# FINAL

# SURVEYOR RUN WATERSHED TMDL

## Clearfield County

For Acid Mine Drainage Affected Segments

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## Introduction

This report presents the Total Maximum Daily Loads (TMDLs) developed for segments in the Surveyor Run Watershed (Attachments A). These were done to address the impairments noted on the 1996 Pennsylvania Section 303(d) list of impaired waters, required under the Clean Water Act, and covers two segments on this list and one additional listed segment (shown in Table 1). High levels of metals, and in some areas depressed pH, caused these impairments. All impairments resulted from acid drainage from abandoned coalmines. The TMDL addresses the three primary metals associated with acid mine drainage (iron, manganese, aluminum) and pH.

**Table 1. 303(d) Sub-List**
**State Water Plan (SWP) Subbasin: 08-C Clearfield Creek**

| Year | Miles | Segment ID | DEP Stream Code | Stream Name | Designated Use | Data Source | Source | EPA 305(b) Cause Code |
|---|---|---|---|---|---|---|---|---|
| 1996 | 4 | 7164 | 26030 | Surveyor Run | CWF | 305(b) Report | RE | Metals |
| 1998 | 4.29 | 7164 | 26030 | Surveyor Run | CWF | SWMP | AMD | Metals |
| 2002 | 2.3 | 7164 | 26030 | Surveyor Run | CWF | SWMP | AMD | Metals |
| 1996 | 2 | 7165 | 26031 | Little Surveyor Run | CWF | RE | AMD | Metals |
| 1998 | 1.98 | 7165 | 26031 | Little Surveyor Run | CWF | SWMP | AMD | Metals |
| 2002 | New survey; new id. (990819-1345-LMS) | | | Little Surveyor Run, Surveyor Run | CWF | SWMP | AMD | Metals & pH |
| 1996 | Not on 303(d) List | | | | | | | |
| 1998 | Not on 303(d) List | | | | | | | |
| 2002 | 4 | 990819-1345-LMS | 26030 | Surveyor Run, Little Surveyor Run | CWF | SWMP | AMD | Metals & Ph |

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

See Attachment D, *Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists.* The use designations for the stream segments in this TMDL can be found in PA Title 25 Chapter 93.

[1] Pennsylvania's 1996, 1998, and 2002 Section 303(d) lists were approved by the Environmental Protection Agency (EPA). The 1997 Section 303(d) list provides the basis for measuring progress under the 1996 lawsuit settlement of *American Littoral Society and Public Interest Group of Pennsylvania v. EPA.*

## Directions to the Surveyor Run Watershed

The Surveyor Run Watershed is located in North Central Pennsylvania, occupying a northeastern portion of Clearfield County within Girard and Goshen Townships. The watershed area is found on portions of the United States Geological Survey maps covering Lecontes Mills and The Knobs 7.5-Minute Quadrangles.

The village of Surveyor is located at the confluence of Surveyor Run and the West Branch of the Susquehanna River. The village of Surveyor lies 15 miles east of Clearfield along State Route 879. Surveyor Run passes under SR 879 just prior to its confluence with the West Branch of the Susquehanna River. The town of Clearfield is easily reached by traveling on Interstate 80, State Route 322 or State Route 153.

## Segments addressed in this TMDL

There are two Sky Haven Coal Company, Inc. active mining operations in the watershed (Attachment A). Both Sky Haven sites have polluting discharges on them that pre-date Sky Haven's operations. The permits, therefore, are issued under DEP's subchapter F regulations, which provide that the permittee's effluent limits are based on baseline pollution conditions rather than standard coal mining BAT standards. Therefore, the subchapter F discharges on these sites have been treated as nonpoint source for the purpose of doing the TMDL, however, waste load allocations have been assigned to the permitted NPDES discharge points for these two active mine sites.

All of the remaining discharges in the watershed are from abandoned mines and will be treated as non-point sources. The distinction between non-point and point sources in this case is determined on the basis of whether or not there is a responsible party for the discharge. Where there is no responsible party the discharge is considered to be a non-point source. Each segment on the PA Section 303(d) list will be addressed as a separate TMDL. These TMDLs will be expressed as long-term, average loadings. Due to the nature and complexity of mining effects on the watershed, expressing the TMDL as a long-term average gives a better representation of the data used for the calculations. See Attachment C for TMDL calculations.

## 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 Environmental Protection Agency's (EPA) implementing regulations (40 CFR Part 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 EPA every two years (April 1 of the even numbered years);

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

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

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

In the cases that have been settled to date, the consent agreements require EPA 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.).

These TMDLs were developed in partial fulfillment of the 1997 lawsuit settlement of *American Littoral Society and Public Interest Group of Pennsylvania v. EPA.*

**Section 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 EPA, the states have developed methods for assessing the waters within their respective jurisdictions.

The primary method adopted by the Pennsylvania Department of Environmental Protection (DEP) for evaluating waters changed between the publication of the 1996 and 1998 Section 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 Section 305(b)[2] reporting

[2] Section 305(b) of the Clean Water Act requires a biannual description of the water quality of the waters of the state.

process.  DEP is now using the Statewide Surface Waters Assessment Protocol (SSWAP), a modification of the EPA's 1989 Rapid Bioassessment Protocol II (RBP-II), as the primary mechanism to assess Pennsylvania's waters.  The SSWAP 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 assessed stream segment can vary between sites.  All the biological surveys included kick-screen sampling of benthic macroinvertebrates and habitat evaluations.  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 habitat scores and a series of narrative biological statements used to evaluate the benthic macroinvertebrate community.  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 Section 303(d) list with the source and cause.  A TMDL must be developed for the stream segment and each pollutant.  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. Calculating TMDL for the waterbody using EPA approved methods and computer models;
3. Allocating pollutant loads to various sources;
4. Determining critical and seasonal conditions;
5. Public review and comment period on draft TMDL;
6. Submittal of final TMDL; and
7. EPA approval of the TMDL.

## Watershed History

Land use within the watershed is dominated by abandoned mine lands at higher elevations on hilltops where coal is found and forest lands in the valleys.  The watershed is sparsely populated. The villages of Eden and Gillingham are situated in the northern part of the watershed.  Each village consists of 10-15 permanent residences scattered within the village boundaries.  There are also several hunting camps located within the watershed that are used seasonally.

The area within the watershed consists of 5.8 square miles. Surveyor Run consists of a main stem 1.3 miles in length as measured from the mouth to the confluence with Little Surveyor Run. Little Surveyor Run is 1.9 miles in length and contains 1.45 square miles of area. The upper stem of Surveyor Run measured from the confluence with Little Surveyor Run to the Surveyor Run headwaters is 3 miles in length and contains 2.97 square miles of area. The streams in the Surveyor Run Watershed flow from north to south. Along its 4-mile length, Surveyor Run flows from an elevation of 1800 feet above sea level in its headwaters to an elevation of 1100 feet above sea level at its confluence with the West Branch of the Susquehanna River.

The Surveyor Run Watershed lies within the Appalachian Plateaus Physiographic Province. The watershed area is comprised of Pennsylvanian aged rocks, which are divided into the Pottsville, Allegheny and Conemaugh Groups. The Clearfield syncline, a broad and relatively flat structure, trends in a northeast-southwest direction across the mouth of Surveyor Run. Rocks of the Allegheny and Conemaugh Groups are found in the syncline. Several wrench faults also cross the watershed.

Older Pennsylvanian rocks of the Connoquesnessing and Mercer Formations are exposed in the valleys of the watershed and the younger rocks of the Conemaugh Group are on the hilltops surrounding the watershed. Minable coals are confined to the Allegheny Group with five such seams spread throughout a startigraphic interval of 200 feet. These seams are the lower Kittanning (B), Middle Kittanning (C), upper Kittanning (C’), lower Freeport (D), and upper Freeport (E). Strata in the watershed are oriented in a southwest to northeast trend and dip to the southeast.

The first settlement, within Girard Township, was made by the Livergoods in 1817 at the mouth of Surveyor Run. This stream was named so because a party of surveyors had camped there before any settlements had been made.

Underground coalmines were operated in the watershed in the 1950’s and 1960’s by Lingle Coal Company and A W Bigler Coal Company and later abandoned. Surface mining conducted in the period from the 1960’s through the early 1980’s by Shawville Coal Company left hundreds of acres of abandoned unreclaimed mine lands in the watershed. Both the underground and surface mining operations resulted in numerous discharges of acid mine drainage which degraded the quality of Surveyor Run for most of its length, rendering it unsuitable for aquatic life.

Currently there are two active mining operations in the Surveyor Run Watershed. Sky Haven Coal Company, Inc. currently holds both permits. The Surveyor Run operation is located in the western portion of the watershed in Goshen Township and the Ridge Road operation is located in the eastern portion of the watershed in Girard Township. Both sites are part of the EPA’s Project XL pilot program.

There are four preexisting discharges on the Surveyor site (MP7, MP9, MP17, and MP13) and two on the Ridge Road (MP2 and MP4) site. The map in attachment A shows the location of these six discharges. The individual discharges are not assigned load allocations, however; discharge affects on the stream are taken into account at the closest downstream sampling point and it is noted that the discharges are a contributing pollutant source to the segment.

The reduction necessary to meet applicable water quality standards from preexisting conditions (including discharges from areas coextensive with areas permitted under the remining program Subchapter F or G) are expressed in the LA portion of the TMDL. The WLAs express the basis for applicable effluent limitations on point sources. Except for any expressed assumptions, any WLA allocated to a remining permittee does not require the permittee to necessarily implement the reductions from preexisting conditions set forth in the LA. Additional requirements for the permittee to address the preexisting conditions are set forth in the applicable NPDES/mining permit

**Project XL**

The DEP, together with the EPA Office of Water and IMCC (Interstate Mining Compact Commission)-member states, has been exploring a new approach to writing coal remining permits based on compliance with best management practices (BMPs) instead of specific NPDES effluent limitations and to monitor for performance based on instream water quality, instead of at individual discharge points. Sky Havens Surveyor Run and Ridge Road Operations were among the initial pilot projects.

Each project watershed is severely degraded by acid mine drainage from abandoned mine discharges and is either currently listed on Pennsylvania's 303 (d) list or has been identified as a water body which does not meet water quality criteria due to abandoned mine drainage. For each watershed it is expected that remining efforts will be an integral part of a water quality remediation plan following TMDL development. Water quality improvements from remining will be achieved by implementing BMP's.

The BMP's to be used to reclaim the Surveyor Run site include the daylighting of eight acres of abandoned underground mines and the revegetation of approximately 48 acres of abandoned mine lands. The BMP's used to reclaim the Ridge Road site include the regrading of 49.7 acres of abandoned mine spoil, daylighting of 8 acres of abandoned under ground mines, special handling of acid forming strata, redistribution of alkaline materials to affected mine spoil, and revegetation of abandoned mine lands.

In the Surveyor Run pilot, the operator is also reclaiming a former coal preparation facility and refuse disposal area, which is adding acid loading to Surveyor Run. These pilots are designed to increase the number of remining operations providing no-cost reclamation and to enhance the degree of reclamation and AMD abatement measures taken on remining operations.

**Surveyor Run Permit**

The Surveyor Run SMP 17930117 was issued to Al Hamilton Contracting Company on May 4, 1999 and transferred to Sky Haven Coal, Inc., in September 2000. The total permit area is 329.8 acres with 279 total acres to be affected. The coal seams to be mined are the Upper Freeport

(31.3 acres), Lower Freeport (93.5 acres), and Upper Kittanning (215.1 acres). Mining is expected to be complete in 2005 at this site.

The Sky Haven, Surveyor Run operation is a remining operation that will reclaim abandoned minelands, underground workings and dangerous highwalls. There are 235 acres of abandoned surface mine land and 143 acres (Upper Freeport-11 acres, Lower Freeport-26 acres and Lower Kittanning-106 acres) of abandoned underground mines located within the Surveyor Run permit boundary. The current mining will reaffect and reclaim 200 acres of abandoned surface mine land and 37 acres (Upper Freeport-11 acres and Lower Freeport-26 acres) of abandoned underground mines. Also within the permit boundary exists 18,800 lineal feet of abandoned highwall. Current mining will eliminate 16,300 lineal feet of abandoned highwall within the permit boundary. Reclamation of existing abandoned highwalls and spoil piles will benefit the permit area by reducing infiltration and restoring a more natural runoff pattern to the sites. The isolation of residual acidic materials in the reclaimed backfill along with on site redistribution of alkaline materials are expected to produce a net improvement in water quality to the Surveyor Run watershed.

The mine drainage treatment facilities for the permit area are assigned a waste load allocation. Discharge rate and frequency vary as a function of precipitation and runoff. The method to quantify the treatment facility discharges is explained in the *Method to Quantify Treatment Pond Pollutant Load* section of the report. It has been determined that effects from sedimentation ponds are negligible because their potential discharges are based on infrequent and temporary events and the ponds should rarely discharge if reclamation and revegetation is concurrent. In addition, sedimentation ponds are designed in accordance with PA Code Title 25 Chapter 87.108 (h) to at minimum contain runoff from a 10-year 24-hour precipitation event. The structures are permitted under NPDES No. PA 0219584.

**Ridge Road Permit**

The Ridge Road SMP 17990101 was issued to Sky Haven Coal, Inc., on February 7, 2001. The total permit area is 149 total acres with 110 total acres to be affected. The coal seams to be mined are the Upper Freeport (2 acres), Lower Freeport (4 acres), Upper Kittanning (19 acres), Middle Kittanning (54 acres) and Lower Kittanning (41 acres). Mining is expected to be complete in 2008 at this site.

The Sky Haven, Ridge Road operation is also a remining operation that will reclaim abandoned minelands and dangerous highwalls. There are 80 acres of abandoned surface mine land located within the Ridge Road permit boundary that will be reaffected and reclaimed. In addition 7,000 lineal feet of abandoned highwall will be eliminated. Reclamation of existing abandoned highwalls and spoil piles will benefit the permit area by reducing infiltration and restoring a more natural runoff pattern to the sites. The isolation of residual acidic materials in the reclaimed backfill along with on site redistribution of alkaline materials are expected to produce a net improvement in water quality to the Surveyor Run watershed.

The mine drainage treatment facilities for the permit area are assigned a waste load allocation. Discharge rate and frequency vary as a function of precipitation and runoff. The method to quantify the treatment facility discharges is explained in the *Method to Quantify Treatment Pond Pollutant Load* section of the report. It has been determined that effects from sedimentation ponds are negligible because their potential discharges are based on infrequent and temporary events and the ponds should rarely discharge if reclamation and revegetation is concurrent. In addition, sedimentation ponds are designed in accordance with PA Code Title 25 Chapter 87.108 (h) to at minimum contain runoff from a 10-year 24-hour precipitation event. The structures are permitted under NPDES No. PA 0238228.

## AMD Methodology

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

The statistical analysis described below can be applied to situations where all of the pollutant loading is from non-point sources as well as those where there are both point and non-point sources. The following defines what are considered point sources and non-point sources for the purposes of our evaluation; point sources are defined as permitted discharges or a discharge that has a responsible party, 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[3] 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:

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

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

PR = required percent reduction for the current iteration

Cc = criterion in mg/l

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

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

Mean = average observed concentration

Standard Deviation = standard deviation of observed data

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

LTA = Mean * (1 – PR99) where (2)

LTA = allowable LTA source concentration in mg/l

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

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

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

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

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

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

**Method to Quantify Treatment Pond Pollutant Load**

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

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

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

Discharge from treatment ponds on a mine site is intermittent and often varies as a result of precipitation events. Measured flow rates are almost never available. If accurate flow data are available, it is used along with the Best Available Technology (BAT) limits to quantify the WLA 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

The following is an approach that can be used to determine a waste load allocation for an active mining operation when treatment pond flow rates are not available. The methodology involves quantifying the hydrology of the portion of a surface mine site that contributes flow to the pit and then calculating waste load allocation using NPDES treatment pond effluent limits.

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

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

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

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

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

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

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

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

Total Average Flow = Direct Pit Precipitation + Spoil Runoff

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

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

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

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

Allowable Aluminum Waste Load Allocation:
30.9 gal./min. x 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.)

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

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

While most mining operations are permitted and allowed to have a standard, 1500’ x 300’ pit, most are well below that size and have a corresponding decreased flow and load. Where pit dimensions are greater than the standard size or multiple pits are present, the calculations to define the potential pollution load can be adjusted accordingly. Hence, the above calculated Waste Load Allocation is very generous and likely high compared to actual conditions that are generally encountered. A large margin of safety is included in the WLA calculations.

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

## 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 applicable 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 a 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 most of the pollution sources in the watershed are nonpoint sources, the larges part of the TMDL is expressed as Load Allocations (LAs). All allocations will be specified as long-term average daily concentrations. These long-term average concentrations are expected to meet water-quality criteria 99% of the time as required in PA Title 25 Chapter 96.3(c). The following table shows the applicable 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 | 30 day average; Total Recoverable |
| Manganese (Mn) | 1.00 | Total Recoverable |
| pH * | 6.0-9.0 | N/A |

*The pH values shown will be used when applicable. In the case of freestone streams with little or no buffering capacity, the TMDL endpoint for pH will be the natural background water quality.

## TMDL Elements (WLA, LA, MOS)

$$TMDL = WLA + LA + MOS$$

A TMDL equation consists of a waste load allocation (WLA), load allocation (LA), and a margin of safety (MOS). The waste load allocation is the portion of the load assigned to point sources. The load allocation is the portion of the load assigned to non-point 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). The TMDL allocations in this report are based on available data. Other allocation schemes could also meet the TMDL.

## Allocation Summary

These TMDLs will focus remediation efforts on the identified numerical reduction targets for each watershed. The reduction schemes 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 TMDLs may be re-evaluated to reflect current conditions. 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 (WLA) and the total WLA for each segment is included in this table. There are currently two permits in the watershed each with one discharge. In addition, a future WLA is assigned to the Little Surveyor Run Watershed because the potential for mining is high. The difference between the TMDL and the WLA at each point is the load allocation (LA) 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. TMDL Component Summary for the Surveyor Run Watershed**

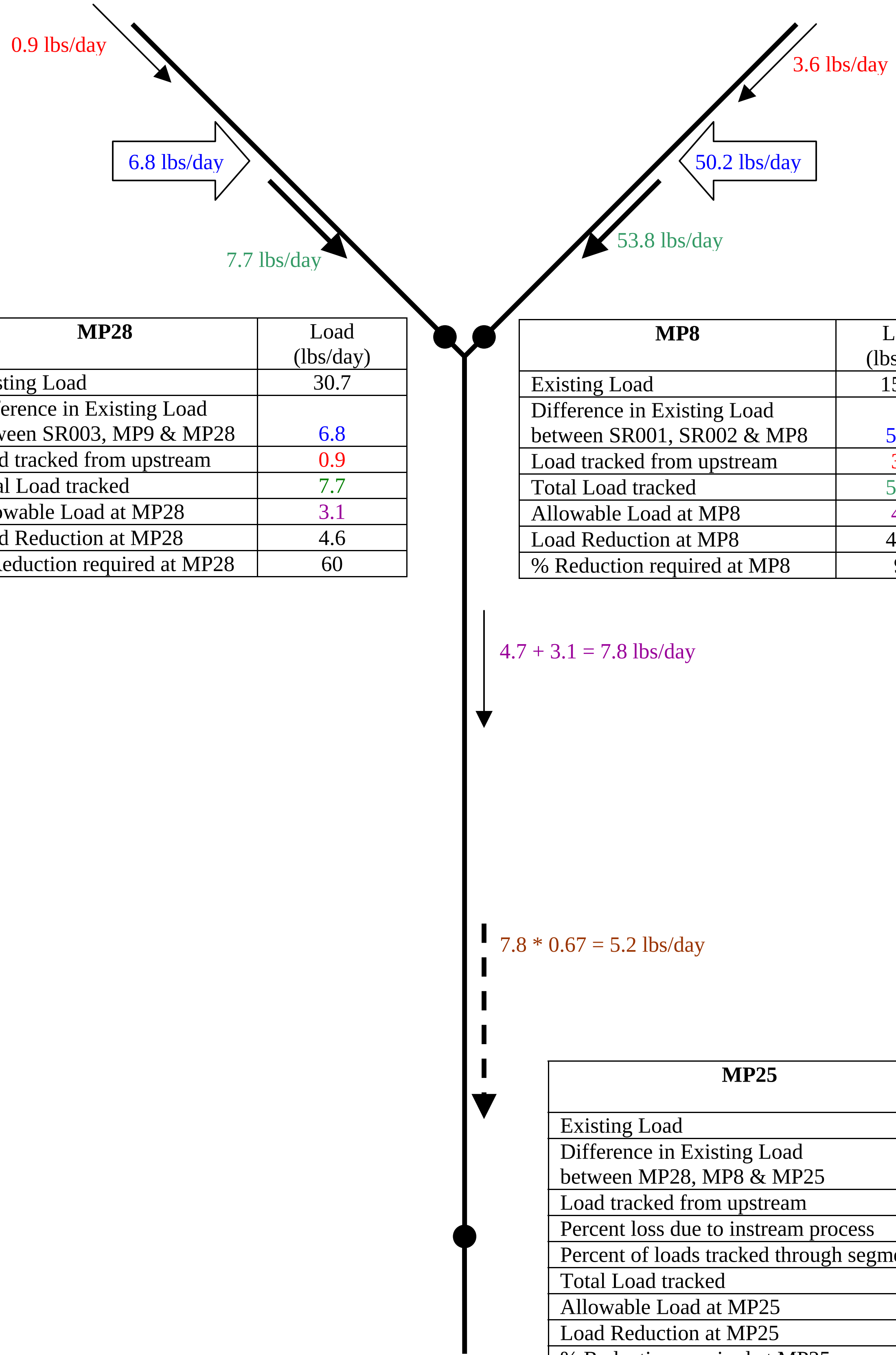
| Station | Parameter | Existing Load (lbs/day) | TMDL Allowable Load (lbs/day) | WLA (lbs/day) | LA (lbs/day) | Load Reduction (lbs/day) | Percent Reduction % |
|---|---|---|---|---|---|---|---|
| SR002 | *Surveyor Run, upstream of Tributary 20634* | | | | | | |
| | Fe | ND | NA | - | - | 0.0 | 0 |
| | Mn | 106.3 | 3.2 | 0.0 | 3.2 | 103.1 | 97 |
| | Al | 62.5 | 2.5 | 0.0 | 2.5 | 60.0 | 96 |
| | Acidity | 869.5 | 17.4 | 0.0 | 17.4 | 852.1 | 98 |
| SR001 | *Mouth of Tributary 26034* | | | | | | |
| | Fe | ND | NA | - | - | 0.0 | 0 |
| | Mn | 0.4 | 0.4 | - | - | 0.0 | 0 |
| | Al | ND | NA | - | - | 0.0 | 0 |
| | Acidity | 13.7 | 8.9 | 0.0 | 8.9 | 4.8 | 35 |
| MP8 | *Surveyor Run, upstream of Tributary 20632* | | | | | | |
| | Fe | 6.6 | 6.6 | - | - | 0.0 | 0 |
| | Mn | 156.9 | 4.7 | 0.0 | 4.7 | 49.1 | 91 |
| | Al | 121.4 | 4.9 | 0.0 | 4.9 | 56.5 | 92 |
| | Acidity | 1771.5 | 35.4 | 0.0 | 35.4 | 879.2 | 96 |
| SR003 | *Unnamed Tributary 20632 to Surveyor Run* | | | | | | |
| | Fe | 1.1 | 1.1 | - | - | 0.0 | 0 |
| | Mn | 21.3 | 0.6 | 0.0 | 0.6 | 20.7 | 97 |
| | Al | 9.4 | 0.6 | 0.0 | 0.6 | 8.8 | 94 |
| | Acidity | 182.0 | 9.1 | 0.0 | 9.1 | 172.9 | 95 |
| MP9 | *Unnamed Tributary 20633* | | | | | | |
| | Fe | 1.7 | 0.4 | 0.0 | 0.4 | 1.3 | 77 |
| | Mn | 2.6 | 0.3 | 0.0 | 0.3 | 2.3 | 88 |
| | Al | 8.2 | 0.4 | 0.0 | 0.4 | 7.8 | 95 |
| | Acidity | 97.2 | 0.0 | 0.0 | 0.0 | 97.2 | 100 |
| MP28 | *Mouth of Tributary 26032* | | | | | | |
| | Fe | 6.1 | 6.1 | - | - | 0.0 | 0 |
| | Mn | 30.7 | 3.1 | 0.0 | 3.1 | 4.6 | 60 |
| | Al | 34.4 | 3.4 | 0.0 | 3.4 | 14.4 | 81 |
| | Acidity | 620.4 | 6.2 | 0.0 | 6.2 | 344.1 | 98 |
| MP25 | *Surveyor Run, upstream of Little Surveyor Run* | | | | | | |
| | Fe | 12.6 | 12.6 | - | - | 0.0 | 0 |
| | Mn | 125.2 | 8.8 | 0.0 | 8.8 | 0.0 | 0 |
| | Al | 138.4 | 5.5 | 0.0 | 5.5 | 1.9 | 26 |
| | Acidity | 1845.4 | 0.0 | 0.0 | 0.0 | 32.1 | 100 |
| MP26 | *Mouth of Little Surveyor Run* | | | | | | |
| | Fe | 2.9 | 4.0* | 1.1 | 2.9 | 0.0 | 0 |
| | Mn | 27.5 | 5.0 | 0.7 | 4.3 | 23.2 | 84 |
| | Al | 8.5 | 3.2 | 0.7 | 2.5 | 6.0 | 70 |
| | Acidity | 231.7 | 23.2 | 0.0 | 23.2 | 208.6 | 90 |

| Station | Parameter | Existing Load (lbs/day) | TMDL Allowable Load (lbs/day) | WLA (lbs/day) | LA (lbs/day) | Load Reduction (lbs/day) | Percent Reduction % |
|---|---|---|---|---|---|---|---|
| LM509 | *Unidentified Tributary to Surveyor Run (No stream code)* | | | | | | |
| | Fe | 3.5 | 3.5 | - | - | 0.0 | 0 |
| | Mn | 31.6 | 2.8 | 0.0 | 2.8 | 28.8 | 91 |
| | Al | 27.7 | 2.5 | 0.0 | 2.5 | 25.2 | 91 |
| | Acidity | 479.6 | 4.8 | 0.0 | 4.8 | 474.8 | 99 |
| MP6 | *Mouth of Surveyor Run* | | | | | | |
| | Fe | 27.0 | 27.0 | 2.2 | 24.8 | 0.0 | 0 |
| | Mn | 188.6 | 28.3 | 1.4 | 26.9 | 0.0 | 0 |
| | Al | 166.3 | 26.6 | 1.4 | 25.2 | 0.0 | 0 |
| | Acidity | 3277.9 | 295.0 | 0.0 | 295.0 | 486.3 | 62 |

ND, Not detected
NA meets WQS. No TMDL necessary.
*Allowable load increased to account for future WLA, narrative following.

In the instance that the allowable load is equal to the measured load (e.g. manganese SR001, Table 3), the simulation determined that water quality standards are being met instream and therefore no TMDL is necessary for the parameter at that point. Although no TMDL is necessary, the loading at the point is considered at the next downstream point. In addition, when all measured values are below the method detection limit, denoted by ND (e.g. iron point SR002, Table 3), no TMDL is necessary. In this case the accounting for upstream loads is not carried through to the next downstream point. Rather, there is a disconnect noted and the allowable load is considered to start over because the water quality standard is satisfied.

Following is an example of how the allocations, presented in Table 3, for a stream segment are calculated. For this example, manganese allocations for MP25 of Surveyor Run are shown. As demonstrated in the example, all upstream contributing loads are accounted for at each point. Attachment C contains the TMDLs by segment analysis for each allocation point in a detailed discussion. These analyses follow the example. Attachment A contains a map of the sampling point locations for reference.




| **MP28** | Load (lbs/day) |
|---|---|
| Existing Load | 30.7 |
| Difference in Existing Load between SR003, MP9 & MP28 | 6.8 |
| Load tracked from upstream | 0.9 |
| Total Load tracked | 7.7 |
| Allowable Load at MP28 | 3.1 |
| Load Reduction at MP28 | 4.6 |
| % Reduction required at MP28 | 60 |

| **MP8** | Load (lbs/day) |
|---|---|
| Existing Load | 156.9 |
| Difference in Existing Load between SR001, SR002 & MP8 | 50.2 |
| Load tracked from upstream | 3.6 |
| Total Load tracked | 53.8 |
| Allowable Load at MP8 | 4.7 |
| Load Reduction at MP8 | 49.1 |
| % Reduction required at MP8 | 91 |

| **MP25** | Load (lbs/day) |
|---|---|
| Existing Load | 125.2 |
| Difference in Existing Load between MP28, MP8 & MP25 | -62.4 |
| Load tracked from upstream | 7.8 |
| Percent loss due to instream process | 33 |
| Percent of loads tracked through segment | 67 |
| Total Load tracked | 5.2 |
| Allowable Load at MP25 | 8.8 |
| Load Reduction at MP25 | 0.0 |
| % Reduction required at MP25 | 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 load allocations for the two existing mining operations were incorporated into the calculations at MP6, the mouth of Surveyor Run. For both operations this is the first downstream monitoring point that receives all the potential flow of treated water from the two individual sites. This is also at or near the location used in the permitting process to evaluate the mining operation and to establish NPDES effluent limits. No required reductions of these permits are necessary at this time. All necessary reductions are assigned to non-point sources.

A third waste load allocation was calculated and incorporated into the allocations at MP26, the mouth of Little Surveyor Run. It is anticipated that there will be mining in the Little Surveyor Run watershed in the near future based on available coal reserves, mining operator interests, and other factors. A WLA that is representative of one future surface mining operation has been included to accommodate this eventuality. Non-point source reductions for manganese and aluminum are increased to accommodate the additional loading. For iron, the allowable loading is equal to the current existing loading. To ensure that the stream has the necessary assimilative capacity to accept the additional future iron loading from the mine, a mass balance equation was solved to determine the resulting instream concentration.

$$Q_{(stream + discharge)} * C_{(stream + discharge)} = Q_{(stream)} * C_{(stream)} + Q_{(discharge)} * C_{(discharge)}$$

$$(1.14 + 0.045) * C_{(stream + discharge)} = (1.14 * 0.31) + (0.045 * 3.0)$$

$$C_{(stream + discharge)} = 0.41 \text{ mg/L}$$

where,
Q = flow, MGD and C= concentration, mg/L

The resulting instream concentration is 0.41 mg/L, which is less than the water quality criterion of 1.5 mg/L; therefore the stream has the assimilative capacity to accept the future loading.

Table 4 below contains the waste load allocations for the two current and one future mine site.

**Table 4. Waste Load Allocation of Permitted Discharges**

| Parameter | Allowable Average Monthly Conc. (mg/L) | Calculated Average Flow (MGD) | WLA (lbs/day) |
|---|---|---|---|
| **Ridge Road Site (NPDES PA0238228)** | | | |
| Fe | 3.0 | 0.0445 | 1.1 |
| Mn | 2.0 | 0.0445 | 0.7 |
| Al | 2.0 | 0.0445 | 0.7 |

| Parameter | Allowable Average Monthly Conc. (mg/L) | Calculated Average Flow (MGD) | WLA (lbs/day) |
|---|---|---|---|
| **Surveyor Run Site (NPDES PA0219584)** | | | |
| Fe | 3.0 | 0.0445 | 1.1 |
| Mn | 2.0 | 0.0445 | 0.7 |
| Al | 2.0 | 0.0445 | 0.7 |
| **Future Site** | | | |
| Fe | 3.0 | 0.0445 | 1.1 |
| Mn | 2.0 | 0.0445 | 0.7 |
| Al | 2.0 | 0.0445 | 0.7 |

**Recommendations**

There is currently no watershed group focused on the Surveyor Run Watershed area. It is recommended that agencies work with local interests to form a watershed organization. This watershed organization could then work to implement projects to achieve the reductions recommended in this TMDL document.

It is anticipated that the current active mining operations, i.e. Project XL, will reclaim abandoned mine lands and decrease pollution loads reporting to the stream. These efforts along with anticipated future mining in the watershed will improve water quality and help achieve the TMDL recommended reductions.

Two primary programs provide maintenance and improvement of water quality in the watershed. DEP'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 DEP'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 CWA Section 319(a) Grant program and Pennsylvania's Growing Greener program has been used extensively to remedy mine drainage impacts. These many activities are expected to continue and result in water quality improvement.

The 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; administers a loan program for bonding anthracite underground mines and for mine subsidence; and 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 1960s, 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.

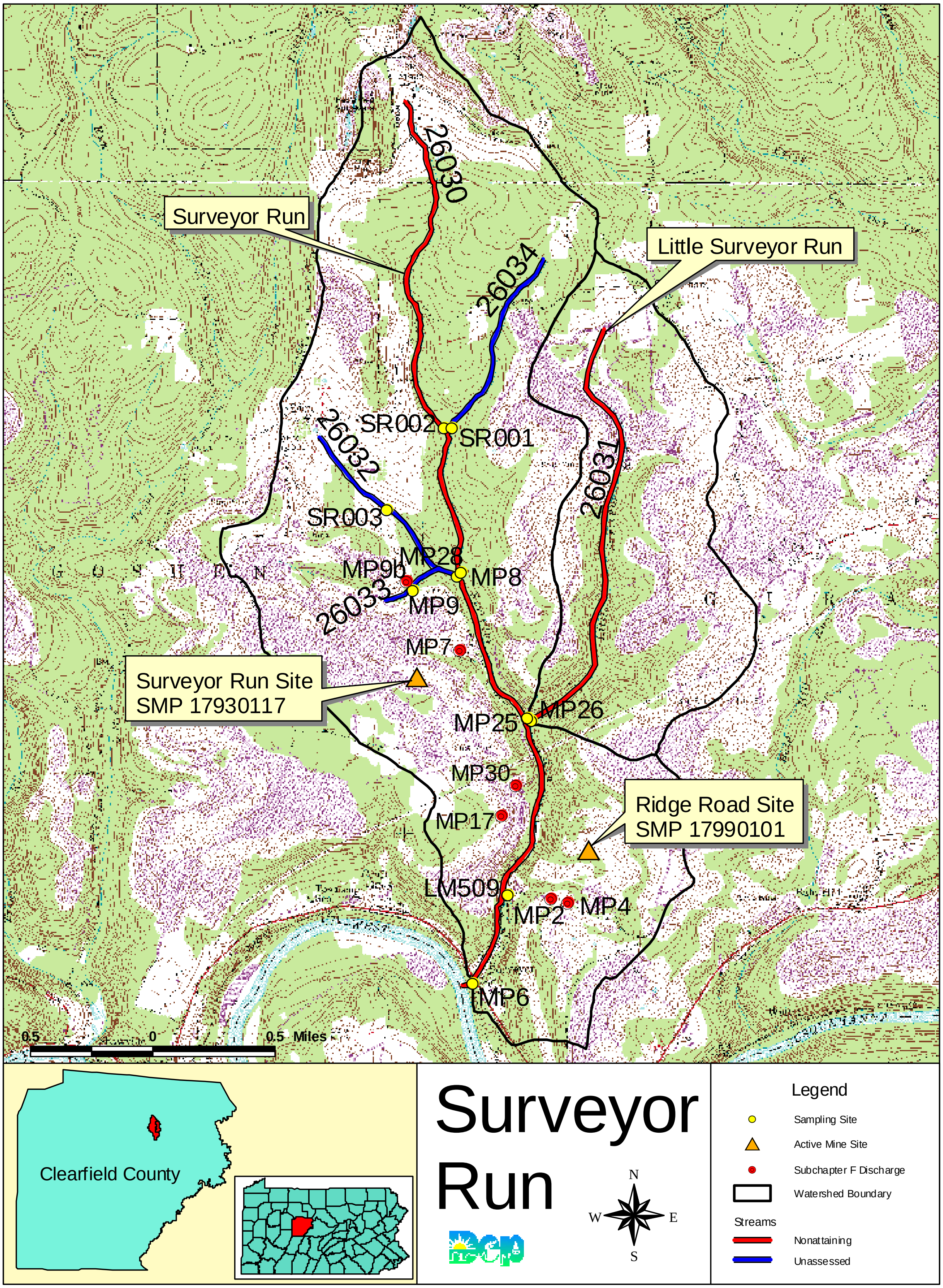
Reclaim PA is DEP's initiative designed to maximize reclamation of the state's quarter million acres of abandoned mineral extraction lands. Abandoned mineral extraction lands in Pennsylvania constituted a significant public liability – more than 250,000 acres of abandoned surface mines, 2,400 miles of streams polluted with mine drainage, over 7,000 orphaned and abandoned oil and gas wells, widespread subsidence problems, numerous hazardous mine openings, mine fires, abandoned structures and affected water supplies – representing as much as one third of the total problem nationally.

## Public Participation

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on January 3, 2004 and *The Progress* on February 2 and February 9, 2004 to foster public comment on the allowable loads calculated. The public comment period on this TMDL was open from January 3, 2004 to March 3, 2004. A public meeting was held on February 19, 2004 at the Clearfield County Multi-Service Center in Clearfield, PA to discuss the proposed TMDL.

# Attachment A

**Surveyor Run Watershed Maps**


Surveyor Run
Little Surveyor Run
26030
26034
26031
26032
26033
SR002
SR001
SR003
MP28
MP9b
MP8
MP9
MP7
Surveyor Run Site
SMP 17930117
MP26
MP25
MP30
Ridge Road Site
SMP 17990101
MP17
LM509
MP2
MP4
MP6
0.5
0
0.5 Miles
Clearfield County
Surveyor
Run
N
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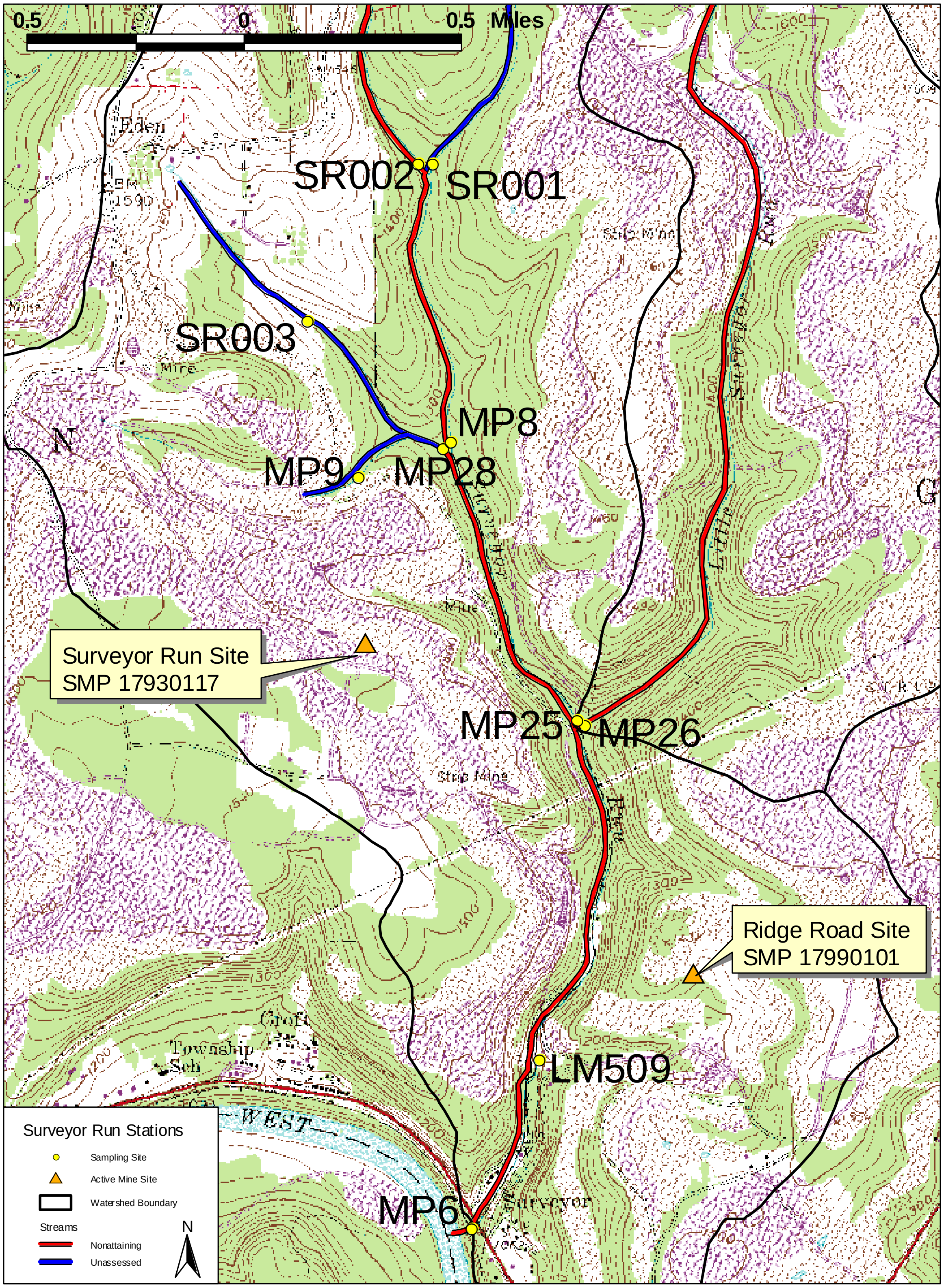
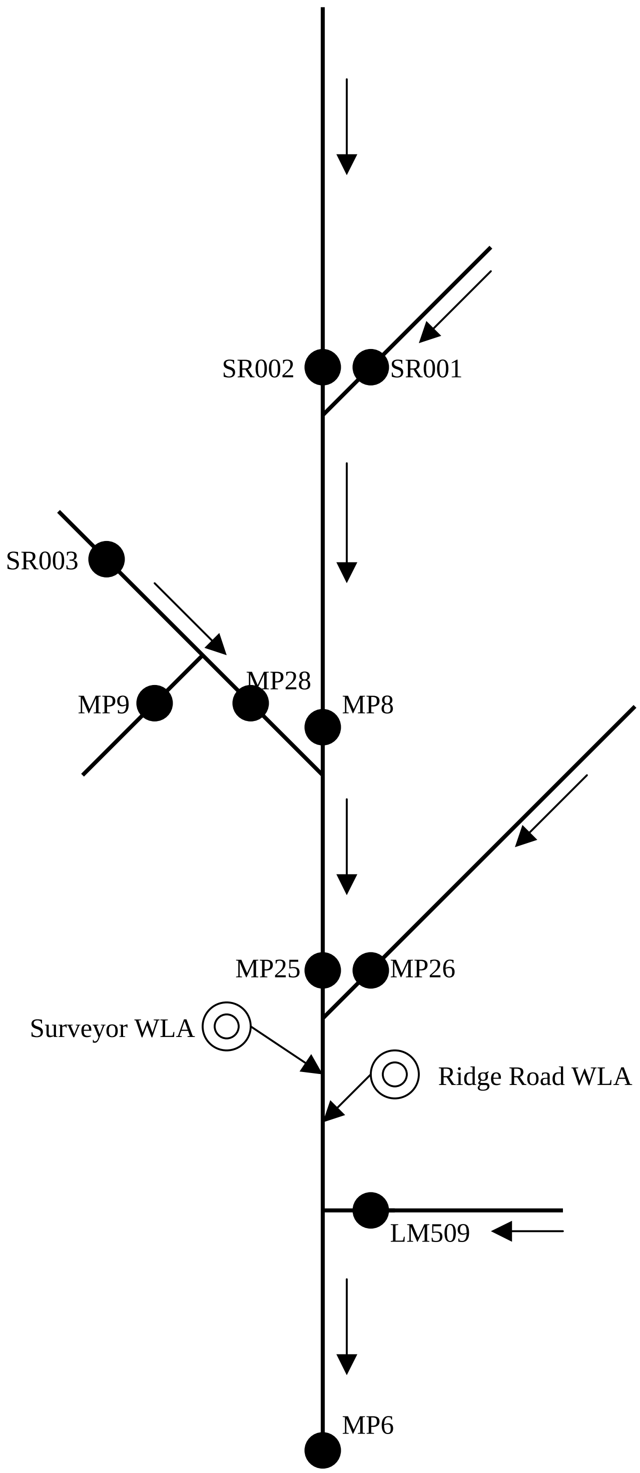
Legend
Sampling Site
Active Mine Site
Subchapter F Discharge
Watershed Boundary
Streams
Nonattaining
Unassessed


0.5
0
0.5 Miles
SR002
SR001
SR003
MP8
MP9
MP28
Surveyor Run Site
SMP 17930117
MP25
MP26
Ridge Road Site
SMP 17990101
LM509
MP6
Surveyor Run Stations
Sampling Site
Active Mine Site
Watershed Boundary
Streams
Nonattaining
Unassessed
N

**Surveyor Run Sampling Station Diagram**
Arrows indicate direction of flow.
Diagram not to scale.



# Attachment B

**Method for Addressing Section 303(d) Listings for pH and Surface Mining Control and Reclamation Act**

# Method for Addressing Section 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 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 EPA'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 Section 303(d) list due to pH. The concentration of acidity in a stream is at least partially chemically dependent upon metals. For this reason, it is extremely difficult to predict the exact pH values, which would result from treatment of abandoned mine drainage. Therefore, net alkalinity will be used to evaluate pH in these TMDL calculations. This methodology assures that the standard for pH will be met because net alkalinity is a measure of the reduction of acidity. When acidity in a stream is neutralized or is restored to natural levels, pH will be acceptable. Therefore, the measured instream alkalinity at the point of evaluation in the stream will serve as the goal for reducing total acidity at that point. The methodology that is applied for alkalinity (and therefore pH) is the same as that used for other parameters such as iron, aluminum, and manganese that have numeric water quality criteria.

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

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

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

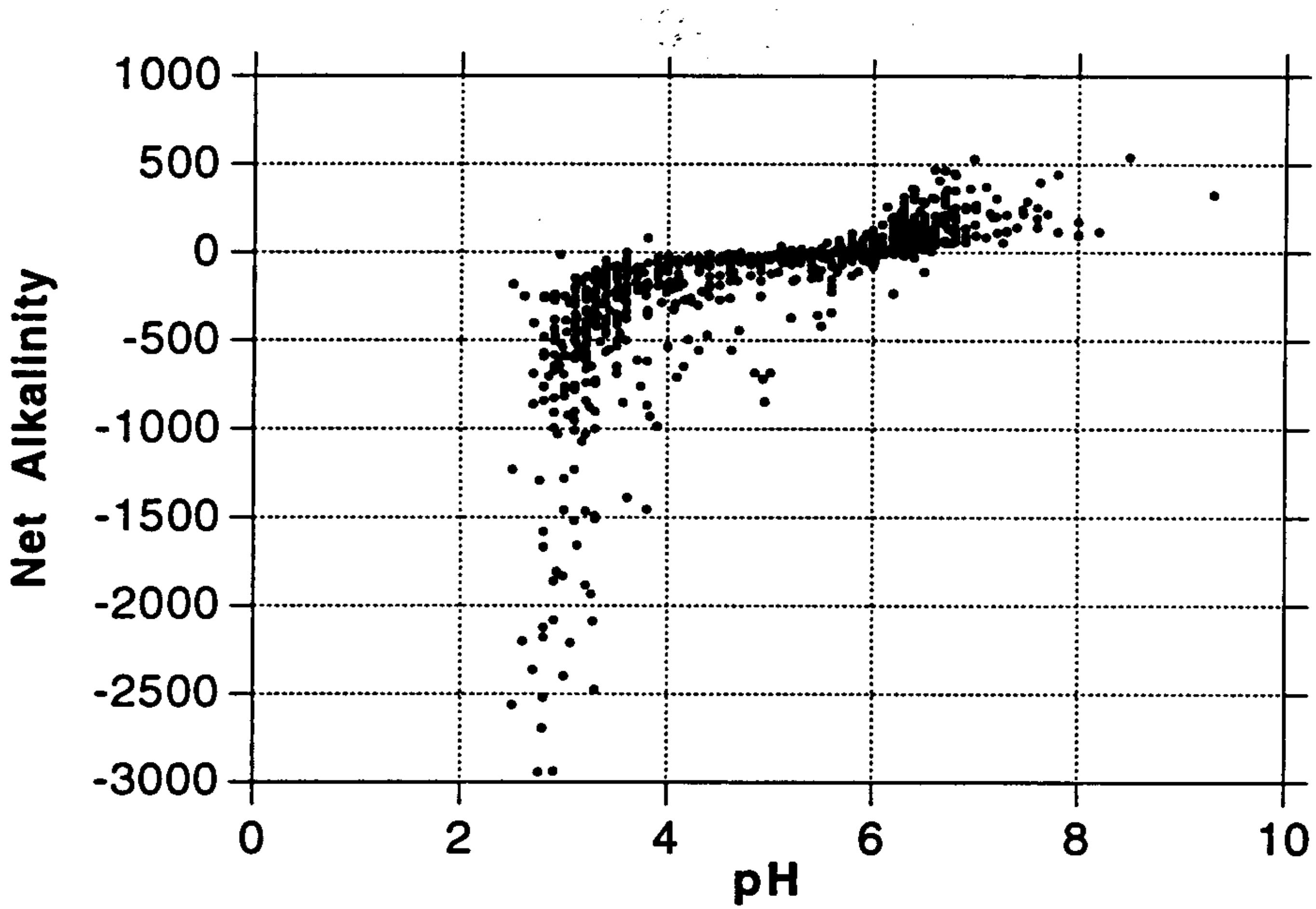



**Figure 1**. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

## Surface Mining Control and Reclamation Act

The Surface Mining Control and Reclamation Act of 1977 (SMCRA, Public Law 95-87) and its subsequent revisions were enacted to established a nationwide program to, among other things, protect the beneficial uses of land or water resources, and pubic health and safety from the adverse effects of current surface coal mining operations, as well as promote the reclamation of mined areas left without adequate reclamation prior to August 3, 1977. SMCRA requires a permit for the development of new, previously mined, or abandoned sites for the purpose of surface mining. Permittees are required to post a performance bond that will be sufficient to ensure the completion of reclamation requirements by the regulatory authority in the event that the applicant forfeits. Mines that ceased operating by the effective date of SMCRA, (often called "pre-law" mines) are not subject to the requirements of SMCRA.

Title IV of the Act is designed to provide assistance for reclamation and restoration of abandoned mines, while Title V states that any surface coal mining operations shall be required to meet all applicable performance standards. Some general performance standards include:

- Restoring the affected land to a condition capable of supporting the uses which it was capable of supporting prior to any mining,

- Backfilling and compacting (to insure stability or to prevent leaching of toxic materials) in order to restore the approximate original contour of the land with all highwalls being eliminated, and topsoil replaced to allow revegetation, and

- Minimizing the disturbances to the hydrologic balance and to the quality and quantity of water in surface and ground water systems both during and after surface coal mining operations and during reclamation by avoiding acid or other toxic mine drainage.

For purposes of these TMDLs, point sources are identified as NPDES-permitted discharge points, and nonpoint sources include discharges from abandoned mine lands, including but not limited to, tunnel discharges, seeps, and surface runoff. Abandoned and reclaimed mine lands were treated in the allocations as nonpoint sources because there are no NPDES permits associated with these areas. In the absence of an NPDES permit, the discharges associated with these land uses were assigned load allocations.

The decision to assign load allocations to abandoned and reclaimed mine lands does not reflect any determination by EPA as to whether there are, in fact, unpermitted point source discharges within these land uses. In addition, by establishing these TMDLs with mine drainage discharges treated as load allocations, EPA is not determining that these discharges are exempt from NPDES permitting requirements.

### Related Definitions

Pre-Act (Pre-Law) - Mines that ceased operating by the effective date of SMCRA and are not subject to the requirements of SMCRA.

Bond – A instrument by which a permittee assures faithful performance of the requirements of the acts, this chapter, Chapters 87-90 and the requirements of the permit and reclamation plan.

Postmining pollution discharge – A discharge of mine drainage emanating from or hydrologically connected to the permit area, which may remain after coal mining activities have been completed, and which does not comply with the applicable effluent requirements described in Chapters 87.102, 88.92, 88.187, 88.292, 89.52 or 90.102. The term includes minimal-impact postmining discharges, as defined in Section of the Surface Mining Conservation and Reclamation Act.

Forfeited Bond – Bond money collected by the regulatory authority to complete the reclamation of a mine site when a permittee defaults on his reclamation requirements.

# Attachment C
## TMDLs By Segment

## Surveyor Run

The TMDL for the Surveyor Run Watershed consists of three waste load allocations, and load allocations of five tributaries and four sampling sites along the stream. Data was collected in 2002 for completion of the TMDL. The 2002 data is used for the TMDL calculations. Preexisting data was not used in the analysis because it is not as representative of current conditions. The data is however, included in Attachment E.

Surveyor Run and Little Surveyor Run are both listed as impaired on the PA Section 303(d) list by both high metals and low pH from AMD as being the cause of the degradation to the stream. The objective is to reduce acid loading to the stream that will in turn raise the pH to the acceptable range. 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.

An allowable long-term average in-stream concentration was determined at all sample points for iron, aluminum, 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.

***TMDL Calculations - Sample Point SR002, Surveyor Run upstream of Unnamed Tributary 26034***

The TMDL for sample point SR002 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this segment was computed using water-quality sample data collected at point SR002. The average flow of 1.12 MGD, measured at the point, is used for these computations.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1998 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point SR002 shows pH ranging between 3.9 and 4.3; pH will be addressed as part of this TMDL because of the mining impacts.

Iron concentrations at point SR002 are below the detectable limit, denoted by ND. Because the WQS is met, no TMDL is necessary for iron at the point.

| Table C1. TMDL Calculations at Point SR002 | | | | |
|---|---|---|---|---|
| Flow = 1.12 MGD | Measured Sample Data | | Allowable | |
| Parameter | Conc. (mg/l) | Load (lbs/day) | LTA Conc. (mg/l) | Load (lbs/day) |
| Fe | ND | ND | NA | NA |
| Mn | 11.41 | 106.3 | 0.34 | 3.2 |
| Al | 6.71 | 62.5 | 0.27 | 2.5 |
| Acidity | 93.25 | 869.5 | 1.87 | 17.4 |
| Alkalinity | 4.20 | 39.2 | | |

| Table C2. Calculation of Load Reduction Necessary at Point SR002 | | | | |
|---|---|---|---|---|
| | Fe (lbs/day) | Mn (lbs/day) | Al (lbs/day) | Acidity (lbs/day) |
| Existing Load | ND | 106.3 | 62.5 | 869.5 |
| Allowable Load = TMDL | NA | 3.2 | 2.5 | 17.4 |
| Load Reduction | 0.0 | 103.1 | 60.0 | 852.1 |
| % Reduction Segment | 0 | 97 | 96 | 98 |

***TMDL Calculations - Sample Point SR001, Mouth of Unnamed Tributary 26034***

The TMDL for sample point SR001 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point SR001. The average flow of 0.47 MGD, measured at the point, is used for these computations.

There is currently no entry for this tributary on the PA Section 303(d) list for impairments from AMD. Sample data at point SR001 shows pH ranging between 5.9 and 6.8; pH will be addressed as part of this TMDL because of the mining impacts.

Iron and aluminum concentrations at point SR001 are below the detectable limit, denoted by ND. The existing manganese load is equal to the allowable manganese load because water quality analysis performed at the point for manganese determined the applicable water quality standard is met. Because WQS are met, no TMDLs for metals are necessary at SR001.

| Table C3. TMDL Calculations at Point SR001 | | | | |
|---|---|---|---|---|
| Flow = 0.47 MGD | Measured Sample Data | | Allowable | |
| Parameter | Conc. (mg/l) | Load (lbs/day) | LTA Conc. (mg/l) | Load (lbs/day) |
| Fe | ND | ND | NA | NA |
| Mn | 0.10 | 0.4 | 0.10 | 0.4 |
| Al | ND | ND | NA | NA |
| Acidity | 3.50 | 13.7 | 2.28 | 8.9 |
| Alkalinity | 13.45 | 52.5 | | |

| Table C4. Calculation of Load Reduction Necessary at Point SR001 | | | | |
|---|---|---|---|---|
| | Fe (lbs/day) | Mn (lbs/day) | Al (lbs/day) | Acidity (lbs/day) |
| Existing Load | ND | 0.4 | ND | 13.7 |
| Allowable Load = TMDL | NA | 0.4 | NA | 8.9 |
| Load Reduction | 0.0 | 0.0 | 0.0 | 4.8 |
| % Reduction Segment | 0 | 0 | 0 | 35 |

***TMDL Calculations - Sampling Point MP8, Surveyor Run upstream of Unnamed Tributary 26032***

The TMDL for sampling point MP8 consists of a load allocation of the area between sample points MP8, SR001, and SR002. The load allocation for this stream segment was computed using water-quality sample data collected at point MP8. The average flow of 2.21 MGD, measured at the point, is used for theses computations.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1998 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point MP8 shows pH ranging between 3.9 and 4.4; pH will be addressed as part of this TMDL because of the mining impacts.

Water quality analysis determined that the existing and allowable iron loads are equal. Because the WQS is met, a TMDL for iron is not necessary.

| Table C5. TMDL Calculations at Point MP8 | | | | |
|---|---|---|---|---|
| Flow = 2.21 MGD | Measured Sample Data | | Allowable | |
| Parameter | Conc. (mg/l) | Load (lbs/day) | LTA Conc. (mg/l) | Load (lbs/day) |
| Fe | 0.36 | 6.6 | 0.36 | 6.6 |
| Mn | 8.53 | 156.9 | 0.26 | 4.7 |
| Al | 6.60 | 121.4 | 0.26 | 4.9 |
| Acidity | 96.30 | 1771.5 | 1.93 | 35.4 |
| Alkalinity | 4.75 | 87.4 | | |

The calculated load reductions for all the loads that enter point MP8 must be accounted for in the calculated reductions at the sample point shown is Table C6. A comparison of measured loads between points SR001, SR002, and MP8 shows that there is additional loading entering the segment for all parameters. The total segment load is the sum of the load tracked from upstream points and the additional load entering the segment.

| Table C6. Calculation of Load Reduction Necessary at Point MP8 | | | | |
|---|---|---|---|---|
| | Fe (lbs/day) | Mn (lbs/day) | Al (lbs/day) | Acidity (lbs/day) |
| Existing Load | 6.6 | 156.9 | 121.4 | 1771.5 |
| Difference in Existing Load between SR001, SR002 & MP8 | 6.6 | 50.2 | 58.9 | 888.3 |
| Load tracked from SR001 & SR002 | 0.0 | 3.6 | 2.5 | 26.3 |
| Total Load tracked between points SR001, SR002 & MP8 | 6.6 | 53.8 | 61.4 | 914.6 |
| Allowable Load at MP8 | 6.6 | 4.7 | 4.9 | 35.4 |
| Load Reduction at MP8 | 0.0 | 49.1 | 56.5 | 879.2 |
| % Reduction required at MP8 | 0 | 91 | 92 | 96 |

***TMDL Calculations - Sample Point SR003, Unnamed Tributary 26032 near headwaters***

The TMDL for sample point SR003 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point SR003. The average flow of 0.33 MGD, measured at point SR003, is used for these computations.

There is currently no entry for this tributary on the PA Section 303(d) list for impairments from AMD. Sample data at point SR003 shows pH ranging between 4.4 and 5.3; pH will be addressed as part of this TMDL because of the mining impacts. Water quality analysis determined that the existing and allowable iron loads are equal. Because the WQS is met, a TMDL for iron is not necessary.

| Table C7. TMDL Calculations at Point SR003 | | | | |
|---|---|---|---|---|
| Flow = 0.33 MGD | Measured Sample Data | | Allowable | |
| Parameter | Conc. (mg/l) | Load (lbs/day) | LTA Conc. (mg/l) | Load (lbs/day) |
| Fe | 0.41 | 1.1 | 0.41 | 1.1 |
| Mn | 7.80 | 21.3 | 0.23 | 0.6 |
| Al | 3.43 | 9.4 | 0.21 | 0.6 |
| Acidity | 66.69 | 182.0 | 3.33 | 9.1 |
| Alkalinity | 8.06 | 22.0 | | |

| Table C8. Calculation of Load Reduction Necessary at Point SR003 | | | | |
|---|---|---|---|---|
| | Fe (lbs/day) | Mn (lbs/day) | Al (lbs/day) | Acidity (lbs/day) |
| Existing Load | 1.1 | 21.3 | 9.4 | 182.0 |
| Allowable Load = TMDL | 1.1 | 0.6 | 0.6 | 9.1 |
| Load Reduction | 0.0 | 20.7 | 8.8 | 172.9 |
| % Reduction Segment | 0 | 97 | 94 | 95 |

*TMDL Calculations - Sample Point MP9, Unnamed Tributary 26033*

The TMDL for sample point MP9 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point MP9. The average flow of 0.10 MGD, measured at point MP9, is used for these computations.

There is currently no entry for this tributary on the PA Section 303(d) list for impairments from AMD. Sample data at point MP9 shows pH ranging between 3.3 and 3.4; pH will be addressed as part of this TMDL because of the mining impacts.

Affects from the MP9 preexisting discharge on the Surveyor site are accounted for in the TMDL for MP9.

| **Table C9. TMDL Calculations at Point MP9** | | | | |
|---|---|---|---|---|
| Flow = 0.10 MGD | Measured Sample Data | | Allowable | |
| Parameter | Conc. (mg/l) | Load (lbs/day) | LTA Conc. (mg/l) | Load (lbs/day) |
| Fe | 1.98 | 1.7 | 0.46 | 0.4 |
| Mn | 2.99 | 2.6 | 0.36 | 0.3 |
| Al | 9.43 | 8.2 | 0.47 | 0.4 |
| Acidity | 111.08 | 97.2 | 0.00 | 0.0 |
| Alkalinity | 0.00 | 0.0 | | |

| **Table C10. Calculation of Load Reduction Necessary at Point MP9** | | | | |
|---|---|---|---|---|
| | Fe (lbs/day) | Mn (lbs/day) | Al (lbs/day) | Acidity (lbs/day) |
| Existing Load | 1.7 | 2.6 | 8.2 | 97.2 |
| Allowable Load = TMDL | 0.4 | 0.3 | 0.4 | 0.0 |
| Load Reduction | 1.3 | 2.3 | 7.8 | 97.2 |
| % Reduction Segment | 77 | 88 | 95 | 100 |

*TMDL Calculations - Sampling Point MP28, Mouth of Unnamed Tributary 26032*

The TMDL for sampling point MP28 consists of a load allocation of the area between sample points MP28, MP9, and SR003. The load allocation for this stream segment was computed using water-quality sample data collected at point MP28. The average flow of 1.10 MGD, measured at the point, is used for theses computations.

There is currently no entry for this tributary on the PA Section 303(d) list for impairments from AMD. Sample data at point MP28 shows pH ranging between 3.6 and 4.2; pH will be addressed as part of this TMDL because of the mining impacts.

Water quality analysis determined that the existing and allowable iron loads are equal. Because the WQS is met, a TMDL for iron is not necessary.

| Table C11. TMDL Calculations at Point MP28 | | | | |
|---|---|---|---|---|
| Flow = 1.10 MGD | Measured Sample Data | | Allowable | |
| Parameter | Conc. (mg/l) | Load (lbs/day) | LTA Conc. (mg/l) | Load (lbs/day) |
| Fe | 0.67 | 6.1 | 0.67 | 6.1 |
| Mn | 3.36 | 30.7 | 0.34 | 3.1 |
| Al | 3.77 | 34.4 | 0.38 | 3.4 |
| Acidity | 67.90 | 620.4 | 0.68 | 6.2 |
| Alkalinity | 1.50 | 13.7 | | |

The calculated load reductions for all the loads that enter point MP28 must be accounted for in the calculated reductions at the sample point shown in Table C12. A comparison of measured loads between points SR003, MP9 and MP28 shows that there is additional loading entering the segment for all parameters. The total segment load is the sum of the load tracked from upstream points and the additional load entering the segment.

| Table C12. Calculation of Load Reduction Necessary at Point MP28 | | | | |
|---|---|---|---|---|
| | Fe (lbs/day) | Mn (lbs/day) | Al (lbs/day) | Acidity (lbs/day) |
| Existing Load | 6.1 | 30.7 | 34.4 | 620.4 |
| Difference in Existing Load between SR003, MP9 & MP28 | 3.3 | 6.8 | 16.8 | 341.2 |
| Load tracked from SR003 & MP9 | 1.5 | 0.9 | 1.0 | 9.1 |
| Total Load tracked between points SR003, MP9 & MP28 | 4.8 | 7.7 | 17.8 | 350.3 |
| Allowable Load at MP28 | 6.1 | 3.1 | 3.4 | 6.2 |
| Load Reduction at MP28 | 0.0 | 4.6 | 14.4 | 344.1 |
| % Reduction required at MP28 | 0 | 60 | 81 | 98 |

***TMDL Calculations - Sampling Point MP25, Surveyor Run, upstream of confluence with Little Surveyor Run***

The TMDL for sampling point MP25 consists of a load allocation of the area between sample points MP25, MP28, and MP8. The load allocation for this stream segment was computed using water-quality sample data collected at point MP25. The average flow of 2.39 MGD, measured at the point, is used for theses computations. Between points MP25, MP28, and MP8 there is a decrease in flow (the summation of average flow from MP8 and MP28 is greater than the flow average flow at MP25). This is consistent with measured flow values during increased flow events. The loss of flow may be a function of the extensive mine workings within the segment or surface geology characteristics.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1998 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point MP25 shows pH ranging between 3.5 and 4.1; pH will be addressed as part of this TMDL because of the mining impacts.

Water quality analysis determined that the existing and allowable iron loads are equal. Because the WQS is met, a TMDL for iron is not necessary.

Affects from the MP7 preexisting discharge on the Surveyor site are accounted for in the TMDL for MP25.

| **Table C13. TMDL Calculations at Point MP25** | | | | |
|---|---|---|---|---|
| Flow = 2.39 MGD | Measured Sample Data | | Allowable | |
| Parameter | Conc. (mg/l) | Load (lbs/day) | LTA Conc. (mg/l) | Load (lbs/day) |
| Fe | 0.64 | 12.6 | 0.64 | 12.6 |
| Mn | 6.29 | 125.2 | 0.44 | 8.8 |
| Al | 6.95 | 138.4 | 0.28 | 5.5 |
| Acidity | 92.74 | 1845.4 | 0.00 | 0.0 |
| Alkalinity | 0.57 | 11.4 | | |

The calculated load reductions for all the loads that enter point MP25 must be accounted for in the calculated reductions at the sample point shown in Table C14. A comparison of measured loads between points MP8, MP28, and MP25 shows that there is loss of loading, for aluminum, manganese, and acidity within the segment. The percent of load lost within the segment is calculated and applied to the upstream allocated loads to determine the amount of the upstream load that is tracked through the segment. There is no change in iron loading.

| **Table C14. Calculation of Load Reduction Necessary at Point MP25** | | | | |
|---|---|---|---|---|
| | Fe (lbs/day) | Mn (lbs/day) | Al (lbs/day) | Acidity (lbs/day) |
| Existing Load | 12.6 | 125.2 | 138.4 | 1845.4 |
| Difference in Existing Load between MP28, MP8 & MP25 | 0.0 | -62.4 | -17.5 | -546.5 |
| Load tracked from MP28 & MP8 | 12.6 | 7.8 | 8.3 | 41.6 |
| Percent loss due to instream process | - | 33 | 11 | 23 |
| Percent of loads tracked through segment | - | 67 | 89 | 77 |
| Total Load tracked between points MP28, MP8 & MP25 | 12.6 | 5.2 | 7.4 | 32.1 |
| Allowable Load at MP25 | 12.6 | 8.8 | 5.5 | 0.0 |
| Load Reduction at MP25 | 0.0 | 0.0 | 1.9 | 32.1 |
| % Reduction required at MP25 | 0 | 0 | 26 | 100 |

***Waste Load Allocation – Future mining allocation***

It is anticipated that there will be mining in the Little Surveyor Run watershed in the near future based on available coal reserves, mining operator interests, and other factors. A WLA that is representative of one future surface mining operation has been included to accommodate this eventuality. Table C15 contains the WLAs calculated using the method explained in the report.

| **Table C15. Waste Load Allocations Little Surveyor Run Watershed Future Mining** | | | |
|---|---|---|---|
| **Parameter** | **Monthly Avg. Allowable Conc. (mg/L)** | **Average Flow (MGD)** | **Allowable Load (lbs/day)** |
| **Future Mine** | | | |
| Fe | 3.0 | 0.0446 | 1.1 |
| Mn | 2.0 | 0.0446 | 0.7 |
| Al | 2.0 | 0.0446 | 0.7 |

***TMDL Calculations - Sample Point MP26, Mouth of Little Surveyor Run***

The TMDL for sample point MP26 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point MP26. The average flow of 1.14 MGD, measured at point MP26, is used for these computations.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1998 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point MP26 shows pH ranging between 5.3 and 7.0; pH will be addressed as part of this TMDL because of the mining impacts.

To account for a future permitted discharge on this stream segment, the wastes load allocations for manganese and aluminum are subtracted from the calculated allowable loads. For iron, no load is subtracted from the calculated allowable load because it is equal to the existing load; however, it was verified in the *Allocation Summary* section of the report that the additional iron loading of 1.1 lbs/day will not cause instream criterion to be exceeded.

| **Table C16. TMDL Calculations at Point MP26** | | | | |
|---|---|---|---|---|
| Flow = 1.14 MGD | Measured Sample Data | | Allowable | |
| Parameter | Conc. (mg/l) | Load (lbs/day) | LTA Conc. (mg/l) | Load (lbs/day) |
| Fe | 0.31 | 2.9 | 0.31 | 2.9 |
| Mn | 2.91 | 27.5 | 0.52 | 5.0 |
| Al | 0.90 | 8.5 | 0.34 | 3.2 |
| Acidity | 24.46 | 231.7 | 2.45 | 23.2 |
| Alkalinity | 11.29 | 106.9 | | |

| Table C17. Calculation of Load Reduction Necessary at Point MP26 | | | | |
|---|---|---|---|---|
| | Fe (lbs/day) | Mn (lbs/day) | Al (lbs/day) | Acidity (lbs/day) |
| Existing Load | 2.9 | 27.5 | 8.5 | 231.7 |
| Allowable Load | 2.9 | 5.0 | 3.2 | 23.2 |
| WLA (Future Mine) | 1.1 | 0.7 | 0.7 | 0.0 |
| Allowable load assigned to WLA (Future Mining) = | NA | 0.7 | 0.7 | 0.0 |
| Allowable Load assigned to LA | 2.9 | 4.3 | 2.5 | 23.2 |
| Load Reduction | 0.0 | 23.2 | 6.0 | 208.5 |
| % Reduction required at 7 | 0 | 84 | 70 | 90 |

***TMDL Calculations - Sample Point LM509 Mouth of Unnamed Tributary (No Stream Code)***

The TMDL for sample point LM509 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point LM509. The average flow of 0.75 MGD, measured at point LM509, is used for these computations.

There is currently no entry for this tributary on the PA Section 303(d) list for impairments from AMD. Sample data at point LM509 shows pH ranging between 3.9 and 4.1; pH will be addressed as part of this TMDL because of the mining impacts.

Water quality analysis determined that the existing and allowable iron loads are equal. Because the WQS is met, a TMDL for iron is not necessary.

Affects from the MP2 and MP4 preexisting discharges on the Ridge Road site are accounted for in the TMDL for LM509.

| Table C18. TMDL Calculations at Point LM509 | | | | |
|---|---|---|---|---|
| Flow = 0.75 MGD | Measured Sample Data | | Allowable | |
| Parameter | Conc. (mg/l) | Load (lbs/day) | LTA Conc. (mg/l) | Load (lbs/day) |
| Fe | 0.56 | 3.5 | 0.56 | 3.5 |
| Mn | 5.03 | 31.6 | 0.45 | 2.8 |
| Al | 4.40 | 27.7 | 0.40 | 2.5 |
| Acidity | 76.31 | 479.6 | 0.76 | 4.8 |
| Alkalinity | 1.11 | 7.0 | | |

| Table C19. Calculation of Load Reduction Necessary at Point LM509 |
|---|

| | Fe (lbs/day) | Mn (lbs/day) | Al (lbs/day) | Acidity (lbs/day) |
|---|---|---|---|---|
| Existing Load | 3.5 | 31.6 | 27.7 | 479.6 |
| Allowable Load = TMDL | 3.5 | 2.8 | 2.5 | 4.8 |
| Load Reduction | 0.0 | 28.8 | 25.2 | 474.8 |
| % Reduction Segment | 0 | 91 | 91 | 99 |

***Waste Load Allocation – Sky Haven Coal, Inc. (Surveyor Run and Ridge Road Mine Sites)***

The Sky Haven Coal, Inc. SMPs 17930117 and 17990101, Surveyor Run and Ridge Road sites respectively, both have permitted treatment facilities. The waste load allocations for each permit was calculated as described in the *Method to Quantify Treatment Pond Pollutant Loading* section of the report. Waste load allocations for the two existing mining operations were incorporated into the calculations at MP6, the mouth of Surveyor Run. For both operations this is the first downstream monitoring point that receives all the potential flow of treated water from the two individual sites. This is also at or near the location used in the permitting process to evaluate the mining operation and to establish NPDES effluent limits. The following table shows the waste load allocations for each discharge.

**Table C20. Waste Load Allocations Surveyor Run and Ridge Road Mine Sites**

| Parameter | Monthly Avg. Allowable Conc. (mg/L) | Average Flow (MGD) | Allowable Load (lbs/day) |
|---|---|---|---|
| **Surveyor Run Site** | | | |
| Fe | 3.0 | 0.0446 | 1.1 |
| Mn | 2.0 | 0.0446 | 0.7 |
| Al | 2.0 | 0.0446 | 0.7 |
| **Ridge Road Site** | | | |
| Fe | 3.0 | 0.0446 | 1.1 |
| Mn | 2.0 | 0.0446 | 0.7 |
| Al | 2.0 | 0.0446 | 0.7 |

***TMDL Calculations - Sampling Point MP06, Mouth of Surveyor Run***

The TMDL for sampling point MP06 consists of two waste load allocations to permitted discharges and a load allocation of the area between sample points MP6, MP25, MP26, and LM509. The load allocation for this stream segment was computed using water-quality sample data collected at point MP6. The average flow of 5.99 MGD, measured at the point, is used for theses computations.

This segment was included on the 1996 and 1998 PA Section 303(d) lists for metals impairments from AMD. In 1998 a new assessment was completed on the segment and pH was added as a cause of impairment. Sample data at point MP25 shows pH ranging between 4.5 and 4.8; pH will be addressed as part of this TMDL because of the mining impacts.

Water quality analysis determined that the existing and allowable iron loads are equal. Because the WQS is met, a TMDL for iron is not necessary.

Affects from the MP30 and MP17 preexisting discharges on the Surveyor site are accounted for in the TMDL for MP6.

**Table C21. TMDL Calculations at Point MP6**

| Flow = 5.99 MGD | Measured Sample Data | | Allowable | |
|---|---|---|---|---|
| Parameter | Conc. (mg/l) | Load (lbs/day) | LTA Conc. (mg/l) | Load (lbs/day) |
| Fe | 0.54 | 27.0 | 0.54 | 27.0 |
| Mn | 3.78 | 188.6 | 0.57 | 28.3 |
| Al | 3.33 | 166.3 | 0.53 | 26.6 |
| Acidity | 65.63 | 3277.9 | 5.91 | 295.0 |
| Alkalinity | 7.53 | 375.9 | | |

The calculated load reductions for all the loads that enter point MP6 must be accounted for in the calculated reductions at the sample point shown in Table C22. A comparison of measured loads between points MP25, MP26, LM509, and MP6 shows that there is loss of aluminum loading within the segment. The percent of load lost within the segment is calculated and applied to the upstream allocated loads to determine the amount of the upstream aluminum load that is tracked through the segment. There is an increase in iron, manganese, and acidity loading. The total segment iron, manganese, and acidity load is the sum of the upstream allocated loads and the additional segment loading.

To determine the load allocation for the segment, the wastes load allocations from the two existing permits are subtracted from the calculated allowable loads, "Fe = 16.9 – 1.1 – 1.1 = 14.7", "Mn = 15.5 – 0.7 - 0.7 = 14.1" and "Al = 12.8 – 0.7 – 0.7 = 11.4". For iron, the calculated allowable load is equal to the existing load; however, the existing loading includes the loading from the two mine sites. Because there are no necessary reductions at the point, the current loading from the two mine sites is acceptable; therefore, no reduction of the iron limit is necessary.

**Table C22. Calculation of Load Reduction Necessary at Point MP6**

| | Fe (lbs/day) | Mn (lbs/day) | Al (lbs/day) | Acidity (lbs/day) |
|---|---|---|---|---|
| Existing Load | 27.0 | 188.6 | 166.3 | 3277.9 |
| Difference in Existing Load between MP6, LM509, MP25, & MP26 | 7.9 | 4.3 | -8.2 | 721.2 |
| Load tracked from MP25, MP26 & LM509 | 19.1 | 13.0 | 13.1 | 60.1 |
| Percent loss due to instream process | - | - | 5 | - |
| Percent of loads tracked through segment | - | - | 95 | - |
| Total Load tracked between points MP25, MP26, LM509 & MP6 | 27.0 | 17.3 | 12.5 | 781.3 |
| Allowable Load at MP6 | 27.0 | 28.3 | 26.6 | 295.0 |
| *WLA (Ridge and Surveyor, part of existing load)* | *2.2* | *1.4* | *1.4* | *0.0* |
| *LA* | *24.8* | *26.9* | *25.2* | *295.0* |
| Load Reduction at MP6 | 0.0 | 0.0 | 0.0 | 486.3 |
| % Reduction required at MP6 | 0 | 0 | 0 | 62 |

*Margin of Safety*

For this study the margin of safety is applied implicitly. A MOS is implicit because the allowable concentrations and loadings were simulated using Monte Carlo techniques and employing the @Risk software. Other margins of safety used for this TMDL analysis include the following:

- 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.
- An additional MOS is provided because the calculations were done with a daily Fe average instead of the 30-day average
- The method used to calculate a flow for a WLA using the area of the pit and unregraded portions is conservative and an implicit margin of safety.

*Seasonal Variation*

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

*Critical Conditions*

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

# Attachment D

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

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

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

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

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

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

# Attachment E
## Water Quality Data Used In TMDL Calculations

| Monitoring Point SR002 | | pH | Alkalinity | Acidity | Fe | Mn | Al | Flow |
|---|---|---|---|---|---|---|---|---|
| | Date | Lab | mg/l | mg/l | mg/l | mg/l | mg/l | gpm |
| **Latitude** | 3/25/2002 | 4.3 | 5.0 | 69.00 | ND | 5.96 | 3.81 | |
| 41-06-31 | 4/1/2002 | 4.3 | 7.0 | 75.60 | ND | 5.70 | 3.69 | 1505 |
| | 4/30/2002 | 4.2 | 3.8 | 75.20 | ND | 8.14 | 5.73 | 1400 |
| **Longitude** | 5/20/2002 | 4.3 | 6.4 | 68.00 | ND | 5.61 | 4.89 | 1400 |
| 78-19-45 | 6/11/2002 | 4.2 | 6.2 | 59.20 | ND | 7.03 | 4.85 | 990 |
| | 7/17/2002 | 3.9 | 0.0 | 149.20 | ND | 15.90 | 9.12 | 40 |
| Surveyor Run (by deer stand) | 9/25/2002 | 4.0 | 3.2 | 138.00 | ND | 23.50 | 12.10 | 50 |
| | 10/7/2002 | 4.0 | 2.0 | 111.80 | ND | 19.40 | 9.45 | 50 |
| | Average | 4.15000 | 4.20000 | 93.25000 | NA | 11.40500 | 6.70500 | 776.42857 |
| | Std Dev | 0.16036 | 2.41897 | 34.84541 | NA | 7.13134 | 3.10829 | 701.40760 |
| **Monitoring Point SR001** | | **pH** | **Alkalinity** | **Acidity** | **Fe** | **Mn** | **Al** | **Flow** |
| | **Date** | **Lab** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **gpm** |
| **Latitude** | 3/25/2002 | 6.4 | 9.4 | 7.60 | ND | 0.06 | ND | |
| 41 06 30 | 4/1/2002 | 5.9 | 11.2 | 11.40 | ND | 0.14 | ND | 675 |
| | 4/30/2002 | 6.2 | 10.4 | 6.00 | ND | 0.10 | ND | 600 |
| **Longitude** | 5/20/2002 | 6.1 | 10.8 | 3.00 | ND | 0.13 | ND | 600 |
| 78 19 45 | 6/11/2002 | 6.2 | 12.8 | 0.00 | ND | 0.06 | ND | 355 |
| | 7/17/2002 | 6.5 | 15.6 | 0.00 | ND | ND | ND | 15 |
| unnamed tributary | 9/25/2002 | 6.7 | 17.8 | 0.00 | ND | ND | ND | 15 |
| to Surveyor Run (near deer stand) | 10/7/2002 | 6.8 | 19.6 | 0.00 | ND | ND | ND | 14 |
| | Average | 6.35000 | 13.45000 | 3.50000 | NA | 0.09820 | NA | 324.85714 |
| | St Dev | 0.30706 | 3.77170 | 4.38699 | NA | 0.03768 | NA | 306.47753 |
| **Monitoring Point MP6** | | **pH** | **Alkalinity** | **Acidity** | **Fe** | **Mn** | **Al** | **Flow** |
| | **Date** | **Lab** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **gpm** |
| **Latitude** | 3/25/2002 | 4.6 | 6.8 | 65.40 | 0.64 | 3.07 | 2.79 | |
| 41 03 59 | 4/4/2002 | 4.7 | 8.8 | 60.80 | 0.72 | 3.69 | 4.00 | 6025 |
| | 4/30/2002 | 4.7 | 7.2 | 68.00 | 0.51 | 4.13 | 3.41 | 6000 |
| **Longitude** | 5/15/2002 | 4.5 | 6.0 | 52.20 | 0.61 | 2.36 | 2.84 | 6000 |
| 79 19 44 | 6/10/2002 | 4.7 | 6.6 | 64.00 | 0.31 | 2.63 | 2.72 | 8965 |
| | 7/16/2002 | 4.8 | 8.2 | 69.00 | 0.45 | 4.49 | 3.77 | 890 |
| MP6 downstream of Route 879 | 9/25/2002 | 4.8 | 8.2 | 73.00 | 0.49 | 5.01 | 3.52 | 529 |
| | 10/3/2002 | 4.7 | 8.4 | 72.60 | 0.61 | 4.83 | 3.59 | 705 |
| | Average | 4.68750 | 7.52500 | 65.62500 | 0.54088 | 3.77625 | 3.33000 | 4159.14286 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | St Dev | 0.09910 | 1.00818 | 6.82720 | 0.12834 | 1.00662 | 0.48644 | 3394.88662 |
| **Monitoring Point LM509** | | **pH** | **Alkalinity** | **Acidity** | **Fe** | **Mn** | **Al** | **Flow** |
| | **Date** | **Lab** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **gpm** |
| **Latitude** | 3/25/2002 | 4.0 | 0.8 | 70.80 | 0.67 | 4.58 | 4.18 | |
| 41 04 51 | 4/4/2002 | 4.0 | 3.0 | 78.80 | 0.45 | 4.33 | 3.95 | 715 |
| | 4/30/2002 | 3.9 | 0.0 | 89.40 | 0.67 | 5.67 | 6.05 | 700 |
| **Longitude** | 5/15/2002 | 4.0 | 0.8 | 57.80 | 0.88 | 3.34 | 3.31 | 700 |
| 78 19 06 | 6/10/2002 | 3.9 | 0.0 | 72.00 | 0.35 | 4.08 | 3.56 | 786 |
| | 7/16/2002 | 4.1 | 3.2 | 70.60 | 0.30 | 4.08 | 3.01 | 175 |
| unnamed tributary #2 to | 9/25/2002 | 3.9 | 0.0 | 94.80 | 0.61 | 9.12 | 6.75 | 64 |
| Surveyor Run | 10/3/2002 | 3.9 | 0.4 | 92.20 | 0.47 | 7.44 | 5.55 | 42 |
| | Average | 3.97143 | 1.11429 | 76.31429 | 0.56086 | 5.02857 | 4.40143 | 523.33333 |
| | St Dev | 0.07559 | 1.40408 | 12.54052 | 0.20565 | 1.93612 | 1.43304 | 316.37804 |
| **Monitoring Point MP26** | | **pH** | **Alkalinity** | **Acidity** | **Fe** | **Mn** | **Al** | **Flow** |
| | **Date** | **Lab** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **gpm** |
| **Latitude** | 3/25/2002 | 6.2 | 9.4 | 45.40 | 0.30 | 1.95 | 0.72 | |
| 41 05 27 | 4/4/2002 | 5.3 | 8.8 | 48.40 | 0.32 | 2.99 | 1.42 | 1500 |
| | 4/30/2002 | 5.5 | 7.8 | 45.20 | 0.30 | 2.79 | 1.18 | 1300 |
| **Longitude** | 5/15/2002 | 5.7 | 7.6 | 32.20 | 0.33 | 1.64 | 1.00 | 1300 |
| 78 19 18 | 7/16/2002 | 6.6 | 12.6 | 0.00 | 0.30 | 3.37 | 0.95 | 300 |
| | 9/25/2002 | 7.0 | 17.8 | 0.00 | 0.30 | 3.95 | 0.50 | 147 |
| Little Surveyor Run before | 10/3/2002 | 6.8 | 15 | 0.00 | 0.30 | 3.66 | 0.50 | 187 |
| confluence w/ Surveyor Run | Average | 6.15714 | 11.28571 | 24.45714 | 0.30829 | 2.90714 | 0.89514 | 789.00000 |
| | St Dev | 0.67047 | 3.94606 | 23.43977 | 0.01444 | 0.85741 | 0.34476 | 638.97606 |
| **Monitoring Point MP25** | | **pH** | **Alkalinity** | **Acidity** | **Fe** | **Mn** | **Al** | **Flow** |
| | **Date** | **Lab** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **gpm** |
| **Latitude** | 3/25/2002 | 4.1 | 2.4 | 84.80 | 0.35 | 4.13 | 4.08 | |
| 41 05 27 | 4/4/2002 | 3.9 | 0.0 | 83.80 | 0.59 | 5.00 | 6.49 | 3080 |
| | 4/30/2002 | 3.9 | 0.0 | 89.80 | 0.43 | 5.11 | 4.85 | 3000 |
| **Longitude** | 5/15/2002 | 4.0 | 1.6 | 66.40 | 0.50 | 3.04 | 4.12 | 3000 |
| 78 19 23 | 7/16/2002 | 3.5 | 0.0 | 117.40 | 0.79 | 8.68 | 10.10 | 360 |
| | 9/25/2002 | 3.6 | 0.0 | 112.20 | 0.96 | 9.02 | 10.40 | 251 |
| Surveyor Run before confluence | 10/3/2002 | 3.6 | 0.0 | 94.80 | 0.83 | 9.06 | 8.64 | 250 |
| with Little Surveyor Run | Average | 3.80000 | 0.57143 | 92.74286 | 0.63529 | 6.29143 | 6.95429 | 1656.83333 |
| | St Dev | 0.23094 | 1.00285 | 17.49503 | 0.22840 | 2.55351 | 2.75525 | 1501.39407 |

| Monitoring Point MP8 | | pH | Alkalinity | Acidity | Fe | Mn | Al | Flow |
|---|---|---|---|---|---|---|---|---|
| | Date | Lab | mg/l | mg/l | mg/l | mg/l | mg/l | gpm |
| **Latitude** | 4/1/2002 | 4.3 | 6.8 | 74.60 | ND | 4.31 | 3.59 | 2940 |
| 41 06 06 | 4/30/2002 | 4.2 | 4.0 | 70.00 | ND | 5.73 | 4.42 | 2900 |
| | 5/15/2002 | 4.4 | 10.0 | 56.60 | 0.37 | 3.36 | 3.39 | 2900 |
| **Longitude** | 6/11/2002 | 4.2 | 5.6 | 72.00 | ND | 5.78 | 5.75 | 1635 |
| 78 19 42 | 7/17/2002 | 3.9 | 0.0 | 168.60 | 0.35 | 13.20 | 10.90 | 70 |
| | 9/25/2002 | 4.1 | 3.4 | 142.20 | ND | 17.50 | 12.00 | 97 |
| Surveyor Run before confluence | 10/7/2002 | 4.0 | 2.8 | 121.60 | ND | 14.00 | 9.34 | 180 |
| with MP28 unnamed trib | 4/1/2002 | 4.3 | 6.8 | 74.60 | ND | 4.31 | 3.59 | 2940 |
| | Average | 4.18750 | 4.75000 | 96.30000 | 0.35700 | 8.52875 | 6.60125 | 1531.71429 |
| | St Dev | 0.18077 | 2.96792 | 41.91079 | 0.01414 | 5.47204 | 3.58786 | 1400.02937 |
| **Monitoring Point MP28** | | **pH** | **Alkalinity** | **Acidity** | **Fe** | **Mn** | **Al** | **Flow** |
| | **Date** | **Lab** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **gpm** |
| **Latitude** | 3/25/2002 | 4.2 | 4.4 | 71.40 | 0.31 | 2.46 | 2.65 | |
| 41 06 06 | 4/1/2002 | 3.9 | 0.0 | 60.40 | 0.95 | 2.07 | 3.71 | 1460 |
| | 4/30/2002 | 4.1 | 2.8 | 68.00 | 0.30 | 2.44 | 2.60 | 1400 |
| **Longitude** | 5/15/2002 | 4.0 | 4.8 | 55.20 | 0.73 | 1.47 | 3.09 | 1400 |
| 78 19 44 | 6/11/2002 | 3.9 | 0.0 | 67.20 | 0.57 | 1.91 | 3.49 | 960 |
| | 7/17/2002 | 3.6 | 0.0 | 93.00 | 0.85 | 3.77 | 5.50 | 45 |
| unnamed trib that receives discharge | 9/25/2002 | 3.7 | 0.0 | 71.80 | 0.96 | 6.91 | 5.01 | 11 |
| from cut prior to confluence with | 10/7/2002 | 3.8 | 0.0 | 56.20 | 0.69 | 5.85 | 4.11 | 50 |
| Surveyor Run | Average | 3.90000 | 1.50000 | 67.90000 | 0.67000 | 3.36000 | 3.77000 | 760.85714 |
| | St Dev | 0.20000 | 2.14609 | 12.02616 | 0.26209 | 1.99878 | 1.05653 | 698.27417 |
| **Monitoring Point MP9** | | **pH** | **Alkalinity** | **Acidity** | **Fe** | **Mn** | **Al** | **Flow** |
| | **Date** | **Lab** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **gpm** |
| **Latitude** | 3/25/2002 | 3.4 | 0.0 | 124.40 | 1.04 | 2.41 | 10.20 | |
| 41 05 57 | 4/1/2002 | 3.3 | 0.0 | 149.00 | 4.65 | 2.32 | 12.10 | 120 |
| | 4/30/2002 | 3.4 | 0.0 | 119.40 | 0.83 | 2.51 | 8.90 | 120 |
| **Longitude** | 5/15/2002 | 3.3 | 0.0 | 85.00 | 2.54 | 1.58 | 8.32 | 120 |
| 78 19 57 | 6/11/2002 | 3.4 | 0.0 | 96.00 | 1.65 | 1.76 | 8.70 | 120 |
| | 7/17/2002 | 3.4 | 0.0 | 118.80 | 0.97 | 2.65 | 7.78 | 15 |
| MP9 unnamed stream #2 | 9/25/2002 | 3.4 | 0.0 | 98.20 | 2.38 | 5.87 | 9.69 | 5 |
| (at blue weir in cut) | 10/7/2002 | 3.4 | 0.0 | 97.80 | 1.78 | 4.78 | 9.72 | 10 |
| | Average | 3.37500 | 0.00000 | 111.07500 | 1.98063 | 2.98500 | 9.42625 | 72.85714 |

| | St Dev | 0.04629 | 0.00000 | 20.68124 | 1.25170 | 1.51802 | 1.34386 | 58.86830 |
|---|---|---|---|---|---|---|---|---|
| **Monitoring Point SR003** | | **pH** | **Alkalinity** | **Acidity** | **Fe** | **Mn** | **Al** | **Flow** |
| | **Date** | **Lab** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **gpm** |
| **Latitude** | 4/1/2002 | 4.8 | 9.2 | 51.00 | ND | 2.62 | 1.30 | 510 |
| 41-06-15 | 4/30/2002 | 4.9 | 7.4 | 51.40 | 0.45 | 3.98 | 2.12 | 400 |
| | 5/20/2002 | 5.2 | 9.6 | 41.00 | ND | 2.06 | 1.18 | 400 |
| **Longitude** | 6/11/2002 | 5.3 | 9.4 | 45.60 | 0.38 | 2.61 | 1.11 | 250 |
| 78-20-04 | 7/17/2002 | 4.8 | 7.4 | 82.80 | ND | 7.26 | 4.90 | 15 |
| | 9/25/2002 | 4.5 | 7.0 | 107.00 | ND | 21.30 | 7.76 | 5 |
| unnamed tributary | 10/7/2002 | 4.4 | 6.4 | 88.00 | ND | 14.80 | 5.66 | 11 |
| to Surveyor Run | Average | 4.84286 | 8.05714 | 66.68571 | 0.41300 | 7.80429 | 3.43286 | 227.28571 |
| | St Dev | 0.33094 | 1.30494 | 25.57104 | 0.04525 | 7.44815 | 2.66397 | 216.54847 |

Data not used in analysis.

| **MP6** | **pH** | **Alkalinity** | **Acidity** | **Fe** | **Mn** | **Al** | **Flow** |
|---|---|---|---|---|---|---|---|
| **Date** | **Lab** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **mg/l** | **gpm** |
| 1/3/2001 | 4.5 | 8 | 30 | 0.85 | 4.82 | 4.22 | NA |
| 2/6/2001 | 4.4 | 7 | 30 | 0.60 | 4.57 | 3.94 | 583 |
| 2/22/2001 | 4.5 | 6 | 29 | 0.84 | 3.31 | 3.41 | 430 |
| 3/2/2001 | 4.4 | 6 | 28 | 0.76 | 4.19 | 4.01 | 710 |
| 3/28/2001 | 4.3 | 5 | 39 | 0.93 | 3.44 | 4.03 | 2908 |
| 4/5/2001 | 4.4 | 6 | 30 | 0.93 | 4.19 | 4.42 | 1884 |
| 4/18/2001 | 4.4 | 5 | 26 | 0.71 | 2.92 | 2.94 | 3231 |
| 5/7/2001 | 4.5 | 6 | 33 | 0.63 | 4.31 | 4.17 | 969 |
| 5/23/2001 | 4.5 | 8 | 36 | 0.77 | 5.67 | 4.30 | 1687 |
| 6/4/2001 | 4.3 | 5 | 38 | 0.78 | 4.53 | 3.67 | 1385 |
| 6/15/2001 | 4.4 | 8 | 30 | 0.54 | 4.44 | 4.21 | 980 |
| 7/5/2001 | 4.5 | 6 | 30 | 0.58 | 4.31 | 3.93 | 807 |
| 7/18/2001 | 4.7 | 8 | 39 | 0.55 | 4.63 | 4.61 | 403 |
| 8/7/2001 | 4.5 | 8 | 35 | 0.38 | 4.66 | 3.98 | 341 |
| 8/22/2001 | 4.3 | 6 | 48 | 0.69 | 5.85 | 4.20 | 484 |
| 9/4/2001 | 4.2 | 4 | 48 | 0.93 | 5.22 | 4.02 | 420 |
| 9/20/2001 | 4.5 | 6 | 36 | 0.99 | 5.15 | 4.18 | 258 |
| 12/26/2001 | 4.8 | 14.8 | 58.80 | 1.23 | 3.81 | 3.14 | |

| LM509 | pH | Alkalinity | Acidity | Fe | Mn | Al | Flow |
|---|---|---|---|---|---|---|---|
| Date | Lab | mg/l | mg/l | mg/l | mg/l | mg/l | gpm |
| 2/22/2001 | 3.8 | <1 | 49 | 0.62 | 6.38 | 5.41 | 75 |
| 4/9/2001 | 3.9 | <1 | 40 | 0.52 | 5.52 | 5.07 | 168 |
| 8/7/2001 | 3.8 | <1 | 85 | 0.64 | 6.71 | 5.36 | 53 |
| 12/26/2001 | 4.1 | 4.8 | 75.20 | 0.93 | 7.57 | 5.50 | |

| MP26 | pH | Alkalinity | Acidity | Fe | Mn | Al | Flow |
|---|---|---|---|---|---|---|---|
| Date | Lab | mg/l | mg/l | mg/l | mg/l | mg/l | gpm |
| 10/10/1991 | 6.57 | 16 | 5 | 0.23 | 5.96 | 1.24 | 200 |
| 11/26/1991 | 6.52 | 9 | 4 | 0.49 | 4.29 | 0.62 | 200 |

| MP25 | pH | Alkalinity | Acidity | Fe | Mn | Al | Flow |
|---|---|---|---|---|---|---|---|
| Date | Lab | mg/l | mg/l | mg/l | mg/l | mg/l | gpm |
| 2/6/2001 | 4.0 | 3 | 48 | 0.46 | 5.91 | | 329 |
| 4/9/2001 | 3.9 | <1 | 47 | 0.50 | 5.14 | | 1638 |
| 8/7/2001 | 3.5 | <1 | 128 | 1.03 | 8.50 | | 78 |
| 11/22/2001 | 3.9 | 0.0 | 58.00 | 0.60 | 7.66 | 6.26 | |
| 5/9/2001 | 3.7 | 0.0 | 74.00 | 0.65 | 7.18 | 7.72 | |

| MP8 | pH | Alkalinity | Acidity | Fe | Mn | Al | Flow |
|---|---|---|---|---|---|---|---|
| Date | Lab | mg/l | mg/l | mg/l | mg/l | mg/l | gpm |
| 7/3/1991 | 3.93 | <1 | 88 | 0.35 | 19.4 | | 450 |
| 9/20/1991 | 3.99 | <1 | 87 | 0.24 | 19.1 | | 400 |

| MP28 | pH | Alkalinity | Acidity | Fe | Mn | Al | Flow |
|---|---|---|---|---|---|---|---|
| Date | Lab | mg/l | mg/l | mg/l | mg/l | mg/l | gpm |
| 10/10/1991 | 3.88 | <1 | 80 | 0.94 | 12 | 4.67 | 600 |
| 11/26/1991 | 4.12 | <1 | 41 | 0.52 | 6.81 | 2.31 | 705 |

| MP9<br>Date | pH<br>Lab | Alkalinity<br>mg/l | Acidity<br>mg/l | Fe<br>mg/l | Mn<br>mg/l | Al<br>mg/l | Flow<br>gpm |
|---|---|---|---|---|---|---|---|
| 1/3/2001 | 3.4 | <1 | 86 | 1.26 | 3.68 | 11.7 | 20 |
| 2/6/2001 | 3.5 | <1 | 118 | 1.28 | 5.3 | 11.7 | 14 |
| 4/9/2001 | 3.4 | <1 | 90 | 1.06 | 2.28 | 9.71 | 62 |
| 8/7/2001 | 3.3 | <1 | 136 | 1.58 | 3.81 | 9.28 | 12 |

# Attachment F
## Comment and Response

## Comments/Responses on the Surveyor Run Watershed TMDL

### EPA Region III Comments

**Comment:**
Please include the following language in the TMDL report to further explain why permitted (remining permits) preexisting flow is considered a load allocation:

> The reduction necessary to meet applicable water quality standards from preexisting conditions (including discharges from areas coextensive with areas permitted under the remining program) are expressed in the LA portion of the TMDL. The WLAs express the basis for applicable effluent limitations on point sources. Except for any expressed assumptions, the WLA allocated to a remining permittee does not require the permittee to necessarily implement the reductions from preexisting conditions set forth in the LA. Additional requirements for the permittee, if any, to address the preexisting conditions (beyond those already expressed in the WLA) are set forth in the applicable NPDES/mining permit.

**Response:**
Appropriate language was added to the TMDL.

**Comment:**
Page 4, Segments Addressed in This TMDL, states that the Sky Haven Coal Company's two sites have both preexisting flows and NPDES permitted discharges. The sampling points downstream of the point where the WLAs enter the stream and the WLAs are identified. However, neither the point(s) where the preexisting flows enter the stream nor the flow quantity been identified. It is assumed that preexisting flows are quantified during the permit application process. Even though these flows are part of the LA, their location needs to be identified, together with the required reduction to meet water quality standards. The required reduction will depend on their location within the watershed.

**Response:**
Locations of the preexisting discharges were added to the map in Attachment A. The preexisting discharges are not assigned individual load allocations, however, the allocation points at which affects of the preexisting discharges are taken into consideration are identified. The load allocations at these point includes the loading from the preexisting discharges.

**Comment:**
Attachment C, TMDLs by Segment, identifies the apparent flow quantity decrease in the downstream direction resulting from flow being measured on different days and differing data set sizes. When this occurs, it is strongly suggested that the data be examined for an alternate method of establishing average flows at each sampling point.

In this case, flow was measured at each sampling point on 9/25/02 and the largest set of flow values is at MP6, at the mouth of the stream. By multiplying each of the upstream 9/25/02 flows by the average flow at MP6 divided by the 9/25/02 flow, a consistent set of flows is obtained representing the average flow at each sampling point.  It is likely the resulting set of flows is closer to the actual average flow because measurements at MP6 cover a broader range of conditions.  See also Comment 4 below.

**Response:**
The data was more closely evaluated and only the data collected specifically for the TMDL was used in the analysis.  It is believed this data was most representative of current stream conditions.  The remaining data is included in Attachment E of the report.

**Comment:**
DEP's analytical method assumes continuity from the upstream sampling points to the downstream sampling point by taking credit at a downstream sampling point for load reductions at an upstream sampling point.  Similarly,  the reduced load at a sampling point must be considered at the next downstream sampling point.  Considering the effect of upstream loads and the allowable load at each sampling point, the allowable loads at MP25 and MP6 are smaller than the upstream loads entering the stream segments represented by MP25 and MP6.

**Response:**
The Department has revised the methodology to insure that allocations at a point are met.  The updated methodology tracks loads through the watershed instead of reductions.  The updated methodology does not assume continuity and takes into account instream processes occurring within a stream segment.