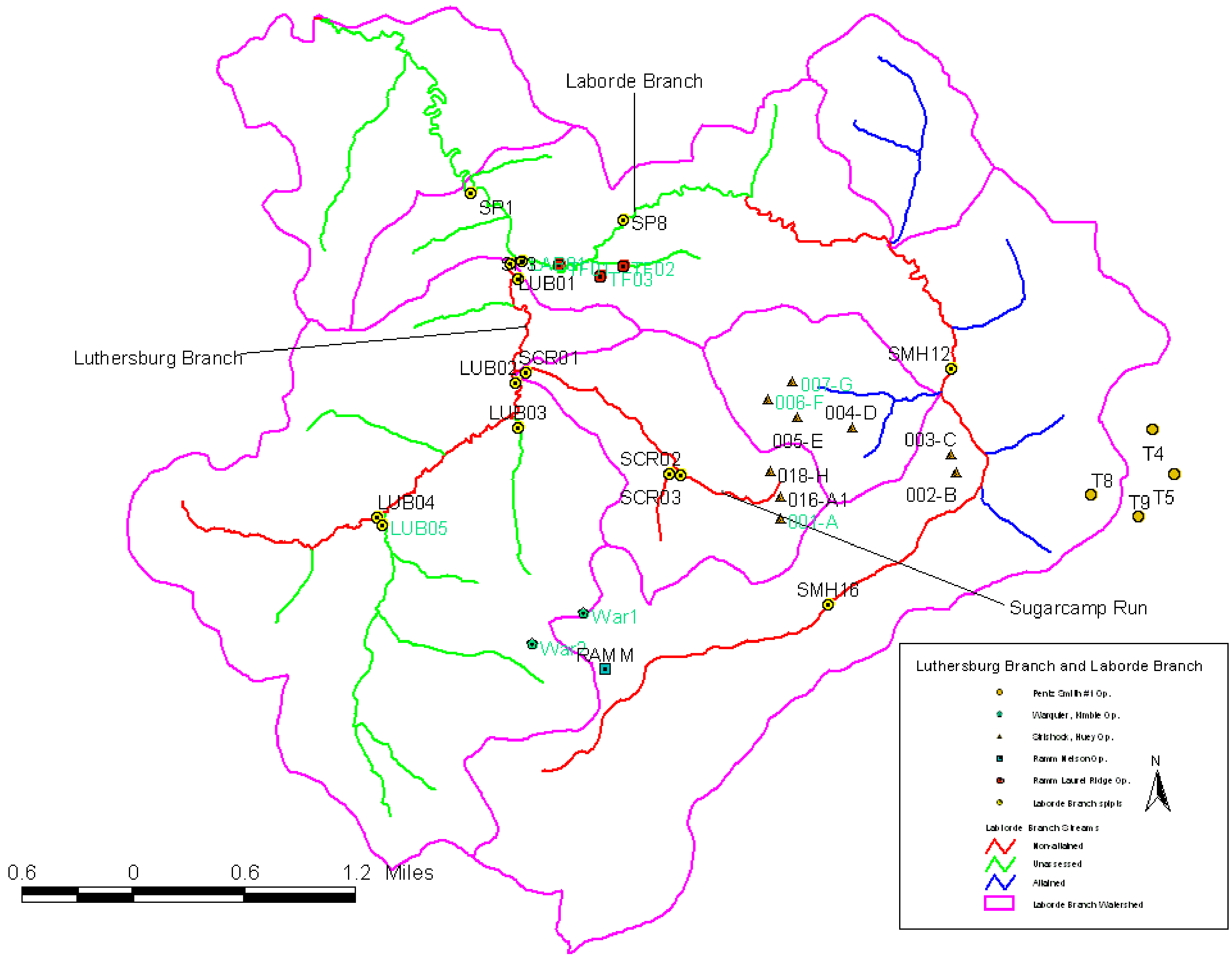

SP1
LUB01
LAB01
SP8
SCR01
LUB02
SCR02
SCR03
LUB03
LUB05
LUB04
SMH12
SMH16

Attachment A

Luthersburg Branch and Laborde Branch Watershed Maps


Laborde Branch
Luthersburg Branch
Sugarcamp Run
SP1
SP8
LUB01
LUB02
LUB03
LUB04
LUB05
SCR01
SCR02
SCR03
SMH12
SMH16
004-D
005-E
003-C
002-B
018-H
016-A1
006-F
001-A
T4
T5
T8
T9
RAM M
0.6
0
0.6
1.2 Miles
Luthersburg Branch and Laborde Branch
N
Non-attained
Unassessed
Attained


Laborde Branch
Luthersburg Branch
Sugarcamp Run
48804
48805
48808
48818
48819
48821
48820
48822
48823
48824
48825
48826
48812
48811
48809
48810
48807
48817
48813
48814
48815
48816
48803
SP8
LUB01
LUB02
SCR01
LUB03
LUB04
LUB05
SCR03
SMH12
SMH16
0.6
0
0.6
1.2 Miles
Luthersburg Branch and Laborde Branch
N


Laborde Branch
SP1
SP8
LUB01
TF03
TF02
Luthersburg Branch
LUB02
SCR01
LUB03
SMH12
007-G
006-F
004-D
005-E
003-C
SCR02
018-H
SCR03
016-A1
002-B
001-A
T4
T8
T9
T5
LUB04
LUB05
SMH16
Sugarcamp Run
War1
RAMM
0.6
0
0.6
1.2
Miles
Luthersburg Branch and Laborde Branch
Laborde Branch Streams
Non-attained
Unassessed
Attained
Laborde Branch Watershed
N

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. 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.

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.*

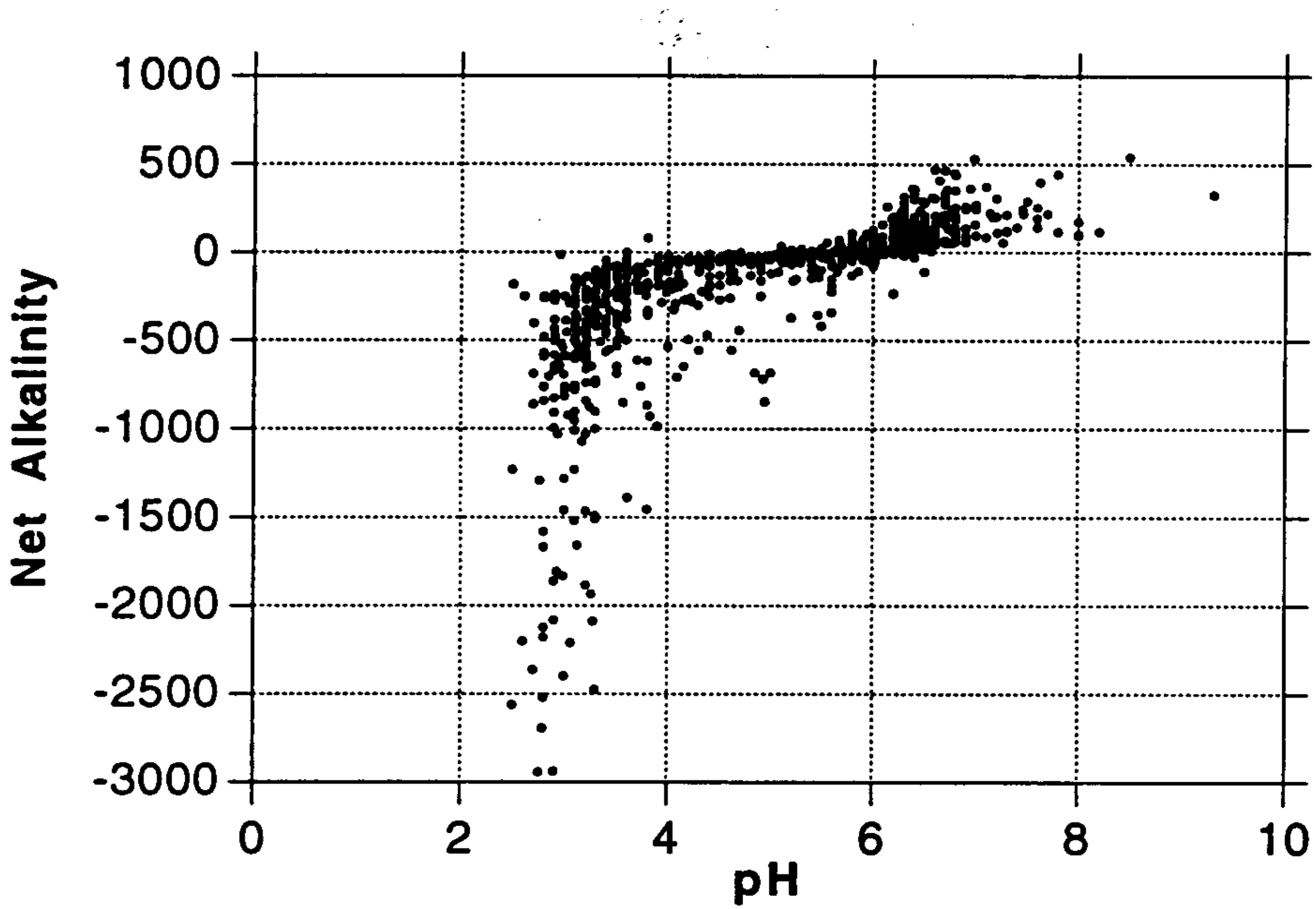


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Attachment C

TMDLs By Segment

Luthersburg Branch and Laborde Branch

The TMDL for Luthersburg Branch and Laborde Branch consists of load allocations for eight sampling sites along Luthersburg Branch Creek and various unnamed tributaries and one sampling site on Laborde Branch.

Luthersburg Branch is listed for metals and other inorganics 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.

Waste Load Allocation – Warquier Coal Co.

The Warquier Coal Co., Kimble Operation Mine Permit has two permitted treatment facilities. One WAR2 is upstream of Sample Point LUB05. The waste load allocation was calculated as described in the Method to Quantify Treatment Pond Pollutant Loading section of the report and is incorporated into the calculations at LUB05. This is the first downstream monitoring point that receives all the potential flow of treated water. The following table shows the waste load allocation.

Table C1. Waste Load Allocation

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
War2			
Al	2.0	0.0445	0.7
Fe	3.0	0.0445	1.1
Mn	2.0	0.0445	0.7

LUB05 UNT to Luthersburg Branch (48813)

The TMDL for this sample point on the UNT to Luthersburg Branch 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 LUB05. The average flow, measured at the sampling point LUB05 (1.02 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 LUB05 shows pH ranging between 6.5 and 6.6, 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.

Allocations were not calculated for aluminum and iron because three of four aluminum and iron sample were less than detection. Because WQS are met, TMDLs for aluminum and iron are not necessary. Although TMDLs are not necessary the measured loads are considered at the next downstream sample point.

Table C2. Load Allocations for Point LUB05

	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	1.13	9.6	0.82	7.0
Acid	29.60	251.8	10.06	85.6
Alkalinity	14.95	127.2		

Table C3. Calculation of Load Reduction Necessary at Point LUB05

	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	ND	ND	9.6	251.8
Allowable Load=TMDL	NA	NA	7.0	85.6
Load Reduction	0.0	0.0	2.6	166.2
Total % Reduction	0	0	27	66

LUB04 Headwaters of Luthersburg Branch (48807)

The TMDL for this segment of Luthersburg Branch consists of a load allocation to all of the watershed area upstream of sample point LUB04. The load allocation for this segment was computed using water-quality sample data collected at point LUB04. The average flow, measured at the sampling point LUB04 (0.46 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 LUB04 shows pH ranging between 7.3 and 7.9, 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.

Allocations were not calculated for aluminum and aciditity because all of the aluminum data were less than detection and the segment was net alkaline. Because the WQS is met, a TMDL for aluminum is not necessary. Although an aluminum TMDL is not necessary the measured load is considered at the next downstream sample point.

Table C4. Load Allocations at Point LUB04

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.65	2.5	0.65	2.5
Manganese	0.33	1.3	0.33	1.3
Acid	ND	ND	MA	NA
Alkalinity	81.95	315.4		

Table C5. Calculation of Load Reduction Necessary at Point LUBO4

	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	ND	2.5	1.3	ND
Allowable Load=TMDL	NA	2.5	1.3	NA
Load Reduction	0.0	0.0	0.0	0.0
Total % Reduction	0	0	0	0

LUB03 UNT to Luthersburg Branch Downstream of LUB04 (48811)

The TMDL for sampling point LUB03 consists of a load allocation to the area upstream of point LUB03. The load allocation for this tributary was computed using water-quality sample data collected at point LUB03. The average flow, measured at the sampling point LUB03 (0.15 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 LUB03 shows pH ranging between 6.6 and 7.0, 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.

Allocations were not calculated for aluminum, iron and acidity because all of the data were less than detection. Because WQS are met, TMDLs for aluminum and iron are not necessary. Although TMDLs are not necessary the measured loads are considered at the next downstream sample point for aluminum, iron and acidity.

Table C6. Load Allocations at Point LUB03				
	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	0.62	0.8	0.50	0.6
Acid	ND	ND	NA	NA
Alkalinity	29.90	3676		

Table C7. Calculation of Load Reduction Necessary at Point LUB03				
	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	ND	ND	0.8	ND
Allowable Load=TMDL	NA	NA	0.6	NA
Load Reduction	0.0	0.0	0.2	0.0
Total % Reduction	0	0	19	0

Waste Load Allocation – Warquier Coal Co.

The Warquier Coal Co., Kimble Operation Mine Permit has two permitted treatment facilities. One WAR1 is upstream of Sample Point LUB02. The waste load allocation was calculated as described in the Method to Quantify Treatment Pond Pollutant Loading section of the report and is incorporated into the calculations at LUB02. This is the first downstream monitoring point that receives all the potential flow of treated water. The following table shows the waste load allocation.

Table C8. Waste Load Allocation			
Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
War1			
Al	2.0	0.0445	0.7
Fe	3.0	0.0445	1.1
Mn	2.0	0.0445	0.7

LUB02 Luthersburg Branch (48807) downstream of LUB03

The TMDL for this segment of Luthersburg Branch consists of a load allocation to the area between sample points LUB05, LUB04, LUB03 and LUB02. The load allocation for this segment was computed using water-quality sample data collected at point LUB02. The average flow, measured at the sampling point LUB02 (3.35 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 LUB02 shows pH ranging between 6.8 and 7.1, 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.

Allocations were not calculated for aluminum and iron because all of the aluminum data was less than detection and three of four iron samples were less than detection. Because WQS are met, TMDLs for aluminum and iron are not necessary. Although TMDLs are not necessary the measured loads are considered at the next downstream sample point.

Table C9. Load Allocations for Point LUB02				
	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	1.31	36.5	0.86	24.1
Acid	8.60	240.2	5.76	160.9
Alkalinity	36.35	1015.3		

The calculated load reductions for all the loads that enter point LUB02 must be accounted for in the calculated reductions at sample point LUB01 shown in Table C10. A comparison of measured loads between points LUB05, LUB04, LUB03, and LUB02 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 manganese loading within the segment. The total segment load for manganese is the sum on the upstream allocated loads and any additional loading within the segment.

Table C10. Calculation of Load Reduction at Point LUB02

	Al	Fe	Mn	Acidity
Existing Load	0	0.0	36.5	240.2
Difference in Existing Load between LUB05, LUB04, LUB03 & LUB02	0.0	-2.5	24.9	-11.6
Load tracked from LUB05, LUB04 & LUB03	0.0	2.5	8.89	85.6
Percent loss due to instream process	-	100	-	5
Percent load tracked from LUB05, LUB04 & LUB03	-	0	-	95
Total Load tracked from LUB05, LUB04 & LUB03	0.0	0.0	33.8	81.7
Allowable Load at LUB03	0.0	0.0	24.1	160.9
Load Reduction at LUB02	0.0	0.0	9.7	0.0
% Reduction required at LUB02	0	0	29	0

SCR03 UNT (48810) to Sugarcamp Run at the mouth

The TMDL for this unnamed tributary of Sugarcamp Run consists of a load allocation to all of the watershed area upstream of sample point SCR03. The load allocation for this segment was computed using water-quality sample data collected at point SCR03. The average flow, measured at the sampling point SCR03 (0.14 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 SCR03 shows pH ranging between 5.1 and 5.3, 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.

Allocations were not calculated for iron because the iron data points were all less than detection. Because the WQS is met, a TMDL for iron is not necessary. Although a TMDL is not necessary the measured load is considered at the next downstream sample point.

Table C11. Load Allocations at Point SCR03				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.77	0.9	0.60	0.7
Iron	ND	ND	NA	NA
Manganese	1.71	2.1	0.77	0.9
Acid	17.45	21.1	4.36	5.3
Alkalinity	8.85	10.7		

Table C12. Calculation of Load Reduction Necessary at Point SCR03				
	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	0.9	ND	2.1	21.1
Allowable Load=TMDL	0.7	NA	0.9	5.3
Load Reduction	0.2	0.0	1.2	15.8
Total % Reduction	22	0	55	75

Waste Load Allocation – Strishock Coal Co.

The Strishock Coal Co., Huey Mine Operation Mine Permit has eight permitted treatment facilities. Three 001-S, 016-A1 and 018-H ARE upstream of Sample Point SCR02. The waste load allocation was calculated as described in the Method to Quantify Treatment Pond Pollutant Loading section of the report and is incorporated into the calculations at SCR02. Only one WLA is required at this sample point because only one of the permitted treatment ponds will be functioning at any time. This is the first downstream monitoring point that receives all the potential flow of treated water. The following table shows the waste load allocation.

Table C13. Waste Load Allocation			
Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
001-A, 016-A1 and 018H			
Al	2.0	0.0445	0.7
Fe	3.0	0.0445	1.1
Mn	2.0	0.0445	0.7

SCR02 Headwaters of Sugarcamp Run (48809)

The TMDL for sampling point SCR02 consists of a load allocation of the area upstream of sample point SCR02. The load allocation for this tributary was computed using water-quality sample data collected at point SCR02. The average flow, measured at the sampling point SCR02 (0.21 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 SCR02 shows pH ranging between 6.7 and 7.2, 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.

Allocations were not calculated for aluminum, iron and acidity because aluminum and iron measurements were less than detection and this sample point is net alkaline. Because WQS are met, TMDLs for aluminum and iron are not necessary. Although TMDLs are not necessary the measured loads are considered at the next downstream sample point for aluminum, iron and acidity.

Table C14. Load Allocations at Point SCR02

	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	0.57	1.0	0.20	0.4
Acid	ND	ND	NA	NA
Alkalinity	11.24	13.1		

Table C15. Calculation of Load Reduction Necessary at Point SCR02

	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	ND	ND	1.0	ND
Allowable Load=TMDL	NA	NA	0.4	NA
Load Reduction	0.0	0.0	0.6	0.0
Total % Reduction	0	0	65	0

SCR01 Mouth of Sugarcamp Run (48809)

The TMDL for sampling point SCR01 consists of a load allocation of the area between sample points SCR03, SCR02 and SCR01. The load allocation for this tributary was computed using water-quality sample data collected at point SCR01. The average flow, measured at the sampling point SCR01 (0.86 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 SCR01 shows pH ranging between 6.5 and 6.7, 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.

Allocations were not calculated for aluminum because all of the aluminum measurements were less than detection. Because the WQS is met, a TMDL for aluminum is not necessary. Although a TMDL is not necessary the measured load is considered at the next downstream sample point.

Table C16. Load Allocations for Point SCR01

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	ND	ND	NA	NA
Iron	0.91	6.5	0.91	6.5
Manganese	2.08	15.0	0.65	4.6
Acid	24.20	174.1	7.99	57.4
Alkalinity	22.85	164.4		

The calculated load reductions for all the loads that enter point SCR01 must be accounted for in the calculated reductions at sample point SCR01 shown in Table C17. A comparison of measured loads between points SCR03, SCR02 and SCR01 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 loads are the sum of the upstream allocated loads and any additional loading within the segment.

Table C17. Calculation of Load Reduction at Point SCR01				
	Al	Fe	Mn	Acidity
Existing Load	0.0	6.5	15.0	147.1
Difference in Existing Load between SCR03, SCR02 & SCR01	-0.9	6.5	11.9	153.0
Load tracked from SCR03 & SCR02	0.7	0.0	1.3	5.3
Percent loss due to instream process	100	-	-	-
Percent load tracked from SCR03 & SCR02	0	-	-	-
Total Load tracked between points SCR03, SCR02 & SCR01	0.0	6.5	13.2	158.3
Allowable Load at SCR01	0.0	6.5	4.6	57.4
Load Reduction at SCR01	0.0	0.0	8.5	100.8
% Reduction required at SCR01	0	0	65	64

LUB01 Mouth of Luthersburg Branch (48807) before confluence with Laborde Branch

The TMDL for this segment of Luthersburg Branch consists of a load allocation to all of the watershed area between sample points LUB02, SCR01 and LUB01. The load allocation for this segment was computed using water-quality sample data collected at point LUB01. The average flow, measured at the sampling point LUB01 (4.64 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 LUB01 shows pH ranging between 6.8 and 7.0, pH will be addressed in this TMDL because the influence of mining. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum because all of the aluminum measurements were less than detection. Because the WQS is met, a TMDL for aluminum is not necessary. Although a TMDL is not necessary the measured loads are considered at the next downstream sample point for.

Table C18. Load Allocations for Point LUB01				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	ND	ND	NA	NA
Fe	0.45	17.2	0.45	17.2
Mn	1.42	55.0	0.78	30.2
Acid	8.70	336.4	6.79	262.4
Alk	35.55	1374.4		

The calculated load reductions for all the loads that enter point LUB01 must be accounted for in the calculated reductions at sample point LUB01 shown in Table C19. A comparison of measured loads between points LUB02, SCR01 and LUB01 shows that there is no additional loading entering the segment for aluminum. For aluminum the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is an increase in iron, manganese and acidity loading within the segment. The total segment load for iron, manganese and acidity is the sum on the upstream allocated loads and any additional loading within the segment.

Table C19. Calculation of Load Reduction at Point LUB01

	Al	Fe	Mn	Acidity
Existing Load	0	17.2	55.0	336.4
Difference in Existing Load between LUB02, SCR01, & LUB01	0.0	10.7	3.5	-77.9
Load tracked from LUB02 & SCR01	0.0	6.5	28.7	218.4
Percent loss due to instream process	-	-	-	19
Percent load tracked from LUB02 & SCR01	-	-	-	81
Total Load tracked from LUB02 & SCR01	0.0	17.2	32.2	177.3
Allowable Load at LUB01	0.0	17.2	30.2	262.4
Load Reduction at LUB01	0.0	0.0	2.0	0.0
% Reduction required at LUB01	0	0	6	0

SMH16 Most Upstream Sample Point on Laborde Branch

The TMDL for sampling point SMH16 consists of a load allocation of the area upstream of sample point SMH16. The load allocation for this tributary was computed using water-quality sample data collected at point SMH16. The average flow, measured at the sampling point SMH16 (0.96 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 SCR02 shows pH ranging between 6.5 and 7.6, pH will not be addressed in this TMDL because acidity data was not collected.

Allocations were not calculated for aluminum and acidity because aluminum and acidity sample data were not collected at this sample point.

Table C20. Load Allocations at Point SMH16				
	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Aluminum	0.0	0.0	0.0	0.0
Iron	0.19	1.5	0.08	0.7
Manganese	0.27	2.2	0.15	1.2
Acid	0.0	0.0	0.0	0.0
Alkalinity	42.10	338.8		

Table C21. Calculation of Load Reduction Necessary at Point SMH16				
	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	0.0	1.5	2.2	0.0
Allowable Load=TMDL	0.0	0.7	1.2	0.0
Load Reduction	0.0	0.8	1.0	0.0
Total % Reduction	0	57	45	0

SMH12 Laborde Branch Sample Point Downnstream of Unt 48823

The TMDL for this segment of Laborde Branch consists of a load allocation to all of the watershed area between sample points SMH16 and SMH12. The load allocation for this segment was computed using water-quality sample data collected at point SMH12. The average flow, measured at the sampling point SMH12 (1.13 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 SMH12 shows pH ranging between 6.5 and 7.6, pH will not be addressed in this TMDL because acidity data was not collected.

Allocations were not calculated for aluminum and acidity because aluminum and acidity data were not collected.

Table C22. Load Allocations for Point SMH12				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.0	0.0	0.0	0.0
Fe	0.36	3.4	0.36	3.4
Mn	1.07	10.0	0.28	2.6
Acid	0.0	0.0	0.0	0.0
Alk	35.31	331.4		

The calculated load reductions for all the loads that enter point SMH12 must be accounted for in the calculated reductions at sample point SMH12 shown in Table C23. A comparison of measured loads between points SMH16 and SMH12 shows that there is an increase in iron, and manganese loading within the segment. The total segment load for iron and manganese is the sum on the upstream allocated loads and any additional loading within the segment.

Table C23. Calculation of Load Reduction at Point SMH12				
	Al	Fe	Mn	Acidity
Existing Load	0	3.4	10.0	0
Difference in Existing Load between SMH16 & SMH12	0.0	1.9	7.9	0.0
Load tracked from SMH16	0.0	0.7	1.2	0.0
Percent loss due to instream process	-	-	-	-
Percent load tracked from SMH16	-	-	-	-
Total Load tracked from SMH16	0.0	2.5	9.0	0.0
Allowable Load at SMH12	0.0	3.4	2.6	0.0
Load Reduction at SMH12	0.0	0.0	6.4	0.0
% Reduction required at SMH12	0	0	71	0

SP8 Laborde Branch Sample Point Downnstream of Unt 48819

The TMDL for this segment of Laborde Branch consists of a load allocation to all of the watershed area between sample points SMH12 and SP8. The load allocation for this segment was computed using water-quality sample data collected at point SP8. The average flow, measured at the sampling point SP8 (0.48 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 SP8 shows pH ranging between 3.9 and 7.4, pH will not be addressed in this TMDL because no acidity data was sampled.

Allocations were not calculated for acidity because acidity data was not collected.

Table C24. Load Allocations for Point SP8				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.12	0.5	0.12	0.5
Fe	0.22	0.9	0.22	0.9
Mn	0.24	1.0	0.24	1.0
Acid	0.0	0.0	0.0	0.0
Alk	28.86	115.5		

The calculated load reductions for all the loads that enter point SP8 must be accounted for in the calculated reductions at sample point SP8 shown in Table C25. A comparison of measured loads between points SMH12 and SP8 shows that there is no additional loading entering the segment for iron and manganese. For iron and manganese the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is an increase in aluminum loading within the segment. The total segment load for aluminum is the sum on the upstream allocated load and any additional loading within the segment.

Table C25. Calculation of Load Reduction at Point SP8

	Al	Fe	Mn	Acidity
Existing Load	0.5	0.9	1.0	0
Difference in Existing Load between SMH12 & SP8	0.5	-2.5	-9.1	0.0
Load tracked from SMH12	0.0	3.4	2.6	0.0
Percent loss due to instream process	-	74	90	-
Percent load tracked from SMH12	-	26	10	-
Total Load tracked from SMH12	0.5	0.9	0.3	0.0
Allowable Load at SP8	0.5	0.9	1.0	0.0
Load Reduction at SP8	0.0	0.0	0.0	0.0
% Reduction required at SP8	0	0	0	0

Waste Load Allocations – RAMM Coal Co., Pentz Coal Co. and Strishock Coal Co.

The RAMM Coal Co., Nelson Operation Mine Permit has one permitted treatment facility. RAMM is upstream of Sample Point LAB01. The waste load allocation was calculated as described in the Method to Quantify Treatment Pond Pollutant Loading section of the report and is incorporated into the calculations at LAB01. This is the first downstream monitoring point that receives all the potential flow of treated water. The following table shows the waste load allocation.

Table C26. Waste Load Allocation

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
RAMM			
Al	2.0	0.0445	0.7
Fe	3.0	0.0445	1.1
Mn	2.0	0.0445	0.7

The Strishock Coal Co., Huey Ridge Operation Mine Permit has five permitted treatment facilities. Treatment ponds 002-B, 003-C, 004-D, 006-E, and 007-G are upstream of Sample Point LAB01. Only one of these treatment ponds will discharge at any time. The waste load allocation was calculated as described in the Method to Quantify Treatment Pond Pollutant

Loading section of the report and is incorporated into the calculations at LAB01. This is the first downstream monitoring point that receives all the potential flow of treated water. The following table shows the waste load allocation.

Table C27. Waste Load Allocation			
Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
002-B, 003-C, 004-D, 006-E, and 007			
Al	2.0	0.0445	0.7
Fe	3.0	0.0445	1.1
Mn	2.0	0.0445	0.7

The Pentz Coal Co., Smith #1 Operation Mine Permit has one permitted treatment facility. Treatment pond T8 is upstream of Sample Point LAB01. The waste load allocation was calculated as described in the Method to Quantify Treatment Pond Pollutant Loading section of the report and is incorporated into the calculations at LAB01. This is the first downstream monitoring point that receives all the potential flow of treated water. The following table shows the waste load allocation.

Table C28. Waste Load Allocation			
Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
War2			
Al	2.0	0.0445	0.7
Fe	3.0	0.0445	1.1
Mn	2.0	0.0445	0.7

The RAMM Coal Co., Laurel Ridge Operation Mine Permit has three permitted treatment facilities. TF01, TF02 and TF03 are upstream of Sample Point LAB01. Only one of these treatment ponds will discharge at any time. The waste load allocation was calculated as described in the Method to Quantify Treatment Pond Pollutant Loading section of the report and is incorporated into the calculations at LAB01. This is the first downstream monitoring point that receives all the potential flow of treated water. The following table shows the waste load allocation.

Table C29. Waste Load Allocation			
Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
TF01, TF02 and TF03			
Al	2.0	0.0445	0.7
Fe	3.0	0.0445	1.1
Mn	2.0	0.0445	0.7

LAB01 Laborde Branch (48803) upstream of the confluence with Luthersburg Branch

The TMDL for this segment of Laborde Branch consists of a load allocation to all of the watershed area upstream of sample point LAB01. The load allocation for this segment was computed using water-quality sample data collected at point LAB01. The average flow, measured at the sampling point LAB01 (5.21 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 LAB01 shows pH ranging between 6.9 and 7.2, 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.

Allocations were not calculated for aluminum and iron because all of the aluminum data was less than detection and three of four iron measurements were less than detection. Because WQS are met, TMDLs for aluminum, iron and manganese are not necessary. Although TMDLs are not necessary the measured loads are considered at the next downstream sample point.

Table C30. Load Allocations for Point LAB01				
	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	0.36	15.4	0.36	15.4
Acid	5.80	251.8	5.05	219.1
Alkalinity	35.80	1554.1		

The calculated load reductions for all the loads that enter point SP8 must be accounted for in the calculated reductions at sample point SP8 shown in Table C25. A comparison of measured loads between points SMH12 and SP8 shows that there is no additional loading entering the segment for iron and manganese. For iron and manganese the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is an increase in aluminum loading within the segment. The total segment load for aluminum is the sum on the upstream allocated load and any additional loading within the segment.

Table C31. Calculation of Load Reduction at Point LAB01

	Al	Fe	Mn	Acidity
Existing Load	0	0	15.4	251.8
Difference in Existing Load between SP8 & LAB01	-0.5	-0.9	14.5	251.8
Load tracked from SP8	0.5	0.9	1.0	0.0
Percent loss due to instream process	100	100	-	-
Percent load tracked from SP8	0	0	-	-
Total Load tracked from SP8	0.0	0.0	15.4	251.8
Allowable Load at LAB01	0.0	0.0	15.1	219.1
Load Reduction at LAB01	0.0	0.0	0.0	32.7
% Reduction required at LAB01	0	0	0	13

SP1 Most Downstream Sample Point on Laborde Run

The TMDL for this segment of Laborde Branch consists of a load allocation to all of the watershed area between sample points LAB01, LUB01 and SP1. The load allocation for this segment was computed using water-quality sample data collected at point SP1. The average flow, measured at the sampling point SP1 (2.76 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 SP1 shows pH ranging between 6.9 and 7.4, pH will not be addressed in this TMDL because acidity was not sampled.

Allocations were not calculated for acidity because acidity data was not collected.

Table C32. Load Allocations for Point SP1

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.09	2.1	0.09	2.1
Fe	0.30	6.9	0.30	6.9
Mn	0.59	13.7	0.55	12.7
Acid	0.0	0.0	0.0	0.0
Alk	30.00	690.6		

The calculated load reductions for all the loads that enter point SP1 must be accounted for in the calculated reductions at sample point SP1 shown in Table C33. A comparison of measured loads between points LAB01, LUB01 and SP1 shows that there is no additional loading entering the segment for iron and manganese. For iron and manganese the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is an increase in aluminum loading within the segment. The total segment load for aluminum is the sum on the upstream allocated load and any additional loading within the segment.

Table C33. Calculation of Load Reduction at Point SP1

	Al	Fe	Mn	Acidity
Existing Load	2.1	6.9	13.7	0
Difference in Existing Load between LAB01, LUB01 & SP8	2.1	-10.3	-56.1	-588.1
Load tracked from LAB01 & LUB01	0.0	17.2	45.7	481.4
Percent loss due to instream process	-	60	81	100
Percent load tracked from LAB01 & LUB01	-	40	19	0
Total Load tracked from LAB01 & LUB01	2.1	6.9	8.9	0.0
Allowable Load at SP1	2.1	6.9	12.7	0.0
Load Reduction at SP1	0.0	0.0	0.0	0.0
% Reduction required at SP1	0	0	0	0

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, 2002, and 2004 Section 303(d) Lists

The following are excerpts from the Pennsylvania DEP 303(d) narratives that justify changes in listings between the 1996, 1998, 2002, and 2004 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

LUB05	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Flow
Date	**Lab**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**gpm**
5/12/2004	6.5	12.0	37.20	<0.3	1.22	<0.500	911
8/10/2004	6.5	17.2	27.80	0.44	1.09	0.51	373
10/26/2004	6.6	17.4	24.80	<.0.3	1.20	<0.500	656
3/7/2005	6.5	13.2	28.60	<0.3	1.01	<0.500	893
avg=	6.53	14.95	29.60		1.13		708.25
stdev=			5.32		0.10		

LUB04	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Flow
Date	**Lab**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**gpm**
5/12/2004	7.9	82.2	-46.00	0.57	0.24	<0.5	445
8/10/2004	7.7	95.0	-72.60	0.84	0.31	<0.5	114
10/26/2004	7.6	89.4	-59.00	0.74	0.50	<0.5	222
3/7/2005	7.3	61.2	-19.40	0.45	0.27	<0.5	501
avg=	7.63	81.95	-49.25	0.65	0.33		320.50
stdev=				0.18	0.12		

LUB03	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Flow
Date	**Lab**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**gpm**
5/11/2004	6.7	30.6	-8.20	<0.3	0.38	<0.5	190
8/10/2004	6.8	37.6	-13.20	<0.3	0.69	<0.5	37
10/25/2004	7.0	28.4	-9.40	<0.3	0.85	<0.5	106
3/7/2005	6.6	23.0	-2.20	<0.3	0.54	<0.5	75
avg=	6.78	29.90	-8.25		0.62		102.00
stdev=					0.20		

LUB02	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Flow
Date	**Lab**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**gpm**
5/11/2004	6.9	33.4	19.40	<0.3	1.42	<0.5	2923
8/10/2004	6.9	43.4	-5.00	0.34	1.24	<0.5	1530
10/25/2004	7.1	38.4	3.20	<0.3	1.33	<0.5	1850
3/7/2005	6.8	30.2	16.80	<0.3	1.24	<0.5	3000
avg=	6.93	36.35	8.60		1.31		2325.75
stdev=			11.52		0.09		

SCR03	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Flow
Date	**Lab**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**gpm**
5/12/2004	5.1	8.4	26.00	<0.3	1.56	0.82	138
8/10/2004	5.3	8.6	16.60	<0.3	1.77	0.85	74
10/26/2004	5.3	9.6	13.40	<0.3	1.97	0.69	90
3/7/2005	5.2	8.8	13.80	<0.3	1.55	0.73	100
avg=	5.23	8.85	17.45		1.71	0.77	100.50
stdev=			5.88		0.20	0.08	

SCR02	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Flow
Date	**Lab**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**gpm**
5/12/2004	7.2	25.2	-5.60	<0.3	0.22	<0.5	106
8/10/2004	6.7	27.0	-9.60	<0.3	0.44	<0.5	101
10/26/2004	7.0	28.0	-9.60	<0.3	0.18	<0.5	85
3/7/2005	7.0	32.2	-2.00	<0.3	1.42	<0.5	300
avg=	6.98	28.10	-6.70		0.57		148.00
stdev=					0.58		

SCR01	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Flow
Date	**Lab**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**gpm**
5/11/2004	6.6	20.2	44.00	0.62	1.87	<0.5	622
8/10/2004	6.5	24.8	15.60	0.95	2.51	<0.5	406
10/25/2004	6.7	24.6	17.00	1.10	2.35	<0.5	532
3/7/2005	6.7	21.8	20.20	0.97	1.60	<0.5	836
avg=	6.63	22.85	24.20	0.91	2.08		599.00
stdev=			13.34	0.21	0.42		

LUB01	pH	Alkalinity	Acidity	Iron	Manganese	Aluminum	Flow
Date	**Lab**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**gpm**
5/11/2004	6.8	33.2	18.40	0.56	1.51	<0.5	4228
8/9/2004	6.8	40.4	-1.60	0.46	1.40	<0.5	2082
10/25/2004	7.0	38.4	3.40	0.44	1.57	<0.5	2503
3/7/2005	6.8	30.2	14.60	0.33	1.21	<0.5	4064
avg=	6.85	35.55	8.70	0.45	1.42		3219.25
stdev=			9.36	0.09	0.16		

SP16							
Date	Flow (gpm)	Lab pH	Alkalinity (mg/l)	Acidity (mg/l)	Iron (mg/l)	Mn (mg/l)	Al (mg/l)
1/3/2003	1000	6.8	21.28		0.13	0.26	
4/2/2003	1000	6.8	25.01		0.18	0.26	
7/3/2003	420	7.3	68.92		0.18	0.22	
10/3/2003	880	7	44.42		0.17	0.35	
1/5/2004	1000	6.5	32.08		0.49	0.25	
4/5/2004	1000	7.1	30.92		0.26	0.4	
7/6/2004	280	7.3	64.02		0.1	0.18	
10/4/2004	550	7.1	60.54		0.1	0.32	
1/10/2005	900	7.1	23.43		0.16	0.3	
4/8/2005	800	7.3	33.05		ltd	0.21	
7/14/2005	170	7.6	60.32		0.2	0.25	
10/5/2005	40	6.8	41.25		0.12	0.23	
avg=	670.00	7.06	42.10		0.19	0.27	
stdev=					0.11	0.06	

SMH12							
Date	Flow (gpm)	Lab pH	Alkalinity (mg/l)	Acidity (mg/l)	Iron (mg/l)	Mn (mg/l)	Al (mg/l)
1/3/2003	1000	6.5	13.19	0.8	0.42	0.66	
4/2/2003	1000	6.6	14.48		0.56	3.1	
7/3/2003	820	7.2	34.26		0.21	0.79	
10/3/2003	1000	7	43.24		0.43	1.68	
1/5/2004	1000	6.7	12.87		0.75	0.64	
4/5/2004	1000	7.1	29.83		0.72	1.48	
7/6/2004	600	7.3	52.31		0.27	0.94	
10/4/2006	700	7.4	62.39		0.23	1.18	
1/10/2005	1000	6.8	20.48		0.27	0.74	
4/8/2005	1000	7.6	31.92		0.25	0.98	
7/14/2005	200	7.6	46.27		0.14	0.26	
10/5/2005	60	7.1	62.42		0.12	0.36	
avg=	781.67	7.08	35.31		0.36	1.07	
stdev=					0.21	0.76	

SP8							
Date	Flow (gpm)	Lab pH	Alkalinity (mg/l)	Acidity (mg/l)	Iron (mg/l)	Mn (mg/l)	Al (mg/l)
11/12/998	200	7.3	34		0.12	0.14	0.04
12/7/1998	200	7.4	38		0.08	0.07	0.04
1/21/1999	250	7	28		0.12	0.23	0.08
2/15/1999	750	3.9	28		0.3	0.26	0.09
3/17/1999	300	7	22		0.3	0.29	0.24
4/7/1999	300	7.1	18		0.24	0.25	0.3
10/30/1999		7.2	34		0.4	0.43	0.05
AVG=	333.33	6.70	28.86		0.22	0.24	0.12
STDEV=					0.12	0.11	0.11

LAB01	**pH**	**Alkalinity**	**Acidity**	**Iron**	**Manganese**	**Aluminum**	**Flow**
Date	**Lab**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**gpm**
5/11/2004	6.9	31.2	17.20	0.36	0.29	<0.5	5539
8/9/2004	6.9	37.4	1.40	<0.3	0.26	<0.5	2398
10/25/2004	7.2	40.6	-3.60	<0.3	0.39	<0.5	2728
3/7/2005	6.9	34.0	8.20	<0.3	0.48	<0.5	3794
avg=	6.98	35.80	5.80		0.36		3614.75
stdev=			9.01		0.10		

SP1							
Date	Flow (gpm)	Lab pH	Alkalinity (mg/l)	Acidity (mg/l)	Iron (mg/l)	Mn (mg/l)	Al (mg/l)
11/12/1998	700	7.4	42		0.33	0.59	0.1
12/7/1998	500	7.5	48		0.21	0.38	0.04
1/21/1999	1800	6.9	20		0.17	0.49	0.12
2/15/1999	4000	6.9	20		0.31	0.5	0.12
3/17/1999	2000	7.1	24		0.34	0.72	0.12
4/7/1999	2500	6.9	20		0.27	0.6	0.07
10/30/2002		7	36		0.47	0.88	0.07
AVG=	1916.67	7.10	30.00		0.30	0.59	0.09
STDEV=					0.10	0.16	0.03

Attachment F

Comment and Response

No comments were received.