

FINAL

Little Toby Creek Watershed TMDL
Elk and Jefferson Counties, Pennsylvania

Prepared by:

Pennsylvania Department of Environmental Protection



February 23, 2009

TABLE OF CONTENTS

Introduction.....	3
Directions to the Little Toby Creek Watershed.....	8
Segments addressed in this TMDL.....	8
Clean Water Act Requirements	9
303(d) Listing Process	9
Basic Steps for Determining a TMDL.....	10
Watershed History	11
AMD Methodology.....	14
Method to Quantify Treatment Pond Pollutant Load	17
Changes in TMDLs That May Require EPA Approval.....	20
Changes in TMDLs That May Not Require EPA Approval.....	20
TMDL Endpoints.....	21
TMDL Elements (WLA, LA, MOS)	21
TMDL Allocations Summary	21
Allocation Summary	21
Recommendations.....	32
Public Participation.....	35

TABLES

Table 1. 303(d) Sub-List Upper Allegheny River.....	3
Table 2. Little Toby Creek Watershed Mining History	11
Table 3 Applicable Water Quality Criteria.....	21
Table 4. Summary Table–Little Toby Creek Watershed.....	22
Table 5. Waste Load Allocation of Permitted Discharges.....	31

ATTACHMENTS

<i>ATTACHMENT A</i>	36
Little Toby Creek Watershed Maps.....	36
<i>ATTACHMENT B</i>	49
Method for Addressing Section 303(d) Listings for pH.....	49
<i>ATTACHMENT C</i>	52
TMDLs By Segment.....	52
<i>ATTACHMENT D</i>	116
Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists and Integrated Report/List (2004, 2006).....	116
<i>ATTACHMENT E</i>	119
Water Quality Data Used In TMDL Calculations	119
<i>ATTACHMENT F</i>	157
TMDLs and NPDES Permitting Coordination	157
<i>ATTACHMENT G</i>	160
Little Toby Creek Sediment Calculations.....	160
<i>ATTACHMENT H</i>	176
Comment and Response.....	176

FINAL TMDL
Little Toby Creek Watershed
Elk and Jefferson Counties, Pennsylvania

Introduction

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

Table 1. 303(d) Sub-List Upper Allegheny River								
HUC 05010005 State Water Plan (SWP) Subbasin: 17A								
Year	Miles	Segment ID	DEP Stream Code	Stream Name	Designated Use	Data Source	Source	EPA 305(b) Cause Code
1996	4 (metals & pH) 3 Sus. Sol.		50229	Little Toby Creek	CWF	303 (d) List	Resource Extraction	Metals, pH & Suspended Solids
1996	2	5431	50364	Johnson Run	CWF	303 (d) List	Resource Extraction	Metals & *Other Inorganics
1998	4 (metals & pH) 3 Sus. Sol.		50229	Little Toby Creek	CWF	SWMP	AMD	Metals, pH & Suspended Solids
1998	4.1	5431	50364	Johnson Run	CWF	SWMP	AMD	Metals & *Other Inorganics
2002		990915-1230-JJM	50229	Little Toby Creek	CWF	SWMP	AMD	Metals
2002		990915-1130-JJM	50229	Little Toby Creek	CWF	SWMP	AMD	Metals & pH
2002		990917-1445-JJM	50229	Little Toby Creek	CWF	SWMP	AMD	Metals
2002	4.1	990915-1030-JJM	50364	Johnson Run	CWF	SWMP	AMD	Metals & *Other Inorganics
2004	3.32	990909-1230-JJM	50383	Benninger Creek	CWF	SWMP	AMD	Metals
2004	1.13	990909-1230-JJM	50384	Unt Benninger Creek	CWF	SWMP	AMD	Metals
2004	0.47	990909-1230-JJM	50385	Unt Benninger Creek	CWF	SWMP	AMD	Metals
2004	3.09 8.1	990909-1645-JJM 990909-0900-JJM	50368	Brandy Camp Creek	CWF	SWMP	AMD	Metals & pH Metals & pH

2004	1.56	990909-0900-JJM	50372	Unt Brandy Camp Creek	CWF	SWMP	AMD	Metals & pH
2004	1.5	990909-0900-JJM	50386	Unt Brandy Camp Creek	CWF	SWMP	AMD	Metals & pH
2004	5.97 4.09	20020731-0945-JJM 990915-1030-JJM	50364	Johnson Run	CWF	SWMP	AMD	Metals, pH & *Other Inorganics Metals & *Other Inorganics
2004	0.43	990915-1031-JJM	50365	Unt Johnson Run	CWF	SWMP	AMD	Metals & *Other Inorganics
2004	0.59	990915-1031-JJM	50366	Unt Johnson Run	CWF	SWMP	AMD	Metals & *Other Inorganics
2004	2.49	990910-1430-JJM	50406	Kyler Run	CWF	SWMP	AMD	Metals & pH
2004	0.81	990910-1430-JJM	50407	Unt Kyler Run	CWF	SWMP	AMD	Metals & pH
2004	0.73	990910-1430-JJM	50409	Unt Kyler Run	CWF	SWMP	AMD	Metals, pH
2004	0.4	990910-1431-JJM	50410	Unt Kyler Run	CWF	SWMP	AMD	Metals, pH
2004	1.75	990915-1131-JJM	50411	Limestone Run	CWF	SWMP	AMD	Metals, pH & Suspended Solids
2004	8.5 15.9 28.4	990917-1445-JJM 991027-1230-JJM 990915-1130-JJM	50229	Little Toby Creek	CWF	SWMP	AMD	Metals, pH & Suspended Solids Metals, pH & Suspended Solids Metals, pH & Suspended Solids
2004	1.31	20021024-1347-JJM	50325	Unt Little Toby Creek	CWF	SWMP	AMD	Metals
2004	0.21	20001024-1347-JJM	50326	Unt Little Toby Creek	CWF	SWMP	AMD	Metals
2004	1.4	990915-1230-JJM	50392	Unt Little Toby Creek	CWF	SWMP	Unknown	Unknown
2004	0.82	990915-1132-JJM	50404	Unt Little Toby Creek	CWF	SWMP	AMD	Metals, pH & Suspended Solids
2004	0.72	990915-1132-JJM	50412	Unt Little Toby Creek	CWF	SWMP	AMD	Metals, pH & Suspended Solids
2004	0.69	990915-1132-JJM	50413	Unt Little Toby Creek	CWF	SWMP	AMD	Metals, pH & Suspended Solids
2004	6.5	990914-1200-JJM	50340	Mead Run	CWF	SWMP	AMD	Metals & pH
2004	1.14	990914-1200-JJM	50341	Unt Mead Run	CWF	SWMP	AMD	Metals & pH

2004	0.99	990914-1200-JJM	50342	Unt Mead Run	CWF	SWMP	AMD	Metals & pH
2004	0.7	990914-1200-JMM	50343	Unt Mead Run	CWF	SWMP	AMD	Metals & pH
2004	1.77	990914-1200-JJM	50344	Unt Mead Run	CWF	SWMP	AMD	Metals & pH
2004	0.58	990914-1200-JJM	50345	Unt Mead Run	CWF	SWMP	AMD	Metals & pH
2004	1.36	990914-1200-JJM	50346	Unt Mead Run	CWF	SWMP	AMD	Metals & pH
2004	0.76	990914-1200-JJM	50347	Unt Mead Run	CWF	SWMP	AMD	Metals & pH
2004	0.69	990914-1200-JJM	50348	Unt Mead Run	CWF	SWMP	AMD	Metals & pH
2004	1.17	990914-1200-JJM	50349	Unt Mead Run	CWF	SWMP	AMD	Metals & pH
2004	1.0	990914-1200-JJM	50350	Unt Mead Run	CWF	SWMP	AMD	Metals & pH
2004	0.12	990914-1200-JJM	50351	Unt Mead Run	CWF	SWMP	AMD	Metals & pH
2004	0.72	990914-1200-JJM	50352	Unt Mead Run	CWF	SWMP	AMD	Metals & pH
2004	1.8	20001024-1230-JMM	50290	Rattlesnake Creek	CWF	SWMP	AMD	Metals
2004	1.02	20001024-1347-JJM	50292	Unt Rattlesnake Creek	CWF	SWMP	AMD	Metals
2004	0.11	20001024-1347-JMM	50293	Unt Rattlesnake Creek	CWF	SWMP	AMD	Metals
2004	0.56	990915-1530-JJM	50393	Sawmill Run	CWF	SWMP	AMD	Metals & pH
2004	1.84	990915-1530-JMM	50394	Unt Sawmill Run	CWF	SWMP	AMD	Metals & pH
2004	0.69	990915-1530-JJM	50395	Unt Sawmill Run	CWF	SWMP	AMD	Metals & pH
2006	3.42	11204	50383	Benninger Creek	CWF	SWMP	AMD	Metals
2006	1.14	11204	50384	Benninger Creek	CWF	SWMP	AMD	Metals
2006	0.47	11204	50385	Benninger Creekt	CWF	SWMP	AMD	Metals
2006	5.13	11203	50368	Brandy Camp Creek	CWF	SWMP	AMD	Metals & pH
	3.19	11206						Metals & pH
2006	0.61	6298	50369	Unt Brandy Camp Creek	CWF	SWMP	AMD	Metals & Siltation
2006	0.49	6297	50370	Unt Brandy Camp Creek	CWF	SWMP	AMD	Siltation
2006	0.6	6298	50371	Unt Brandy Camp Creek	CWF	SWMP	AMD	Siltation
2006	1.57	11203	50372	Unt Brandy Camp Creek	CWF	SWMP	AMD	Metals & pH
2006	1.49	11203	50386	Unt Brandy Camp Creek	CWF	SWMP	AMD	Metals & pH
2006	2.54	11218	50406	Kyler Run	CWF	SWMP	AMD	Metals & pH
2006	0.83	11218	50407	Unt Kyler Run	CWF	SWMP	AMD	Metals & pH
2006	0.27	11519	50408	Unt Kyler Run	CWF	SWMP	AMD	Metals
2006	0.74	11218	50409	Unt Kyler Run	CWF	SWMP	AMD	Metals & pH

2006	0.39	11218	50410	Unt Kyler Run	CWF	SWMP	AMD	Metals, pH
2006	6.04	4290	50364	Johnson Run	CWF	SWMP	AMD	Metals, pH
	4.14	11225						Metals, pH
2006	0.59	11226	50365	Unt Johnson Run	CWF	SWMP	AMD	Metals
2006	0.59	11226	50366	Unt Johnson Run	CWF	SWMP	AMD	Metals
2006	1.75	11228	50411	Limestone Run	CWF	SWMP	AMD	Metals, pH
2006	6.62	226	50229	Little Toby Creek	CWF	SWMP	AMD	Metals, pH & Suspended Solids
	2.92	5284						Metals, pH
	12.77	11227						Metals, pH & Suspended Solids
	0.7	11242						Metals, pH & Suspended Solids
	8.5	11242						Metals, pH & Suspended Solids
2006	1.31	1557	50325	Unt Little Toby Creek	CWF	SWMP	AMD	Metals
2006	0.21	1557	50326	Unt Little Toby Creek	CWF	SWMP	AMD	Metals
2006	0.62	6294	50354	Unt Little Toby Creek	CWF	SWMP	AMD	Metals
2006	0.6	11516	50387	Unt Little Toby Creek	CWF	SWMP	AMD	Metals
2006	1.42	11230	50392	Unt Little Toby Creek	CWF	SWMP	Cause Unknown	Other
2006	0.48	11515	50400	Unt Little Toby Creek	CWF	SWMP	AMD	Metals
2006	0.23	11515	50403	Unt Little Toby Creek	CWF	SWMP	AMD	Metals
2006	0.82	11229	50404	Unt Little Toby Creek	CWF	SWMP	AMD	Metals, pH & Suspended Solids
2006	1.48	11515	50405	Unt Little Toby Creek	CWF	SWMP	AMD	Metals
2006	0.7	11229	50412	Unt Little Toby Creek	CWF	SWMP	AMD	Metals, pH & Suspended Solids

2006	1.93	11227	50413	Unt Little Toby Creek	CWF	SWMP	AMD	Metals, pH & Suspended Solids
	0.7	11229						Metals, pH & Suspended Solids
2006	2.68	11515	50401	McCauley Run	CWF	SWMP	AMD	Metals
2006	0.48	11515	50402	Unt McCauley Run	CWF	SWMP	AMD	Metals
2006	6.64	11221	50340	Mead Run	CWF	SWMP	AMD	Metals, pH
2006	1.15	11221	50341	Unt Mead Run	CWF	SWMP	AMD	Metals, pH
2006	1.0	11221	50342	Unt Mead Run	CWF	SWMP	AMD	Metals, pH
2006	0.69	11221	50343	Unt Mead Run	CWF	SWMP	AMD	Metals, pH
2006	1.8	11221	50344	Unt Mead Run	CWF	SWMP	AMD	Metals, pH
2006	0.59	11221	50345	Unt Mead Run	CWF	SWMP	AMD	Metals, pH
2006	1.39	11221	50346	Unt Mead Run	CWF	SWMP	AMD	Metals, pH
2006	0.76	11221	50347	Unt Mead Run	CWF	SWMP	AMD	Metals, pH
2006	0.71	11221	50348	Unt Mead Run	CWF	SWMP	AMD	Metals, pH
2006	1.17	11221	50349	Unt Mead Run	CWF	SWMP	AMD	Metals, pH
2006	1.02	11221	50350	Unt Mead Run	CWF	SWMP	AMD	Metals, pH
2006	0.16	11221	50351	Unt Mead Run	CWF	SWMP	AMD	Metals, pH
2006	0.71	11221	50352	Unt Mead Run	CWF	SWMP	AMD	Metals, pH
2006	2.1	1554	50290	Rattlesnake Creek	CWF	SWMP	AMD	Metals
2006	1.02	1557	50292	Unt Rattlesnake Creek	CWF	SWMP	AMD	Metals
2006	0.2	1557	50293	Unt Rattlesnake Creek	CWF	SWMP	AMD	Metals
2006	0.57	11231	50393	Sawmill Run	CWF	SWMP	AMD	Metals, pH
2006	2.1	11231	50394	Unt Sawmill Run	CWF	SWMP	AMD	Metals, pH
2006	0.7	11231	50395	Unt Sawmill Run	CWF	SWMP	AMD	Metals, pH

*Other Inorganics listing is not included on 2006 Integrated List.

Cold Water Fishes=CWF

Surface Water Monitoring Program = SWMP

Abandoned Mine Drainage = AMD

Directions to the Little Toby Creek Watershed

The Little Toby Creek Watershed is approximately 38.3 square miles in area and is located in Snyder and Washington Townships in Jefferson County and Fox, Horton and Spring Creek Townships, Elk County. The watershed can be located on the U. S. Geological Service (USGS) 7.5-minute quadrangles of Brandy Camp, Carman, Falls Creek, Kersey and Sabula. Little Toby Creek is approximately 28.9 miles in length. The stream flows approximately 16.1 miles from its headwaters in the town of Coal Hollow in a southwestern direction to the town of Brockway where the stream takes a 90 degree turn and flows for approximately 12.8 miles in a northwestern direction to its confluence with the Clarion River in the town of Carman.

The mouth of Little Toby Creek can be accessed by taking exit 73 (Corsica) of Interstate 80 (I-80). Turn onto Route 949 North and travel for approximately 31.7 miles to the Town of Carmen. Little Toby Creek flows into the Clarion River in the Town of Carmen at this point. The headwaters of Little Toby Creek can be accessed by taking exit 97 (Dubois/Brockway) of I-80 and traveling North on Rt. 219 for approximately 7.2 miles to the town of Brockway. Little Toby Creek flows under Rt. 219 at this point. Continue traveling on Rt. 219 North for approximately 6.7 miles and take a right onto Toby Road (TR2003). Travel for approximately 4.2 miles and turn Right onto Coal Hollow Road (TR2005). Travel for approximately 1.7 miles on Coal Hollow Road to the town of Coal Hollow. The headwaters of Little Toby Creek originate around this area.

Segments addressed in this TMDL

The Little Toby Creek Watershed is affected by pollution from AMD. This pollution has caused high levels of metals throughout the Little Toby Creek Watershed. The sources of the AMD are seeps and discharges from areas disturbed by surface and deep mining activities.

There are seventeen active mining operations in the watershed (Table 2). Three of these operations are small non-coal mines with erosion and sedimentation control structures, rather than mine drainage treatment facilities, therefore Waste Load Allocations (WLAs) are not required for these sites. The remaining operations are active coal mines and will be assigned WLAs.

The remaining discharges in the Little Toby Creek 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. 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.

The designation for this stream segment can be found in PA Title 25 Chapter 93.

Clean Water Act Requirements

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

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

- States to develop lists of impaired waters for which current pollution controls are not stringent enough to meet water quality standards (the list is used to determine which streams need TMDLs);
- States to establish priority rankings for waters on the lists based on severity of pollution and the designated use of the waterbody; states must also identify those waters for which TMDLs will be developed and a schedule for development;
- States to submit the list of waters to USEPA every four years (April 1 of the even numbered years);
- States to develop TMDLs, specifying a pollutant budget that meets state water quality standards and allocate pollutant loads among pollution sources in a watershed, e.g., point and nonpoint sources; and
- USEPA to approve or disapprove state lists and TMDLs within 30 days of final submission.

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

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

303(d) Listing Process

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

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

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

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

Basic Steps for Determining a TMDL

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

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

This document will present the information used to develop the Little Toby Creek Watershed TMDL.

Watershed History

Mining originated in the Little Toby Creek Watershed during the late 1800s and early 1900s in the form of drift mines near the town of Brandy Camp. This deep mine, named the Elbon Mine, was worked until the 1930s mining the Lower Kittanning coal seam. Shortly after the Elbon Mine was closed, the Shawmut Mine was opened and in operation until the 1950s, mining coal from the Middle Kittanning coal seam. Surface mining dominated the area around this time due to the advent of heavy machinery that was capable of removing the overburden covering the coal seams.

The mining history prior to the 1970's sometimes referred to as pre-Act mining (mining that occurred before the passage of the Surface Mining Control and Reclamation Act of 1977), will likely be an unknown as records are not available. Only the environmental scars, such as unreclaimed pits, mine land and discharges, remain as records of the sites of the unknown mines. Surface mining has occurred primarily on the Upper and Lower Freeport, and Upper, Middle and Lower Kittanning Coal seams.

The majority of well-documented mining in the Little Toby Creek Watershed occurred in the 1970's and 1980's and continues on a smaller scale today. The following provides a brief outline of the mining history of the Little Toby Creek Watershed. Although most of the files no longer exist, some information has been saved through microfiche:

Table 2. Little Toby Creek Watershed Mining History

Company	Permit #	Mine Name	Date Issued	Acerage	Coal Seam(s)	Status
STARR COAL CO	3068BSM18	STARR 6 MINE	9/5/1968	171.0	UK, LF	RECLAMATION COMPLETE
STARR COAL CO	3870BSM6	BRUBAKER 4 MINE	8/12/1970	106.0	UK, LK, UF	RECLAMATION COMPLETE
NEW SHAWMUT MINING CO	3067BSM38	HORTON MINE	10/24/1972	220.0	LF	RECLAMATION COMPLETE
FAIRVIEW COAL CO	4674SM13	FAIRVIEW MINE	11/25/1974	82.0	LF, UF, BC	RECLAMATION COMPLETE
FAIRVIEW COAL CO	4674SM8	FAIRVIEW 86 MINE	1/29/1975	63.0	LF, UF	RECLAIMED - CHEMICAL TREATMENT
BENJAMIN COAL CO	3067BSM4	CALHOUN MINE	7/8/1975	64.5	UF, LF	ABANDONED - BOND FORFEITED
MAUD MINING CO	3874SM36	BOYER MINE	8/19/1975	86.0	UF, LF	RECLAMATION COMPLETE
GLEN IRVAN CORP	4675SM9	BELOTTI MINE	1/19/1976	81.0	UK, LF, UF	ABANDONED - BOND FORFEITED
BENJAMIN COAL CO	3875SM41	HOLT MINE	3/30/1976	36.0	LK	RECLAMATION COMPLETE
HEPBURNIA COAL CO	4676SM6	DAGUS MINE	7/29/1976	105.0	LF, LK, MK	RECLAMATION COMPLETE
BENJAMIN COAL CO	38(A)76SM12	KEARNEY MINE	12/6/1976	75.0	MK	RECLAMATION COMPLETE
THOMAS FUELS INC	38A76SM22	MINNIS MINE	2/17/1977	303.0	LF, UF	RECLAMATION COMPLETE
KEECH COAL CO	4676SM14	KEECH 1 MINE	3/11/1977	20.0	UK	RECLAMATION COMPLETE
STARR COAL CO	38A77SM3	CRIBBS STARR DENNISON MINE	5/23/1977	90.0	LF, UF	RECLAMATION COMPLETE
BROCKWAY CLAY CO	38A77SM4	LUNDBURG 1 MINE	11/10/1977	45.9	SHALE	ABANDONED - BOND FORFEITED
ESQUIRE FUEL CO	4677SM14	FARNSWORTH MINE	2/1/1978	85.0	MK, UF, LF, UF	RECLAMATION COMPLETE
NEW HOPE MINING CO	4677SM16	MINE 1	2/3/1978	215.0	UF, LF, UK, MK, LK	CANCLD 8/13/1981
CECIL J SHAFFER	38A77SM33	BROCKWAY MINE	4/26/1978	16.9	UF, LF	ABANDONED - BOND FORFEITED
GLEN IRVAN CORP	4677SM5	KEECH	8/4/1978	73.0	UK	CANCLD 8/13/1981
BLAKE I BECKER JR	38A78BC7	PUHALA MINE	9/13/1978	109.8	UF, LF	ABANDONED - BOND FORFEITED
US COAL INC	38(A)78BC7	PUHALA TRACT MINE	9/14/1978	110.0	UK, LF, UF	RECLAMATION COMPLETE
HEPBURNIA COAL CO	38A77SM17	TOBIN MINE	10/13/1978	65.0	LF, UF	RECLAMATION COMPLETE
GUROSIK COAL CO INC	2479101	BENNINGER MINE	6/1/1979	65.0	LK, MK, UK, LF	RECLAMATION COMPLETE
NORTHERN CNTY COAL CO INC	2479102	BROCKPORT MINE	10/12/1979	223.0	LK, MK, LF, UF	RECLAMATION COMPLETE
BENJAMIN COAL CO	3379129	CALHOUN MINE	11/15/1979	117.0	UK, LF, UF	ABANDONED - BOND FORFEITED
BENJAMIN COAL CO	3379125	HICKS MINE	11/15/1979	450.0	UK, LF, UF	ABANDONED - BOND FORFEITED
GUROSIK COAL CO INC	2479106	BENNINGER 2 MINE	2/27/1980	62.0	LK, MK, UK, LF	RECLAMATION COMPLETE
BENJAMIN COAL CO	33800108	MINNS 3 MINE	8/7/1980	360.0	LF, UF	ABANDONED - BOND FORFEITED
HEPBURNIA COAL CO	33810107	FREMER MINE	2/11/1981	53.0	UF	RECLAMATION COMPLETE
NORTHERN CNTY COAL CO INC	2479105	JOHNSON RUN MINE	4/16/1981	202.0	LK, MK, LF, UF	RECLAMATION COMPLETE
ESQUIRE FUEL CO	2479104	ESPOSITO MINE	4/24/1981	37.0	MK	RECLAMATION COMPLETE

BENJAMIN COAL CO	33810111	BUCHANON MINE	8/21/1981	420.0	UK, LF, UF	ABANDONED - BOND FORFEITED
ESQUIRE FUEL CO	24810104	DOVE MINE	10/16/1981	313.0	UK, LF, UF	RECLAMATION COMPLETE
GUROSIK COAL CO INC	24810103	KYLERS CORNERS MINE	11/18/1981	127.0	LK, MK, UK, LF	RECLAMATION COMPLETE
HEPBURNIA COAL CO	4677SM3	BRILL MINE	12/30/1981	67.0	LF, UF	RECLAMATION COMPLETE
GLEN IRVAN CORP	24800102	MARTINI MINE	3/16/1982	61.0	LF, UF	ABANDONED - BOND FORFEITED
ESQUIRE FUEL CO	33800138	LOPEZ MINE	5/24/1982	36.0	UK, LF, UF	RECLAMATION COMPLETE
STARR COAL CO	33800112	STARR 8 MINE	9/30/1982	94.0	LK	RECLAMATION COMPLETE
ESQUIRE FUEL CO	24820103	BROSKY MINE	12/1/1982	30.0	LK, MK, UK	RECLAMATION COMPLETE
BENJAMIN COAL CO	33810125	CALHOUN BRITTON MINE	3/17/1983	81.0	UF	ABANDONED - BOND FORFEITED
ESQUIRE FUEL CO	33820147	SHAW MINE	11/7/1983	51.0	LF, UF, UK	RECLAMATION COMPLETE
BENJAMIN COAL CO	33813031	GUSTAFSON KEARNEY MINE	2/8/1984	264.0	UF	ABANDONED - BOND FORFEITED
FAIRVIEW COAL CO	24820108	WOODWARD MINE	3/9/1984	107.0	LK, MK	RECLAMATION COMPLETE
DOAN COAL CO	33820117	HOLT AND ESPISITO	3/15/1984	419.0	LK, C	RECLAMATION COMPLETE
AMFIRE MINING CO LLC	24820107	BURTON MINE	3/26/1984	134.0	LK, MK	ACTIVE - STAGE 2 ELIGIBLE
NEW SHAWMUT MINING CO	24820106	HORTON 2 MINE	3/26/1984	81.0	UK, LF, UF	RECLAMATION COMPLETE
ENERGY RESOURCES INC	33813013	WESTVILLE MINE	3/27/1984	509.0	LK, MK, UK	RECLAMATION COMPLETE
ENERGY RESOURCES INC	33803013	RATTLESNAKE EAST MINE	4/4/1984	639.0	LK, MK, UK, LF, UF	RECLAMATION COMPLETE
ENERGY RESOURCES INC	33773114	LANES MILLS MINE	4/6/1984	376.5	UK, LF, UF	RECLAMATION COMPLETE
TAMBURLIN BROS COAL CO INC	24830103	ERICH MINE	5/18/1984	134.0	LK, MK, UK, LF, UF	RECLAMATION COMPLETE
BENJAMIN COAL CO	33820105	JOHNS GRANT MINE	7/8/1984	262.8	UF	ABANDONED - BOND FORFEITED
NORTHERN CNTY COAL CO INC	24683026	NORTHERN CNTY 4 MINE	8/20/1984	101.0	LF, UF, LK, MK, UK	RECLAMATION COMPLETE
NORTHERN CNTY COAL CO INC	24753024	MORELLI 1 MINE	8/20/1984	198.0	LK, MK, UK, LF, UF	RECLAMATION COMPLETE
THOMAS FUELS INC	PA0102121	CRENSHAW TIPPLE	8/23/1984	5.0		RECLAMATION COMPLETE
HEPBURNIA COAL CO	24820105	HEPBURNIA MINE	8/30/1984	225.0	LF, UF, MK, UK	RECLAMATION COMPLETE
BENJAMIN COAL CO	33810124	SEDLACK KNIGHT MINE	10/2/1984	249.0	UF	ABANDONED - BOND FORFEITED
ENERGY RESOURCES INC	PA0102199	BROCKWAY TIPPLE	12/6/1984	5.0		RECLAMATION COMPLETE
NORTHERN CNTY COAL CO INC	24840101	MONARCH 2 MINE	12/10/1984	55.2	LK	RECLAMATION COMPLETE
HEPBURNIA COAL CO	33820123	KEARNEY MINE	2/4/1985	130.8	UF	RECLAMATION COMPLETE
STARR COAL CO	33803012	STARR 8 MINE	3/7/1985	94.3	UK, LK, UF	RECLAMATION COMPLETE
HEPBURNIA COAL CO	3381203	BROCKWAY TIPPLE	3/11/1985	5.0		RECLAMATION COMPLETE
ENERGY RESOURCES INC	33830115	VERNE MINE	3/18/1985	69.0	UF, LF, UK	RECLAMATION COMPLETE
HEPBURNIA COAL CO	24813007	LUCHINI MINE	5/6/1985	63.3	MK	RECLAMATION COMPLETE
TAMBURLIN BROS COAL CO INC	24813008	MEAD RUN MINE	5/6/1985	458.0	LF, UF, MK, UK	ACTIVE - STAGE1/REGRADED
TAMBURLIN BROS COAL CO INC	24783003	BROCKPORT MINE	5/9/1985	237.0	MK, UK, LF, UF	RECLAMATION COMPLETE
NORTHERN CNTY COAL CO INC	24743016	R & R 3 MINE	5/13/1985	300.0	LK, MK, LF, UF	RECLAMATION COMPLETE
HEPBURNIA COAL CO	24763006	KYLER RUN MINE	5/15/1985	468.5	LF, UF	RECLAMATION COMPLETE
BENJAMIN COAL CO	33810130	PATTON STEWART MINE	5/22/1985	150.0	LF, UF	ABANDONED - BOND FORFEITED
TAMBURLIN BROS COAL CO INC	24673003	VOLLMER MINE	7/1/1985	56.2	MK	ACTIVE
ROCKWOOD ENERGY & MINERAL CORP	24813002	GAVAZZI MINE	7/10/1985	461.0	MK, LF	ABANDONED - BOND FORFEITED
ENERGY RESOURCES INC	33840125	ENERGY RESOURCES 7 MINE	7/14/1985	334.0	LK	RECLAMATION COMPLETE
BENJAMIN COAL CO	33813025	CALHOUN BRITTON MINE	7/18/1985	81.0	UF	BOND FORFEITED
HEPBURNIA COAL CO	24820109	UPLINGER MINE	7/18/1985	65.8	LF, MK, UK	RECLAMATION COMPLETE
FAIRVIEW COAL CO	24743008	SQUAB HOLLOW MINE	8/19/1985	66.0	LF, UF, BC	RECLAIMED - CHEMICAL TREATMENT
NORTHERN CNTY COAL CO INC	24823001	MONARCH 1 MINE	10/15/1985	108.0	LK, MK, LF	RECLAMATION COMPLETE
ENERGY RESOURCES INC	33850101	ENERGY RESOURCES 9 MINE	12/9/1985	757.2	LF, UF, UK	RECLAMATION COMPLETE
FAIRVIEW COAL CO	33820140	WOODS MINE	7/21/1986	94.1	LK	RECLAMATION COMPLETE
TAMBURLIN BROS COAL CO INC	24783004	FREEBURG MINE	7/21/1986	181.0	LK, MK	RECLAMATION COMPLETE
FAIRVIEW COAL CO	24840103	CHALLENGE MINE	9/12/1986	407.0	UF, LF, UK, MK, LK	RECLAMATION COMPLETE
ESQUIRE FUEL CO	33860105	SILO MINE	9/24/1986	48.0	MK	RECLAMATION COMPLETE
WAROQUIER COAL CO	33850123	WAROQUIER 10 MINE	10/14/1986	203.2	UK, LF, UF	ACTIVE - STAGE1/REGRADED
ENERGY RESOURCES INC	24870103	ENERGY RESOURCES 10 MINE	1/5/1988	161.0	UK, UF	RECLAMATION COMPLETE
ED HANSLOVAN COAL CO INC	33860109	BUCHANAN 2 MINE	2/19/1988	167.0	MK	ACTIVE - BOND IN FORFEITURE
TAMBURLIN BROS COAL CO INC	24870906	GREENTREE LFL MINE	3/22/1988	2.9	UK	RECLAMATION COMPLETE
TAMBURLIN BROS COAL CO INC	24870101	SWANSON MINE	7/14/1988	81.0	MK, UK, UF	RECLAMATION COMPLETE
ENERGY RESOURCES INC	24880101	ENERGY RESOURCES 20 MINE	9/7/1988	361.0	UK, LF, UF	RECLAMATION COMPLETE
ENERGY RESOURCES INC	24880103	ENERGY RESOURCES 21 MINE	11/14/1988	541.0	LK, MK	RECLAIMED - PASSIVE TREATMENT
ED HANSLOVAN COAL CO INC	33860114	ASKEY MINE	11/16/1988	497.9	UF, LF, UK	ABANDONED - BOND FORFEITED
TAMBURLIN BROS COAL CO INC	24880104	REED MINE	12/20/1988	121.0	LF, UF	RECLAMATION COMPLETE
HEPBURNIA COAL CO	24880105	CODER MINE	3/21/1989	241.4	UK, LF, UF	RECLAMATION COMPLETE
NORTH STAR AGGREGATES INC	33880304	CRENSHAW MINE	4/19/1989	57.0	SAND & GRAVEL	RECLAMATION COMPLETE
ENERGY RESOURCES INC	24890101	ENERGY RESOURCES 22 MINE	9/12/1989	377.0	UF, LF	ACTIVE - STAGE1/REGRADED
ENERGY RESOURCES INC	24890102	ENERGY RESOURCES 23 MINE	11/7/1989	316.0	LK, LF, UF	ACTIVE - STAGE 2 APPROVED
HEPBURNIA COAL CO	33890110	WHELPLEY MINE	12/26/1989	223.0	UF, LF, UF	RECLAMATION COMPLETE
FRED WHELPLEY EXCAV	33900802	WHELPLEY MINE	3/23/1990	5.0	SHALE	ACTIVE
AMFIRE MINING CO LLC	24890107	BUHLER MINE	3/27/1990	38.0	UK, LF, UF	RECLAMATION COMPLETE
HEPBURNIA COAL CO	33900105	SAWMILL MINE	11/2/1990	650.2	LK, MK, UK, LF, UF	ACTIVE
TAMBURLIN BROS COAL CO INC	33900109	ANDERSON MINE	2/1/1991	87.0	LF	RECLAMATION COMPLETE
TAMBURLIN BROS COAL CO INC	24900105	VALLEY COAL 1 MINE	3/19/1991	30.0	UK, LF	RECLAMATION COMPLETE
ENERGY RESOURCES INC	24900104	ENERGY RESOURCES 30 MINE	4/4/1991	431.0	LK, MK, UK, LF	RECLAIMED - PASSIVE TREATMENT
ENERGY RESOURCES INC	24890108	ENERGY RESOURCES 27	9/23/1991	695.0	UK, LF	RECLAMATION COMPLETE

		MINE				
ENERGY RESOURCES INC	24900102	ENERGY RESOURCES 29 MINE	9/23/1991	143.0	LF, UF, MK, UK	RECLAMATION COMPLETE
ENERGY RESOURCES INC	24900103	ENERGY RESOURCES 31 MINE	5/26/1992	367.0	MK, UK, LF, UF, Shale	ACTIVE - STAGE 2 APPROVED
FAIRVIEW COAL CO	33900116	BAGHDAD MINE	7/28/1992	192.0	LF, UF	RECLAMATION COMPLETE
HEPBURNIA COAL CO	33920102	HOOK MINE	9/16/1992	195.0	UK, LF, UF	RECLAMATION COMPLETE
TAMBURLIN BROS COAL CO INC	24920101	CAYLOR MINE	7/7/1994	33.8	MK, UK	ACTIVE - STAGE 2 APPROVED
FAIRVIEW COAL CO	24930101	JOHNSON RUN MINE	1/25/1995	65.3	LF, UF, UK, MK	RECLAMATION COMPLETE
ED HANSLOVAN COAL CO INC	33940106	ASKEY 2 MINE	4/11/1995	169.3	MK, LF, UF	ABANDONED - BOND FORFEITED
FAIRVIEW COAL CO	24930102	BODEROCO MINE	8/25/1995	236.7	UF, LF, UK, MK, Shale	ACTIVE - STAGE1/REGRADED
HEPBURNIA COAL CO	33950103	F & S MINE	9/6/1995	82.0	LK	ACTIVE - STAGE 2 APPROVED
TAMBURLIN BROS COAL CO INC	24940101	MEAD RUN 2 MINE	10/18/1995	133.0	LF, UF, UK	RECLAMATION COMPLETE
SWISHER CONTR INC	33950105	SCARNATI MINE	12/5/1995	105.0	LF, UF	RECLAMATION COMPLETE
ENERGY RESOURCES INC	24960101	ENERGY RESOURCES 34 MINE	5/31/1996	235.0	UK, UF	ACTIVE - STAGE 2 ELIGIBLE
TAMBURLIN BROS COAL CO INC	4678SM4	TAMBURLIN 9 MINE	5/10/1997	192.0	LK, MK	RECLAMATION COMPLETE
ENERGY RESOURCES INC	24970101	ENERGY RESOURCES 41 MINE	11/7/1997	44.7	LK, MK, UK, LF	RECLAMATION COMPLETE
SWISHER CONTR INC	33970104	COLEMAN MINE	11/19/1997	30.0	LF, UF, BC	RECLAMATION COMPLETE
ENERGY RESOURCES INC	24970102	ENERGY RESOURCES 36 MINE	1/29/1998	230.5	MK, UK, LF, UF	ACTIVE - STAGE 2 APPROVED
ENERGY RESOURCES INC	24970103	ENERGY RESOURCES 37 MINE	3/4/1998	312.0	MK, UK, LF, UF	ACTIVE - STAGE 2 ELIGIBLE
ED HANSLOVAN COAL CO INC	33970112	ASKEY 3 MINE	6/2/1998	102.0	LF, UF	ABANDONED - BOND FORFEITED
ENERGY RESOURCES INC	24980101	ENERGY RESOURCES 38 MINE	11/5/1998	457.0	LF, MK, UK, LK, Clay, Shale	ACTIVE - STAGE 2 APPROVED
FAIRVIEW COAL CO	24980106	OYSTER RUN MINE	6/18/1999	228.8	MK, UK	ACTIVE
TAMBURLIN BROS COAL CO INC	24980105	CASTINA MINE	9/24/1999	139.0	UF, LF, UK, MK	ACTIVE
TAMBURLIN BROS COAL CO INC	24980102	PONTZER MINE	9/24/1999	196.0	LF, UF, MK, UK	ACTIVE
ENERGY RESOURCES INC	24990101	ENERGY RESOURCES 35 MINE	1/13/2000	588.0	LK, UK	ACTIVE - APPROVED CESSATION
FAIRVIEW COAL CO	24980104	MARCHE MINE	5/2/2000	29.5	UF, LF, UK	ACTIVE - STAGE1/REGRADED
TAMBURLIN BROS COAL CO INC	24990102	PONTZER 2 MINE	6/7/2000	136.0	MK, UK, LF, UF	ACTIVE
TAMBURLIN BROS COAL CO INC	24000101	SUPERIOR MINE	10/23/2000	62.1	LK, MK	ACTIVE - STAGE1/REGRADED
VEOLIA ES GREENTREE LDFL LLC	24011002	TOBY 1 MINE	5/8/2001	16.0	CLAY	ACTIVE - STAGE 2 ELIGIBLE
ENERGY RESOURCES INC	24010101	ENERGY RESOURCES 33 MINE	10/4/2001	264.3	UF, LF, UK, Clay	ACTIVE
ROSEBUD MINING CO	24991301	LITTLE TOBY MINE	2/6/2003	19.9 surface 1346.0 deep	LK- DEEP MINE	ACTIVE
HEPBURNIA COAL CO	24020104	TOBY MINE	8/5/2003	260.0	MK	ACTIVE
AMFIRE MINING CO LLC	33020104	AMFIRE 128 MINE	12/17/2003	207.4	LF, UF, UK, MK	ACTIVE
AMFIRE MINING CO LLC	24030103	AMFIRE 127 MINE	7/15/2004	581.1	LK, MK, UF, LF, UK	ACTIVE
VEOLIA ES GREENTREE LDFL LLC	24020301	TOBY 1 MINE	11/13/2004	57.0	CLAY	NOT STARTED
WAROQUIER COAL CO	33010107	STARR MINE	11/19/2004	348.0	UF, LF, UK	ACTIVE
NORTH STAR AGGREGATES INC	24042801	OYSTER RUN MINE	11/29/2004	5.0	SANDSTONE	RECLAMATION COMPLETE
HEPBURNIA COAL CO	33030110	KEARNEY MINE	3/30/2005	122.5	UF	NOT STARTED
NORTH STAR AGGREGATES INC	24050301	OYSTER RUN MINE	5/18/2006	130.0	TOPSOIL, SANDSTONE	ACTIVE
TAMBURLIN BROS COAL CO INC	24030101	BIANCO MINE	6/8/2006	53.2	UK	ACTIVE
ROSEBUD MINING CO	33071301	KOCJANCIC MINE		1735.0	LK- DEEP MINE	PROPOSED

Beginning in the early 1970's, several studies were completed in the Little Toby Creek watershed under Pennsylvania's Operation Scarlift program, which focused on quantifying the extent of the pollution produced by coal mining. These studies determined the extent and severity of the mine drainage in the watershed along with detailed investigations of the hydrology and geology in order to determine the most practical methods for abating the acid mine drainage both the abandoned deep mines and unreclaimed strip mines. Project SL 132-5 investigated the Upper Little Toby Creek watershed including the headwaters of Little Toby Creek, Limestone Run, Sawmill Run, Hayes Run and Kyler Run. Project SL 132-6 focused specifically on the Mead Run watershed and Project SL 132 studied the portion of the Little Toby Creek watershed between these two areas, including Brandy Camp Creek, Benninger Creek, McCauley Run and Curry Run. A copy of these reports can be found on the Abandoned Mine Reclamation Clearing House Website at the following link:

<http://www.amrclearinghouse.org/Sub/SCARLIFTReports/>

The Toby Creek Watershed Association (TCWA) has been the driving force for restoration efforts in the Little Toby Creek watershed for more than 30 years. The Pennsylvania Department of Environmental Protection (PADEP) Knox District Mining Office (DMO) has been directly

involved in the restoration process since 1980, through permitting surface mining and reclamation projects and enforcement of surface mining regulations. The PADEP Bureau of Abandoned Mine Reclamation (BAMR) continues to be a major partner in improving the water quality in the Little Toby Creek Watershed by providing funding for the construction, operation and maintenance of several active AMD treatment facilities, including the Little Plant, Limestone Plant and Brandy Camp Treatment Facility.

The TCWA has also partnered with numerous other organizations, including the Pennsylvania Fish and Boat Commission (PFBC), the Headwaters Charitable Trust (HCT), the Natural Resources Conservation Service (NRCS) and the Elk County Conservation District (ECCD) in order to procure funds for the installation of eight passive AMD treatment systems in the watershed, including a fish culture station that treats the abandoned Blue Valley deep mine discharge and uses the treated water to raise trout in an innovative recirculating trout hatchery. Funding sources for these projects have come from a variety of sources, including the PADEP's Growing Greener program, Project Scarlift, United States Department of Interior Office of Surface Mining (OSM) Watershed Cooperative Agreement Program and the Environmental Protection Agency (EPA) Section 319 Nonpoint Source Management Program.

AMD Methodology

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

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

Allowable loads are determined for each point of interest using Monte Carlo simulation. Monte Carlo simulation is an analytical method meant to imitate real-life systems, especially when other analyses are too mathematically complex or too difficult to reproduce. Monte Carlo simulation calculates multiple scenarios of a model by repeatedly sampling values from the probability distribution of the uncertain variables and using those values to populate a larger data set. Allocations were applied uniformly for the watershed area specified for each allocation point. For each source and pollutant, it was assumed that the observed data were log-normally

distributed. Each pollutant source was evaluated separately using @Risk¹ by performing 5,000 iterations to determine the required percent reduction so that the water quality criteria, as defined in the *Pennsylvania Code. Title 25 Environmental Protection, Department of Environmental Protection, Chapter 93, Water Quality Standards*, will be met instream at least 99 percent of the time. For each iteration, the required percent reduction is:

$$PR = \text{maximum} \{0, (1 - C_c/C_d)\} \text{ where (1)}$$

PR = required percent reduction for the current iteration

C_c = criterion in mg/l

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

C_d = 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:

$$LTA = \text{Mean} * (1 - PR_{99}) \text{ where (2)}$$

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

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

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

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

In Low pH TMDLs, acidity is compared to alkalinity as described in Attachment B. Each sample point used in the analysis of pH by this method must have measurements for total alkalinity and total acidity. Net alkalinity is alkalinity minus acidity, both in units of milligrams per liter (mg/l) CaCO₃. Statistical procedures are applied, using the average value for total alkalinity at that point as the target to specify a reduction in the acid concentration. By maintaining a net alkaline stream, the pH value will be in the range between six and eight. This method negates the need to specifically compute the pH value, which for streams affected by low pH may not be a true reflection of acidity. This method assures that Pennsylvania's standard for pH is met when the acid concentration reduction is met.

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

This document contains one or more future mining Waste Load Allocations (WLA) to accommodate possible future mining operations. The Knox District Mining Office determined the number of and location of the future mining WLAs. All comments and questions concerning permitting issues and future mining WLAs are to be directed to the appropriate DMO.

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

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

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

Standard Treatment Pond Effluent Limits:

Alkalinity > Acidity

6.0 <= pH <= 9.0

Al <= 0.75 mg/l (Criteria)

Fe <= 3.0 mg/l (BAT)

Mn <= 2.0 mg/l (BAT)

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:

$$\text{Flow (MGD)} \times \text{BAT limit (mg/l)} \times 8.34 = \text{lbs/day}$$

The following is an approach that can be used to determine a WLA 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 WLA 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 ungraded area following the pit's progression through the site. Groundwater seepage reporting to the pit is considered negligible compared to the flow rates resulting from precipitation.

In an active mining scenario, a mine operator pumps pit water to the ponds for chemical treatment. Pit water is often acidic with dissolved metals in nature. At the treatment ponds, alkaline chemicals are added to increase the pH and encourage dissolved metals to precipitate and settle. Pennsylvania averages 41.4 inches of precipitation per year (Mid-Atlantic River Forecast Center, National Weather Service, State College, PA, 1961-1990, <http://www.dep.state.pa.us/dep/subject/hotopics/drought/PrecipNorm.htm>). A maximum pit dimension without special permit approval is 1,500 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.

$$41.4 \text{ in. precip/yr} \times 0.95 \times 1 \text{ ft}/12\text{in.} \times 1,500' \times 300' / \text{pit} \times 7.48 \text{ gal}/\text{ft}^3 \times 1 \text{ yr}/365\text{days} \times 1 \text{ day}/24\text{hr} \times 1 \text{ hr}/60 \text{ min} =$$

$$= 21.0 \text{ gal}/\text{min} \text{ average discharge from direct precipitation into the open mining pit area}$$

Pit water also can result from runoff from the ungraded 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. The PADEP 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. PADEP 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 instream limits are met. The same approach is used in the following equation, which represents the average flow reporting to the pit from the ungraded and unvegetated spoil area.

$$41.4 \text{ in. precip/yr} \times 3 \text{ pit areas} \times 1 \text{ ft}/12\text{in.} \times 1,500' \times 300' / \text{pit} \times 7.48 \text{ gal}/\text{ft}^3 \times 1 \text{ yr}/365\text{days} \times 1 \text{ day}/24\text{hr} \times 1 \text{ hr}/60 \text{ min} \times 15 \text{ in. runoff}/100 \text{ in. precip} =$$

$$= 9.9 \text{ gal}/\text{min} \text{ average discharge from spoil runoff into the pit area}$$

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:

$$\text{Total Average Flow} = \text{Direct Pit Precipitation} + \text{Spoil Runoff}$$

$$\text{Total Average Flow} = 21.0 \text{ gal}/\text{min} + 9.9 \text{ gal}/\text{min} = 30.9 \text{ gal}/\text{min}$$

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

Allowable Aluminum WLA:
 $30.9 \text{ gal/min} \times 0.75 \text{ mg/l} \times 0.01202 = 0.3 \text{ lbs/day}$

Allowable Iron WLA:
 $30.9 \text{ gal/min} \times 3 \text{ mg/l} \times 0.01202 = 1.1 \text{ lbs/day}$

Allowable Manganese WLA:
 $30.9 \text{ gal/min} \times 2 \text{ mg/l} \times 0.01202 = 0.7 \text{ lbs/day}$

(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 (MOS) in the methodology. County specific precipitation rates can be used in place of the long-term state average rate, although the MOS 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 PADEP’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, 1,500 ft x 300 ft 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 WLA is very generous and likely high compared to actual conditions that are generally encountered. A large MOS 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 instream 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

is greater than the current level of mining activity, an additional WLA amount may be included to allow for future mining.

Derivation of the flow used in the future mining WLAs:

$$30.9 \text{ gal/min} \times 2 \text{ (assume two pits)} \times 0.00144 = 0.09 \text{ MGD}$$

Future TMDL Modifications

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

Changes in TMDLs That May Require EPA Approval

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

Changes in TMDLs That May Not Require EPA Approval

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

TMDL Endpoints

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

Because of the nature of the pollution sources in the watershed, the TMDLs component makeup will be load allocations that are specified above a point in the stream segment. All allocations will be specified as long-term average daily concentrations. These long-term average daily concentrations are expected to meet water quality criteria 99 percent of the time. Pennsylvania Title 25 Chapter 96.3(c) specifies that a minimum 99 percent level of protection is required. All metals criteria evaluated in this TMDL are specified as total recoverable. Pennsylvania does have dissolved criteria for iron; however, the data used for this analysis report iron as total recoverable. Table 3 shows the water quality criteria for the selected parameters.

Table 3 Applicable Water Quality Criteria

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

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

TMDL Elements (WLA, LA, MOS)

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

TMDL Allocations Summary

There were not enough samples at any sample point to check for correlation between metals and flow for Little Toby Creek.

Allocation Summary

This TMDL will focus remediation efforts on the identified numerical reduction targets for each watershed. The reduction schemes in Table 4 for each segment are based on the assumption that all upstream allocations are achieved and take in to 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.

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 4. Summary Table–Little Toby Creek Watershed

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
SP3	Most Upstream Sample Point on Little Toby Creek (50229)						
	Al	25.9	1.6	0.56	1.04	24.3	94
	Fe	7.7	2.7	2.25	0.45	5.0	65
	Mn	22.8	2.3	1.5	0.8	20.5	90
	Acidity	259.4	1.3	0.0	1.3	258.1	99.5
SPD	Little Toby Creek Upstream of Confluence with Limestone Run (50411)						
	Al	18.5	2.0	0.88 + 0.56	0.56	0.0	0
	Fe	47.8	7.2	3.5 + 2.25	1.45	35.6	83
	Mn	58.2	5.8	2.24 + 1.5	2.06	31.9	85
	Acidity	248.6	32.3	0.0	32.3	0.0	0
SP6	Limestone Run Upstream of Confluence with Little Toby Creek						
	Al	20.9	1.5	0.6	0.9	19.4	93
	Fe	38.5	3.1	2.34	0.76	35.4	92
	Mn	67.9	3.4	1.55	1.85	64.5	95
	Acidity	190.5	21.0	0.0	21.0	169.5	89
SP2	Little Toby Creek Downstream of Confluence of Little Toby Creek and Limestone Run						
	Al	76.5	6.9	2.8	4.1	33.7	83
	Fe	118.0	13.0	11.25	1.75	29.0	69
	Mn	142.4	10.0	7.5	2.5	15.5	61
	Acidity	916.0	27.5	0.0	27.5	502.7	95
KR10	Kyler Run(50406) Upstream of Confluence with Little Toby Creek						
	Al	144.0	8.6	2.8	5.8	135.4	94
	Fe	150.3	12.0	11.25	0.75	138.3	92
	Mn	154.9	20.1	7.5	12.6	134.8	87
	Acidity	1709.3	68.4	0.0	68.4	213.8	96
SP1	Little Toby Creek Upstream of Confluence with Unt 50405						
	Al	306.2	21.4	0.84 + 2.8	17.76	79.8	79
	Fe	224.1	31.4	3.35 + 11.25	16.85	0.0	0
	Mn	361.8	32.6	2.23 + 7.5	22.87	62.1	66
	Acidity	3115.8	31.2	0.0	31.2	555.3	95

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
HR1	Mouth of Unt (50405) Local Name Hayes Run						
	Al	0.9	0.9	0.0	0.9	0.0	0
	Fe	17.0	1.7	0.0	1.7	15.3	90
	Mn	16.1	2.1	0.0	2.1	14.0	87
	Acidity	0.0	0.0	0.0	0.0	0.0	0
LTU73	Mouth of Unt (50404) Upstream of Confluence with Little Toby Creek						
	Al	8.4	0.6	0.0	0.6	7.8	93
	Fe	3.8	1.3	0.0	1.3	2.5	65
	Mn	22.7	1.4	0.0	1.4	21.3	94
	Acidity	92.5	13.0	0.0	13.0	79.5	86
LT91	Little Toby Creek Downstream of LTU73 AND HR1						
	Al	327.9	13.1	2.8	10.3	22.2	63
	Fe	255.0	33.1	11.25	21.85	11.3	25
	Mn	390.3	31.2	7.5	23.7	3.9	11
	Acidity	3761.6	225.7	0.0	225.7	371.7	62
SR3	Mouth of Unt (50394) of Sawmill Run Upstream of Confluence with Sawmill Run						
	Al	3.4	0.8	0.0	0.8	2.6	78
	Fe	0.4	0.4	0.0	0.4	0.0	0
	Mn	13.0	1.0	0.0	1.0	12.0	92
	Acidity	64.2	5.1	0.0	5.1	59.1	92
SR2	Sawmill Run (50393) Upstream of Confluence Unt (50394) Sawmill Run						
	Al	6.4	6.4	0.0	6.4	0.0	0
	Fe	3.9	3.9	0.0	3.9	0.0	0
	Mn	1.6	1.6	0.0	1.6	0.0	0
	Acidity	15.4	15.4	0.0	15.4	0.0	0
SR1	Mouth of Sawmill Run Upstream of Confluence with Little Toby Creek						
	Al	5.2	2.5	0.0	2.5	1.4	36
	Fe	2.0	2.0	0.0	2.0	0.0	0
	Mn	21.1	4.2	0.0	4.2	4.9	54
	Acidity	212.3	40.3	0.0	40.3	112.9	74
50403	Unt (50403) of Little Toby Creek						
	Al	0.2	0.2	0.0	0.2	0.0	0
	Fe	0.6	0.4	0.0	0.4	0.2	40
	Mn	1.6	0.3	0.0	0.3	1.3	81
	Acidity	0.0	0.0	0.0	0.0	0.0	0
MR15	Mouth of McCauley Run (50401) Upstream of Confluence with Little Toby Creek						
	Al	0.8	0.6	0.0	0.6	0.2	24
	Fe	1.11	1.0	0.0	0.97	0.1	12
	Mn	5.3	1.0	0.0	1.0	4.3	82
	Acidity	0.5	0.5	0.0	0.5	0.0	0
LTU51	Unt (50400) of Little Toby Creek						
	Al	0.2	0.02	0.0	0.02	0.18	92
	Fe	0.3	0.02	0.0	0.02	0.28	91
	Mn	0.7	0.03	0.0	0.03	0.67	96
	Acidity	3.9	0.08	0.0	0.08	3.82	98
50392	Unt (50392) of Little Toby Creek						
	Al	0.12	0.12	0.0	0.12	0.0	0
	Fe	0.07	0.07	0.0	0.07	0.0	0
	Mn	0.262	0.258	0.0	0.258	0.0	1.3

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Acidity	0.0	0.0	0.0	0.0	0.0	0
50391	Unt (50391) of Little Toby Creek						
	Al	0.04	0.04	0.0	0.04	0.0	0
	Fe	0.02	0.02	0.0	0.02	0.0	0
	Mn	0.8	0.04	0.0	0.04	0.76	95
	Acidity	1.3	1.3	0.0	1.3	0.0	0
50387	Unt (50387) of Little Toby Creek						
	Al	5.7	0.3	0.0	0.3	5.4	95
	Fe	0.1	0.1	0.0	0.1	0.0	0
	Mn	24.1	0.2	0.0	0.2	23.9	99
	Acidity	91.5	0.3	0.0	0.3	91.2	99.7
LT11	Little Toby Creek Upstream of Confluence with Brandy Camp Creek (50368)						
	Al	256.5	33.3	0.0	33.3	0.0	0
	Fe	238.6	28.6	0.0	28.6	5.1	15
	Mn	459.7	59.8	0.0	59.8	0.0	0
	Acidity	3370.4	404.4	0.0	404.4	0.0	0
BE18	Unt (50384) of Benninger Creek (50383)						
	Al	0.34	0.34	0.0	0.34	0.0	0
	Fe	0.49	0.49	0.0	0.49	0.0	0
	Mn	0.16	0.16	0.0	0.16	0.0	0
	Acidity	12.3	3.6	0.0	3.6	8.7	71
BE20	Most Upstream Sample Point on Benninger Creek (50383)						
	Al	0.88	0.34	0.0	0.34	0.54	61
	Fe	1.1	0.46	0.0	0.46	0.64	58
	Mn	13.2	0.53	0.0	0.53	12.67	96
	Acidity	13.43	9.26	0.0	9.26	4.17	31
BE21	Unt (50385) of Benninger Creek						
	Al	0.21	0.21	0.0	0.21	0.0	0
	Fe	0.12	0.12	0.0	0.12	0.0	0
	Mn	1.65	0.28	0.0	0.28	1.37	83
	Acidity	12.7	3.6	0.0	3.6	9.1	72
BE1	Mouth of Benninger Run						
	Al	2.1	2.1	0.06	2.04	0.0	0
	Fe	1.2	1.2	0.23	0.97	0.0	0
	Mn	2.1	1.9	0.15	1.75	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
BC29	Unt (50386) of Brandy Camp Creek (50368)						
	Al	0.47	0.47	0.0	0.47	0.0	0
	Fe	0.28	0.28	0.0	0.28	0.0	0
	Mn	0.33	0.33	0.0	0.33	0.0	0
	Acidity	16.2	3.4	0.0	3.4	12.8	79
BC30A	Most Upstream Sample Point on Brandy Camp Creek						
	Al	0.75	0.75	0.0	0.75	0.0	0
	Fe	0.45	0.45	0.0	0.45	0.0	0
	Mn	0.78	0.78	0.0	0.78	0.0	0
	Acidity	28.4	6.8	0.0	6.8	21.6	76
BC28	Brandy Camp Creek Upstream of Confluence with Benninger Creek						
	Al	1.4	1.4	0.0	1.4	0.0	0
	Fe	0.9	0.9	0.0	0.9	0.0	0

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Mn	1.4	1.4	0.0	1.4	0.0	0
	Acidity	50.0	9.5	0.0	9.5	6.1	39
BC24	Brandy Camp Creek Upstream of Confluence with Unt (50372) of Brandy Camp Creek						
	Al	7.7	7.7	0.0	7.7	0.0	0
	Fe	5.9	5.9	0.0	5.9	0.0	0
	Mn	12.8	12.8	0.0	12.8	0.0	0
	Acidity	216.9	125.8	0.0	125.8	50.6	29
BC22A	Unt (50372) of Brandy Camp Creek						
	Al	22.5	0.7	0.0	0.7	21.8	97
	Fe	11.6	1.3	0.0	1.3	10.3	89
	Mn	12.2	1.0	0.0	1.0	11.2	92
	Acidity	108.3	5.4	0.0	5.4	102.9	95
BC21	Brandy Camp Creek Down Stream of Sample Point BC22A						
	Al	65.0	26.6	0.28 + 2.8	23.52	16.5	38
	Fe	395.7	47.5	1.12 + 11.25	35.13	337.9	88
	Mn	109.4	37.2	0.74 + 7.5	28.96	61.0	62
	Acidity	1105.3	342.7	0.0	342.7	568.7	62
50371	Unt (50371) to Brandy Camp Creek						
	Al	0.83	0.11	0.0	0.11	0.72	87
	Fe	0.85	0.23	0.0	0.23	0.62	73
	Mn	1.18	0.57	0.0	0.57	0.61	52
	Acidity	0.0	0.0	0.0	0.0	0.0	0
BCU12A	Unt (50369) to Brandy Camp Creek						
	Al	0.36	0.36	0.0	0.36	0.0	0
	Fe	0.86	0.63	0.0	0.63	0.23	26
	Mn	0.43	0.43	0.0	0.43	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
BC10	Mouth of Brandy Camp Creek Upstream of Confluence With Little Toby Creek						
	Al	104.5	19.9	0.08 + 2.8	17.02	45.6	70
	Fe	497.8	44.8	0.34 + 11.25	33.21	104.0	70
	Mn	228.0	29.6	0.23 + 7.5	21.87	125.6	81
	Acidity	1930.8	405.5	0.0	405.5	762.6	65
LT10	Little Toby Creek Downstream of Confluence with Brandy Camp Creek						
	Al	388.4	58.3	2.8	55.5	22.4	28
	Fe	716.6	121.8	11.25	110.55	0.0	0
	Mn	740.5	88.9	7.5	81.4	53.3	38
	Acidity	5793.1	926.9	0.0	926.9	375.2	29
5	Unt (50367) to Johnson Run						
	Al	0.09	0.03	0.0	0.03	0.06	61
	Fe	0.09	0.05	0.0	0.05	0.04	42
	Mn	0.32	0.09	0.0	0.09	0.23	71
	Acidity	3.55	0.28	0.0	0.28	0.27	92
6A	Johnson Run (50364) Downstream of Unt (50367)						
	Al	0.9	0.9	0.0	0.9	0.0	0
	Fe	5.6	1.7	0.0	1.7	3.9	70
	Mn	24.0	1.4	0.0	1.4	22.4	94
	Acidity	75.0	13.5	0.0	13.5	58.2	81
JR1	Mouth of Johnson Run						
	Al	2.9	2.9	0.23	2.67	0.0	0

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Fe	2.8	2.8	0.94	1.86	0.0	0
	Mn	9.0	3.6	0.63	2.97	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
LT404	Little Toby Creek Downstream of Johnson Run						
	Al	262.3	47.2	2.8	44.4	0.0	0
	Fe	504.0	105.8	11.25	94.55	0.0	0
	Mn	624.4	81.2	7.5	73.7	0.0	0
	Acidity	3064.6	643.6	0.0	643.6	0.0	0
50354	Unt (50354) to Little Toby Creek						
	Al	0.08	0.08	0.0	0.08	0.0	0
	Fe	0.07	0.07	0.0	0.07	0.0	0
	Mn	0.08	0.08	0.0	0.08	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
22	Most Upstream Sample Point on Mead Run (50340)						
	Al	1.35	0.3	0.0	0.3	1.05	76
	Fe	0.23	0.23	0.0	0.23	0.0	0
	Mn	3.19	0.32	0.0	0.32	2.87	90
	Acidity	30.8	1.5	0.0	1.5	29.3	95
21	Mouth of Unt (50352) Mead Run Upstream of Confluence with Mead Run						
	Al	5.7	0.5	0.0	0.5	5.2	91
	Fe	0.2	0.2	0.0	0.2	0.0	0
	Mn	12.9	0.6	0.0	0.6	12.3	95
	Acidity	75.8	2.3	0.0	2.3	73.5	97
16	Mead Run Upstream with Confluence with Unts (50348 & 50349)						
	Al	4.5	0.9	0.0	0.9	8.7	91
	Fe	0.6	0.6	0.0	0.6	0.3	37
	Mn	13.8	1.4	0.0	1.4	23.1	94
	Acidity	108.9	7.6	0.0	7.6	150.0	95
19	Unt (50350) Mead Run Downstream with Confluence with Unt (50351)						
	Al	4.5	0.5	0.0	0.5	4.0	88
	Fe	0.2	0.2	0.0	0.2	0.0	0
	Mn	9.9	1.2	0.0	1.2	8.7	88
	Acidity	67.1	3.4	0.0	3.4	63.7	95
17	Mouth of Unt (50350) Mead Run Upstream of Confluence with Mead Run						
	Al	3.5	0.8	0.23	0.57	0.0	0
	Fe	0.7	0.7	0.7	0.0	0.0	0
	Mn	10.0	0.8	0.6	0.2	0.5	38
	Acidity	77.7	31.1	0.0	31.1	0.0	0
	Headwaters of Unt (50348) Mead Run						
18	Al	0.6	0.6	0.0	0.6	0.0	0
	Fe	0.8	0.8	0.0	0.8	0.0	0
	Mn	2.5	0.6	0.0	0.6	1.9	77
	Acidity	47.1	6.6	0.0	6.6	40.5	86
15	Mead Run Downstream of Sample Points 17 and 16						
	Al	0.9	0.10	0.0	0.10	0.14	59
	Fe	0.3	0.26	0.0	0.26	0.0	0
	Mn	2.5	0.13	0.0	0.13	0.14	52
	Acidity	0.0	0.0	0.0	0.0	0.0	0
5A	Unt to Mead Run Downstream of Sample Point 15 (tributary not included on stream file)						

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Al	0.6	0.6	0.0	0.6	0.0	0
	Fe	1.5	0.8	0.0	0.8	0.7	47
	Mn	0.6	0.3	0.0	0.3	0.3	46
	Acidity	0.0	0.0	0.0	0.0	0.0	0
T1	Mead Run Upstream of Confluence with Unt (50347)						
	Al	3.2	3.2	1.12	2.08	0.0	0
	Fe	6.4	6.4	4.5	1.9	0.0	0
	Mn	33.9	4.4	3.0	1.4	29.5	87
	Acidity	452.7	194.7	0.0	194.7	258.0	57
T4	Mouth of Unt (50347) Mead Run						
	Al	2.27	0.20	0.08	0.12	2.07	91
	Fe	2.11	0.57	0.34	0.23	1.54	73
	Mn	1.32	0.22	0.23	-0.01	1.09	83
	Acidity	0.0	0.0	0.0	0.0	38.7	0
T2	Mead Run Downstream to Unt (50344) Mead Run						
	Al	4.9	4.9	0.56	4.34	0.0	0
	Fe	3.7	3.7	2.25	1.45	0.0	0
	Mn	17.2	5.2	1.5	3.7	0.0	0
	Acidity	298.0	214.6	0.0	214.6	0.0	0
11	Mouth of Unt (50342) Mead Run (Local name Hipple Run)						
	Al	0.52	0.52	0.0	0.52	0.0	0
	Fe	0.68	0.68	0.0	0.68	0.0	0
	Mn	0.76	0.34	0.0	0.34	0.42	55
	Acidity	0.0	0.0	0.0	0.0	0.0	0
12	Mead Run Downstream of Unt (50342) Mead Run						
	Al	6.3	6.3	1.12	5.18	0.0	0
	Fe	6.1	6.1	4.5	1.6	0.0	0
	Mn	18.9	5.1	3.0	2.1	1.4	21
	Acidity	0.0	0.0	0.0	0.0	0.0	0
MR01	Mouth of Mead Run Upstream of Confluence with Little Toby Creek						
	Al	7.0	7.0	1.12	5.88	0.0	0
	Fe	12.7	10.7	4.5	6.2	2.0	16
	Mn	5.1	5.1	3.0	2.1	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
50354	Unt (50354) to Little Toby Creek						
	Al	0.08	0.08	0.0	0.08	0.0	0
	Fe	0.07	0.07	0.0	0.07	0.0	0
	Mn	0.08	0.08	0.0	0.08	0.0	0
	Acidity	0.00	0.0	0.0	0.0	0.0	0
LT402	Little Toby Creek Downstream of Confluence with Mead Run						
	Al	188.5	37.7	0.49 + 2.8	34.41	0.0	0
	Fe	397.2	67.5	1.62 + 11.25	54.63	21.4	24
	Mn	503.3	90.6	1.08 + 7.5	82.02	0.0	0
	Acidity	1753.24	631.2	0.0	631.2	0.0	0
50325	Mouth of Unt (50325) to Little Toby Creek						
	Al	1.5	1.5	0.0	1.5	0.0	0
	Fe	3.2	3.2	0.0	3.2	0.0	0
	Mn	0.3	0.3	0.0	0.3	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
LT400	Little Toby Creek Downstream of Unt (50325)						
	Al	226.9	45.4	2.8	42.6	30.7	40
	Fe	448.0	89.6	<i>11.25</i>	78.35	28.7	24
	Mn	648.2	142.6	7.5	135.1	92.9	39
	Acidity	2862.3	887.3	0.0	887.3	852.9	49
RR06	Unt (50303) to Rattlesnake Run						
	Al	0.4	0.4	0.0	0.4	0.0	0
	Fe	0.3	0.3	0.0	0.3	0.0	0
	Mn	0.1	0.1	0.0	0.1	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
RR04	Unt (50302) to Rattlesnake Run						
	Al	0.3	0.3	0.0	0.3	0.0	0
	Fe	0.5	0.5	0.0	0.5	0.0	0
	Mn	0.2	0.2	0.0	0.2	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
RC06	Rattlesnake Creek (50290) Upstream from Confluence with Rattlesnake Run						
	Al	8.5	8.5	2.8	5.7	0.0	0
	Fe	24.2	15.7	<i>11.25</i>	4.45	8.5	35
	Mn	14.8	14.8	7.5	7.3	0.0	0
	Acidity	978.5	479.5	0.0	479.5	499.0	51
RC03	Rattlesnake Creek Upstream with Confluence with Unt (50292) Rattlesnake Creek						
	Al	14.0	14.0	0.09 + 2.8	11.11	0.0	0
	Fe	46.0	43.2	0.37 + <i>11.25</i>	31.58	0.0	0
	Mn	19.6	19.6	0.25 + 7.5	11.85	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
RC01	Mouth of Rattlesnake Creek Upstream of Confluence with Little Toby Creek						
	Al	27.9	27.9	0.09 + 2.8	25.01	0.0	0
	Fe	75.8	69.0	0.37 + <i>11.25</i>	57.38	4.1	6
	Mn	34.7	34.7	0.25 + 7.5	26.95	0.0	0
	Acidity	1249.4	1249.4	0.0	1249.4	0.0	0
LT01	Mouth of Little Toby Creek						
	Al	154.1	154.1	0.3 + 2.8	151.0	0.0	0
	Fe	605.6	339.2	1.21 + <i>11.25</i>	326.74	0.0	0
	Mn	375.3	150.1	0.8 + 7.5	141.8	0.0	0
	Acidity	8689.6	8689.6	0.0	8689.6	0.0	0

The italicized values in the WLA column in table four are future mining wlas.

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

Wasteload allocations for the existing mining operations were incorporated into the calculations at SPD (Hepburnia Coal Co. Toby Mine, TE, TF, TG, TH, TI, & TJ; and Tamburlin Brothers Coal Co., Inc., Pontzer mine, P6), SP6 (Tamburlin Brothers Coal Co., Inc.; Tamburlin Brothers Coal Co., Inc., Pontzer Mine, P1, P2, & P5; and Tamburlin Brothers Coal Co., Pontzer 2 Mine, P2TB1 & P2TB2), SP1 (Tamburlin Brothers Coal Co., Pontzer Mine, P3 & P4) ; BE20 (Fairview Coal Co., Squab Hollow Mine, SHTP, a post mining discharge); BC21 (Taburllin Brothers Coal Co., Castina Mine, C3 & C5); 50371 (Taburllin Brothers Coal Co., Castina Mine,

C1, C2 & C4); BC10 (Fairview Coal Co., ORTP1); JR1 (Fairview Coal Co., ORTP2, ORTP3 & ORTP4); Aimfire Mining Co., LLC., Amfire 127 Mine, ATP2, ATP3, ATP4, ATP5 and ATP6; Energy Resources, Inc., Number 33 Mine, H33TP3, H33TP4, H33TP4 & H33TP6); 17 (Energy Resources, Inc., H21TP, a post mining discharge); T4 (Energy Resources, Inc., Number 33 Mine, H33TP1, H33TP2 & H33TP7); LT402 (Aimfire Mining Co., LLC., Aimfire 127 Mine, ATP1 & ATP7; Rosebud Mining Co., Rosebud underground mine, R002 and Tamburlin Brothers Coal Co., Inc., Bianco Mine, BTB1); RC03 (Waroquier Coal Co. Starr Mine, SL, SS, SN & SM); RC01 (Waroquier Coal Co. Starr Mine, SO, SP, SQ, SR, SK & SJ) and LT01 (Energy Resources, Inc., H30TP, a post mining discharge and Hepburnia Coal Co., Kearney Mine, KF, KG, KH, KI & KJ). These are the first downstream monitoring points that receive all the potential flow of treated water from any of the treatment sites. No required reductions of these permits are necessary at this time because there are upstream non-point sources that when reduced will meet the TMDL or there is available assimilation capacity. All necessary reductions are assigned to non-point sources.

The Hepburnia Coal Co., Kearney Mine (SMP#33030110) has a non-standard pit size of 150 feet in length and a width of 100 feet. There is one pit of this size. This pit size was used in the Method to Quantify Treatment Pond Pollutant Load calculation example shown below:

$41.4 \text{ in. precip/yr} \times 0.95 \times 1 \text{ ft}/12 \text{ in.} \times 150' \times 100' / \text{pit} \times 7.48 \text{ gal}/\text{ft}^3 \times 1 \text{ yr}/365 \text{ days} \times 1 \text{ day}/24 \text{ hr} \times 1 \text{ hr}/60 \text{ min} = 0.7 \text{ gal}/\text{min}$ average discharge from direct precipitation into the open mining pit area.

$41.4 \text{ in. precip/yr} \times 3 \text{ pit areas} \times 1 \text{ ft}/12 \text{ in.} \times 150' \times 100' / \text{pit} \times 7.48 \text{ gal}/\text{ft}^3 \times 1 \text{ yr}/365 \text{ days} \times 1 \text{ day}/24 \text{ hr} \times 1 \text{ hr}/60 \text{ min} \times 15 \text{ in. runoff}/100 \text{ in. precip} = 0.3 \text{ gal}/\text{min}$ 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:

$$\text{Total Average Flow} = \text{Direct Pit Precipitation} + \text{Spoil Runoff}$$

$$\text{Total Average Flow} = 0.7 \text{ gal}/\text{min.} + 0.3 \text{ gal}/\text{min.} = 1.0 \text{ gal}/\text{min.}$$

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

Allowable Aluminum Waste Load Allocation:
 $1.0 \text{ gal.}/\text{min.} \times 0.75 \text{ mg}/\text{l} \times 0.01202 = 0.01 \text{ lbs.}/\text{day}$

Allowable Iron Waste Load Allocation:
 $1.0 \text{ gal.}/\text{min.} \times 3 \text{ mg}/\text{l} \times 0.01202 = 0.04 \text{ lbs.}/\text{day}$

Allowable Manganese Waste Load Allocation:
 $1.0 \text{ gal.}/\text{min.} \times 2 \text{ mg}/\text{l} \times 0.01202 = 0.02 \text{ lbs.}/\text{day}$

The Amfire Mining Co., LLC Amfire 127 Mine (permit SMP#24030103, NPDES PA0242390) is actively mining coal. There are seven permitted treatment ponds on the permit. Only one treatment pond will be discharging at any time. The non-standard pit sizes are for Pit 1 (335 ft. X 125 ft.), Pit 2 (400 ft. X 115 ft.) and Pit 3 (275 ft. X 65 ft.). These pit sizes were used in the Method to Quantify Treatment Pond Pollutant Load calculation and are shown in Table 5.

The Energy Resources Inc. Number 33 Mine (permit SMP#24010101, NPDES PA0241857) is actively mining coal. There are seven permitted treatment ponds on the permit. Only one treatment pond will be discharging at any time. The non-standard pit sizes are for Pit 1 (500 ft. X 150 ft.) and Pit 2 (455 ft. X 135 ft.). These pit sizes were used in the Method to Quantify Treatment Pond Pollutant Load calculation example are shown in Table 5.

The Energy Resources Inc. Number 21 Mine (permit SMP#24880103, NPDES PA0104779) is no longer actively mining coal. There a treated post mining discharge. Only one treatment pond will be discharging at any time. A design flow of 25 gpm was used to calculate the WLAs and is shown in Table 5. The Iron criteria had to be reduced to 2.34 mg/l.

The Fairview Coal Co. Oyster Run Mine (permit SMP#24980106, NPDES PA0227919) is actively mining coal. There are four permitted treatment ponds on the permit. Only one treatment pond will be discharging at any time. The non-standard pit sizes are for Pit 1 (535 ft. X 180 ft.), Pit 2 (125 ft. X 200 ft.) and Pit 3 (150 ft X 100 ft.) These pit sizes were used in the Method to Quantify Treatment Pond Pollutant Load calculation and are shown in Table 5.

The Hepburnia Coal Co. Kearney Mine (permit SMP#33030110, NPDES PA0242454) is actively mining coal. There are five treatment ponds on the permit. Only one treatment pond will be discharging at any time. There is one non-standard pit size of 150 ft. X 100 ft. This pit size was used in the Method to Quantify Treatment Pond Pollutant Load calculation and is shown in Table 5.

The Hepburnia Coal Co. Toby Mine (permit SMP#24020104, NPDES PA0242268) is actively mining coal. There are six treatment ponds on the permit. Only one treatment pond will be discharging at any time. The non-standard pit sizes are for Pit 1 (200 ft. X 150 ft.) and Pit 2 (200 ft. X 150 ft.) This pit size was used in the Method to Quantify Treatment Pond Pollutant Load calculation and are shown in Table 5.

The Tamburlin Brothers Coal Co., Inc. Bianco Mine (permit SMP#24030101, NPDES PA0242306) is actively mining coal. There is one treatment pond on the permit. There is one non-standard pit size of 680 ft. X 100 ft. This pit size was used in the Method to Quantify Treatment Pond Pollutant Load calculation and are shown in Table 5.

The Tamburlin Brothers Coal Co., Inc. Castina Mine (permit SMP#249980105, NPDES PA0227871) is actively mining coal. There are five treatment ponds on the permit. Only one treatment pond will be discharging at any time. The standard pit sizes are for Pit 1 (1500 ft. X 300 ft.) and Pit 2 (1500 ft. X 300 ft.) Mining has progressed to the use of C4 and C5 treatment facilities. When treatment facility C4 is used a pit size of 900 ft X 200 ft for one pit was used in

the Method to Quantify Treatment Pond Pollutant Load calculation and are shown in Table 5. Additionally an iron criteria of 1.5 was used.

The Tamburlin Brothers Coal Co., Inc. Pontzer 2 Mine (permit SMP#249980102, NPDES PA0241580) is actively mining coal. There are two treatment ponds on the permit. Only one treatment pond will be discharging at any time. The standard pit sizes are for Pit 1 (1635 ft. X 300 ft.), Pit 2 (1635 ft. X 300 ft.) and Pit 3 (1635 ft. X 300 ft.) Only one pit will be allowed to be open when treatment plants P2TB1 and P2TB2 are in use due to the low assimilation capacity at sample point SP6. So one pit sizes was used in the Method to Quantify Treatment Pond Pollutant Load calculation and are shown in Table 5.

The Tamburlin Brothers Coal Co., Inc. Pontzer Mine (permit SMP#24673003, NPDES PA0119849) is actively mining coal. There is one treatment pond on the permit. The non-standard pit size for Pits 1, 2 and 3 are (500 ft. X 50 ft.) Only one pit will be allowed to be open when treatment plants P1, P2 and P5 (these discharge into sample point SP6) are in use due to the low assimilation capacity at sample point SP6 Three pits can be used when treatment systems P3 and P4 are in use because the discharge to sample point SP1. .So two pit sizes were used in the Method to Quantify Treatment Pond Pollutant Load calculation and are shown in Table 5.

For the Tamburlin Brothers Coal Co., Inc. Vollmer Mine (permit SMP#24673003, NPDES PA0119848) active mining is complete and there are no operating treatment facilities so, WLAs are not required.

The Waroquier Coal Co., Starr Mine (permit SMP#33010107, NPDES PA0242012) is actively mining coal. There are ten treatment ponds on the permit. Only one treatment pond will be discharging at any time. The standard pit sizes are for Pit 1 (500 ft. X 50 ft.) and Pit 2 (500 ft. X 50 ft.) This pit size was used in the Method to Quantify Treatment Pond Pollutant Load calculation and are shown in Table 5.

The Rosebud Mining Co., Little Toby Mine (permit SMP#24991301, NPDES PA0235466) is actively mining coal. This is an underground mine and there is one treatment pond on the permit. Flow data was used to calculate the wlas shown in Table 5.

Table 5. Waste Load Allocation of Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	Wla (lbs/day)	Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Amfire Mining Co., LLC, Amfire 127 Mine (SMP # 24030103)				Tamburlin Bros. Coal Co., Inc., Castina Mine (SMP # 24980105)			
Al	0.75	0.01	0.07	Al	0.75	C3 & C5 = 0.045 C1, C2 & C4 = 0.02	C3 & C5 = 0.28 C1, C2 & C4 = 0.11
Fe	3.0	0.01	0.26	Fe	3.0	C3 & C5 = 0.045 C1, C2 & C4 = 0.02	C3 & C5 = 1.12 C1, C2 & C4 = 0.22
Mn	2.0	0.01	0.17	Mn	2.0	C3 & C5 = 0.045 C1, C2 & C4 = 0.02	C3 & C5 = 0.74 C1, C2 & C4 = 0.3

Energy Resources, Inc., No. 33 Mine (SMP # 24010101)			
Al	0.75	0.014	0.08
Fe	3.0	0.014	0.34
Mn	2.0	0.014	0.23
Fairview Coal Co., Oyster Run Mine (SMP# 24980106)			
Al	0.75	0.013	0.08
Fe	3.0	0.013	0.34
Mn	2.0	0.013	0.23
Hepburnia Coal Co., Kearny Mine (SMP # 33030110)			
Al	0.75	0.001	0.01
Fe	3.0	0.001	0.04
Mn	2.0	0.001	0.02
Hepburnia Coal Co., Toby Mine (SMP # 24020104)			
Al	0.75	0.006	0.04
Fe	3.0	0.006	0.15
Mn	2.0	0.006	0.10
Tamburlin Bros. Coal Co., Inc., Bianco Mine (SMP # 24030101)			
Al	0.75	0.007	0.04
Fe	3.0	0.007	0.17
Mn	2.0	0.007	0.11
Fairview Coal Co., Squab Holloe (SMP24743008)			
Al	0.75	SHTB1 0.006 SHTB2 0.003	0.04 0.02
Fe	3.0	SHTB1 0.006 SHTB2 0.003	0.15 0.08
Mn	2.0	SHTB1 0.006 SHTB2 0.003	0.10 0.05

Tamburlin Bros. Coal Co., Inc., Pontzer 2 Mine (SMP # 24990102)			
Al	0.75	0.049	0.30
Fe	3.0	0.049	1.22
Mn	2.0	0.049	0.81
Energy Resource, Inc. SMP24900104 (Mine No. 30)			
Al	0.75	0.05	0.29
Fe	3.0	0.05	1.17
Mn	2.0	0.05	0.78
Tamburlin Bros. Coal Co., Inc., Pontzer Mine (SMP # 24980102)			
Al	0.75	3P 0.134 1P 0.045	3P 0.84 1P 0.28
Fe	3.0	3P 0.134 1P 0.045	3P 3.35 1P 1.12
Mn	2.0	3P 0.134 1P 0.045	3P 2.23 1P 0.74
Waroquier Coal Co., Starr Mine (SMP # 33010107)			
Al	0.75	0.015	0.09
Fe	3.0	0.015	0.37
Mn	2.0	0.015	0.25
Rosebud Mining Co., Little Toby Mine (SMP # 24991301)			
Al	0.5	0.09	0.37
Fe	1.5	0.09	1.11
Mn	1.0	0.09	0.74
Energy Resources, Inc. SMP24880103 (No. 21 Mine)			
Al	0.75	0.04	0.23
Fe	2.4	0.04	0.72
Mn	2.0	0.04	0.6

There are three treated post mining discharges within the Little Toby Creek watershed. Fairview Coal Co., SMP24743008 Squab Holloe. Outfall numbers SHTB1 & SHTB2 are accounted for at sample point BE1. Energy Resources, Inc. SMP24880103 No. 21 Mine. Outfall number H21TP is accounted for at sample point 17. Energy Resource, Inc. SMP24900104 Mine No. 30. Outfall number H30TP is accounted for at sample point LT01. The wlas for these are contained in Table 5 above.

Recommendations

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

through the Department the Interior, Office of Surface Mining (OSM), for reclamation and mine drainage treatment through the Appalachian Clean Streams Initiative and through Watershed Cooperative Agreements.

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

The Bureau of Abandoned Mine Reclamation, Pennsylvania's primary bureau in dealing with abandoned mine reclamation (AMR) issues, has established a comprehensive plan for abandoned mine reclamation throughout the Commonwealth to prioritize and guide reclamation efforts for throughout the state to make the best use of valuable funds (www.dep.state.pa.us/dep/deputate/minres/bamr/complan1.htm). In developing and implementing a comprehensive plan for abandoned mine reclamation, the resources (both human and financial) of the participants must be coordinated to insure cost-effective results. The following set of principles is intended to guide this decision making process:

- Partnerships between the DEP, watershed associations, local governments, environmental groups, other state agencies, federal agencies and other groups organized to reclaim abandoned mine lands are essential to achieving reclamation and abating acid mine drainage in an efficient and effective manner.
- Partnerships between AML interests and active mine operators are important and essential in reclaiming abandoned mine lands.
- Preferential consideration for the development of AML reclamation or AMD abatement projects will be given to watersheds or areas for which there is an approved rehabilitation plan. (guidance is given in Appendix B to the Comprehensive Plan).
- Preferential consideration for the use of designated reclamation moneys will be given to projects that have obtained other sources or means to partially fund the project or to projects that need the funds to match other sources of funds.
- Preferential consideration for the use of available moneys from federal and other sources will be given to projects where there are institutional arrangements for any necessary long-term operation and maintenance costs.
- Preferential consideration for the use of available moneys from federal and other sources will be given to projects that have the greatest worth.
- Preferential consideration for the development of AML projects will be given to AML problems that impact people over those that impact property.
- No plan is an absolute; occasional deviations are to be expected.

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

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

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

- Project XL - The Pennsylvania Department of Environmental Protection ("PADEP"), has proposed this XL Project to explore a new approach to encourage the remining and reclamation of abandoned coal mine sites. The approach would be based on compliance with in-stream pollutant concentration limits and implementation of best management practices ("BMPs"), instead of National Pollutant Discharge Elimination System ("NPDES") numeric effluent limitations measured at individual discharge points. This XL project would provide for a test of this approach in up to eight watersheds with significant acid mine drainage ("AMD") pollution. The project will collect data to compare in-stream pollutant concentrations versus the loading from individual discharge points and provide for the evaluation of the performance of BMPs and this alternate strategy in PADEP's efforts to address AMD.
- Awards of grants for 1) proposals with economic development or industrial application as their primary goal and which rely on recycled mine water and/or a site that has been made suitable for the location of a facility through the elimination of existing Priority 1 or 2 hazards, and 2) new and innovative mine drainage treatment technologies that will provide waters of higher purity that may be needed by a particular industry at costs below conventional treatment costs as in common use today or reduce the costs of water treatment below those of conventional lime treatment plants. Eight contracts totaling \$4.075 M were awarded in 2006 under this program.
- Projects using water from mine pools in an innovative fashion, such as the Shannopin Deep Mine Pool (in southwestern Pennsylvania), the Barnes & Tucker Deep Mine Pool (the Susquehanna River Basin Commission into the Upper West Branch Susquehanna River), and the Wadesville Deep Mine Pool (Excelon Generation in Schuylkill County).

The Toby Creek Watershed Association will continue to work with the stakeholders to maintain the current AMD treatment systems and to pursue additional AMD abatement projects in the

Little Toby Creek watershed that will work to achieve the reductions recommended in this TMDL document.

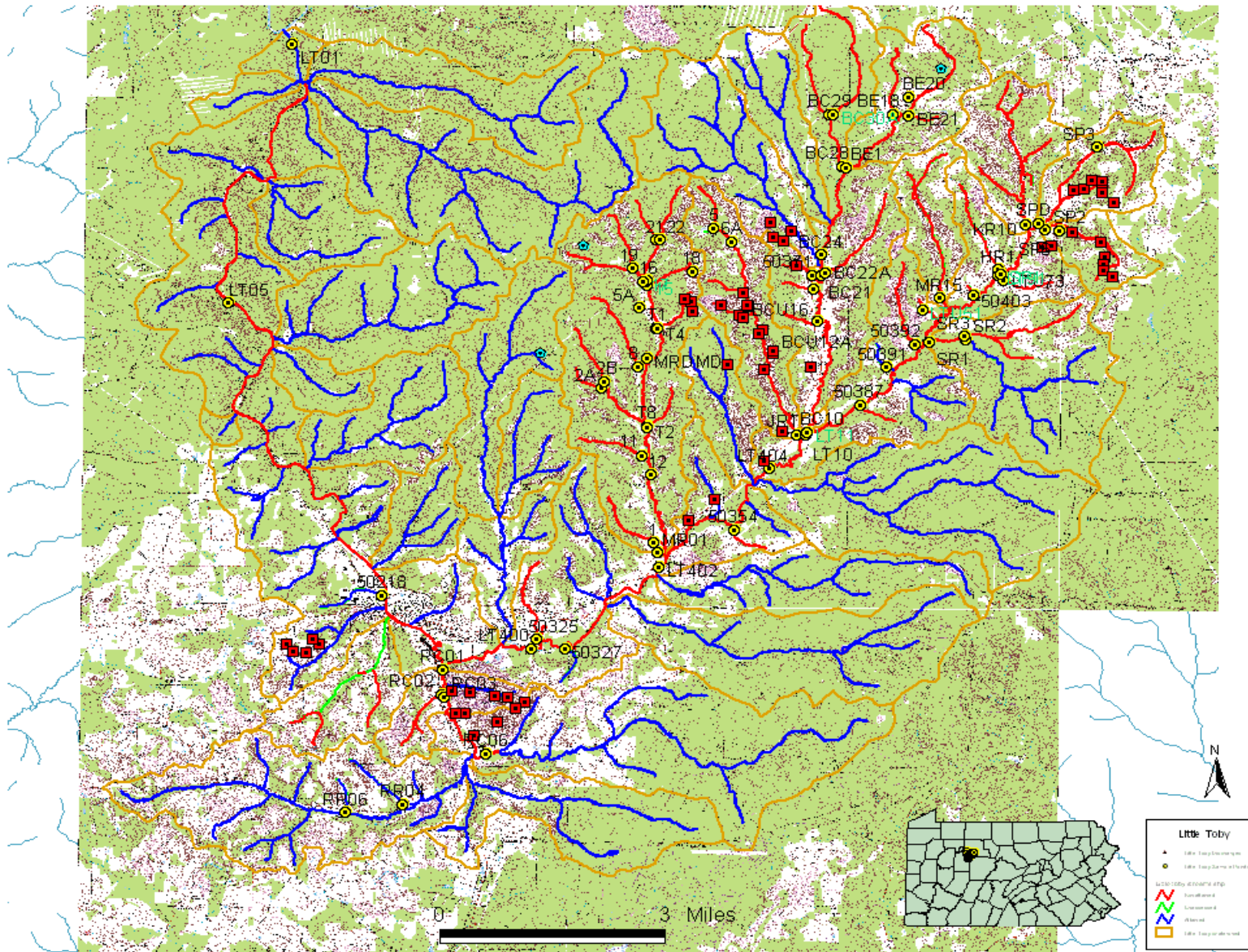
Candidate or federally-listed threatened and endangered species may occur in or near the watershed. While implementation of the TMDL should result in improvements to water quality, they could inadvertently destroy habitat for candidate or federally-listed species. TMDL implementation projects should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

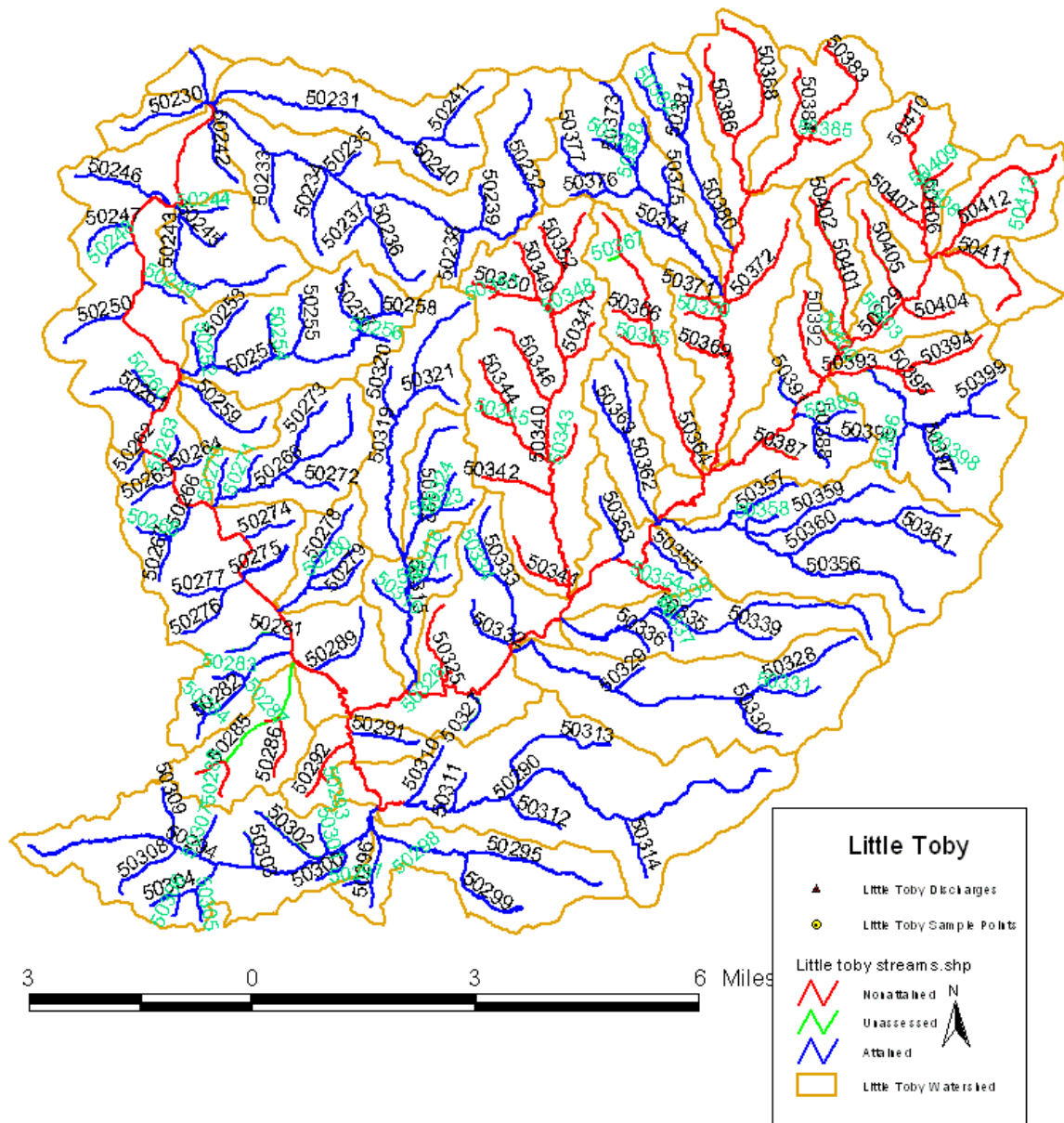
Public Participation

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on September 27, 2008 to foster public comment on the allowable loads calculated. A public meeting was held on October 7, 2008 beginning at 10:00 a.m., at the Knox District Mining Office in Knox, PA, to discuss the proposed TMDL.

Attachment A

Little Toby Creek Watershed Maps





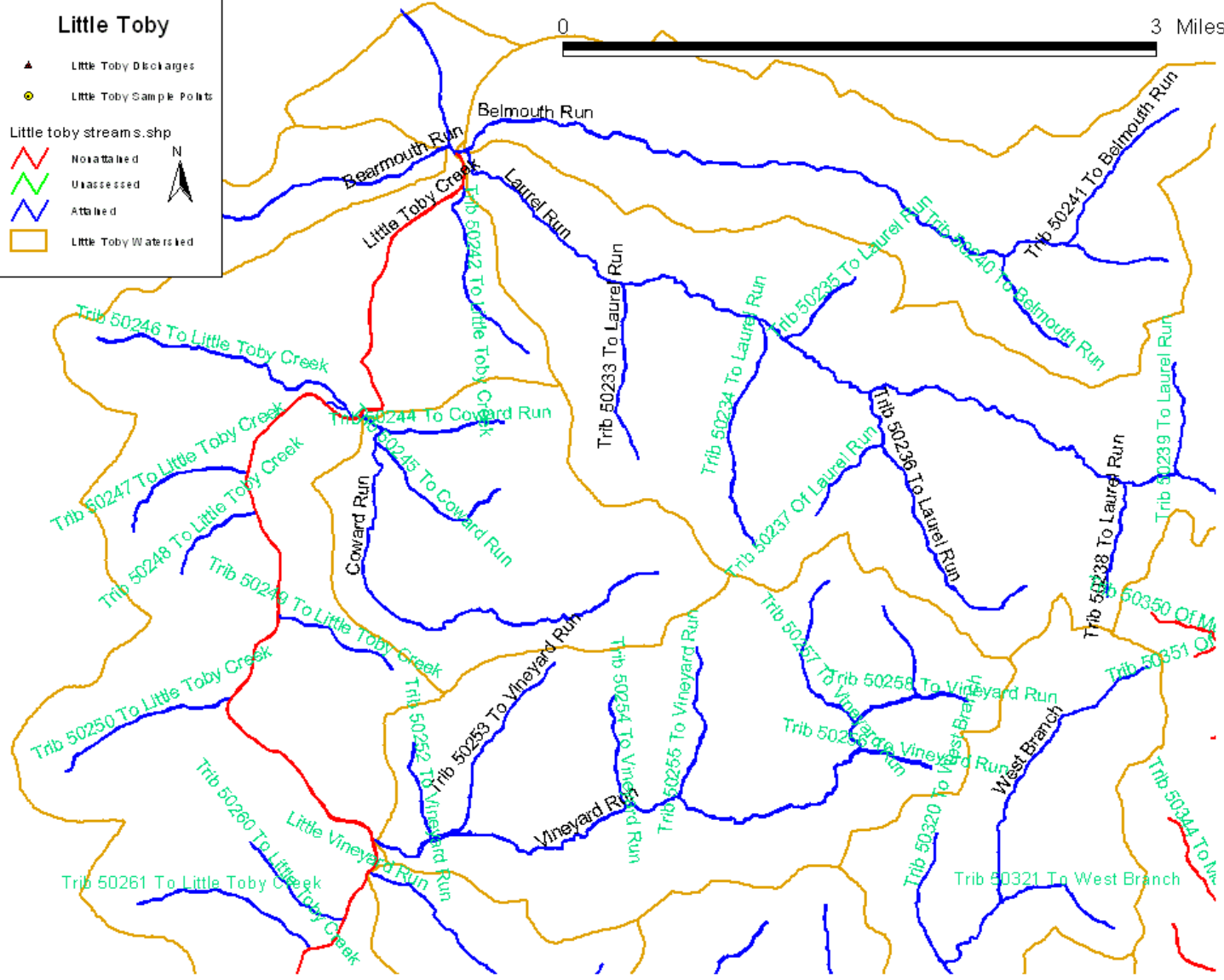
Little Toby

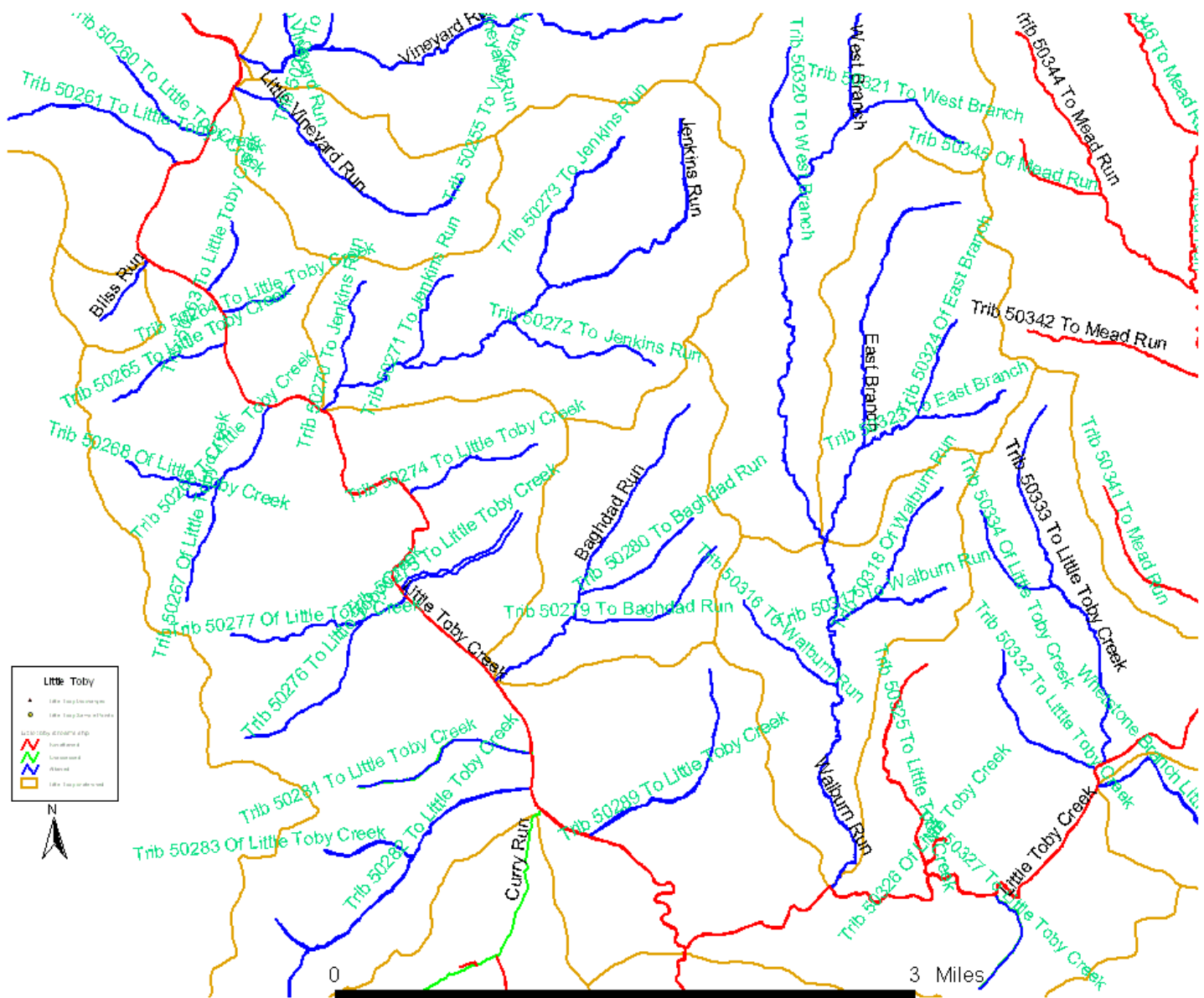
- ▲ Little Toby Discharges
- Little Toby Sample Points

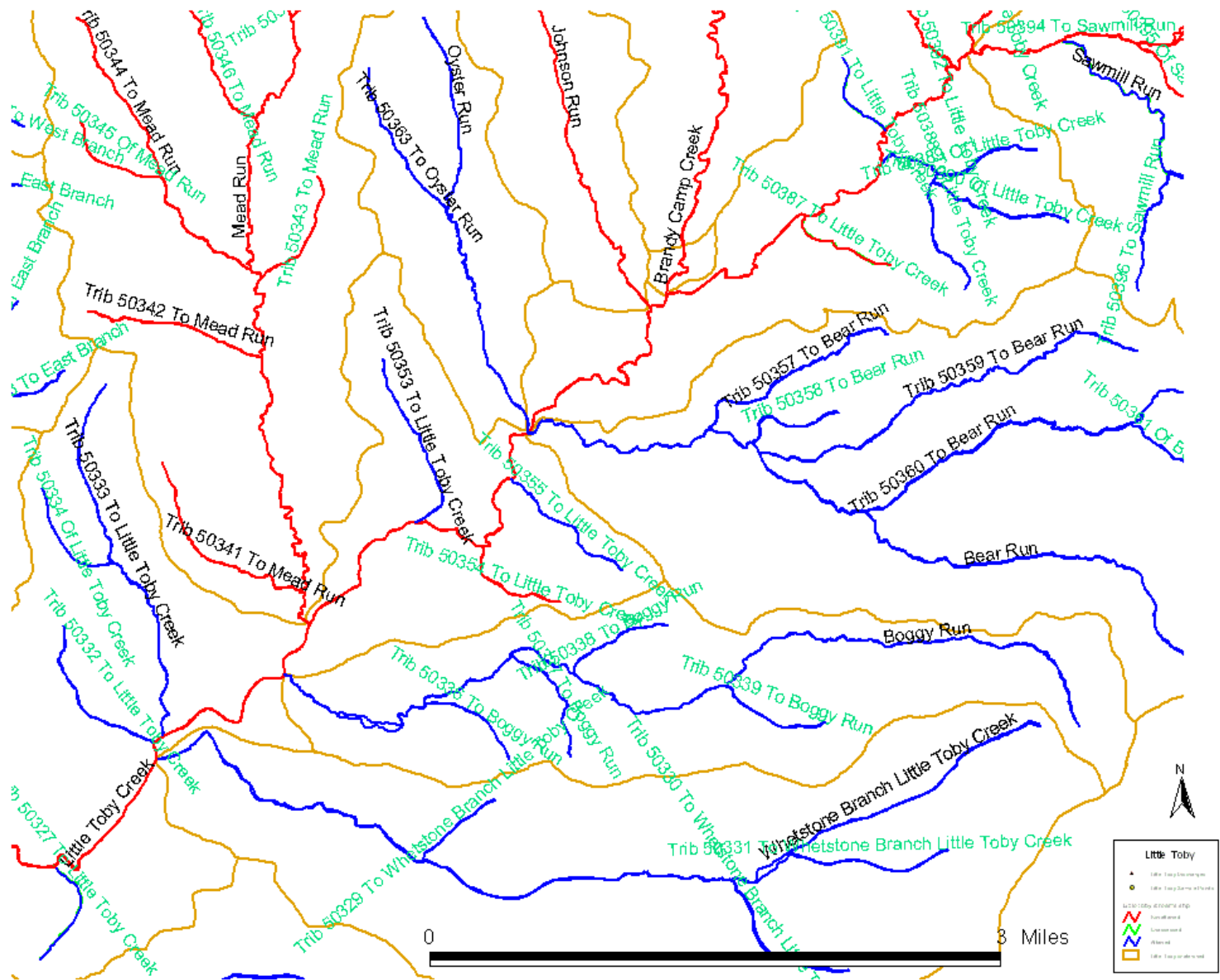
Little toby streams.shp

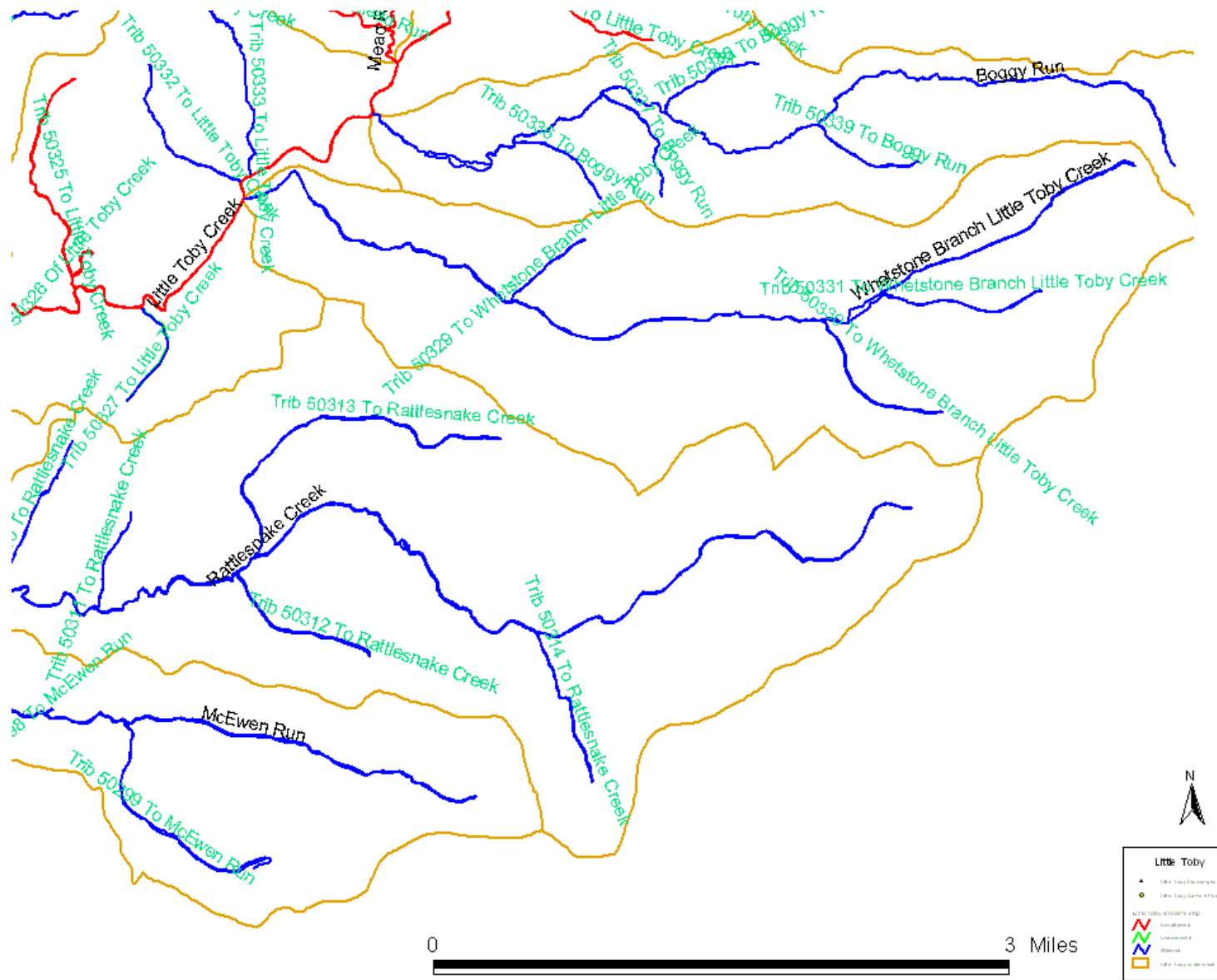
- Red line: Not Attended
- Green line: Unassessed
- Blue line: Attended

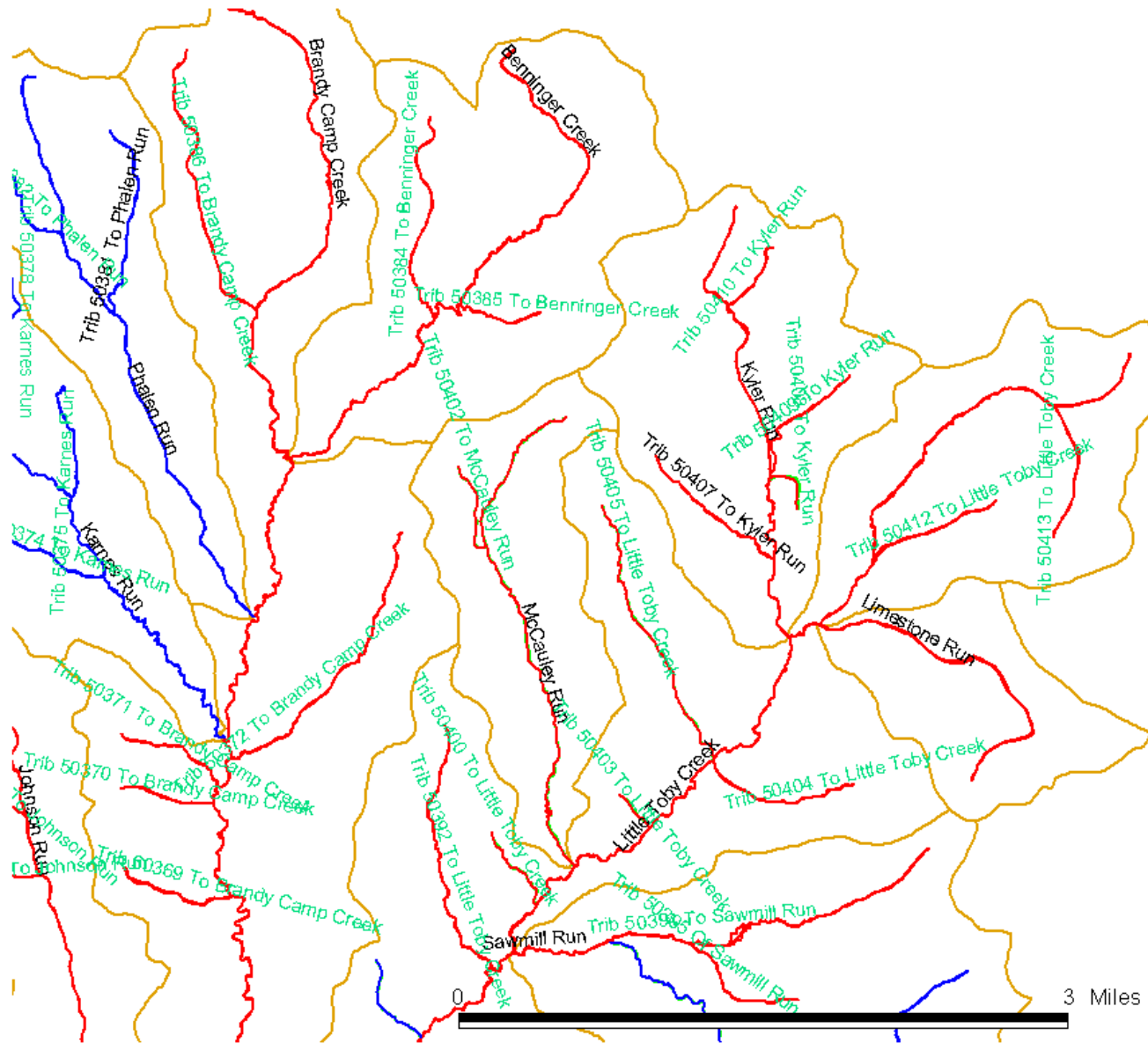
Orange outline: Little Toby Watershed

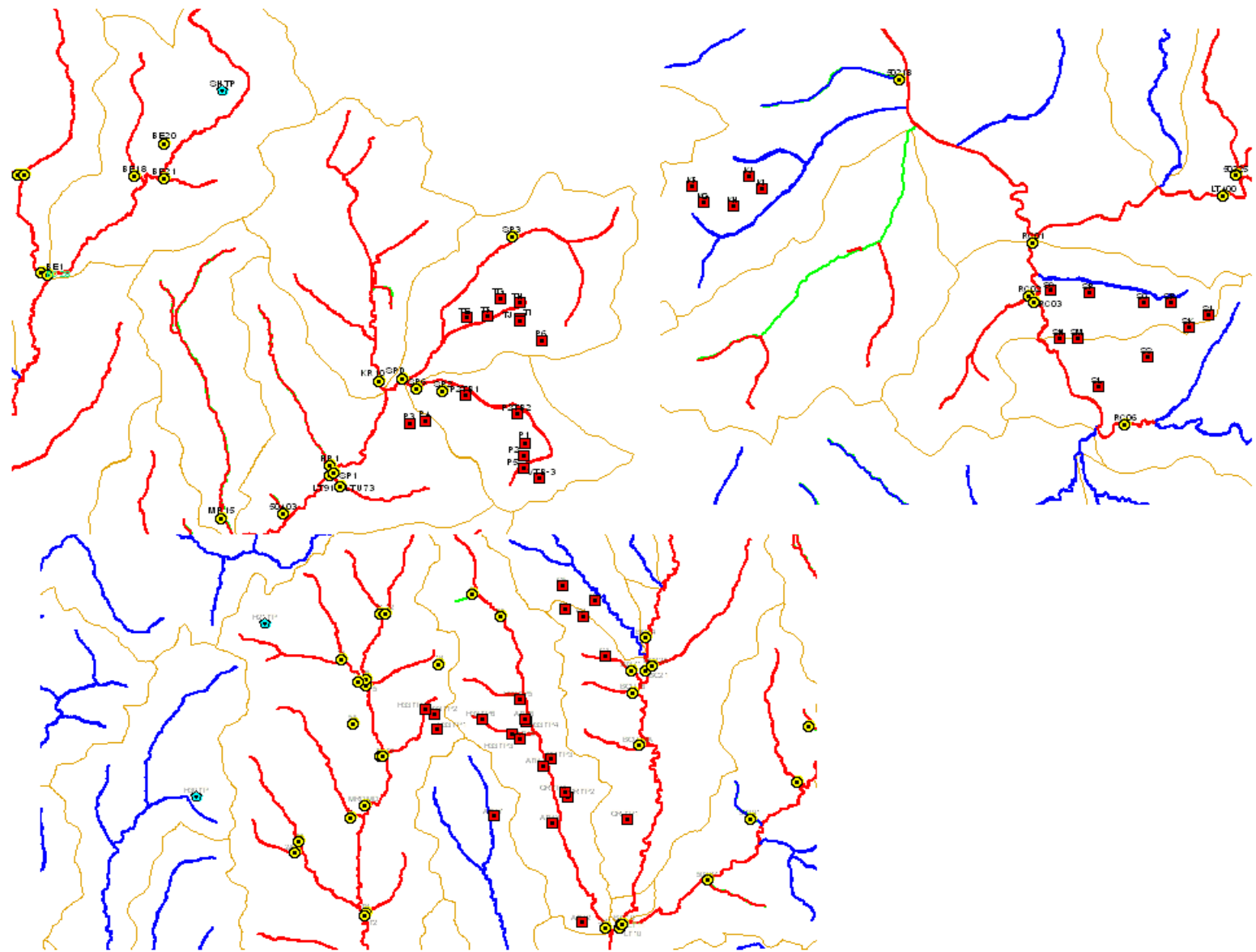












Attachment B

Method for Addressing Section 303(d) Listings for pH

Method for Addressing 303(d) Listings for pH

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

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

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

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

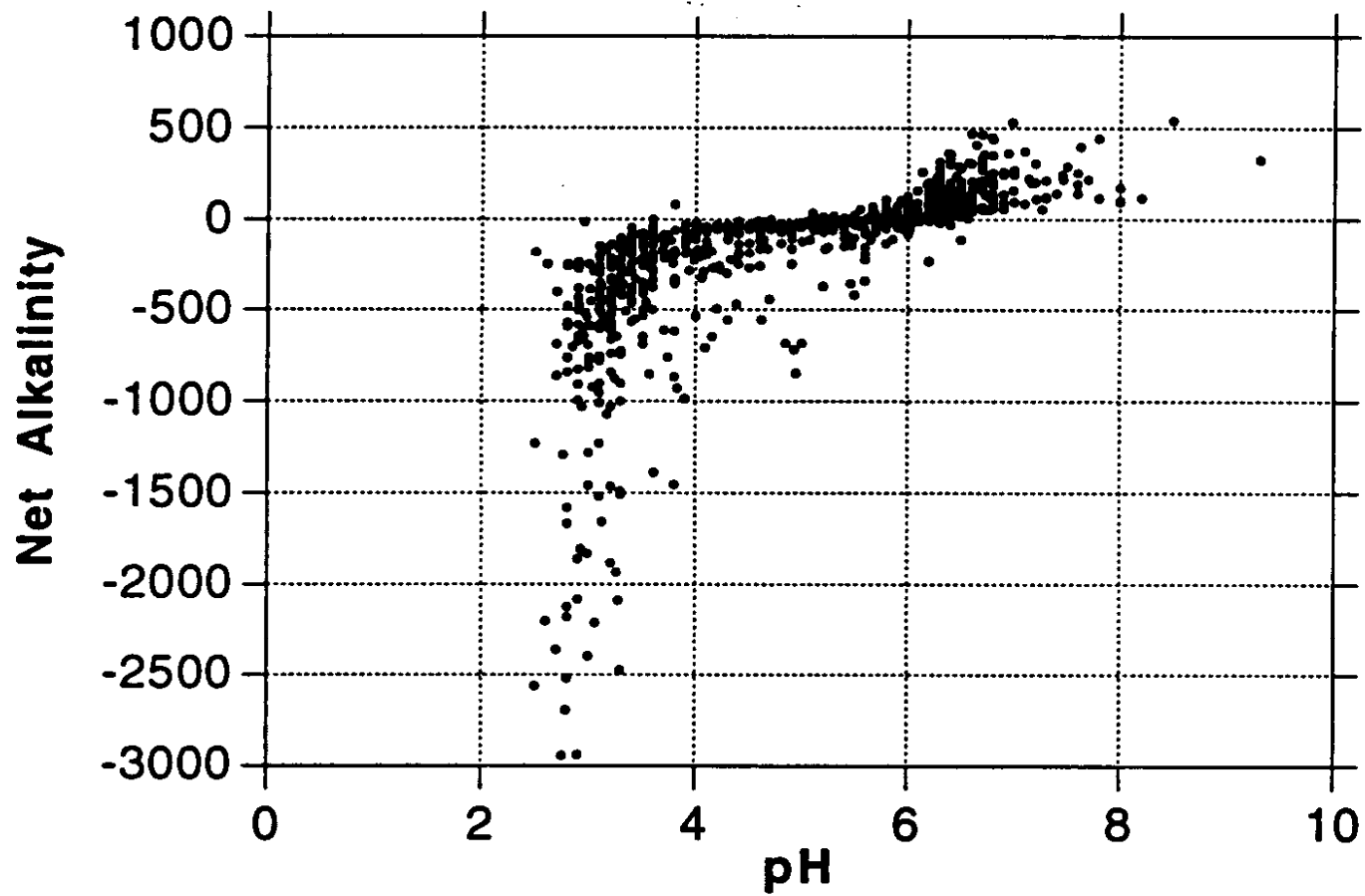


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Attachment C

TMDLs By Segment

Little Toby Creek

The TMDL for Little Toby Creek consists of load allocations for sixty seven sampling sites along Little Toby Creek, Limestone Run, Kyler Run, McCauley Run, Benninger Creek, Brandy Camp Creek, Mead Run, Rattlesnake Creek Curry Run and various unnamed tributaries.

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

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

A waste load allocation for future mining was included for this segment of Little Toby Creek (SPD) allowing for one operation with two active pits (1500' x 300') to be permitted in the future on this segment (see page 19 for the method used to quantify treatment pond load).

Table C1. Waste Load Allocations for future mining operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

SP3 Most Upstream Sample Point on Little Toby Creek (50229)

The TMDL for this sample point on Little Toby Creek consists of a load allocation to the segment upstream. The load allocation for this segment was computed using water-quality sample data collected at point SP3. The average flow, measured at the sampling point SP3 (0.49 MGD), is used for these computations.

There currently is an entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SP3 shows pH ranging between 3.6 and 4.8; pH will be addressed in this TMDL because of the mining impacts. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	6.40	25.9	0.38	1.6	24.4	94
Fe	1.89	7.7	0.66	2.7	5.0	65
Mn	5.61	22.8	0.56	2.3	20.5	90
Acid	63.98	259.4	0.32	1.3	258.1	99.5
Alk	0.70	2.8				

A waste load allocation for future mining was included for this segment of Little Toby Creek (SPD) allowing for one operation with two active pits (1500' x 300') to be permitted in the future on this segment (see page 19 for the method used to quantify treatment pond load).

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

Waste Load Allocations– Permitted Discharges

The Hepburnia Coal Co. SMP 24020104, Toby Run Mine has six permitted treatment ponds, TE, TF, TG, TH, TI and TJ that discharge to Little Toby Creek. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are two permitted pits in the permit with a total combined pit area of 20,000 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLA for TA is evaluated at point 16.

The Tamburlin Brothers Coal Co., Inc. SMP 24980102, Pontzer Mine has six permitted treatment ponds, P1, P2, P2, P4, P5 and P6 that discharge to Little Toby Creek. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are three permitted pits in the permit with a total combined pit area of 1,350,000 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for P1, P2 and P5 are evaluated at point SP6 and P3 and P4 at point SP1

Table C4. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Toby Run Mine; TE, TF, TG, TH TI & TJ			
Al	0.75	0.006	0.04
Fe	3.0	0.006	0.15
Mn	2.0	0.006	0.1
Pontzer Mine; P6			
Al	0.75	0.134	0.84
Fe	3.0	0.134	3.35
Mn	2.0	0.134	2.23

SPD Little Toby Creek Upstream of Confluence with Limestone Run (50411)

The TMDL for this sample point on Little Toby Creek consists of a load allocation to all of the area upstream of sample point SPD. The load allocation for this segment was computed using water-quality sample data collected at point SPD. The average flow, measured at the sampling point SPD (1.62 MGD), is used for these computations.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day
Al	1.37	18.5	0.15	2.0
Fe	3.53	47.8	0.53	7.2
Mn	4.30	58.2	0.43	5.8
Acid	18.37	248.6	2.39	32.3
Alk	12.74	172.4		

There currently is an entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SPD shows pH ranging between 4.4 and 6.2; pH will be addressed in this TMDL because of the mining impacts. The method and rationale for addressing pH is contained in Attachment B.

The calculated load reductions for all the loads that enter point SPD must be accounted for in the calculated reductions at sample point SPD shown in Table C6. A comparison of measured loads between points SP3 and SPD shows that there is no additional loading entering the segment for aluminum and acidity. For aluminum and acidity the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is additional loading entering the segment for iron and manganese. The total segment iron and manganese loads are the sum of the upstream allocated loads and any additional loading within the segment.

Table C6. Calculation of Load Reduction at Point SPD				
	Al	Fe	Mn	Acidity
Existing Load	18.5	47.8	58.2	248.6
Difference in Existing Load between SP3 & SPD	-7.4	40.1	35.4	-10.8
Load tracked from SP3	1.6	2.7	2.3	1.3
Percent loss due to instream process	29	-	-	4
Percent load tracked from SP3	71	-	-	96
Total Load tracked from SP3	1.1	42.8	37.7	1.2
Allowable Load at SPD	2.0	7.2	5.8	32.3
Load Reduction at SPD	0.0	35.6	31.9	0.0
% Reduction required at SPD	0	83	85	0

Waste Load Allocations– Permitted Discharges

The Tamburlin Brothers Coal Co., Inc. SMP 24980102, Pontzer Mine has six permitted treatment ponds, P1, P2, P2, P4, P5 and P6 that discharge to Limestone run. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are three permitted pits in the permit with a total combined pit area of 1,350,000 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for P1, P2 and P5 are evaluated at point SP6, P6 at point SPD and P3 and P4 at point SP1

The Tamburlin Brothers Coal Co., Inc. SMP 24990102, Pontzer 2 Mine has two permitted treatment ponds, P2TB1 and P2TB2 that discharge to Limestone Run. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are three permitted pits in the permit with a total combined pit area of 1,471,500 square feet. Included in the permit are limits for aluminum, iron and manganese.

Table C7. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Pontzer Mine; P1, P2 & P5			
Al	0.75	0.045	0.28
Fe	3.0	0.045	1.12
Mn	2.0	0.045	0.74
Pontzer 2 Mine; P2TB1 & P2TB2			
Al	0.75	0.049	0.3
Fe	3.0	0.049	1.22
Mn	2.0	0.049	0.81

SP6 Limestone Run Upstream of Confluence with Little Toby Creek

The TMDL for this sample point on Limestone Run consists of a load allocation to all of the area upstream of sample point SP6. The load allocation for this segment was computed using water-quality sample data collected at point SP6. The average flow, measured at the sampling point SP6 (0.72 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SP6 shows pH ranging between 4.7 and 7.1; pH will be addressed in this TMDL because of the mining impacts. The method and rationale for addressing pH is contained in Attachment B.

Table C8. Load Allocations and Load Reductions for Point SP6						
Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	3.49	20.9	0.24	1.5	19.5	93
Fe	6.41	38.5	0.51	3.1	35.4	92
Mn	11.32	67.9	0.57	3.4	64.5	95
Acid	31.75	190.5	3.49	21.0	169.5	89
Alk	17.95	107.7				

A waste load allocation for future mining was included for this segment of Little Toby Creek (SP2) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

SP2 Little Toby Creek Downstream of Confluence Little Toby Creek and Limestone Run

The TMDL for this sample point on Little Toby Creek consists of a load allocation to all of the area between sample points SPD, SP6 and SP2. The load allocation for this segment was computed using water-quality sample data collected at point SP2. The average flow, measured at the sampling point SP2 (2.35 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 19 shows pH ranging between 4.1 and 6.6; pH will be addressed in this TMDL because of the mining impacts. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 3			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 4			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 5			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day
Al	3.90	76.5	0.35	6.9
Fe	6.01	118.0	0.66	13.0
Mn	7.26	142.4	0.51	10.0
Acid	46.71	916.0	1.40	27.5
Alk	4.78	93.8		

The calculated load reductions for all the loads that enter point SP2 must be accounted for in the calculated reductions at sample point SP2 shown in Table C11. A comparison of measured loads between points SPD, SP6 and SP2 shows that there is additional loading entering the segment for aluminum, iron, manganese and acidity. The total segment aluminum, iron, manganese and acidity loads are the sum of the upstream allocated loads and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	76.5	118.0	142.4	916.0
Difference in Existing Load between SPD, SP6 & SP2	37.1	31.8	16.3	476.9
Load tracked from SPD & SP6	3.5	10.2	9.2	52.3
Percent loss due to instream process	-	-	-	-
Percent load tracked from SPD, & SP6	-	-	-	-
Total Load tracked from SPD & SP6	40.6	42.0	25.5	530.1
Allowable Load at SP2	6.9	13.0	10.0	27.5
Load Reduction at SP2	33.7	29.0	15.5	502.7
% Reduction required at SP2	83	69	61	95

A waste load allocation for future mining was included for this segment of Little Toby Creek (KR10) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

KR10 Kyler Run (50406) Upstream of Confluence with Little Toby Creek

The TMDL for Kyler Run consists of a load allocation to all of the watershed area upstream of sample point KR10. The load allocation for this segment was computed using water-quality sample data collected at point KR10. The average flow, measured at the sampling point KR10 (3.37 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point KR10 shows pH ranging between 3.6 and 6.6; pH will be addressed in this TMDL because of the mining impacts. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 3			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 4			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 5			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	5.12	144.0	0.31	8.6	135.3	94
Fe	5.34	150.3	0.43	12.0	138.3	92
Mn	5.51	154.9	0.72	20.1	134.8	87
Acid	60.78	1709.3	2.43	68.4	1640.9	96
Alk	6.00	168.7				

A waste load allocation for future mining was included for this segment of Little Toby Creek (SP1) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

The Tamburlin Brothers Coal Co., Inc. SMP 24980102, Pontzer Mine has six permitted treatment ponds, P1, P2, P2, P4, P5 and P6 that discharge to Limestone run. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are three permitted pits in the permit with a total combined pit area of 1,350,000 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for P1, P2 and P5 are evaluated at point SP6, P6 at point SPD and P3 and P4 at point SP1

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 3			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 4			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 5			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

Table C15. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Pontzer Mine; P3 & P4			
Al	0.75	0.134	0.84
Fe	3.0	0.134	3.35
Mn	2.0	0.134	2.23

SP1 Little Toby Creek Upstream of Confluence with Unt (50405)

The TMDL for sampling point SP1 consists of a load allocation to the area upstream of point SP1. The load allocation for this tributary was computed using water-quality sample data collected at point SP1. The average flow, measured at the sampling point SP1 (6.69 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SP1 shows pH ranging between 3.6 and 6.7; pH will be addressed in this TMDL because of the mining impacts. The method and rationale for addressing pH is contained in Attachment B.

Table C16. Load Allocations at Point SP1				
Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	5.49	306.2	0.38	21.4
Fe	4.02	224.1	0.56	31.4
Mn	6.49	361.8	0.58	32.6
Acid	55.87	3115.8	0.56	31.2
Alk	1.59	88.8		

The calculated load reductions for all the loads that enter point SP1 must be accounted for in the calculated reductions at sample point SP1 shown in Table C17. A comparison of measured loads between points SP2, KR10 and SP1 shows that there is no additional loading entering the segment for iron. For iron the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is additional loading entering the segment for aluminum, manganese and acidity. The total segment aluminum, manganese and acidity loads are the sum of the upstream allocated loads and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	306.2	224.1	361.8	3115.8
Difference in Existing Load between SP2, KR10 & SP1	85.7	-44.1	64.5	490.6
Load tracked from SP2 & KR10	15.5	25.0	30.1	95.8
Percent loss due to instream process	-	19	-	-
Percent load tracked from SP2 & KR10	-	84	-	-
Total Load tracked from SP2 & KR10	101.2	20.9	94.6	586.4
Allowable Load at SP1	21.4	31.4	32.6	31.2
Load Reduction at SP1	79.8	0.0	62.1	555.3
% Reduction required at SP1	79	0	66	95

HR1 Mouth of Unt (50405) Local name Hayes Run

The TMDL for sampling point HR1 consists of a load allocation to all of the area upstream of point HR1. The load allocation for this tributary was computed using water-quality sample data collected at point HR1. The average flow, measured at the sampling point HR1 (0.44 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point HR1 shows pH ranging between 6.8 and 7.5, pH will not be addressed in this TMDL because of this segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Measured Sample Data		Allowable			
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day	Load Reduction	% Reduction
Al	0.25	0.92	0.25	0.92	0.0	0
Fe	4.64	17.0	0.46	1.7	15.3	90
Mn	4.41	16.1	0.57	2.1	14.0	87
Acid	0.00	0.0	0.00	0.0	0.0	0
Alk	62.28	228.0				

LTU73 Mouth of Unt (50404) Upstream of Confluence with Little Toby Run

The TMDL for sampling point LTU73 consists of a load allocation to the all of the area upstream of point LTU73. The load allocation for this tributary was computed using water-quality sample data collected at point LTU73. The average flow, measured at the sampling point LTU73 (0.32 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point LTU73 shows pH ranging between 4.1 and 6.8; pH will be addressed

in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

Table C19. Load Allocations and Load Reductions for Point LTU73

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	3.13	8.4	0.22	0.6	7.8	93
Fe	1.43	3.8	0.50	1.3	2.5	65
Mn	8.45	22.7	0.51	1.4	21.3	94
Acid	34.38	92.5	4.81	13.0	79.5	86
Alk	15.42	41.5				

A waste load allocation for future mining was included for this segment of Little Toby Creek (LT91) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

LT91 Little Toby Creek Downstream of LTU73 and HR1

The TMDL for this segment of Little TobyCreek consists of a load allocation to the area between sample points SP1, HR1, LTU73 and LT91. The load allocation for this segment was computed using water-quality sample data collected at point LT91. The average flow, measured at the sampling point LTU91 (7.34 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 14 shows pH ranging between 3.6 and 7.3; pH will be addressed in this TMDL because of the mining impacts. The method and rationale for addressing pH is contained in Attachment B.

Table C20. Waste Load Allocations for future mining operations

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 3			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 4			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 5			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	5.35	327.9	0.21	13.1
Fe	4.16	255.0	0.54	33.1
Mn	6.37	390.3	0.51	31.2
Acid	61.41	3761.6	3.68	225.7
Alk	9.24	566.2		

The calculated load reductions for all the loads that enter point LT91 must be accounted for in the calculated reductions at sample point LT91 shown in Table C22. A comparison of measured loads between points SP1, HR1, LTU73 and LT91 shows that there is no additional loading entering the segment for manganese. For manganese the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is additional loading entering the segment for aluminum, iron and acidity. The total segment aluminum, iron and acidity loads are the sum of the upstream allocated loads and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	327.9	255.0	390.3	3761.6
Difference in Existing Load between SP1, HR1, LTU73 & LT91	12.4	10.0	-10.4	553.3
Load tracked from SP1, HR1 & LTU73	22.9	34.4	36.0	44.1
Percent loss due to instream process	-	-	3	-
Percent load tracked from SP1,HR1 & LTU73	-	-	97	-
Total Load tracked from SP1, HR1 & LTU73	35.3	44.5	35.1	597.4
Allowable Load at LT91	13.1	33.1	31.2	255.7
Load Reduction at LT91	22.2	11.3	3.9	371.7
% Reduction required at LT91	63	25	11	62

SR3 Mouth of Unt (50394) of Sawmill Run Upstream of Confluence with Sawmill Run

The TMDL for this Unt of Sawmill Run consists of a load allocation to the area upstream of sample point SR3. The load allocation for this segment was computed using water-quality sample data collected at point SR3. The average flow, measured at the sampling point SR3 (0.28 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SR3 shows pH ranging between 4.6 and 5.1; pH will be addressed in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for iron because WQS were met and a TMDL for iron is not necessary. Although a TMDL is not necessary, the measured load is considered at the next downstream point SR1.

Table C23. Load Allocations and Load Reductions for Point SR3

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	1.45	3.4	0.32	0.7	2.6	78
Fe	0.15	0.4	0.15	0.4	0.0	0
Mn	5.58	13.0	0.45	1.0	11.9	92
Acid	27.68	64.2	2.21	5.1	59.1	92
Alk	7.88	18.3				

SR2 Sawmill Tun (50393) Upstream of Confluence with Unt (50394) Sawmill Run

The TMDL for this segment of Sawmill Run consists of a load allocation to the area upstream of sample point SR2. The load allocation for this segment was computed using water-quality sample data collected at point SR2. The average flow, measured at the sampling point SR2 (3.08 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SR2 shows pH ranging between 6.3 and 6.7; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron, manganese and acidity because WQS were met and the segment was net alkaline, a TMDL for aluminum, iron, manganese and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point SR1.

Table C24. Load Allocations and Load Reductions for Point SR2

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	6.4	0.25	6.4	0.0	0
Fe	0.15	3.9	0.15	3.9	0.0	0
Mn	0.06	1.6	0.06	1.6	0.0	0
Acid	0.60	15.4	0.60	15.4	0.0	0
Alk	18.40	473.1				

SR1 Mouth of Sawmill Run Upstream of Confluence with Little Toby Creek

The TMDL for this segment of Sawmill Run consists of a load allocation to the area between sample points SR3, SR2 and SR1. The load allocation for this segment was computed using

water-quality sample data collected at point SR1. The average flow, measured at the sampling point SR1 (1.57 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point SR3 shows pH ranging between 5.9 and 6.3; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for iron because WQS were met, a TMDL for iron is not necessary. Although a TMDL is not necessary, the measured load is considered at the next downstream point LT11.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.40	5.2	0.19	2.5
Fe	0.15	2.0	0.15	2.0
Mn	1.61	21.1	0.32	4.2
Acid	16.17	212.3	3.07	40.3
Alk	10.69	140.3		

The calculated load reductions for all the loads that enter point SR1 must be accounted for in the calculated reductions at sample point SR1 shown in Table C26. A comparison of measured loads between points SR3, SR2 and SR1 shows that there is no additional loading entering the segment for aluminum and iron. For aluminum and iron the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is additional loading entering the segment for manganese and acidity. The total segment manganese and acidity loads are the sum of the upstream allocated loads and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	5.2	2.0	21.1	212.3
Difference in Existing Load between SR3, SR2 & SR1	-4.6	-2.2	6.5	132.7
Load tracked from SR3 & SR2	7.2	4.2	2.6	20.6
Percent loss due to instream process	47	53	-	-
Percent load tracked from SR3 & SR2	53	47	-	-
Total Load tracked from SR3 & SR2	3.8	2.0	9.2	153.2
Allowable Load at SR1	2.5	2.0	4.2	40.3
Load Reduction at SR1	1.4	0.0	4.9	112.9
% Reduction required at SR1	36	0	54	74

50403 Unt (50403) of Little Toby Creek

The TMDL for this segment of Unt (50403) of Little Toby Creek consists of a load allocation to all of the watershed area upstream of sample point 50403. The load allocation for this segment was computed using water-quality sample data collected at point 50403. The average flow, measured at the sampling point 50403 (0.07 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 50403 shows pH ranging between 7.5 and 8.1, pH will not be addressed in this TMDL because this segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum and acidity because WQS were met and there was no acidity present. Because WQS were met, TMDLs for aluminum and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point LT11.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.15	0.25	0.15	0.0	0
Fe	1.05	0.64	0.63	0.39	0.26	40
Mn	2.56	1.57	0.49	0.30	1.27	81
Acid	0.00	0.0	0.00	0.0	0.0	0
Alk	176.12	107.9				

MR15 Mouth of McCauley Run (50401) Upstream of Confluence with Little Toby Creek

The TMDL for this segment of McCauley Run consists of a load allocation to the entire watershed upstream of sample point MR15. The load allocation for this segment was computed using water-quality sample data collected at point MR15. The average flow, measured at the sampling point MR15 (0.33 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point MR15 shows pH ranging between 6.3 and 7.2, pH will not be addressed in this TMDL because it is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for acidity because there was little acidity present, a TMDL for acidity is not necessary. Although a TMDL is not necessary, the measured load is considered at the next downstream point LT11.

Table C28. Load Allocations and Load Reductions for Point MR15

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.30	0.8	0.23	0.6	0.2	24
Fe	0.40	1.1	0.36	1.0	0.1	12
Mn	1.92	5.3	0.35	1.0	4.3	82
Acid	0.17	0.5	0.17	0.5	0.0	0
Alk	48.78	136.3				

LTU51 Unt (50400) of Little Toby Creek

The TMDL for sampling point LTU51 consists of a load allocation to all of the area upstream of sample point LTU51. The load allocation for this tributary was computed using water-quality sample data collected at point LTU51. The average flow, measured at the sampling point LTU51 (0.01 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point LTU51 shows pH ranging between 3.4 and 5.9; pH will be addressed in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

Table C29. Load Allocations and Load Reductions for Point LTU51

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	2.86	0.21	0.23	0.017	0.193	92
Fe	3.63	0.27	0.33	0.024	0.246	91
Mn	9.22	0.69	0.37	0.027	0.663	96
Acid	52.13	3.9	1.04	0.078	3.822	98
Alk	3.74	0.28				

50392 Unt (50392) of Little Toby Creek

The TMDL for this Unt of Little Toby Creek consists of a load allocation to all of the watershed area upstream of sample point 50392. The load allocation for this segment was computed using water-quality sample data collected at point 50392. The average flow, measured at the sampling point 50392 (0.06 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 50392 shows pH ranging between 6.4 and 6.8, pH not be addressed in this TMDL because this segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron and acidity because WQS were met and there was no acidity present, TMDLs for aluminum, iron and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point LT11.

Table C30. Load Allocations and Load Reductions for Point 50392

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.12	0.25	0.12	0.0	0
Fe	0.15	0.07	0.15	0.07	0.0	0
Mn	0.548	0.262	0.541	0.258	0.004	1.3
Acid	0.00	0.0	0.00	0.0	0.0	0
Alk	31.30	14.9				

50391 Mouth of Unt (50391) of Little Toby Creek

The TMDL for this Unt of Little Toby Creek consists of a load allocation to all of the watershed area upstream of sample point 50391. The load allocation for this segment was computed using water-quality sample data collected at point 50391. The average flow, measured at the sampling point 50391 (0.02 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 50391 shows pH ranging between 6.3 and 7.1, pH not be addressed in this TMDL because this segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron and acidity because WQS were met and there was little acidity present, TMDLs for aluminum, iron and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point LT11.

Table C31. Load Allocations and Load Reductions for Point 50391

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.04	0.25	0.04	0.0	0
Fe	0.15	0.02	0.15	0.02	0.0	0
Mn	5.28	0.76	0.26	0.04	0.72	95
Acid	9.20	1.3	9.20	1.3	0.0	0
Alk	34.36	5.0				

50387 Unt (50387) of Little Toby Creek

The TMDL for this segment of Little Toby Creek consists of a load allocation to all of the watershed area upstream of sample points 50387. The load allocation for this segment was

computed using water-quality sample data collected at point 50387. The average flow, measured at the sampling point 50387 (0.07 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 50387 shows pH ranging between 3.8 and 4.0; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for iron because WQS were met, a TMDL for iron is not necessary. Although a TMDL is not necessary, the measured loads are considered at the next downstream point LT11.

Table C32. Load Allocations and Load Reductions for Point 50387

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	9.24	5.7	0.46	0.28	5.42	95
Fe	0.15	0.09	0.15	0.09	0.0	0
Mn	39.20	24.1	0.39	0.24	23.86	99
Acid	148.72	91.5	0.45	0.27	91.23	99.7
Alk	1.04	0.64				

LT11 Little Toby Creek Upstream of Confluence with Brandy Camp Creek (50368)

The TMDL for this segment of Little Toby Creek consists of a load allocation to all of the watershed area between sample points LT91, 50403, MR15, LTU15, 50392, SR1,50391,50387 and LT11. The load allocation for this segment was computed using water-quality sample data collected at point LT11. The average flow, measured at the sampling point LT11 (13.57 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point LT11 shows pH ranging between 4.5 and 6.4; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Table C33. Load Allocations for Point LT11

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	2.27	256.5	0.29	33.3
Fe	2.11	238.6	0.25	28.6
Mn	4.06	459.7	0.53	59.8
Acid	29.77	3370.0	3.57	404.4
Alk	11.13	1260.4		

The calculated load reductions for all the loads that enter point LT11 must be accounted for in the calculated reductions at sample point LT11 shown in Table C34. A comparison of measured loads between points LT91, 50403, MR15, LTU12, 50392, SR1, 50391, 50387 and LT11 shows that there is no additional loading entering the segment for aluminum, iron and acidity. For aluminum, iron and acidity the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is additional loading entering the segment for manganese. The total segment manganese load is the sum of the upstream allocated load and any additional loading within the segment.

Table C34. Calculation of Load Reduction at Point LT11				
	Al	Fe	Mn	Acidity
Existing Load	256.5	238.6	459.7	3370.0
Difference in Existing Load between LT91, 50403, MR15, LTU15, 50392, SR1. 50391 & 50387	-83.7	-20.6	15.7	-701.0
Load tracked from LT91, 50403, MR15, LTU15, 50392, SR1. 50391 & 50387	16.8	36.7	37.2	268.2
Percent loss due to instream process	25	8	-	17
Percent load tracked from LT91, 50403, MR15, LTU15, 50392, SR1. 50391 & 50387	75	92	-	83
Total Load tracked from LT91, 50403, MR15, LTU15, 50392, SR1. 50391 & 50387	12.7	33.8	53.0	222.0
Allowable Load at LT11	33.3	28.6	59.8	404.41
Load Reduction at LT11	0.0	5.1	0.0	0.0
% Reduction required at LT11	0	15	0	0

BE18 Unt (50384) of Benninger Creek(50383)

The TMDL for this Unt of Benninger Creek consists of a load allocation to all of the watershed area upstream of sample point BE18. The load allocation for this segment was computed using water-quality sample data collected at point BE18. The average flow, measured at the sampling point BE18 (0.16 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BE18 shows pH ranging between 6.5 and 7.0; pH will be addressed in this TMDL. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron and manganese because WQS were met, TMDLs for aluminum, iron and manganese are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point BE1.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.34	0.25	0.34	0.0	0
Fe	0.37	0.49	0.37	0.49	0.0	0
Mn	0.12	0.16	0.12	0.16	0.0	0
Acid	9.13	12.3	2.65	3.6	8.7	71
Alk	15.95	21.5				

BE20 Most Upstream Sample Point on Benninger Creek (50383)

The TMDL for this segment of Benninger Creek consists of a load allocation to all of the watershed area upstream of sample point BE20. The load allocation for this segment was computed using water-quality sample data collected at point BE20. The average flow, measured at the sampling point BE20 (0.32 MGD), is used for these computations.

There currently is an entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BE20 shows pH ranging between 5.7 and 7.2, pH be addressed in this TMDL because of the mining impacts. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.33	0.88	0.13	0.34	0.53	61
Fe	0.41	1.09	0.17	0.46	0.63	58
Mn	4.96	13.2	0.20	0.53	12.66	96
Acid	5.05	13.4	3.48	9.3	4.1	31
Alk	28.55	75.9				

BE21 Unt (50385) of Benninger Creek

The TMDL for this segment of Benninger Creek consists of a load allocation to all of the watershed area upstream of sample point BE21. The load allocation for this segment was computed using water-quality sample data collected at point BE21. The average flow, measured at the sampling point BE21 (0.10 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BE21 shows pH ranging between 6.1 and 6.9; pH will be addressed in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum and iron because WQS were met, TMDLs for aluminum, and iron are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point BE1.

Table C37. Load Allocations and Load Reductions for Point BE21

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.21	0.25	0.21	0.0	0
Fe	0.15	0.12	0.15	0.12	0.0	0
Mn	2.00	1.7	0.34	0.28	1.37	83
Acid	15.47	12.7	4.33	3.6	9.1	72
Alk	15.76	13.0				

The Fairview Coal Co. SMP 24743008 has one permitted post mining treatment pond, SHTP that discharge to Benninger Creek. The waste load allocation for the discharge is calculated with average monthly permit limits and flow data. Included in the permit are limits for aluminum, iron and manganese.

Table C38. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Squab Holloe; SHTP			
Al	0.75	0.009	0.06
Fe	3.0	0.009	0.23
Mn	2.0	0.009	0.15

BE1 Mouth of Benninger Run

The TMDL for this segment of Benninger Run consists of a load allocation to all of the watershed area between sample points BE18, BE20, BE21 and BE1. The load allocation for this segment was computed using water-quality sample data collected at point BE1. The average flow, measured at the sampling point BE1 (0.99 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BE1 shows pH ranging between 6.3 and 6.9, pH will not be addressed in this TMDL because this segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron and acidity because WQS were met and there was no acidity present; TMDLs for aluminum, iron and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point BC24.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.25	2.1	0.25	2.1
Fe	0.15	1.2	0.15	1.2
Mn	0.26	2.1	0.23	1.9
Acid	0.00	0.0	0.00	0.0
Alk	24.95	205.8		

The calculated load reductions for all the loads that enter point BE1 must be accounted for in the calculated reductions at sample point BE1 shown in Table C40. A comparison of measured loads between points BE18, BE21, BE20 and BE1 shows that there is no additional loading entering the segment for iron, manganese and acidity. For iron, manganese and acidity the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is additional loading entering the segment for aluminum. The total segment aluminum load is the sum of the upstream allocated load and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	2.1	1.2	2.1	0.0
Difference in Existing Load between BE18, BE20, BE21 & BE1	0.6	-0.5	-12.9	-38.4
Load tracked from BE18, BE20 & BE21	0.9	1.1	1.0	16.4
Percent loss due to instream process	-	27	86	100
Percent load tracked from BE18, BE20 & BE21	-	73	14	0
Total Load tracked from BE18, BE20 & BE21	1.5	0.8	0.1	0.0
Allowable Load at BE1	2.1	1.2	1.9	0.0
Load Reduction at BE1	0.0	0.0	0.0	0.0
% Reduction required at BE1	0	0	0	0

BC29 Unt (50386) of Brandy Camp Creek (50368)

The TMDL for this Unt of Brandy Camp Creek consists of a load allocation to all of the watershed area upstream of the sample point. The load allocation for this segment was computed using water-quality sample data collected at point BC29. The average flow, measured at the sampling point BC29 (0.22 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BC29 shows pH ranging between 4.7 and 5.1; pH will be addressed in

this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron and manganese WQS were met, TMDLs for aluminum, iron and manganese are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point BC28.

Table C41. Load Allocations and Load Reductions for Point BC29

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.47	0.25	0.47	0.0	0
Fe	0.15	0.28	0.15	0.28	0.0	0
Mn	0.18	0.33	0.18	0.33	0.0	0
Acid	8.68	16.2	1.82	3.4	12.8	79
Alk	6.52	12.2				

BC30A Most Upstream Sample Point on Brandy Camp Creek

The TMDL for this segment of Brandy Camp Creek consists of a load allocation to all of the watershed area upstream of sample point BC30A. The load allocation for this segment was computed using water-quality sample data collected at point BC30A. The average flow, measured at the sampling point BC30A (0.36 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BC30A shows pH ranging between 4.6 and 5.0; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron acidity and because WQS were met and there was no acidity present; TMDLs for aluminum, iron and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point BC28.

Table C42. Load Allocations and Load Reductions for Point BC30A

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.75	0.25	0.75	0.0	0
Fe	0.15	0.45	0.15	0.45	0.0	0
Mn	0.26	0.78	0.26	0.78	0.0	0
Acid	9.40	28.4	2.26	6.8	21.6	76
Alk	6.36	19.2				

BC28 Brandy Camp Creek Upstream of Confluence with Benninger Creek

The TMDL for this segment of Brandy Camp Creek consists of a load allocation to all of the watershed area between sample points BC29, BC30A and BC28. The load allocation for this segment was computed using water-quality sample data collected at point BC28. The average flow, measured at the sampling point BC28 (0.69 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BC28 shows pH ranging between 4.7 and 5.3; pH will be addressed in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron acidity because WQS were met and there was little acidity present; TMDLs for aluminum and iron are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point BC24.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.25	1.4	0.25	1.4
Fe	0.15	0.9	0.15	0.9
Mn	0.24	1.4	0.24	1.4
Acid	8.72	50.0	1.7	9.5
Alk	6.84	39.2		

The calculated load reductions for all the loads that enter point BC28 must be accounted for in the calculated reductions at sample point BC29 shown in Table C44. A comparison of measured loads between point's BC29, BC30A and BC28 shows that there is additional loading entering the segment for aluminum iron, manganese and acidity. The total segment aluminum iron, manganese and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	1.4	0.9	1.4	50.0
Difference in Existing Load between BC29, BC30A & BC28	0.2	0.1	0.3	5.4
Load tracked from BC29 & BC30A	1.2	0.7	1.1	10.2
Percent loss due to instream process	-	-	-	-
Percent load tracked from BC29 & BC30A	-	-	-	-
Total Load tracked from BC29 & BC30A	1.4	0.9	1.4	15.6
Allowable Load at BC28	1.4	0.9	1.4	9.5
Load Reduction at BC28	0.0	0.0	0.0	6.1
% Reduction required at BC28	0	0	0	39

BC24 Brandy Camp Creek Upstream of Confluence with Unt (50372) Brandy Camp Creek

The TMDL for this segment of Brandy Camp Creek consists of a load allocation to all of the watershed area between sample points B21, BC28 and BC24. The load allocation for this segment was computed using water-quality sample data collected at point BC24. The average flow, measured at the sampling point BC24 (3.66 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BC24 shows pH ranging between 6.2 and 6.8; pH will be addressed in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron and manganese because WQS were met; TMDLs for aluminum, iron and manganese are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point BC21.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.25	7.7	0.25	7.7
Fe	0.19	5.9	0.19	5.9
Mn	0.42	12.8	0.42	12.8
Acid	7.07	216.9	4.1	125.8
Alk	22.30	684.4		

The calculated load reductions for all the loads that enter point BC24 must be accounted for in the calculated reductions at sample point BC24 shown in Table C46. A comparison of measured loads between point's BE1, BC28 and BC24 shows that there is additional loading entering the

segment for aluminum iron, manganese and acidity. The total segment aluminum iron, manganese and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	7.7	5.9	12.8	216.9
Difference in Existing Load between BE1, BC28 & BC24	4.2	3.8	9.3	166.9
Load tracked from BE1 & BC28	3.5	2.1	3.3	9.5
Percent loss due to instream process	-	-	-	-
Percent load tracked from BE1 & BC28	-	-	-	-
Total Load tracked from BE1 & BC28	7.7	5.9	12.6	176.4
Allowable Load at BC24	7.7	5.9	12.8	125.8
Load Reduction at BC24	0.0	0.0	0.0	50.6
% Reduction required at BC24	0	0	0	29

BC22A Unt (50372) of Brandy Camp Creek

The TMDL for this Unt of Brandy Camp Creek consists of a load allocation to all of the watershed area upstream of sample point BC22A. The load allocation for this segment was computed using water-quality sample data collected at point BC22A. The average flow, measured at the sampling point BC22A (0.31 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BC22A shows pH ranging between 4.6 and 5.7; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	8.76	22.5	0.26	0.7	21.8	97
Fe	4.51	11.6	0.50	1.3	10.3	89
Mn	4.73	12.2	0.38	1.0	11.2	92
Acid	42.16	108.3	2.11	5.4	102.8	95
Alk	11.48	29.5				

A waste load allocation for future mining was included for this segment of Little Toby Creek (BC21) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

The Tamburlin Brothers Coal Co., Inc. SMP 24980105, Castina Mine has five permitted treatment ponds, C1, C2, C3, C4 and C5 that discharge to Brandy Camp Creek. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are two permitted pits in the permit with a total combined pit area of 900,000 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for C3 and C5 are evaluated at point BC21.

Table C49. Waste Load Allocations for Permitted Discharges			
Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Castina Mine; C3, C5			
Al	0.75	0.045	0.28
Fe	3.0	0.045	1.12
Mn	2.0	0.045	0.74

BC21 Brandy Camp Creek Downstream of Sample Point BC33At

The TMDL for this segment of Brandy Camp Creek consists of a load allocation to all of the watershed area between sample points BC24, BC22A and BC21. The load allocation for this segment was computed using water-quality sample data collected at point BC21. The average flow, measured at the sampling point BC21 (7.05 MGD), is used for these computations.

Table C48. Waste Load Allocations for future mining operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 3			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 4			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 5			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

Table C50. Load Allocations at Point BC21				
Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	1.11	65.0	0.45	26.6
Fe	6.73	395.7	0.81	47.5
Mn	1.86	109.4	0.63	37.2
Acid	18.80	1105.3	5.8	342.7
Alk	21.16	1244.1		

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BC21 shows pH ranging between 6.1 and 6.5; pH will be addressed in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

The calculated load reductions for all the loads that enter point BC21 must be accounted for in the calculated reductions at sample point BC21 shown in Table C51. A comparison of measured loads between point's BC24, BC22A and BC21 shows that there is additional loading entering the segment for aluminum iron, manganese and acidity. The total segment aluminum iron, manganese and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	65.0	395.7	109.4	1105.3
Difference in Existing Load between BC24, BC22A & BC2	34.8	378.3	84.4	780.2
Load tracked from BC24 & BC22A	8.3	7.1	13.8	131.2
Percent loss due to instream process	-	-	-	-
Percent load tracked from BC24 & BC22A	-	-	-	-
Total Load tracked from BC24 & BC22A	43.1	385.4	98.2	911.4
Allowable Load at BC21	26.6	47.5	37.2	342.7
Load Reduction at BC21	16.5	337.9	61.0	568.7
% Reduction required at BC21	38	88	62	62

The Tamburlin Brothers Coal Co., Inc. SMP 24980105, Castina Mine has three permitted treatment ponds, C1, C2 and C4 that discharge to Unt 50371 of Brandy Camp Creek. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. Included in the permit are limits for aluminum, iron and manganese. Mining has progressed to the use of C4 and C5 treatment facilities. When treatment facility C4 is used a pit size of 900 ft X 200 ft for one pit was used in the Method to Quantify Treatment Pond Pollutant Load calculation and are shown in Table 5. Additionally an iron criteria of 1.5 was used.

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Castina Mine C1, C2 & C4			
Al	0.75	0.02	0.11
Fe	3.0	0.02	0.22
Mn	2.0	0.02	0.3

50371 Unt (50371) of Brandy Camp Creek

The TMDL for this Unt of Brandy Camp Creek consists of a load allocation to all of the watershed area upstream of sample point 50371. The load allocation for this segment was computed using water-quality sample data collected at point 50371. The average flow, measured at the sampling point 50371 (0.12 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 50371 shows pH ranging between 7.3 and 8.1; pH will not be addressed in this TMDL because the Unt is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.82	0.83	0.11	0.11	0.72	87
Fe	0.84	0.85	0.23	0.23	0.62	73
Mn	1.16	1.2	0.56	0.57	0.61	52
Acid	0.00	0.0	0.00	0.0	0.0	0
Alk	104.64	106.1				

BCU12A Unt (503769 of Brandy Camp Creek

The TMDL for this Unt of Brandy Camp Creek consists of a load allocation to all of the watershed area upstream of sample point BCU12A. The load allocation for this segment was computed using water-quality sample data collected at point BCU12A. The average flow, measured at the sampling point BCU12A (0.17 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BCU12A shows pH ranging between 8.1 and 8.2; pH will not be addressed in this TMDL because the Unt is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, manganese and acidity because WQS were met and there was no acidity present; TMDLs for aluminum, manganese and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point BC10.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.36	0.25	0.36	0.0	0
Fe	0.60	0.86	0.45	0.63	0.22	26
Mn	0.30	0.43	0.30	0.43	0.0	0
Acid	0.00	0.00	0.0	0.0	0.0	0
Alk	262.2	373.1				

A waste load allocation for future mining was included for this segment of Little Toby Creek (BC10) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

The Fairview Coal Co. SMP 24980106, Oyster Run Mine has four permitted treatment ponds, ORTP1, ORTP2, ORTP3 and ORTP4 that discharge to Brandy Camp Creek. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are three permitted pits in the permit with a total combined pit area of 136,300 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for ORTP1 is evaluated at point BC10 and ORTP2, ORTP3 and ORTP4 at point JR1.

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Oyster Run Mine; ORTP1			
Al	0.75	0.013	0.08
Fe	3.0	0.013	0.34
Mn	2.0	0.013	0.23

**BC10 Mouth of Brandy Camp Creek
Upstream of Confluence with Little Toby
Creek**

The TMDL for this segment of Brandy Camp Creek consists of a load allocation to all of the watershed area between sample points BC21, 50371, BCU12A, BC21 and BC10. The load allocation for this segment was computed using water-quality sample data collected at point BC10. The average flow, measured at the sampling point BC10 (10.55 MGD), is used for these computations.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	1.19	104.5	0.23	19.9
Fe	5.66	497.8	0.51	44.8
Mn	2.59	228.0	0.34	29.6
Acid	21.95	1930.8	4.6	405.5
Alk	18.86	1659.0		

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BC10 shows pH ranging between 4.1 and 6.8; pH will be addressed in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 3			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 4			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 5			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

The calculated load reductions for all the loads that enter point BC10 must be accounted for in the calculated reductions at sample point BC10 shown in Table C58. A comparison of measured loads between point's BC21, 50371, BC12A and BC10 shows that there is additional loading entering the segment for aluminum iron, manganese and acidity. The total segment aluminum iron, manganese and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	104.5	497.8	228.0	1930.8
Difference in Existing Load between BC21, 50371, BC12A & BC10	38.4	100.4	117.0	825.4
Load tracked from BC21, 50371 & BC12A	27.1	48.3	38.2	342.7
Percent loss due to instream process	-	-	-	-
Percent load tracked from BC21, 50371 & BC12A	-	-	-	-
Total Load tracked from BC21, 50371 & BC12A	65.5	148.8	155.2	1168.1
Allowable Load at BC10	19.9	44.8	29.6	405.5
Load Reduction at BC10	45.6	104.0	125.6	762.6
% Reduction required at BC10	70	70	81	65

A waste load allocation for future mining was included for this segment of Little Toby Creek (LT10) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)	Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1				Future Operation 4			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 2				Future Operation 5			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 3							
Al	0.75	0.090	0.56				
Fe	3.0	0.090	2.25				
Mn	2.0	0.090	1.50				

LT10 Little Toby Creek Downstream of Confluence with Brandy Camp Creek

The TMDL for this segment of Little Toby Creek consists of a load allocation to all of the watershed area between sample points LT11, BC10 and LT10. The load allocation for this segment was computed using water-quality sample data collected at point LT10. The average flow, measured at the sampling point LT10 (26.71 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point BC10 shows pH ranging between 4.7 and 7.2; pH will be addressed in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	1.74	388.4	0.26	58.3
Fe	3.22	716.6	0.55	121.8
Mn	3.32	740.5	0.40	88.9
Acid	26.00	5793.1	4.2	926.9
Alk	14.03	3126.6		

The calculated load reductions for all the loads that enter point LT10 must be accounted for in the calculated reductions at sample point LT10 shown in Table C61. A comparison of measured loads between point's LT11, BC10 and LT10 shows that there is no additional loading entering the segment for iron. For iron the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is additional loading entering the segment for aluminum, manganese and acidity. The total segment aluminum, manganese and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	388.4	716.6	740.5	5793.1
Difference in Existing Load between LT11, BC10 & LT10	27.4	-19.8	52.8	492.3
Load tracked from LT11 & BC10	53.2	73.4	89.4	809.9
Percent loss due to instream process	-	3	-	-
Percent load tracked from LT11 & BC10	-	97	-	-
Total Load tracked from LT11 & BC10	80.6	71.5	142.2	1302.1
Allowable Load at LT10	58.3	121.8	88.9	926.9
Load Reduction at LT10	22.4	0.0	53.3	375.2
% Reduction required at LT10	28	0	38	29

5 Unt (50367) of Johnson Run

The TMDL for this Unt of Johnson Run consists of a load allocation to all of the watershed area upstream of sample point 5. The load allocation for this segment was computed using water-quality sample data collected at point 5. The average flow, measured at the sampling point 5 (0.02 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 5 shows pH ranging between 4.7 and 6.3; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.64	0.09	0.25	0.03	0.05	61
Fe	0.69	0.09	0.40	0.05	0.04	42
Mn	2.35	0.32	0.68	0.09	0.23	71
Acid	26.27	3.55	2.1	0.28	3.27	92
Alk	8.60	1.16				

6A Johnson Run (50364) Downstream of Confluence with Unt 50367)

The TMDL for this segment of Johnson Run consists of a load allocation to all of the watershed area between sample points 5 and 6A. The load allocation for this segment was computed using water-quality sample data collected at point 6A. The average flow, measured at the sampling point 6A (0.41 MGD), is used for these computations.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.25	0.86	0.25	0.86
Fe	1.64	5.6	0.49	1.7
Mn	7.00	24.0	0.42	1.4
Acid	21.87	75.0	3.9	13.5
Alk	19.33	66.3		

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 6A shows pH ranging between 6.3 and 6.6; pH will be addressed in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

The calculated load reductions for all the loads that enter point 6A must be accounted for in the calculated reductions at sample point 6A shown in Table C64. A comparison of measured loads between point's 5 and 6A shows that there is additional loading entering the segment for aluminum, iron, manganese and acidity. The total segment aluminum, iron, manganese and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

Table C64. Calculation of Load Reduction at Point 6A				
	Al	Fe	Mn	Acidity
Existing Load	0.86	5.6	24.0	75.0
Difference in Existing Load between 5 & 6A	0.8	5.5	23.7	71.4
Load tracked from 5	0.03	0.05	0.09	0.28
Percent loss due to instream process	-	-	-	-
Percent load tracked from 5	-	-	-	-
Total Load tracked from 5	0.8	5.6	23.8	71.7
Allowable Load at 6A	0.9	1.7	1.4	13.5
Load Reduction at 6A	0.0	3.9	22.4	58.2
% Reduction required at 6A	0	70	94	81

Waste Load Allocations– Permitted Discharges

The Energy Resources, Inc. SMP 24010101, No. 33 Mine has seven permitted treatment ponds, H33TP1, H33TP2, H33TP3, H33TP4, H33TP5, H33TP6 and H33TP7. The waste load allocation for the discharge is calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are two permitted pits in the permit with a total pit area of 136,425 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for H33TP3, H33TP4, H33TP5 and H33TP6 are evaluated at point JR1 and H33TP1, H33TP2 and H33TP7 at point T4.

The Aimfire Mining Co., LLC; SMP 24030103, Aimfire 127 Mine has seven permitted treatment ponds, ATP1, ATP2, ATP3, ATP4, ATP5, ATP6 and ATP7. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are three permitted pits in the permit with a total combined pit area of 105,750 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for ATP1 and ATP7 are evaluated at point LT402 and ATP2, ATP3, ATP4, ATP5 and ATP6 at point JR1.

The Fairview Coal Co.. SMP 24980106, Oyster Run Mine has four permitted treatment ponds, ORTP1, ORTP2, ORTP3 and ORTP4. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are three permitted pits in the permit with a total combined pit area of 136,300 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for ORTP1 is evaluated at point BC10 and ORTP2, ORTP3 and ORTP4 at point JR1.

Table C65. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
No. 33 Mine; H22TP3, H33TP4, H33TP5 & HEETP6			
Al	0.75	0.014	0.08
Fe	3.0	0.014	0.34
Mn	2.0	0.014	0.23
Aimfire 127 Mine; ATP2, ATP3, ATP4 ATP5 and ATP6			
Al	0.75	0.010	0.07
Fe	3.0	0.010	0.26
Mn	2.0	0.010	0.17
Oyster Run Mine; ORTP2, ORTP3 & ORTP4			
Al	0.75	0.013	0.08
Fe	3.0	0.013	0.34
Mn	2.0	0.013	0.23

JR1 Mouth of Johnson Run

The TMDL for this segment of Johnson Run consists of a load allocation to all of the watershed area between sample points 6A and JR1. The load allocation for this segment was computed using water-quality sample data collected at point JR1. The average flow, measured at the sampling point JR1 (1.36 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point JR1 shows pH ranging between 7.4 and 8.0; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Table C66. Load Allocations at Point JR1				
Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.25	2.9	0.25	2.9
Fe	0.25	2.8	0.25	2.8
Mn	0.79	9.0	0.32	3.6
Acid	0.00	0.0	0.0	0.0
Alk	82.53	939.3		

The calculated load reductions for all the loads that enter point JR1 must be accounted for in the calculated reductions at sample point JR1 shown in Table C67. A comparison of measured loads between point's 6A and JR1 shows that there is no additional loading entering the segment for iron and manganese. For iron and manganese the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is additional loading entering the segment for aluminum and acidity. The total segment aluminum and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	2.9	2.8	9.0	0.0
Difference in Existing Load between 6A & JR1	2.0	-2.8	-15.0	-75.0
Load tracked from 6A	0.9	1.7	1.4	13.5
Percent loss due to instream process	-	50	63	100
Percent load tracked from 6A	-	50	37	0
Total Load tracked from 6A	2.9	0.9	0.5	0.0
Allowable Load at JR1	2.9	2.8	3.6	0.0
Load Reduction at JR1	0.0	0.0	0.0	0.0
% Reduction required at JR1	0	0	0	0

A waste load allocation for future mining was included for this segment of Little Toby Creek (LT404) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)	Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1				Future Operation 4			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 2				Future Operation 5			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 3							
Al	0.75	0.090	0.56				
Fe	3.0	0.090	2.25				
Mn	2.0	0.090	1.50				

LT404 Little Toby Creek Downstream of Johnson Run

The TMDL for this segment of Little Toby Creek consists of a load allocation to all of the watershed area between sample points LT10, JR1 and LT404. The load allocation for this segment was computed using water-quality sample data collected at point LT404. The average flow, measured at the sampling point LT404 (21.98 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point LT404 shows pH ranging between 4.6 and 6.8; pH will be addressed in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	1.43	262.3	0.26	47.2
Fe	2.75	504.0	0.58	105.8
Mn	3.41	624.4	0.44	81.2
Acid	16.72	3064.6	3.51	643.6
Alk	14.08	2581.3		

The calculated load reductions for all the loads that enter point LT404 must be accounted for in the calculated reductions at sample point LT404 shown in Table C70. A comparison of measured loads between point's LT10, JR1 and LT404 shows that there is no additional loading entering the segment for aluminum, iron, manganese and acidity. For aluminum, iron, manganese and acidity the percent decrease in existing loads are applied to the allowable upstream loads entering the segment.

	Al	Fe	Mn	Acidity
Existing Load	262.3	504.0	624.4	3064.6
Difference in Existing Load between LT10, JR1 & LT404	-129.0	-215.4	-125.1	-2728.5
Load tracked from LT10, JR1 & LT404	61.1	124.7	92.5	926.9
Percent loss due to instream process	33	30	17	47
Percent load tracked from LT10 & JR1	67	70	83	53
Total Load tracked from LT10 & JR1	41.0	87.3	77.0	490.3
Allowable Load at LT404	47.2	105.8	81.2	643.6
Load Reduction at LT404	0.0	0.0	0.0	0.0
% Reduction required at LT404	0	0	0	0

50354 Unt (50354) of Little Toby Creek

The TMDL for this Unt of Little TobyCreek consists of a load allocation to all of the watershed area upstream of sample point 50354. The load allocation for this segment was computed using water-quality sample data collected at point 50354. The average flow, measured at the sampling point 50354 (0.04 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 50354 shows pH ranging between 7.1 and 7.8; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron, manganese and acidity because WQS were met and there was no acidity present, TMDLs for aluminum, iron, manganese and acidity are not

necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point LT402.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.08	0.25	0.08	0.0	0
Fe	0.21	0.07	0.21	0.07	0.0	0
Mn	0.25	0.08	0.25	0.08	0.0	0
Acid	0.00	0.00	0.00	0.0	0.0	0
Alk	57.00	18.5				

22 Most Upstream Sample Point on Mead Run (50340)

The TMDL for this segment of Mead Run consists of a load allocation to all of the watershed area upstream of sample point 22. The load allocation for this segment was computed using water-quality sample data collected at point 22. The average flow, measured at the sampling point 22 (0.14 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 22 shows pH ranging between 4.3 and 4.8; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for iron because WQS were met, a TMDL for iron are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point LT402.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	1.18	1.35	0.28	0.32	1.03	76
Fe	0.20	0.23	0.20	0.23	0.0	0
Mn	2.79	3.2	0.28	0.32	2.87	90
Acid	26.84	30.8	1.34	1.5	29.21	95
Alk	6.56	7.5				

21 Mouth of Unt (50352) of Mead Run Upstream of Confluence with Mead Run

The TMDL for this Unt of Mead Run consists of a load allocation to all of the watershed area upstream of sample point 21. The load allocation for this segment was computed using water-quality sample data collected at point 21. The average flow, measured at the sampling point 21 (0.13 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 21 shows pH ranging between 4.2 and 4.3; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for iron because WQS were met, a TMDL for iron is not necessary. Although a TMDL is not necessary, the measured load is considered at the next downstream point LT402.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	5.27	5.67	0.47	0.51	5.16	91
Fe	0.15	0.16	0.15	0.16	0.0	0
Mn	11.98	12.9	0.60	0.64	12.25	95
Acid	70.40	75.8	2.11	2.3	73.48	97
Alk	5.12	5.5				

16 Mead Run Upstream with Confluence with Unts (50348 & 50349)

The TMDL for this segment of Mead Run consists of a load allocation to all of the watershed area between sample points 21, 22 and 16. The load allocation for this segment was computed using water-quality sample data collected at point 16. The average flow, measured at the sampling point 16 (0.45 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 16 shows pH ranging between 4.3 and 6.3; pH will be addressed in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	1.19	4.5	0.24	0.89
Fe	0.15	0.56	0.15	0.56
Mn	3.70	13.8	0.37	1.4
Acid	29.20	108.9	2.04	7.6
Alk	7.28	27.1		

Allocations were not calculated for iron because WQS were met, a TMDL for iron are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 15.

The calculated load reductions for all the loads that enter point 16 must be accounted for in the calculated reductions at sample point 16 shown in Table C75. A comparison of measured loads between point's 22, 21 and 16 shows that there is additional loading entering the segment for aluminum, iron, manganese and acidity. The total segment aluminum, iron, manganese and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	4.5	0.6	13.8	108.9
Difference in Existing Load between 22, 21 & 16	8.8	0.5	23.5	153.9
Load tracked from 22 & 21	0.8	0.4	1.0	3.8
Percent loss due to instream process	-	-	-	-
Percent load tracked from 22 & 21	-	-	-	-
Total Load tracked from 22 & 21	9.6	0.9	24.5	157.7
Allowable Load at 16	0.9	0.6	1.4	7.6
Load Reduction at 16	8.7	0.3	23.1	150.0
% Reduction required at 16	91	37	94	95

19 Unt (50350) Mead Run Downstream of Confluence with Unt (50351)

The TMDL for this segment of Mead Run consists of a load allocation to all of the watershed area upstream of sample points 19. The load allocation for this segment was computed using water-quality sample data collected at point 19. The average flow, measured at the sampling point 19 (0.18 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 19 shows pH ranging between 4.1 and 4.3; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for iron because WQS were met, a TMDL for iron are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 15.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	3.06	4.5	0.37	0.54	3.96	88
Fe	0.15	0.22	0.15	0.22	0.0	0
Mn	6.73	9.9	0.81	1.2	8.7	88
Acid	45.76	67.1	2.3	3.4	63.7	95
Alk	4.80	7.0				

The Energy Resources, Inc. SMP 249880103 No. 21 Mine post mining discharge has one permitted treatment pond, H21TP. The waste load allocation for the discharge was calculated with average monthly permit limits and flow data. Included in the permit are limits for aluminum, iron and manganese. The WLAs for H21TP is evaluated at point 17.

Table C77. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
No. 21 Mine post mining discharge; H21TP			
Al	0.75	0.04	0.23
Fe	2.4	0.04	0.72
Mn	2.0	0.04	0.60

17 Mouth of Unt (50350) Mead Run Upstream of Confluence with Mead Run

The TMDL for this segment of Mead Run consists of a load allocation to all of the watershed area between sample points 19 and 17. The load allocation for this segment was computed using water-quality sample data collected at point 17. The average flow, measured at the sampling point 17 (0.57 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 17 shows pH ranging between 4.9 and 7.9; pH will be addressed in this TMDL because of the mining impairment. The method and rationale for addressing pH is contained in Attachment B.

Table C78. Load Allocations at Point 17				
Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.72	3.5	0.17	0.8
Fe	0.15	0.72	0.15	0.72
Mn	2.09	10.0	0.17	0.8
Acid	16.25	77.7	6.5	31.1
Alk	25.04	119.7		

The calculated load reductions for all the loads that enter point 17 must be accounted for in the calculated reductions at sample point 17 shown in Table C79. A comparison of measured loads between point's 19 and 17 shows that there is no additional loading entering the segment for aluminum. For aluminum the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is additional loading entering the segment for iron, manganese and acidity. The total segment iron, manganese and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	3.5	0.7	10.0	77.7
Difference in Existing Load between 19 & 17	-1.0	0.5	0.1	10.6
Load tracked from 19	0.5	0.2	1.2	3.4
Percent loss due to instream process	23	-	-	-
Percent load tracked from 19	77	-	-	-
Total Load tracked from 19	0.4	0.7	1.3	14.0
Allowable Load at 17	0.8	0.7	0.8	31.1
Load Reduction at 17	0.0	0.0	0.5	0.0
% Reduction required at 17	0	0	38	0

18 Headwaters of Unt (50348) Mead Run

The TMDL for this segment of Mead Run consists of a load allocation to all of the watershed area upstream of sample points 18. The load allocation for this segment was computed using water-quality sample data collected at point 18. The average flow, measured at the sampling point 18 (0.28 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 18 shows pH ranging between 6.3 and 6.7; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum and iron because WQS were met, a TMDL for aluminum and are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 15.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.58	0.25	0.58	0.0	0
Fe	0.32	0.75	0.32	0.75	0.0	0
Mn	1.05	2.5	0.24	0.56	1.94	77
Acid	20.20	47.1	2.8	6.6	40.5	86
Alk	13.00	30.3				

15 Mead Run Downstream fo Sample Points 17 and 16

The TMDL for this segment of Mead Run consists of a load allocation to all of the watershed area between sample points 16, 17, 18 and 15. The load allocation for this segment was computed using water-quality sample data collected at point 15. The average flow, measured at the sampling point 15 (0.09 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 15 shows pH ranging between 4.1 and 8.0; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	1.20	0.9	0.13	0.1
Fe	0.33	0.26	0.33	0.26
Mn	3.28	2.5	0.16	0.13
Acid	0.00	0.0	0.0	0.0
Alk	63.84	49.1		

Allocations were not calculated for acidity because there was no acidity present, a TMDL for acidity is not necessary. Although a TMDL is not necessary, the measured loads are considered at the next downstream point T2.

The calculated load reductions for all the loads that enter point 15 must be accounted for in the calculated reductions at sample point 15 shown in Table C82. A comparison of measured loads between point's 16, 17, 18 and 15 shows that there is no additional loading entering the segment for aluminum, iron, manganese and acidity. For aluminum, iron, manganese and acidity the percent decrease in existing loads are applied to the allowable upstream loads entering the segment.

	Al	Fe	Mn	Acidity
Existing Load	0.9	0.26	2.5	0.0
Difference in Existing Load between 16, 17, 18 & 15	-7.6	-1.8	-23.7	-233.6
Load tracked from 16, 17 & 18	2.3	2.0	2.7	45.3
Percent loss due to instream process	89	87	90	100
Percent load tracked from 16, 17 & 18	11	13	10	0
Total Load tracked from 16, 17 & 18	0.25	0.26	0.26	0.0
Allowable Load at 15	0.1	0.26	0.13	0.0
Load Reduction at 15	0.14	0.0	0.14	0.0
% Reduction required at 15	59	0	52	0

5A Unt to Mead Run Downstream of Sample Point 14 (tributary not included in stream file)

The TMDL for this segment of Mead Run consists of a load allocation to all of the watershed area upstream of sample points 5A. The load allocation for this segment was computed using water-quality sample data collected at point 5A. The average flow, measured at the sampling point 5A (0.29 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 5A shows pH ranging between 6.9 and 7.8; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum and acidity because WQS were met and there was no acidity present, TMDLs for aluminum and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point T2.

Parameter	Measured Sample Data		Allowable			
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day	Load Reduction	% Reduction
Al	0.25	0.60	0.25	0.60	0.0	0
Fe	0.63	1.5	0.33	0.8	0.7	47
Mn	0.25	0.59	0.13	0.32	0.27	46
Acid	0.00	0.0	0.0	0.0	0.0	0
Alk	65.08	156.5				

A waste load allocation for future mining was included for this segment of Mead Run (T1) allowing for two operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

T1 Mead Run Upstream of Confluence with Unt 50347)

The TMDL for this segment of Mead Run consists of a load allocation to all of the watershed area upstream of sample points T1. The load allocation for this segment was computed using water-quality sample data collected at point T1. The average flow, measured at the sampling point T1 (1.55 MGD), is used for these computations.

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point T1 shows pH ranging between 6.1 and 6.7; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum and iron because WQS were met, TMDLs for aluminum and iron are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point T2.

	Al	Fe	Mn	Acidity
Existing Load	3.2	6.4	33.9	452.7
Difference in Existing Load between 15, 5A & T1	1.7	4.6	30.7	452.7
Load tracked from 15 & 5A	0.7	1.1	0.4	0.0
Percent loss due to instream process	-	-	-	-
Percent load tracked from 15 & 5A	-	-	-	-
Total Load tracked from 15 & 5A	2.4	5.6	31.2	452.7
Allowable Load at T1	3.2	6.4	4.4	194.7
Load Reduction at T1	0.00	0.0	26.79	258.1
% Reduction required at T1	0	0	86	57

The Energy Resources, Inc. SMP 24010101, No. 33 Mine has seven permitted treatment ponds, H33TP1, H33TP2, H33TP3, H33TP4, H33TP5, H33TP6 and H33TP7. The waste load allocation for the discharge is calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are two permitted pits in the permit with a total pit area of 136,425 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for H33TP3, H33TP4, H33TP5 and H33TP6 are evaluated at point JR1 and H33TP1, H33TP2 and H33TP7 at point T4.

Table C86. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
No. 33 H33TP1, H33TP2 and H33TP7			
Al	0.75	0.014	0.08
Fe	3.0	0.014	0.34
Mn	2.0	0.014	0.23

T4 Mouth of Unt 50347) Mead Run

The TMDL for this tributary of Mead Run consists of a load allocation to all of the watershed area upstream of sample points T4. The load allocation for this segment was computed using water-quality sample data collected at point T4. The average flow, measured at the sampling point T4 (0.20 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point T4 shows pH ranging between 6.9 and 7.5; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for acidity because there was no acidity present, a TMDL for acidity is not necessary. Although a TMDL is not necessary, the measured loads are considered at the next downstream point T2.

Parameter	Measured Sample Data		Allowable			
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day	Load Reduction	% Reduction
Al	1.35	2.27	0.12	0.20	2.07	91
Fe	1.26	2.11	0.34	0.57	1.54	73
Mn	0.78	1.32	0.13	0.22	1.09	83
Acid	0.00	0.0	0.0	0.0	0.0	0
Alk	80.12	134.5				

A waste load allocation for future mining was included for this segment of Mead Run (T2) allowing for one operation with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

**T2 Mead Run Downstream of Unt (50344)
Mead Run**

The TMDL for this segment of Mead Run consists of a load allocation to all of the watershed area between sample points 5A, T1, T4 and T2. The load allocation for this segment was computed using water-quality sample data collected at point T2. The average flow, measured at the sampling point T2 (2.37 MGD), is used for these computations.

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point T2 shows pH ranging between 6.5 and 7.2; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.25	4.9	0.25	4.9
Fe	0.19	3.7	0.19	3.7
Mn	0.87	17.2	0.26	5.2
Acid	15.10	298.0	10.87	214.6
Alk	33.40	659.1		

Allocations were not calculated for aluminum and iron because WQS were met, TMDLs for aluminum and iron are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 12.

The calculated load reductions for all the loads that enter point T2 must be accounted for in the calculated reductions at sample point T2 shown in Table C90. A comparison of measured loads between point's 5A, T1, T4 and T2 shows that there is no additional loading entering the segment for aluminum, iron, manganese and acidity. For aluminum, iron, manganese and acidity the percent decrease in existing loads are applied to the allowable upstream loads entering the segment.

	Al	Fe	Mn	Acidity
Existing Load	4.9	3.7	17.2	298.0
Difference in Existing Load between T1 & T4	-0.6	-4.8	-18.0	-154.8
Load tracked from T1 & T4	3.4	6.9	4.6	194.7
Percent loss due to instream process	10	57	51	34
Percent load tracked from T1 & T4	90	43	49	66
Total Load tracked from T1 & T4	3.1	3.0	2.3	128.1
Allowable Load at T2	4.9	3.7	5.2	214.6
Load Reduction at T2	0.0	0.0	0.0	0.0
% Reduction required at T2	0	0	0	0

11 Mouth of Unt (50342) Mead Run (Local name Hipple Run)

The TMDL for this unnamed tributary of Mead Run consists of a load allocation to all of the watershed area upstream of sample points 11. The load allocation for this segment was computed using water-quality sample data collected at point 11. The average flow, measured at the sampling point 11 (0.25 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 11 shows pH ranging between 6.9 and 7.9; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron and acidity because WQS are met and there was no acidity present, TMDLs for aluminum, iron and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 12.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.52	0.25	0.52	0.0	0
Fe	0.33	0.68	0.33	0.68	0.0	0
Mn	0.37	0.76	0.17	0.34	0.42	55
Acid	0.00	0.0	0.0	0.0	0.0	0
Alk	79.36	164.1				

A waste load allocation for future mining was included for this segment of Mead Run (12) allowing for two operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

**12 Mead Run Downstream of Unt (50342)
Mead Run**

The TMDL for this segment of Mead Run consists of a load allocation to all of the watershed area between sample points T2, 11 and 12. The load allocation for this segment was computed using water-quality sample data collected at point 12. The average flow, measured at the sampling point 12 (3.00 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 12 shows pH ranging between 6.6 and 7.3; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron and acidity because WQS were met and there was no acidity present, TMDLs for aluminum, iron and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point MR01.

Table C92. Waste Load Allocations for future mining operations

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

Table C93. Load Allocations at Point 12

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.25	6.3	0.25	6.3
Fe	0.24	6.1	0.24	6.1
Mn	0.76	18.9	0.20	5.1
Acid	0.00	0.0	0.00	0.0
Alk	35.95	898.7		

The calculated load reductions for all the loads that enter point 12 must be accounted for in the calculated reductions at sample point 12 shown in Table C94. A comparison of measured loads between points's T2, 11 and 12 shows that there is no additional loading entering the segment for acidity. For acidity the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is additional loading entering the segment for aluminum, iron and manganese. The total segment aluminum, iron and manganese loads are the sum of the upstream allocated load and any additional loading within the segment.

	Al	Fe	Mn	Acidity
Existing Load	6.3	6.1	18.9	0.0
Difference in Existing Load between T2, 11 & 12	0.8	1.7	1.0	-298.0
Load tracked from T2 & 11	5.5	4.3	5.5	214.5
Percent loss due to instream process	-	-	-	100
Percent load tracked from T2 & 11	-	-	-	0
Total Load tracked from T2 & 11	6.2	6.1	6.5	0.0
Allowable Load at 12	6.3	6.1	5.1	0.0
Load Reduction at 12	0.0	0.0	1.4	0.0
% Reduction required at 12	0	0	21	0

A waste load allocation for future mining was included for this segment of Mead Run (MR01) allowing for two operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

MR01 Mouth of Mead Run Upstream of Confluence with Little Toby Creek

The TMDL for this segment of Mead Run consists of a load allocation to all of the watershed area between sample points 12 and MR01. The load allocation for this segment was computed using water-quality sample data collected at point MR01. The average flow, measured at the sampling point MR01 (3.37 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point MR01 shows pH ranging between 6.6 and 7.4; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, manganese and acidity because WQS were met and there was no acidity present, TMDLs for aluminum, manganese and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point LT402.

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.25	7.0	0.25	7.0
Fe	0.45	12.7	0.38	10.7
Mn	0.18	5.1	0.18	5.1
Acid	0.00	0.0	0.00	0.0
Alk	45.75	1285.4		

The calculated load reductions for all the loads that enter point MR01 must be accounted for in the calculated reductions at sample point MR01 shown in Table C97. A comparison of measured loads between point's 12 and MR01 shows that there is no additional loading entering the segment for manganese. For manganese the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is additional loading entering the segment for aluminum, iron and acidity. The total segment aluminum, iron and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

Table C97. Calculation of Load Reduction at Point MR01				
	Al	Fe	Mn	Acidity
Existing Load	7.0	12.7	5.1	0.0
Difference in Existing Load between 12 & MR01	0.8	6.7	-13.8	0.0
Load tracked from 12	6.2	6.1	5.1	0.0
Percent loss due to instream process	-	-	73	-
Percent load tracked from 12	-	-	27	-
Total Load tracked from 12	7.0	12.7	1.4	0.0
Allowable Load at MR01	7.0	10.7	5.1	0.0
Load Reduction at MR01	0.0	2.0	0.0	0.0
% Reduction required at MR01	0	16	0	0

A waste load allocation for future mining was included for this segment of Little Toby Creek (LT402) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

50354 Mouth of Unt (50354) Little Toby Creek

The TMDL for this unnamed tributary of Little Toby Creek consists of a load allocation to all of the watershed area upstream of sample points 50354. The load allocation for this segment was computed using water-quality sample data collected at point 50354. The average flow, measured at the sampling point 50354 (0.04 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 50354 shows pH ranging between 7.1 and 7.8; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron, manganese and acidity because WQS are met and there was no acidity present, TMDLs for aluminum, iron, manganese and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point LT402.

Parameter	Measured Sample Data		Allowable			
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day	Load Reduction	% Reduction
Al	0.25	0.08	0.25	0.08	0.0	0
Fe	0.21	0.07	0.21	0.07	0.0	0
Mn	0.25	0.08	0.25	0.08	0.0	0
Acid	0.00	0.0	0.0	0.0	0.0	0
Alk	57.00	18.5				

A waste load allocation for future mining was included for this segment of Little Toby Creek (LT402) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)	Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1				Future Operation 4			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 2				Future Operation 5			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 3							
Al	0.75	0.090	0.56				
Fe	3.0	0.090	2.25				
Mn	2.0	0.090	1.50				

The Aimfire Mining Co., LLC; SMP 24030103, Aimfire 127 Mine has seven permitted treatment ponds, ATP1, ATP2, ATP3, ATP4, ATP5, ATP6 and ATP7. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are three permitted pits in the permit with a total combined pit area of 105,750 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for ATP1 and ATP7 are evaluated at point LT402 and ATP2, ATP3, ATP4, ATP5 and ATP6 at point JR1.

The Rosebud Mining Coal Co. SMP 24991301, underground mine has one permitted treatment pond R002. The waste load allocation for the discharge was calculated with average monthly permit limits and flow data. Included in the permit are limits for aluminum, iron and manganese.

The Tamburlin Brothers Coal Co., Inc. SMP 24030101, Bianco Mine has one permitted post discharge treatment pond R002. The waste load allocation for the discharge was calculated with

average monthly permit limits and flow data. Included in the permit are limits for aluminum, iron and manganese.

Table C100. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Aimfire 127 Mine; ATP1 and ATP7			
Al	0.75	0.014	0.08
Fe	3.0	0.014	0.34
Mn	2.0	0.014	0.23
Rosebud Mining Coal Co., underground mine; R002			
Al	0.75	0.089	0.37
Fe	3.0	0.089	1.11
Mn	2.0	0.089	0.74
Bianco Mine; BTB1			
Al	0.75	0.007	0.04
Fe	3.0	0.007	0.17
Mn	2.0	0.007	0.11

LT402 Little Toby Creek Downstream of Confluence with Mead Run

The TMDL for this segment of Little Toby Creek consists of a load allocation to all of the watershed area between sample points MR01, LT404, 50354 & LT402. The load allocation for this segment was computed using water-quality sample data collected at point LT402. The average flow, measured at the sampling point LT402 (25.70 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point LT402 shows pH ranging between 5.8 and 7.5; pH will be addressed in this TMDL because of the mining impact alkaline. The method and rationale for addressing pH is contained in Attachment B.

The calculated load reductions for all the loads that enter point LT402 must be accounted for in the calculated reductions at sample point LT402 shown in Table C102. A comparison of measured loads between points's MR01, LT404, 50354 and LT402 shows that there is no additional loading entering the segment for aluminum, iron, manganese and acidity. For

Table C101. Load Allocations at Point LT402				
Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.88	188.5	0.18	37.7
Fe	1.85	397.2	0.32	67.5
Mn	2.35	503.3	0.42	90.6
Acid	8.18	1753.2	2.95	631.2
Alk	18.65	3997.5		

aluminum, iron, manganese and acidity the percent decrease in existing loads are applied to the allowable upstream loads entering the segment.

	Al	Fe	Mn	Acidity
Existing Load	188.5	397.2	503.3	1753.2
Difference in Existing Load between MR01, LT404, 50354 & LT402	-80.9	-119.6	-126.3	-1311.3
Load tracked from MR01, LT404 & 50354	54.3	116.6	86.3	643.6
Percent loss due to instream process	31	24	20	43
Percent load tracked from MR01, LT404 & 50354	69	76	80	57
Total Load tracked from MR01, LT404 & 50354	37.6	88.9	68.9	368.2
Allowable Load at LT402	37.7	67.5	90.6	631.2
Load Reduction at LT402	0.0	21.4	0.0	0.0
% Reduction required at LT402	0	24	0	0

50325 Mouth of Unt (50325) Little Toby Creek

The TMDL for this unnamed tributary of Little Toby Creek consists of a load allocation to all of the watershed area upstream of sample points 50325. The load allocation for this segment was computed using water-quality sample data collected at point 50325. The average flow, measured at the sampling point 50325 (0.74 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 50325 shows pH ranging between 6.7 and 7.7; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron, manganese and acidity because WQS are met and there was no acidity present, TMDLs for aluminum, iron, manganese and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point LT400.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	1.54	0.25	1.54	0.0	0
Fe	0.52	3.19	0.52	3.19	0.0	0
Mn	0.04	0.25	0.04	0.25	0.0	0
Acid	0.00	0.0	0.0	0.0	0.0	0
Alk	67.00	414.0				

A waste load allocation for future mining was included for this segment of Little Toby Creek (LT400) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)	Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1				Future Operation 4			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 2				Future Operation 5			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 3							
Al	0.75	0.090	0.56				
Fe	3.0	0.090	2.25				
Mn	2.0	0.090	1.50				

LT400 Little Toby Creek Downstream of Unt (50325)

The TMDL for this segment of Little Toby Creek consists of a load allocation to all of the watershed area between sample points LT402, 50325 & LT400. The load allocation for this segment was computed using water-quality sample data collected at point LT400. The average flow, measured at the sampling point LT400 (37.42 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point LT400 shows pH ranging between 5.7 and 7.6; pH will be addressed in this TMDL because of the mining impact alkaline. The method and rationale for addressing pH is contained in Attachment B.

The calculated load reductions for all the loads that enter point LT400 must be accounted for in the calculated reductions at sample point LT400 shown in Table C106. A comparison of measured loads between points's LT402, 50325 and LT400 shows that there is additional loading entering the segment for aluminum, iron, manganese and acidity. The total segment aluminum, iron, manganese and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.73	226.9	0.15	45.4
Fe	1.44	448.0	0.29	89.6
Mn	2.08	648.2	0.46	142.6
Acid	9.17	2862.3	2.84	887.3
Alk	18.57	5794.3		

	Al	Fe	Mn	Acidity
Existing Load	226.9	448.0	648.2	2862.3
Difference in Existing Load between LT402, 50325 & LT400	36.9	47.6	144.7	1109.0
Load tracked from LT402 & 50325	39.2	70.7	90.8	631.2
Percent loss due to instream process	-	-	-	-
Percent load tracked from LT402 & 50325	-	-	-	-
Total Load tracked from LT402 & 50325	76.1	118.3	235.5	1740.2
Allowable Load at LT400	45.4	89.6	142.6	887.3
Load Reduction at LT400	30.7	28.7	92.9	852.9
% Reduction required at LT400	40	24	39	49

RR06 Mouth of Unt (50303) to Rattlesnake Run

The TMDL for this unnamed tributary of Rattlesnake Run consists of a load allocation to all of the watershed area upstream of sample point RR06. The load allocation for this segment was computed using water-quality sample data collected at point RR06. The average flow, measured at the sampling point RR06 (0.18 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point RR06 shows pH ranging between 8.2 and 8.2; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron, manganese and acidity because WQS are met and there was no acidity present, TMDLs for aluminum, iron, manganese and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point RC03.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.37	0.25	0.37	0.0	0
Fe	0.21	0.31	0.21	0.31	0.0	0
Mn	0.04	0.07	0.04	0.07	0.0	0
Acid	0.00	0.0	0.0	0.0	0.0	0
Alk	224.00	334.5				

RR04 Mouth of Unt (50302) to Rattlesnake Run

The TMDL for this unnamed tributary of Rattlesnake Run consists of a load allocation to all of the watershed area upstream of sample point RR04. The load allocation for this segment was

computed using water-quality sample data collected at point RR04. The average flow, measured at the sampling point RR04 (0.15 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point RR04 shows pH ranging between 6.8 and 8.0; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum, iron, manganese and acidity because WQS are met and there was no acidity present, TMDLs for aluminum, iron, manganese and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point RC03.

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	0.3	0.25	0.3	0.0	0
Fe	0.40	0.5	0.40	0.5	0.0	0
Mn	0.16	0.2	0.16	0.2	0.0	0
Acid	0.00	0.0	0.0	0.0	0.0	0
Alk	99.80	121.7				

A waste load allocation for future mining was included for this segment of Rattlesnake Creek (RC06) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)	Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1				Future Operation 4			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 2				Future Operation 5			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 3							
Al	0.75	0.090	0.56				
Fe	3.0	0.090	2.25				
Mn	2.0	0.090	1.50				

RC06 Rattlesnake Creek (50290) Upstream from Confluence with Rattlesnake Run

The TMDL for this segment of Rattlesnake Creek consists of a load allocation to all of the watershed area upstream of sample point RC06. The load allocation for this segment was computed using water-quality sample data collected at point RC06. The average flow, measured at the sampling point RC06 (4.06 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point RC06 shows pH ranging between 6.4 and 7.4; pH will be addressed in this TMDL because of the mining impact. The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for aluminum and manganese because WQS are met, TMDLs for aluminum and manganese are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point RC03.

Table C110. Load Allocations and Load Reductions for Point RC06

Parameter	Measured Sample Data		Allowable		Load Reduction	% Reduction
	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day		
Al	0.25	8.5	0.25	8.5	0.0	0
Fe	0.71	24.2	0.46	15.7	8.5	35
Mn	0.44	14.8	0.44	14.8	0.0	0
Acid	28.87	978.5	14.14	479.5	499.0	51
Alk	32.47	1100.5				

A waste load allocation for future mining was included for this segment of Rattlesnake Creek (RC03) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

Table C111. Waste Load Allocations for future mining operations

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)	Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1				Future Operation 4			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 2				Future Operation 5			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 3							
Al	0.75	0.090	0.56				
Fe	3.0	0.090	2.25				
Mn	2.0	0.090	1.50				

The Waroquier Mining Co., SMP 33010107, Starr Mine has ten permitted treatment ponds, SJ, SK, SL, SM, SN, SO, SP, SQ, SR and SS. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are two permitted pits in the permit with a total combined pit area of 150,000 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for SL, SS, SN and SM are evaluated at point RC03 and SO, SP, SQ, SR, SK, and SJ at point RC01.

Table C112. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Starr Mine; SL, SS, SN and SM			
Al	0.75	0.015	0.09
Fe	3.0	0.015	0.37
Mn	2.0	0.015	0.25

RC03 Rattlesnake Creek Upstream of Confluence with Unt (50292) Rattlesnake Creek

The TMDL for this segment of Rattlesnake Creek consists of a load allocation to all of the watershed area between sample points RR06, RR04, RC06 & RC03. The load allocation for this segment was computed using water-quality sample data collected at point RC03. The average flow, measured at the sampling point RC03 (6.72 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point RC03 shows pH ranging between 6.9 and 7.8; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

Table C113. Load Allocations at Point RC03

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.25	14.0	0.25	14.0
Fe	0.82	46.0	0.77	43.2
Mn	0.35	19.6	0.35	19.6
Acid	0.00	0.0	0.00	0.0
Alk	86.13	4829.7		

The calculated load reductions for all the loads that enter point RC03 must be accounted for in the calculated reductions at sample point RC03 shown in Table C114. A comparison of measured loads between points's RR06, RR04, RC06 and RC03 shows that there is no additional loading entering the segment for acidity. For acidity the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is additional loading entering the segment for aluminum, iron and manganese. The total segment aluminum, iron and manganese load is the sum of the upstream allocated load and any additional loading within the segment.

Table C114. Calculation of Load Reduction at Point RC03				
	Al	Fe	Mn	Acidity
Existing Load	14.0	46.0	19.6	0.0
Difference in Existing Load between RR06, RR04, RC06 & RC03	4.9	21.0	4.6	-978.5
Load tracked from RR06, RR04 & RC06	9.2	16.5	15.0	479.5
Percent loss due to instream process	-	-	-	100
Percent load tracked from RR06, RR04 & RC06	-	-	-	0
Total Load tracked from RR06, RR04 & RC06	14.0	37.5	19.6	0.0
Allowable Load at RC030	14.0	43.2	19.6	0.0
Load Reduction at RC03	0.0	0.0	0.0	0.0
% Reduction required at RC03	0	0	0	0

A waste load allocation for future mining was included for this segment of Rattlesnake Creek (RC01) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

Table C115. Waste Load Allocations for future mining operations							
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)	Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1				Future Operation 4			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 2				Future Operation 5			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 3							
Al	0.75	0.090	0.56				
Fe	3.0	0.090	2.25				
Mn	2.0	0.090	1.50				

The Waroquier Mining Co., SMP 33010107, Starr Mine has ten permitted treatment ponds, SJ, SK, SL, SM, SN, SO, SP, SQ, SR and SS. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There are two permitted pits in the permit with a total combined pit area of 150,000 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for SL, SS, SN and SM are evaluated at point RC03 and SO, SP, SQ, SR, SK, and SJ at point RC01.

Table C116. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Starr Mine; SO, SP, SQ, SR, SK and SJ			
Al	0.75	0.015	0.09
Fe	3.0	0.015	0.37
Mn	2.0	0.015	0.25

RC01 Mouth of Rattlesnake Creek Upstream of Confluence with Little Toby Creek

The TMDL for this segment of Rattlesnake Creek consists of a load allocation to all of the watershed area between sample points RR03 & RC01. The load allocation for this segment was computed using water-quality sample data collected at point RC01. The average flow, measured at the sampling point RC01 (13.38 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point RC01 shows pH ranging between 6.8 and 8.0; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

The calculated load reductions for all the loads that enter point RC01 must be accounted for in the calculated reductions at sample point RC01 shown in Table C118. A comparison of measured loads between points's RC03 and RC01 shows that there is additional loading entering the segment for aluminum, iron, manganese and acidity. The total segment aluminum, iron, manganese and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

Table C117. Load Allocations at Point RC01

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.25	27.9	0.25	27.9
Fe	0.68	75.8	0.62	69.0
Mn	0.31	34.7	0.31	34.7
Acid	11.20	1294.4	0.00	0.0
Alk	95.96	10704.3		

	Al	Fe	Mn	Acidity
Existing Load	27.9	75.8	34.7	1249.4
Difference in Existing Load between RC03 & RC01	13.9	29.8	15.1	1249.4
Load tracked from RC03	14.0	43.2	19.6	0.0
Percent loss due to instream process	-	-	-	-
Percent load tracked from RC03	-	-	-	-
Total Load tracked from RC03	27.9	73.0	34.7	1249.4
Allowable Load at RC01	27.9	69.0	34.7	1249.4
Load Reduction at RC01	0.0	4.1	0.0	0.0
% Reduction required at RC01	0	6	0	0

A waste load allocation for future mining was included for this segment of Little Toby Creek (LT01) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 19 for the method used to quantify treatment pond load).

Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)	Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1				Future Operation 4			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 2				Future Operation 5			
Al	0.75	0.090	0.56	Al	0.75	0.090	0.56
Fe	3.0	0.090	2.25	Fe	3.0	0.090	2.25
Mn	2.0	0.090	1.50	Mn	2.0	0.090	1.50
Future Operation 3							
Al	0.75	0.090	0.56				
Fe	3.0	0.090	2.25				
Mn	2.0	0.090	1.50				

The Hepburnia Coal Co., SMP 33030110, Kearney Mine has five permitted treatment ponds, KF, KG, KH, KI and KJ. The waste load allocation for the discharges are calculated with average monthly permit limits and average flow, which is estimated with permitted pit areas and average rainfall. There is one permitted pit in the permit with a total combined pit area of 15,000 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for KF, KG, KH, KI and KJ are evaluated at point LT01.

The Energy Resources, Inc., SMP 24900104, Mine No. 30 has a treated post mining discharge treatment pond, H30TP. The waste load allocation for this discharge is calculated with average monthly permit limits and measured flow. Included in the permit are limits for aluminum, iron and manganese. The WLAs for H30TP is evaluated at point LT01.

Table C120. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Kearney Mine; KF, KG, KH, KI and KJ			
Al	0.75	0.001	0.01
Fe	3.0	0.001	0.04
Mn	2.0	0.001	0.02
Mine No. 30,H30TP			
Al	0.75	0.05	0.29
Fe	3.0	0.05	1.17
Mn	2.0	0.05	0.78

LT01 Mouth of Little Toby Creek

The TMDL for this segment of Little Toby Creek consists of a load allocation to all of the watershed area between sample points LT400, RC01 & LT01. The load allocation for this segment was computed using water-quality sample data collected at point LT01. The average flow, measured at the sampling point LT01 (73.90 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point LT01 shows pH ranging between 6.6 and 7.8; pH will not be addressed in this TMDL because the segment is net alkaline. The method and rationale for addressing pH is contained in Attachment B.

The calculated load reductions for all the loads that enter point RC01 must be accounted for in the calculated reductions at sample point RC01 shown in Table C122. A comparison of measured loads between points' RC03 and RC01 shows that there is no additional loading entering the segment for aluminum and manganese.

For aluminum and manganese the percent decrease in existing loads are applied to the allowable upstream loads entering the segment. There is additional loading entering the segment for iron and acidity. The total segment iron and acidity load is the sum of the upstream allocated load and any additional loading within the segment.

Parameter	Measured Sample Data		Allowable	
	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.25	154.1	0.25	154.1
Fe	0.98	605.6	0.55	339.2
Mn	0.61	375.3	0.24	150.1
Acid	14.10	8689.6	14.10	8689.6
Alk	43.34	26711.6		

Table C122. Calculation of Load Reduction at Point LT01				
	Al	Fe	Mn	Acidity
Existing Load	154.1	605.6	375.3	8689.6
Difference in Existing Load between LT400, RC01 & LT01	-100.7	81.8	-307.6	4578.0
Load tracked from LT400 and RC01	73.3	158.6	177.3	2136.7
Percent loss due to instream process	40	-	45	-
Percent load tracked from LT400 and RC01	60	-	55	-
Total Load tracked from LT400 and RC01	44.3	240.4	97.5	6714.7
Allowable Load at LT01	154.1	339.2	150.1	8689.6
Load Reduction at LT01	0.0	0.0	0.0	0.0
% Reduction required at LT01	0	0	0	0

Margin of Safety (MOS)

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

- Effluent variability plays a major role in determining the average value that will meet water-quality criteria over the long-term. The value that provides this variability in our analysis is the standard deviation of the dataset. The simulation results are based on this variability and the existing stream conditions (an uncontrolled system). The general assumption can be made that a controlled system (one that is controlling and stabilizing the pollution load) would be less variable than an uncontrolled system. This implicitly builds in a margin of safety.
- A MOS is added when the calculations were performed with a daily iron average instead of the 30-day average.

Seasonal Variation

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

Critical Conditions

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

Attachment D

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

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

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

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

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

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

Migration to National Hydrography Data (NHD)

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

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

Attachment E
Water Quality Data Used In TMDL Calculations

MP **SP#3** **Little Toby Creek**
 Lat 41-20-38 Long 78-36-56

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
242	8/6/1998		3.8	0	56	1.13	6.74	5.07
271	9/17/1998		3.9	0	44	1.9	6.84	4.46
286	10/8/1998		4.8	2.4	14.4	1.62	3.46	2.22
341	11/17/1998		4.1	0	42	1.51	6.58	5.01
383	12/10/1998		4.1	0	40	1.5	6.2	4.68
6	1/21/1999		4.4	0	28	1.43	4.16	3.77
33	2/11/1999		3.8	0	56	2.2	3.71	5.23
59	3/11/1999		3.8	0	58	1.78	5.15	6.02
90	4/8/1999		3.8	0	54	1.36	3.81	5.26
169	6/2/1999		3.8	0	70	1.31	5.62	6.61
192	7/8/1999		3.7	0	68	1.79	6.72	7.03
223	8/12/1999		3.7	0	68	1.98	7.38	6.86
239	9/16/1999		4.2	0	38	2.34	5.97	5.11
267	10/13/1999		3.9	0	48	1.96	6.59	5.55
293	11/2/1999		3.9	0	44	1.26	6.17	5.05
324	12/2/1999		4.1	0	62	3.88	7.13	9.29
2	1/5/2000		4	0	50	2.35	5.01	5.99
38	2/3/2000		3.8	0	80	2.72	7.03	8.9
102	3/21/2000		4.3	0	38	3.91	3.91	5.92
123	4/20/2000		3.7	0	72	2.05	4.94	7.63
151	5/9/2000		3.7	0	68	1.49	5.54	7.53
191	6/14/2000		4.4	0	40	1.53	4.53	5.38
36	7/25/2000		3.6	0	82	1.9	7.35	8.79
311	10/3/2000		3.7	0	68	2	7.57	8.11
372	12/7/2000		4	0	64	2.29	6.85	7.34
33	2/1/2001		4.1	0	54	1.75	5.63	6.26
87	3/13/2001		4.3	0	46	1.77	5.08	6.72
124	4/5/2001		3.9	0	58	1.54	4.25	6.38
142	5/3/2001		3.8	0	62	1.31	5.35	7.53
169	6/7/2001		3.7	0	77.8	1.79	6.85	9
245	7/10/2001		3.6	0	104.4	2	7.9	9.01
297	8/8/2001		3.5	0	104.2	2	9.93	8.56
62	11/27/2001		4.3	0	81.4	2	5.62	5.09
10	1/15/2002		3.8	0	94.2	3.12	7.84	9.46
15	2/20/2002		3.7	0	84.2	2.45	6.67	9.42
15	4/4/2002		3.8	0	82	1.73	4.26	7.34
15	6/11/2002		3.9	0	84.4	2.06	5.06	7.76
15	7/11/2002		3.5	0	119.2	2.49	7.51	10.1
15	10/8/2002		3.8	0	97.2	2.08	7.73	7.61
15	1/6/2003		4	0	90.4	0.788	3.71	5.8
15	2/5/2003		3.7	0	90	2	6.46	9.63
15	4/1/2003		3.6	0	88.4	5.15	4.78	9.54
15	5/20/2003		3.7	0	79.4	1.17	4.98	7.57

15	6/23/2003		3.7	0	94.8	0.808	4.811	6.884
15	7/15/2003		3.7	0	87	2.079	6.835	8.542
15	8/21/2003		3.8	0	66	2.01	6.18	6.59
15	10/2/2003		4.7	1.2	56.2	1.68	3.76	4.15
15	11/24/2003		4.4	0	54.4	1.411	3.189	4.561
15	12/11/2003		6.1	7.8	33.2	2.35	3.79	1.99
15	2/19/2004		4.2	0	61.6	1.47	5.23	6.94
15	3/25/2004		4.8	1.6	44.2	1.15	2.7	3.13
387	6/30/2005	201	4.2	5.2	69.6	1.3	4.83	3.93
559	9/21/2005	35	4.1	3	58.2	1.48	5.15	3.35
726	3/8/2006	456	4.3	5.4	54.8	1.121	4.641	5.656
860	7/11/2006	382	4.7	7.6	22.4	1.481	4.053	3.261
5	9/26/2006	614	4.3	4.8	30.6	1	4.46	3.64
	avg=	337.60	4.01	0.70	63.98	1.89	5.61	6.40
	stdev=				22.40	0.76	1.48	2.03

MP **SP#D** **Little Toby Creek**
Lat 41-19-42 Long 078-37-50

Seq	Date Collected	Final Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
249	8/6/1998		6	17.6	0	1.78	3.31	0.275
278	9/17/1998		6.4	26	0	1.75	2.84	0.227
293	10/8/1998		6.4	20	0	4.07	1.76	1.04
348	11/17/1998		6.3	18.4	0	2.01	2.65	0.1
390	12/10/1998		6.3	19.4	0	4.9	2.4	0.225
13	1/21/1999		6.1	15.6	0	2.08	2.07	0.239
40	2/11/1999		5	2.6	16.4	2.52	4.03	1.92
66	3/11/1999		5.1	3.2	14.8	3.79	4.8	3.4
97	4/8/1999		5.4	3.2	8	2.7	5.13	1.78
176	6/2/1999		5.5	3.4	17.2	4.25	6.2	2.08
199	7/8/1999		6.3	12.4	0	2.23	3.3	0.832
230	8/12/1999		6.2	16.8	0	1.3	2.79	0.343
246	9/16/1999		6.4	26	0	2.54	2.49	0.592
274	10/13/1999		6.4	24	0	0.754	2.5	0.1
300	11/2/1999		6.5	20	0	0.537	2.28	0.1
331	12/2/1999		6.1	12.8	6.2	6.16	3.8	2.22
9	1/5/2000		6.2	12.4	0	1.93	2.21	1.02
44	2/3/2000		6.1	10.2	5.6	4.09	4.37	3.65
108	3/21/2000		6.1	8.8	6.8	6.35	3.1	7.23
129	4/20/2000		4.9	2.2	20	2.79	5.04	3.08
157	5/9/2000		5	2.6	18	3.73	7.4	2.79
197	6/14/2000		6.2	14.4	0	2.75	3.61	1.41
42	7/25/2000		5	2.8	16.8	3.16	6.29	3.03
317	10/3/2000		6.4	26	0	1.71	3.25	0.665
378	12/7/2000		6.4	18	0	4.32	3.6	1.42
39	2/1/2001		6.3	17	0	2.41	2.47	0.88
93	3/13/2001		6.3	8.6	3.6	4.95	5.11	2.85
130	4/5/2001		5.3	3.4	14	2.47	5.26	2.44

148	5/3/2001		5.2	3	12.2	3.4	6.74	2.66
175	6/5/2001		5.9	6	8.4	3.32	5.97	2.39
251	7/10/2001		6.1	8	42	2.78	3.74	1.69
303	8/8/2001		6.2	17.4	27.2	1.27	3.74	0.43
68	11/27/2001		6.3	30	27	4.23	2.35	1.41
16	1/15/2002		6.1	9	48.4	6.47	8.32	2.79
21	2/20/2002		5	2.8	49.4	7.32	7.85	3.24
21	4/4/2002		6	6.6	51.8	5.85	5.64	2.69
21	6/11/2002		5.8	5.4	48.8	7.95	7.29	0.687
21	7/11/2002		5.8	5	73.4	7.09	7.93	0.568
21	10/8/2002		6.6	14.6	0	1.39	2.92	0.1
21	1/6/2003		5.6	3.2	56.4	5.75	6.1	1.06
21	2/5/2003		6.3	8.4	42	3.38	4.23	0.862
21	4/1/2003		4.9	2	47.2	4.77	5.88	3.03
21	5/20/2003		6	4	43.2	2.69	3.9	0.977
21	6/23/2003		5.8	7	41	3.41	4.046	0.259
21	7/15/2003		6.1	7.2	39	1.99	4.84	0.267
21	8/21/2003		5.6	3.6	52.4	7.83	7.4	0.45
21	10/2/2003		6.6	11.8	0	3.9	4.06	0.227
21	11/24/2003		6.6	9.6	0	3.756	3.511	0.616
21	12/11/2003		6.7	11.6	0	2.24	1.91	0.494
21	2/19/2004		6.2	8.6	41	5.27	6.24	0.947
21	3/25/2004		6.4	8.2	22.4	2.11	3.05	0.644
382	6/29/2005	715	6.6	28.8	22.8	2.3	3.35	0.25
555	9/21/2005	274	6.6	47.6		0.479	1.78	0.25
723	3/8/2006	1366	6.4	15.6	39.8	5.425	5.939	1.206
859	7/11/2006	1753	6.5	42.2		2.71	3.039	0.25
4	9/26/2006	1526	6.6	18.6	8.8	4.55	4.88	0.25
	avg=	1126.80	6.02	12.74	18.37	3.53	4.30	1.37
	stdev=				20.37	1.86	1.78	1.33

MP SP#6 Limestone Run Below the Treatment Plant
Lat 41-19-38 Long 78-37-43

Seq	Date	Final Flow	pH	ALK	HOT A	FE	MN	AL
	Collected		pH units	MG/L	MG/L	MG/L	MG/L	MG/L
243	8/6/1998		7.1	80	0	3.54	13.7	0.706
272	9/17/1998		6.4	34	0	5.17	11.8	0.466
287	10/8/1998		6.1	10.6	3.8	3.57	9.68	2.5
342	11/17/1998		6.4	28	9	9.44	13.7	0.341
384	12/10/1998		6.3	32	0	9.67	13.2	0.606
7	1/21/1999		5.8	8	2.4	2.75	7.25	2.66
34	2/11/1999		6.2	26	0	2.46	7.95	3.03
60	3/11/1999		6.2	32	0	4.93	11.3	2.61
91	4/8/1999		6.1	16.6	0	2.55	7.77	2.33
170	6/2/1999		6.6	54	0	8.49	16.2	3.01
193	7/8/1999		6.3	22	0	2.7	14.1	2.53
224	8/12/1999		6.4	48	0	3.68	13.1	1.94
240	9/16/1999		6.6	42	0	3.14	14.3	3.03

268	10/13/1999		6.6	46	0	2.27	13.8	1.6
294	11/2/1999		6.8	44	0	2.42	13	2.2
325	12/2/1999		5.7	8	32	6.2	12.1	6.14
3	1/5/2000		5	3.4	30	8.29	10.8	4.04
39	2/3/2000		5	4	52	15.3	15.7	4.4
103	3/21/2000		6	12.4	9.8	7.1	9.23	5.22
124	4/20/2000		4.7	2	52	6.88	10.7	5.61
152	5/9/2000		6.9	56	0	3.31	13	1.75
192	6/14/2000		6.2	22	6	3.59	9.14	2.72
37	7/25/2000		6.4	48	0	9.82	15.8	0.703
312	10/3/2000		6.3	30	0	8.46	7.66	1.2
373	12/7/2000		5.3	3.8	24	13.2	14	5.74
34	2/1/2001		5.4	4.8	24	5.52	12.5	4.31
88	3/13/2001		5.6	7.4	14.4	6.14	10.1	5.01
125	4/5/2001		4.8	3	36	4.25	8.66	4.52
143	5/3/2001		5.8	12	7.2	8.85	15.4	3.95
170	6/7/2001		6.1	19	5.2	8.82	14.5	2.72
246	7/10/2001		4.7	2	107.4	10.5	14.2	5.84
298	8/8/2001		6	28	59.6	7.16	16.5	1.47
63	11/27/2001		5.5	5.2	55.8	3.6	12.2	3.76
11	1/15/2002		4.9	3.2	64.4	8.94	13.8	4.58
16	2/20/2002		5.7	6.2	38.2	6.87	12.3	5.4
16	4/4/2002		4.8	2	84.6	6.22	9.46	5.82
16	6/11/2002		6.1	17	39	6.72	10.5	3.59
16	7/11/2002		6	10.8	103	14.9	16.7	2.51
16	10/8/2002		5.6	3.8	94.2	10.2	15.3	2.6
16	1/6/2003		4.8	1.6	45.6	1.9	6.28	4.37
16	2/5/2003		4.6	1.2	100	7.22	12	9.98
16	4/1/2003		4.8	2	51.8	4.97	10.7	5.87
16	5/20/2003		4.6	1.2	98.6	12.1	11.7	6.9
16	6/23/2003		5.6	7.6	79.6	9.558	10.613	3.314
16	7/15/2003		5.6	5.4	89.2	15	15.3	3.273
16	8/21/2003		5	2.2	62	4.92	10.6	4.07
16	10/2/2003		6.3	13.2	40.8	7.08	8.21	3.09
16	11/24/2003		6.6	22.4	0	6.085	7.926	3.241
16	12/11/2003		5	2	47.2	1.14	2.3	1.98
16	2/19/2004		6.2	13.8	34	6.27	11.8	3.57
16	3/25/2004		6	6.6	27.8	3.28	5.28	2.81
386	6/30/2005	401	6.8	32.6	16.4	2.69	7.92	0.927
556	9/21/2005	206	6.3	22.6	49	3.75	10.4	1.46
724	3/8/2006	453	4.8	10	55.6	5.739	7.495	7.007
858	7/11/2006	772	6	14.4	4.4	3.407	6.48	4.808
3	9/26/2006	666	5.2	9.2	22	6.11	7.75	5.46
	avg=	499.60	5.80	17.95	31.75	6.41	11.32	3.49
	stdev=				33.17	3.47	3.19	1.93

MP SP#2 Little Toby Creek Below Lime Stone Run

Lat 41-19-37 Long 78-37-30

Date	Final	pH	ALK	HOT A	FE	MN	AL
------	-------	----	-----	-------	----	----	----

Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
107	3/21/2000		5	3.2	24	9.36	5.02	8.01
128	4/20/2000		4.5	0	46	5	6.97	5.49
156	5/9/2000		4.8	2.4	26	4.69	8.22	4.63
196	6/14/2000		5.5	5	17.4	3.64	5.4	3.16
41	7/25/2000		5.2	3.6	24	8.54	12.6	4.49
316	10/3/2000		6	12.6	0.2	4.34	7.83	2.72
377	12/7/2000		5.3	3.6	20	5.77	7.48	4.03
38	2/1/2001		5.5	4.2	13.8	4	6.21	3.39
92	3/13/2001		5.4	4	12.4	4.29	5.62	4.36
129	4/5/2001		4.7	1.8	34	3.94	6.6	4.84
147	5/3/2001		4.8	2.4	28	6.66	9.17	5.05
174	6/7/2001		4.6	1.6	36.2	7.03	7.95	5.49
250	7/10/2001		4.7	2	89.6	5.87	9.47	5.05
302	8/8/2001		5.3	3.6	52.2	4.04	10.7	2.51
67	11/27/2001		5.5	5.4	41	4.22	5.34	3.44
15	1/15/2002		4.9	3	60.4	8.04	11.4	5.17
20	2/20/2002		4.8	2	57	7.68	9.34	5.54
20	4/4/2002		4.7	1.4	73.8	7.35	7.25	5.7
20	6/11/2002		4.4	0	72	10.5	8.31	4.58
20	7/11/2002		4.2	0	110.2	12.8	10.7	4.48
20	10/8/2002		4.8	1.8	89	6.39	9.05	3.09
20	1/6/2003		4.6	0.6	69.8	5.27	6.41	3.78
20	2/5/2003		4.7	1.4	81.8	5.65	7.19	5.37
20	4/1/2003		4.6	0.8	57.4	5.84	7.31	5.02
20	5/20/2003		4.4	0	78.6	7.56	7.25	4.89
20	6/23/2003		4.7	1.8	77.8	7.124	7.057	3.102
20	7/15/2003		4.7	3.6	73	9.098	9.552	3.445
20	8/21/2003		4.1	0	69.2	8.45	8.42	3.48
20	10/2/2003		4.8	1.8	61.2	8.67	6.09	4.1
20	11/24/2003		5	2.4	48.8	5.748	5.264	3.246
20	12/11/2003		5.3	2.8	39.4	3.51	2.59	1.65
20	2/19/2004		4.9	2.2	61.8	6.91	7.58	3.84
20	3/25/2004		5	2	35.8	3.79	3.91	2.41
385	6/29/2005	959	6.6	25.8	14.8	1.91	4.68	0.711
557	9/21/2005	480	6.4	25	36	1.98	6.02	1.22
722	3/8/2006	1974	5.6	11	44.2	5.548	6.416	3.324
857	7/11/2006	2517	6.5	22.6	-5.4	2.43	3.68	1.56
2	9/26/2006	2235	6.3	14.4	3.4	4.93	5.79	1.91
	avg=	1633.00	5.07	4.78	46.71	6.01	7.26	3.90
	stdev=				27.93	2.38	2.17	1.47

MP: KR10

Kyler Run-Down

Lat. 41-19-41

Long. 078-38-02

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
657	10/9/1996		3.7	0	82	4.11	6.49	6.91
702	11/21/1996		3.8	0	94	3.72	6.29	7.29
721	1/23/1997		4	2	58	3.35	4.86	5.43
759	2/6/1997		4.1	4.2	62	3.22	4.77	5.3
774	4/23/1997		3.9	0	68	3.43	5.19	5.79
513	5/29/1997		3.7	0	76	3.56	5.63	6.07
106	6/29/1998		3.6	0	74	4.11	6.09	5.72
714	6/24/1999		3.6	0	78	2.85	6.68	6.78
390	6/24/2003		3.9	0	95	7.48	6.91	8.44
421	7/30/2003		3.8	0	113.6	18.9	7.17	10.7
438	8/15/2003		4.8	8.4	53.4	4.01	5.48	5.63
471	9/25/2003		5.4	8.4	51	13.1	5.71	5.97
516	10/27/2003		5.2	8.8	49.6	4.66	5.02	4.46
538	12/16/2003		4.8	8.6	64	5.75	4.57	4.6
567	3/25/2004		4.8	9	51.2	4.37	4.43	5.22
609	4/28/2004		4.7	8.4	63.4	3.89	4.63	4.56
638	5/26/2004		4.7	8.4	76.8	6.08	5.07	5.14
657	6/29/2004		4.6	8	54.8	6.17	5.6	4.14
713	8/24/2004		4.8	8.2	45.6	3.53	3.63	3.24
743	9/28/2004		4.7	9.8	50.2	5.93	5.98	4.56
384	6/29/2005	1908	6.1	10.8	33.4	2.9	5.24	1.22
560	9/22/2005	1139	6.5	25	20.2	1.34	6.67	0.701
725	3/8/2006	2515	4.8	8.6	58.8	6.42	5.996	4.063
856	7/11/2006	2982	4.9	7	17	4.2	4	2.24
1	9/26/2006	3165	4.7	6.4	29.4	6.5	5.59	3.82
	avg=	2341.80	4.54	6.00	60.78	5.34	5.51	5.12
	stdev=				22.91	3.60	0.91	2.11

MP **SP1** **Little Toby Creek Above Hayes Run**
 Lat 41-19-05 Long 078-38-24

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
241	8/6/1998		3.9	0	52	1.92	6.83	5.35
270	9/17/1998		4	0	36	1.39	7.37	4.62
285	10/8/1998		4.7	1.8	17.4	6.11	3.98	2.72
340	11/17/1998		4.2	0	40	1.93	7.59	5.28
382	12/10/1998		4.4	0	38	2.02	7.06	5.08
5	1/21/1999		4.7	1.4	24	1.89	4.29	3.65
32	2/11/1999		4.5	0	44	2.05	4.86	4.85
58	3/11/1999		4.5	0	48	3.76	6.81	6.06
89	4/8/1999		4.2	0	40	2.02	5.18	4.5
168	6/2/1999		4.4	0	48	3.19	7.68	5.65
191	7/8/1999		4	0	48	2.02	6.99	5.56
222	8/12/1999		4.1	0	52	1.32	7.22	5.51
238	9/16/1999		4.1	0	44	2.17	6.96	5.85
266	10/13/1999		4.5	0	38	1.09	6.9	5.45
292	11/2/1999		4.3	0	42	1.02	6.76	5.35
323	12/2/1999		4.5	0	54	2.8	5.34	5.65
1	1/5/2000		4.6	1.4	36	3.31	5.28	4.67
37	2/3/2000		4.4	0	54	4.97	7.97	6.3
101	3/21/2000		4.6	2	40	7.28	5.59	7.51
122	4/20/2000		3.7	0	76	5.79	6.53	8.01
150	5/9/2000		3.8	0	70	5.5	7.75	8.14
190	6/14/2000		4.6	1.2	32	3.18	4.63	3.64
35	7/25/2000		4	0	56	5.57	8.16	6.99
310	10/3/2000		4.2	0	44	2.01	7.57	5.73
371	12/7/2000		4.6	1.2	46	4.35	7.03	5.84
32	2/1/2001		4.7	2	32	2.7	5.23	4.52
86	3/13/2001		4.7	2	38	3.27	5.99	5.57
123	4/5/2001		4.2	0	54	2.89	5.94	6.27
141	5/3/2001		4	0	60	4.61	7.39	6.33
168	6/7/2001		3.8	0	62.8	3.56	6.59	7.21
244	7/10/2001		3.8	0	105	2.73	8.25	7.11
296	8/8/2001		3.7	0	105.8	1.57	9.63	6.86
61	11/27/2001		4.7	1.8	53.4	4.41	5.96	4.93
9	1/15/2002		4.2	0	74.2	4.44	8.22	7.02
14	2/20/2002		4.1	0	91.2	5.27	8.25	7.46
14	4/4/2002		4.2	0	92	4.32	5.52	5.97
14	6/11/2002		3.7	0	83.4	9.86	8.25	8.78
14	7/11/2002		3.6	0	132.6	9.7	9.78	9.25
14	10/8/2002		3.7	0	107.6	4.96	8.16	7.83
14	1/6/2003		4.7	1.2	66.6	4.03	5.05	3.81
14	2/5/2003		4.8	2	70.4	5.22	6.93	5.59
14	4/1/2003		4.2	0	65.4	6.37	6.75	7.29
14	5/20/2003		3.9	0	83	5.91	7.12	7.75

14	6/23/2003		4	0	83.6	5.763	6.403	5.943
14	7/15/2003		3.9	0	78.6	4.868	7.898	6.624
14	8/21/2003		4.2	0	78.2	5.02	7.42	5.2
14	10/2/2003		4.8	1.8	59.6	7.25	5.82	4.41
14	11/24/2003		4.7	1.6	58.8	5.745	5.139	4.691
14	12/11/2003		5	1.8	42.6	5.17	2.77	2.3
14	2/19/2004		4.8	2	62.4	6.41	6.92	5.44
14	3/25/2004		4.7	1.4	38.8	3.62	4.01	3.83
380	6/29/2005	3548	6.7	15.2	24	2.27	4.91	1.02
554	9/21/2005	1826	6.3	23.6	23.6	0.869	5.36	0.612
720	3/8/2006	5215	4.9	8.4	51.8	5.129	6.01	4.496
853	7/11/2006	6298	5.4	8.2	11.4	3.34	3.66	2.13
998	9/26/2006	6331	4.9	7.2	18.6	5.09	5.64	3.26
	avg=	4643.60	4.40	1.59	55.87	4.02	6.49	5.49
	stdev=				24.78	2.04	1.46	1.78

MP: HR1 Mouth of Hayes Run

Lat. Long.

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
379	6/29/2005	168	7.2	66.8		2.83	4.33	0.25
553	9/21/2005	185	6.8	73.6		2.39	5.06	0.25
719	3/8/2006	316	7	55.4		9.692	5.643	0.25
852	7/11/2006	491	7.5	58.2		2.83	2.6	0.25
997	9/26/2006	364	7.3	57.4		5.46	4.4	0.25
	avg=	304.80	7.16	62.28		4.64	4.41	0.25
	stdev=					3.07	1.14	0.00

MP: LTU73 UNT to Little Toby (LTU82)

Lat. 41-19-00 Long. 078-38-21

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
115	9/18/1996		5.7	11.4	18	0.639	4.88	1.05
649	10/9/1996		4.5	8.2	58	0.879	9.84	4.56
695	11/21/1996		4.2	6.4	68	1.26	9.84	6.38
735	1/23/1997		4.9	10	40	0.912	5.3	2.75
752	2/6/1997		4.8	9.8	34	0.68	5.72	3.09
227	2/13/1997		4.8	10.4	44	1.19	8.11	4.08
298	4/10/1997		4	3.2	62	1.76	8.61	5.99
768	4/23/1997		4.6	10.4	64	0.983	8.06	4.95
516	5/29/1997		4.8	8.8	36	0.615	7.44	3.49
819	6/26/1997		4.6	10.2	54	0.716	10.6	3.52
373	8/25/1997		5.3	9.2	40	1.2	9.38	2.13
396	10/2/1997		5.8	14.2	20	1.61	7.58	1.53
978	1/30/1998		4.8	11.8	32	1.08	6.5	3.78
446	2/4/1998		4.8	11.2	32	1.49	7.21	3.82
497	4/1/1998		4.5	8.2	42	0.598	8.72	4.75
588	9/16/1998		6	15.4	13.8	1.84	11.7	1.39

608	10/14/1998		6	22	0.2	2.26	11.6	1.28
627	12/16/1998		6.3	34	0	2.2	10.9	0.867
630	2/3/1999		5.8	11.2	2.8	0.348	4.32	1.47
644	3/10/1999		4.7	10.2	42	1.13	8.63	6.74
655	4/8/1999		4.1	3.2	54	1.33	8.57	5.99
810	3/6/2000		4.9	13.2	30	0.662	7.12	5.14
832	4/17/2000		4.4	7.8	56	1.75	7.47	5.86
941	10/3/2000		6.4	24	0	2.13	9.23	1.37
95	9/19/2001		6.4	30	25	4.06	12	1.92
123	10/15/2001		6.2	34	42	0.748	4.67	0.25
141	1/8/2002		6	38	19.4	1.46	7	1.37
195	4/9/2002		5.9	19.8	34.6	0.761	7.49	4.27
225	7/17/2002		5.8	15.4	59.2	2.97	15	6.11
256	10/8/2002		6.8	46	0	3.8	11.4	1.06
277	1/9/2003		5.2	9	38.4	0.803	7.88	3.62
311	4/7/2003		4.7	7.8	81	1.83	7.98	7.08
406	7/23/2003		5.9	16.4	45.8	0.916	6.57	1.48
491	10/9/2003		5.2	9.6	57.4	1.95	10.4	4.56
630	5/11/2004		5.2	9.4	49.6	0.707	6.71	3.02
669	7/13/2004		6.3	20.8	16.8	1.1	4.56	0.876
804	11/1/2004		6.1	18	31.4	2	9.18	1.82
381	6/29/2005	72	6.5	23.4	23	1.55	11.8	0.657
558	9/21/2005	102	6.6	30.4	36.8	1.47	10	0.25
721	3/8/2006	207	5.3	10.4	27.6	1.07	8.438	3.667
854	7/11/2006	484	6.6	15.4	0.4	1.21	6.19	1.18
999	9/26/2006	255	5.7	9.4	12.8	2.2	10.5	2.49
	avg=	224.00	5.41	15.42	34.38	1.43	8.45	3.13
	stdev=				20.76	0.81	2.34	1.98

MP: LT91 Below Confluence of LTC, Hays Run, Toby Creek & Kyler Run

Lat. 41-19-04 Long. 078-38-26

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
7	4/9/1997		4.8	11.6	40	2.97	5.62	4.26
609	10/14/1998		4.8	11.4	22	1.33	7.4	4.02
854	5/11/2000		4	3.4	62	5.22	6.98	7.9
884	7/20/2000		4.7	11.8	32	1.35	6.85	4.76
911	9/12/2000		4.5	9.4	46	3.43	6.32	5.25
982	12/6/2000		4.8	14.6	44	4.56	7.12	6.06
15	4/3/2001		4.2	4.6	74	2.47	5.21	5.45
92	8/15/2001		3.6	0	125.4	1.98	8.63	7.98
96	9/19/2001		4.3	6.6	82.6	3.2	14.1	19.9
106	10/1/2001		4	3.2	89	2.37	7.81	6.57
124	10/15/2001		4.3	5.4	93	1.81	6.21	4.73
136	1/3/2002		4.3	7.6	85.8	4.51	6.3	5.9
146	1/8/2002		4.2	6.2	78	4.22	6.71	6.04
196	4/9/2002		4.2	7.4	92.2	5.46	6.48	7.83
212	5/22/2002		3.9	0	104	10.8	6.43	9.53
229	7/23/2002		3.6	0	103.6	8.39	10.4	9.81
249	10/3/2002		3.7	0	103.8	4.13	7.76	8.3
257	10/8/2002		3.7	0	91.2	4.22	7.3	7.9
263	10/9/2002		7.3	72	0	1.63	6.03	0.25
278	1/9/2003		4.8	7.6	57.2	4.96	6.59	5.13
314	4/7/2003		4.4	5.4	62.8	4.61	4.76	5.85
356	5/12/2003		3.9	0	66.8	5.23	5.42	5.83
381	6/18/2003		3.9	2	84.4	5.3	6.55	6.36
407	7/23/2003		4.7	9.4	62.6	5.36	4.72	3.56
431	8/15/2003		4.4	6	66.6	0.15	0.025	0.25
450	9/17/2003		4.8	6.8	58.6	4.59	6.2	3.98
520	10/29/2003		4.7	6.2	56	5.27	6.16	4.02
523	11/5/2003		4.8	7.6	66.8	5.33	6.8	4.84
645	6/3/2004		4.8	8.4	67.6	5.28	5.53	4.3
651	6/7/2004		4.8	10.6	73	6.02	6.3	4.77
732	9/20/2004		4.7	8.2	54.6	5.6	4.14	3.95
787	10/18/2004		6.2	13.6	27.6	6.02	7.21	3.17
383	6/29/2005	3788	6.5	19.2	10.8	2.38	5.1	0.92
552	9/21/2005	2113	6.4	28	23.8	0.984	5.34	0.517
718	3/8/2006	5738	5.1	9	44.2	5.379	6.19	3.557
855	7/7/06	7273	5.9	10.2	5.2	3.05	3.74	1.9
996	9/26/2006	6590	5.1	8.6	15	4.44	5.3	2.73
	avg=	5100.40	4.67	9.24	61.41	4.16	6.37	5.35
	stdev=				30.44	2.08	2.07	3.43

MP: SR3 Unnamed Tributary to Sawmill Run Upstream from SR2

Lat. 41-18-19 Long. 078-38-57

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
423	7/7/2005	101	4.6	8.2	43.8	0.15	8.26	1.89
549	9/21/2005	27	4.7	8	51	0.15	7.51	1.06
733	3/29/2006	316	4.9	7.4	22.4	0.15	3.79	2.18
892	7/19/2006	315	5.1	8.4	8	0.15	2.89	0.704
9	9/26/2006	207	5.1	7.4	13.2	0.15	5.46	1.41
	avg=	193.20	4.88	7.88	27.68	0.15	5.58	1.45
	stdev=				18.90	0.00	2.31	0.60

MP: SR2 Sawmill Run Upstream from SR3 Confluence

Lat. 41-18-17 Long. 078-38-56

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
424	7/7/2005	183	6.7	16.4	1	0.15	0.076	0.25
548	9/21/2005	82	6.7	30.8		0.15	0.122	0.25
732	3/29/2006	1135	6.7	10.4	0.2	0.15	0.025	0.25
891	7/19/2006	7163	6.3	16		0.15	0.025	0.25
	avg=	2140.75	6.60	18.40	0.60	0.15	0.06	0.25
	stdev=				0.57	0.00	0.05	0.00

MP: SR1 Mouth of Sawmill Run

Lat. 41-18-15 Long. 078-39-30

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
979	12/6/2000		6	12.8	0	0.15	0.025	0.25
741	9/22/2004		5.6	9.8	33.6	0.15	1.7	1.17
898	4/20/2005		5.9	8.8	22.2	0.15	1.06	0.663
955	7/19/2005		6.5	12.2	11.6	0.15	2.95	0.25
422	7/7/2005	377	6.1	10	11.4	0.15	3.04	0.25
547	9/21/2005	121	6.3	13.6	22.2	0.15	2.17	0.25
734	3/29/2006	1881	5.9	8	12.2	0.15	0.91	0.25
848	7/7/2006	1661	6.6	10.8		0.15	1.3	0.25
993	9/29/2006	1426	6.5	10.2		0.15	1.29	0.25
	avg=	1093.20	6.16	10.69	16.17	0.15	1.61	0.40
	stdev=				10.78	0.00	0.98	0.32

MP: 50403

Unnamed Tributary to Little Toby Creek

Lat. *Long.*

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
378	6/29/2005	24	8.1	206.2		1.22	2.82	0.25
551	9/21/2005	20	7.5	199.8		1.08	2.52	0.25
717	3/8/2006	73	7.8	175.2		1.707	2.16	0.25
851	7/7/2006	103	8	144.4		0.609	3.8	0.25
995	9/26/2006	35	7.8	155		0.636	1.49	0.25
	avg=	51.00	7.84	176.12		1.05	2.56	0.25
	stdev=					0.45	0.85	0.00

MP: MR15

McCauley Run-Down

Elk County

Horton TWP

Lat. 41-18-47 *Long.* 078-39-20

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
421	10/29/1997		6.5	44	0	0.15	0.845	0.25
519	4/14/1998		6.5	28	0	0.15	0.669	0.25
568	7/15/1998		6.8	64	0	0.695	2.41	0.25
610	10/19/1998		6.8	64	0	0.15	0.524	0.25
646	3/22/1999		6.6	26	0	0.15	0.686	0.25
683	5/6/1999		6.5	30	0	0.844	1.83	0.25
724	7/12/1999		6.8	62	0	0.15	1.63	0.25
762	10/6/1999		6.8	64	0	0.15	1.93	0.25
820	4/10/2000		6.3	20	0	0.15	0.677	0.25
888	8/2/2000		6.4	34	0	0.15	1.04	0.25
895	8/9/2000		6.6	48	0	0.563	2.94	0.25
958	11/1/2000		6.8	68	0	0.519	3.76	0.25
46	5/10/2001		6.4	38	0	0.15	1.32	0.25
53	6/11/2001		6.7	54	0	0.15	1.59	0.25
117	10/4/2001		7.1	78	0	0.381	1.44	0.25
186	4/2/2002		6.8	32	0	0.15	0.914	0.25
230	8/1/2002		6.5	52	0	0.395	4.23	0.25
240	10/1/2002		7	46	0	0.488	3.13	0.25
678	7/14/2004		7.2	42.8	3.2	0.901	1.63	0.551
377	6/29/2005	200	7	51.8		1.54	2.51	1.16
550	9/21/2005	251	7.2	67.6		0.331	2.66	0.25
716	3/8/2006	220	7.2	54.4		0.621	3.496	0.25
850	7/7/2006	228	7.7	61.2		0.626	2.52	0.25
994	9/26/2006	241	7.4	65		0.15	1.77	0.25
	avg=	228.00	6.82	49.78	0.17	0.40	1.92	0.30
	stdev=				0.73	0.35	1.06	0.19

MP: LTU51

Unnamed Tributary to Little Toby-Down

Lat. 41-18-38 *Long.* 078-39-36

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
648	10/9/1996		3.5	0	74	5.25	5.55	4.23
694	11/21/1996		3.7	0	54	3.53	5.22	3.73
224	1/8/1997		3.8	0	58	2.95	4.71	3.82
734	1/23/1997		3.8	0	64	2.77	4.84	3.41
751	2/6/1997		3.8	0	42	1.81	2.64	2.28
420	10/29/1997		3.4	0	102	12.7	7.09	4.83
100	6/29/1998		3.4	0	76	8.02	5.67	2.55
611	10/19/1998		5.7	11.6	3.4	0.373	4.98	0.25
647	3/22/1999		5.1	11.2	8	0.15	3.72	1.18
684	5/6/1999		4.7	8.2	16.2	0.15	7.49	2.02
723	7/12/1999		5.1	10	22	0.15	12.6	0.655
761	10/6/1999		5.9	13.6	6.2	0.553	9.83	0.25
821	4/10/2000		4.5	8.8	44	0.337	11.3	7.08
376	6/29/2005	7	3.9	0.8	71	3.45	18.25	3.33
545	9/21/2005	1	4.1	3.2	102	5.11	16.4	2.58
715	3/8/2006	4	3.7	0	101	7.39	19.07	4.74
849	7/7/2006	10	3.5	0	51.2	6.38	12.4	2.55
991	9/26/2006	9	3.8	0	43.4	4.22	14.2	1.94
	avg=	6.20	4.19	3.74	52.13	3.63	9.22	2.86
	stdev=				32.38	3.43	5.21	1.76

MP: 50392

Unnamed Tributary to Little Toby Creek

Lat.

Long.

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
375	6/29/2005	40	6.8	30.4		0.15	0.625	0.25
546	9/21/2005	18	6.6	34.8		0.15	0.614	0.25
714	3/8/2006	38	6.9	29	1	0.15	0.642	0.25
846	7/6/2006	63	6.4	31		0.15	0.312	0.25
	avg=	39.75	6.675	31.3		0.15	0.54825	0.25
	stdev=					0.00	0.16	0.00

MP: 50391**Unnamed Tributary to Little Toby Creek***Lat.* *Long.*

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
374	6/29/2005	15	6.7	36.8	8	0.15	11.3	0.25
544	9/20/2005	3	7.1	43.4	9.8	0.15	6.98	0.25
713	3/8/2006	12	6.7	25.8	9.8	0.15	2.236	0.25
845	7/6/2006	18	6.3	31.6		0.15	2.71	0.25
992	9/26/2006	12	7	34.2		0.15	3.15	0.25
	avg=	12.00	6.76	34.36	9.20	0.15	5.28	0.25
	stdev=				1.04	0.00	3.86	0.00

MP: 50387**Unnamed Tributary to Little Toby Creek***Lat.* *Long.*

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
373	6/26/2005	13	3.9	1	127.6	0.15	31.4	7.97
543	9/20/2005	8	3.8	0	271.2	0.15	56.8	11.1
705	3/1/2006	38	4	2.8	126.2	0.15	38.01	12.12
844	7/6/2005	163	4	1.4	92.2	0.15	24.6	5.93
987	9/20/2006	34	3.9	0	126.4	0.15	45.2	9.095
	avg=	51.20	3.92	1.04	148.72	0.15	39.20	9.24
	stdev=				70.08	0.00	12.46	2.47

MP: LT11**Little Toby Creek-Down***Lat.* 41-17-08 *Long.* 078-41-21

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
127	7/25/1996		4.6	7.8	26	0.383	6.07	3.05
110	8/12/1996		4.5	7.2	36	0.358	5.9	4.16
774	10/9/1996		4.8	9	26	0.579	5	2.58
887	11/21/1996		4.8	10.4	28	1.45	4.67	3.46
220	1/7/1997		4.9	10.2	19.8	1.95	3.61	2.73
733	1/23/1997		5.2	9.6	24	2.34	2.75	1.95
292	4/7/1997		4.8	8.6	26	1.39	3.82	2.73
332	4/30/1997		5	11.2	19	1.14	3.69	1.92
253	5/7/1997		5.1	11.2	18	1.22	3.5	1.81
804	6/26/1997		4.9	9.8	20	0.808	4.76	1.44
949	1/21/1998		4.9	11.2	17.4	1.92	4.34	2.98
91	6/29/1998		4.8	9.4	22	0.598	5.56	1.94
711	5/18/1999		4.8	9.6	36	1.49	6.1	3.78
728	7/13/1999		4.9	10.6	17.6	0.492	5.31	3.11
448	9/3/1999		4.9	9.4	8.8	<.3	5.44	1.22
521	11/17/1999		5.1	11.6	7.8	0.697	5.28	1.52
558	1/26/2000		4.7	8.8	24	2	5.36	3.43
635	3/15/2000		4.8	10.2	24	1.4	4.12	3.08

686	4/20/2000		4.6	10	36	1.53	4.68	4.7
675	5/18/2000		4.6	10	38	0.656	5.79	4.86
775	6/20/2000		5.1	10.2	19.6	1.26	3.39	2.07
758	7/26/2000		5.3	10.4	60	19.5	5.67	2
787	8/23/2000		4.9	9.2	26	6.25	5.21	3.74
848	10/25/2000		5.9	11.2	9.6	3.2	3.83	1.06
868	11/7/2000		5.3	11.8	11.4	0.766	5.2	1.92
952	12/13/2000		6.1	13.8	3.8	0.943	2.8	0.25
916	1/31/2001		6.2	17	2	2.92	2.7	2.13
934	2/28/2001		5	10.8	19.2	1.27	3.68	2.75
966	3/21/2001		5.2	8.2	10.2	4.31	2.84	3.79
33	4/25/2001		4.9	10.2	22	1.38	3.53	3.14
28	5/23/2001	15276	5.2	8.8	15.6	1.99	2.95	2.07
65	6/27/2001		5	13.6	59	0.724	5.1	2.85
80	7/23/2001		4.8	11.4	60.2	0.57	5.89	3.55
83	8/28/2001		4.8	9	54	0.48	6.52	3.08
125	10/26/2001		6.1	11	32	0.749	4.15	0.25
183	1/29/2002		5.2	7.8	37.6	1.46	3.39	1.97
231	2/26/2002		4.9	8	44.6	1.95	4.36	2.98
247	3/27/2002		5.9	12.2	30	3.32	0.944	1.38
267	4/25/2002		5.5	9.8	44.6	5.41	3.17	2.19
367	10/29/2002		4.9	8.2	62.2	0.898	4.47	2.42
405	11/20/2002		6	10.2	46	1.27	2.89	1.16
289	3/18/2003		5.9	8.8	38.8	2.53	1.97	1.57
331	4/23/2003		4.7	8.8	46.4	2.6	4.66	3.62
367	5/22/2003		5.5	10.2	49.6	3.32	2.05	1.83
389	6/24/2003		4.7	7.8	69.6	1.15	5.3	3.79
417	7/30/2003		5.2	8.4	46.2	2.66	3.87	2.04
437	8/15/2003		5	8.2	50	1.49	4.1	2.26
466	9/25/2003		6.4	11.2	38.4	2.05	3.82	1.5
513	10/27/2003		6.2	11.8	38	2.91	4.21	2.24
530	11/17/2003		6.7	16.8	0	3.34	2.62	1.03
541	12/16/2003		5.6	9.2	37.6	2.46	2.98	1.82
574	3/25/2004		5.6	9.8	27.2	2.13	3.02	2.41
614	4/28/2004		6.2	12.4	45.4	1.76	2.87	1.59
641	5/26/2004		6	12.8	43.8	2.29	3.33	1.91
661	6/29/2004		5.8	10.4	34	2.12	5.04	1.63
716	8/24/2004		6.4	15.6	31.4	1.44	2.54	0.996
748	9/28/2004		5	10	57	1.99	5.24	2.4
370	6/29/2005	6445	6.7	22.6	28.2	3.68	3.25	1.45
518	9/15/2005	2579	7	29.8	7.4	0.359	2.64	0.25
709	3/1/2006	9256	5.9	10.6	36.2	3.189	4.525	1.947
842	7/6/2006	11299	6.1	15.6	0.6	1.12	2.93	0.988
986	9/20/2006	12655	6.6	14.6	5.6	1.709	3.732	1.546
116	3/8/2007	8476	6.6	17.4	0	1.34	2.7	0.696
	avg=	9426.57	5.38	11.13	29.77	2.11	4.06	2.27
	stdev=				17.23	2.54	1.21	1.04

MP:

BE20

Benning Creek Downstream

Lat. 41-21-14 Long. 078-39-50

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
105	8/6/1996		6.6	36	0	0.15	5.87	0.25
664	10/9/1996		6.3	19.8	36	0.15	15.4	0.25
176	10/15/1996		6.4	18.6	26	0.15	13.4	0.25
897	11/21/1996		6.4	19	24	0.15	12.4	0.25
234	2/26/1997		5.7	14.8	22	0.15	7.54	0.25
273	3/26/1997		6	12.2	14	0.711	5.38	0.803
335	5/14/1997		6.2	19.6	0	0.15	7.23	0.25
362	8/11/1997		6.5	36	0	0.15	20.2	0.25
382	9/23/1997		6.4	38	4.2	1.44	9.44	0.535
478	3/16/1998		6.5	26	0	0.376	7.28	0.25
485	3/24/1998		6.1	17.6	7.6	0.15	5.37	0.25
536	4/28/1998		6.2	17.4	0	0.15	3.56	0.25
550	5/18/1998		6.4	22	0	0.362	6.61	0.25
578	7/27/1998		6.6	48	0	0.422	11.1	0.25
614	10/20/1998		6.5	42	0	0.15	9.53	0.25
635	2/10/1999		6.4	17.6	0	0.314	3.06	0.25
654	3/23/1999		6.5	16.2	0	0.15	2.79	0.25
672	4/15/1999		6.4	15.8	0	0.15	2.54	0.25
708	5/18/1999		6.5	26	0	0.15	3.3	0.25
740	8/10/1999		6.7	62	0	0.749	3.87	0.25
801	12/10/1999		6.1	22	0	0.15	1.57	0.25
842	4/25/2000		6.4	17	0	0.15	2.88	0.25
856	5/18/2000		6.5	28	0	0.763	3.86	0.25
882	7/18/2000		6.5	40	0	0.15	3.39	0.25
891	8/3/2000		6.5	44	0	0.15	1.96	0.25
951	10/17/2000		6.8	32	0	0.15	1.46	0.25
964	11/14/2000		6.8	36	0	0.882	2.55	0.25
50	5/14/2001		6.4	26	0	0.15	3.51	0.25
115	10/4/2001		6.9	42	0	0.15	0.894	0.25
153	1/24/2002		6.6	26	0	0.15	2.66	0.25
158	2/20/2002		6.5	22	0	0.973	4.17	0.25
185	4/1/2002		6.6	13.2	0	5.79	16.4	3
264	10/17/2002		7.2	44	0	0.15	0.903	0.25
326	4/21/2003		6.8	16.4	0	0.15	3.54	0.25
401	7/14/2003		7	29.6	0	0.15	2.28	0.25
494	10/14/2003		6.4	22.4	4	0.15	2.18	0.25
553	1/13/2004		6.8	18.8	0	0.15	7.57	0.25
624	5/10/2004		6.6	19	24.2	0.15	3.78	0.25
672	7/13/2004		6.5	17.8	15.4	0.606	2.49	0.25
760	9/30/2004		6.9	30.8	2.8	0.15	4.15	0.39
913	5/3/2005		7	27.8	20.8	0.15	1.36	0.25
399	6/30/2005	286	6.9	33.6		0.405	0.827	0.25
931	7/12/2005		7.5	41.4		0.15	0.765	0.25
573	10/4/2005	69	7.4	54		0.15	0.522	0.25
25	10/24/2005		7	26	11	0.467	0.651	0.25

744	3/29/2006	288	7.1	39.2		0.15	0.427	0.25
888	7/18/2006	243	7.7	48.2		0.15	0.301	0.25
	avg=	221.50	6.61	28.55	5.05	0.41	4.96	0.33
	stdev=				9.41	0.85	4.58	0.41

MP:	BE21	Unnamed Tributary to Benninger Creek Downstream BE20						
<i>Lat.</i>		<i>Long.</i>						
	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
400	6/30/2005	83	6.4	14.2	14	0.15	3.95	0.25
574	10/4/2005	13	6.8	26.2	27	0.15	1.4	0.25
745	3/29/2006	80	6.1	10.2	5.4	0.15	2.01	0.25
887	7/18/2006	56	6.9	14.8		0.15	1.14	0.25
6	9/26/2006	110	6.5	13.4		0.15	1.52	0.25
	avg=	68.40	6.54	15.76	15.47	0.15	2.00	0.25
	stdev=				10.87	0.00	1.13	0.00

MP: BE1 Mouth of Benninger Creek

<i>Lat.</i>		<i>Long.</i>						
	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
397	6/30/2005	860	6.6	20.4	4.6	0.15	0.406	0.25
571	10/4/2005	162	6.9	31.4		0.15	0.025	0.25
741	3/29/2006	893	6.9	21.6		0.15	0.498	0.25
884	7/18/2006	832	6.3	26.4		0.15	0.101	0.25
	avg=	686.75	6.675	24.95		0.15	0.2575	0.25
	stdev=					0.00	0.23	0.00

MP: BC29 Left Headwater Trib Upstream from BC28

<i>Lat.</i>		<i>Long.</i>						
	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
395	6/30/2005	152	4.7	6.6	12.8	0.15	0.227	0.25
586	10/4/2005	42	4.7	7.4	17.2	0.15	0.314	0.25
746	3/29/2006	322	4.8	6.2	6.2	0.15	0.116	0.25
890	7/18/2006	84	4.6	6	5.6	0.15	0.207	0.25
7	9/26/2006	176	5.1	6.4	1.6	0.15	0.022	0.25
	avg=	155.20	4.78	6.52	8.68	0.15	0.18	0.25
	stdev=				6.23	0.00	0.11	0.00

MP: BC30A Right Headwater Trib Upstream from BC28

<i>Lat.</i>	<i>Long.</i>	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
396	6/30/2005	497	4.6	6	12.4	0.15	0.333	0.25	
569	10/4/2005	95	4.7	7.2	16	0.15	0.297	0.25	
747	3/29/2006	124	4.8	6	7.2	0.15	0.165	0.25	
889	7/18/2006	97	5	7	8.4	0.15	0.249	0.25	
8	9/26/2006	444	4.6	5.6	3	0.15	0.241	0.25	
	avg=	251.40	4.74	6.36	9.40	0.15	0.26	0.25	
	stdev=				4.98	0.00	0.06	0.00	

MP: BC28 Brandy Camp Upstream from Confluence with Benninger Creek

<i>Lat.</i>	<i>Long.</i>	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
394	6/30/2005	690	4.7	6.8	16	0.15	0.283	0.25	
570	10/4/2005	156	4.8	7.6	16.6	0.15	0.31	0.25	
742	3/29/2006	471	5	7	5.8	0.15	0.128	0.25	
885	7/18/2006	422	5.3	7.2	3	0.15	0.225	0.25	
990	9/20/2006	646	4.7	5.6	2.2	0.15	0.26	0.25	
	avg=	477.00	4.90	6.84	8.72	0.15	0.24	0.25	
	stdev=				7.05	0.00	0.07	0.00	

Brandy Camp Upstream From Confluence with Karnes Run

MP: BC24

<i>Lat.</i>	<i>Long.</i>	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
393	6/30/2005	3430	6.5	17.4	16.2	0.315	0.404	0.25	
565	9/22/2005	423	6.7	31.4	4	0.15	0.663	0.25	
740	3/29/2006	2881	6.8	18.2	1	0.15	0.359	0.25	
883	7/18/2006	3488	6.2	22.2		0.15	0.248	0.25	
	avg=	2555.50	6.55	22.30	7.07	0.19	0.42	0.25	
	stdev=				8.05	0.08	0.18	0.00	

MP: BC22A Unnamed Tributary to Brandy Camp Creek upstream from BC21

<i>Lat.</i>	<i>Long.</i>	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
392	6/30/2005	182	5.7	13.6	30	3.48	3.64	4.6	
564	9/22/2005	33	4.6	11	116.6	9.15	8.66	18	
739	3/29/2006	144	4.8	9.8	36.2	3.92	4.16	9.05	
882	7/18/2006	508	5.1	10.2	20.2	2.78	3.6	5.7	
989	9/20/2006	202	5.6	12.8	7.8	3.218	3.602	6.456	
	avg=	213.80	5.16	11.48	42.16	4.51	4.73	8.76	
	stdev=				42.98	2.63	2.21	5.42	

MP: BC21 Brandy Camp Creek Below Brandy Camp Deep Mine Discharge

Lat. 41-19-03 Long. 078-41-10

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
390	6/30/2005	6464	6.5	17.4	30.8	3.44	1.18	0.759
563	9/22/2005	1403	6.5	26.4		6.62	2.2	1.35
737	3/29/2006	4958	6.3	16.8	21.2	8.99	1.85	1.31
880	7/18/2006	4544	6.1	28		6.92	2.08	0.909
988	9/20/2006	7109	6.3	17.2	4.4	7.683	1.991	1.197
	avg=	4895.60	6.34	21.16	18.80	6.73	1.86	1.11
	stdev=				13.36	2.05	0.40	0.26

MP: 50371 Unnamed Tributary to Little Toby Creek

Lat. Long.

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
391	6/30/2005	141	7.8	78		2.98	1.5	3.1
562	9/22/2005	25	7.9	118	12	0.15	1.09	0.25
738	3/29/2006	88	8.1	107.4		0.346	0.929	0.25
881	7/18/2006	62	7.3	122.6		0.354	0.808	0.25
982	9/19/2006	106	7.8	97.2		0.362	1.49	0.25
	avg=	84.40	7.78	104.64		0.84	1.16	0.82
	stdev=					1.20	0.32	1.27

MP: BCU16 Unnamed Tributary to Brandy Camp Creek

Lat. 41-18-53 Long. 078-41-17

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
389	6/30/2005	20	7.3	43.4		0.772	0.062	<.5
0	9/22/2005	0						
736	3/29/2006	44	7.6	56.2		<.3	<.05	<.5
879	7/18/2006	8.6	7.4	37.2		<.3	0.318	<.5

MP: BCU12A Unt to Brandy Camp Creek downstream from BCU12

Lat. Long.

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
388	6/30/2005	31	8.2	242		1.12	0.378	0.25
561	9/22/2005	52	8.1	279		0.547	0.429	0.25
735	3/29/2006	270	8.2	244.2		0.15	0.106	0.25
878	7/17/2006	121	8.1	283.4		0.591	0.305	0.25
	avg=	118.50	8.15	262.15		0.60	0.30	0.25
	stdev=					0.40	0.14	0.00

MP: BC10 Brandy Camp Creek

Lat. 41-17-08 Long. 078-41-22

	<i>Date</i>	<i>Final</i>	<i>pH</i>	<i>ALK</i>	<i>HOT A</i>	<i>FE</i>	<i>MN</i>	<i>AL</i>
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
128	7/25/1996		5.7	13	30	10.1	3.93	0.796
773	10/9/1996		6.2	15.2	26	8.1	2.8	1.36
886	11/21/1996		5.9	14.2	22	7.86	2.83	1.61
732	1/23/1997		5.9	12.8	19.4	3.4	1.69	0.967
246	2/27/1997		5.2	11.6	4.6	4.63	1.34	2.31
10	4/9/1997		5.6	12.2	26	7.82	2.92	2.05
333	4/30/1997		5.9	14.4	14	4.81	1.85	1.05
803	6/26/1997		5.8	13.6	30	9.48	3.09	1.72
950	1/21/1998		5.9	14.6	12.8	8.81	3.12	2.47
92	6/29/1998		5.9	11.6	26	9.43	3.26	1.49
447	9/3/1999		4.4	7	11	3.03	5.82	0.749
522	11/17/1999		5.8	20	5.8	7.01	3.25	0.817
557	1/26/2000		6.4	30	0	3.2	2.9	0.586
582	2/29/2000		6.1	11.4	12.2	2.11	1.01	0.25
631	3/15/2000		6.4	24	1.2	3.41	2.21	0.25
685	4/20/2000		6	18.6	20	11.6	3.04	1.92
676	5/18/2000		6.4	32	0	7.06	4.6	0.25
774	6/20/2000		6.1	15	14.8	6.03	1.86	1.22
757	7/26/2000		4.7	9.8	32	0.548	6.06	4.47
788	8/23/2000		5.9	14.2	30	13.8	5.21	2.28
849	10/25/2000		5.8	11.8	15.4	5.78	3.16	1.3
865	11/7/2000		6	17	52	8.52	4.18	1.48
953	12/13/2000		6.1	13.2	6.2	4.01	1.63	0.827
917	1/31/2001		6.3	17	0.8	2.28	1.18	0.762
932	2/28/2001		6.7	28	0	2.39	1.87	0.527
962	3/21/2001		6.3	17.6	0	2.34	1.38	0.857
34	4/25/2001		6.4	20	0.8	4.28	1.75	0.57
29	5/23/2001	8122	6.3	15	6	3.03	1.43	0.992
64	6/27/2001		6.2	20	54.6	8.65	4.19	0.638
84	7/23/2001		5.9	14.4	45.8	7.31	6.15	0.899
84	8/28/2001		4.1	4.4	66	1.73	6.89	3.2
124	10/26/2001		6.3	13.6	38	5.7	3.07	0.631
182	1/29/2002		6.3	14.8	25.6	1.21	1.04	0.515
232	2/26/2002		6.3	20	34	6.24	2.11	0.892
248	3/27/2002		5.7	11.8	39	3.67	1.7	2.1
269	4/25/2002		6.1	20	40.6	8.18	2.49	1.11
368	10/29/2002		6.8	30	0	1.94	1.78	0.25
406	11/20/2002		6.5	17.4	0	1.1	0.972	0.543
288	3/18/2003		6.3	12	34.8	3.21	1.15	1.45
330	4/23/2003		6.4	22.4	36.4	8.83	2.59	1.57
366	5/21/2003		6.2	16.4	41.6	3.84	1.03	1.31
415	7/30/2003		6.6	19.6	0	5	1.9	0.895
472	9/25/2003		6.5	21.2	0	4.49	1.67	0.753

515	10/27/2003		6.7	21.6	0	7.05	1.96	1.5
526	11/17/2003		6.7	18.4	0	4.88	1.57	0.664
539	12/16/2003		6.6	22.8	0	3.13	1.4	0.593
573	3/25/2004		6.5	20.2	27	4.18	1.58	1.31
613	4/28/2004		6.3	16	53.6	4.59	1.64	1.13
639	5/26/2004		6.5	22	50.6	5.68	1.93	1.41
660	6/29/2004		6.4	27.8	26.4	11.6	3.26	2
714	8/24/2004		6.4	18.8	27.4	2.64	1.32	0.661
747	9/28/2004		6.5	34.8	42	10.4	3.69	2.04
371	6/29/2005	10326	6.7	21.6	31.6	4.58	1.33	1.23
519	9/15/2005	1771	6.7	30.6	39.6	8.16	4.01	0.25
710	3/1/2006	6772	6.5	29	33.8	10.09	2.722	1.43
841	7/6/2006	6809	6.4	39		3.37	2.06	0.25
985	9/20/2006	8448	6.8	30.2		4.921	1.963	0.87
115	3/8/2007	9016	6.7	28.4		7.06	1.82	0.911
	avg=	7323.43	6.15	18.86	21.95	5.66	2.59	1.19
	stdev=				18.07	3.03	1.41	0.77

MP: LT10 Little Toby Below Confluence w/ Brandy Camp
Lat. 41-17-06 Long. 078-41-23

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
129	7/25/1996		5.2	8.6	24	6.55	4.54	1.63
772	10/9/1996		5.8	11.2	26	5.82	3.46	1.63
885	11/21/1996		5.1	10.8	26	5.49	3.43	2.21
731	1/23/1997		5.8	10.8	20	2.71	2.03	1.18
334	4/30/1997		5.5	11.4	18	3.12	2.72	1.51
254	5/7/1997		5.6	11.8	18	3.28	2.37	1.3
802	6/26/1997		5.6	11.6	24	6.2	3.54	1.63
948	1/21/1998		5.2	12.4	16.2	5.41	3.79	2.73
446	9/3/1999		4.7	8.4	10.6	1.32	5.77	1.09
520	11/17/1999		5.6	15.6	8.2	3.97	4.14	1.09
556	1/26/2000		5.6	12.2	10	2.36	4.26	2.19
581	2/29/2000		6.1	11.2	11.4	2.18	1.08	0.504
630	3/15/2000		6.3	22	5.4	3.07	2.5	0.879
684	4/20/2000		5.2	12.8	22	7.78	3.36	2.51
677	5/18/2000		5.1	10.8	17	3.87	5.82	3.06
773	6/20/2000		6	13.6	16.8	4.69	2.11	1.28
759	7/26/2000		4.7	9.6	42	5.97	6.04	3.86
789	8/23/2000		4.7	9.2	38	1.19	5.44	3.89
850	10/25/2000		5.8	11.2	26	0.345	4.32	0.721
864	11/7/2000		5.7	13.4	48	4.04	4.81	1.75
954	12/13/2000		6.1	13	5.4	2.76	1.89	0.598
918	1/31/2001		6.3	16.6	0	2.36	1.44	1.1
933	2/28/2001		6.1	17.2	1.4	1.53	2.2	1.41
961	3/21/2001		6.3	16.8	0	2.42	1.52	0.905
32	4/25/2001		4.9	10.2	19.8	1.82	3.54	2.98
30	5/23/2001	34529	6.2	14	7	2.7	1.77	1.14

63	6/27/2001		5.2	7.8	40	4.09	4.82	1.76
83	7/23/2001		4.8	10.6	52.4	3.16	7	2.79
82	8/28/2001		4.5	7.4	52	0.983	6.95	3.25
126	10/26/2001		6.2	11.4	36	2.26	3.88	0.25
181	1/29/2002		6.1	11.4	27.8	1.33	1.92	1.05
230	2/26/2002		6.1	14	37.6	4.6	2.7	1.34
246	3/27/2002		5.8	9.6	34.6	4.07	1.03	1.79
268	4/25/2002		4.7	7.8	65.2	1.94	4.34	4.07
366	10/29/2002		6.4	16.2	37.8	1.37	3.11	1.3
404	11/20/2002		6.5	15.4	0	1.08	1.38	0.647
290	3/18/2003		6	9.2	38	3	1.84	1.82
332	4/23/2003		4.8	8.8	45.8	3.74	4.58	3.49
368	5/22/2003		5.7	10.8	47.8	3.79	1.94	1.98
388	6/24/2003		4.8	8	54.4	3.08	5.02	3.4
416	7/30/2003		5.5	9	40.4	3.22	3.7	2.07
436	8/15/2003		5.4	9.2	46.6	2.96	4.09	2.19
476	9/25/2003		6.5	13.6	0	2.57	3.18	1.26
529	11/17/2003		7.2	81.2	0	0.15	0.327	0.25
514	10/27/2003		6.7	18.2	0	4.57	3.11	1.7
540	12/16/2003		6	11.2	40.8	2.59	2.74	1.66
575	3/25/2004		5.8	10.8	26.2	2.29	2.88	2.21
640	5/26/2004		6.5	19.6	39.6	3.14	2.58	1.4
662	6/29/2004		6.2	16.4	29	4.98	4.2	1.63
715	8/24/2004		6.4	15.6	32	1.68	2.39	1.01
372	6/29/2005	16771	6.7	21.6	31	4.31	2.01	1.32
521	9/15/2005	4350	6.8	28.6	36	3.35	3.24	0.25
	avg=	18550.00	5.74	14.03	26.00	3.22	3.32	1.74
	stdev=				17.06	1.64	1.52	0.96

MP: 5 Flow From Reservoir on Headwaters of Johnson Run

Lat. *Long.*

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
401	7/6/2005	45	4.7	6.6	50.6	1.52	2.33	0.795
522	9/15/2005	2	5.5	9.4	53.8	0.511	2.36	0.25
706	3/1/2006	3	5	7.6	31.6	1.103	3.04	1.216
871	7/17/2006	4.6	4.5	5.8	9.2	0.373	2.49	0.601
972	9/12/2006	12	6.3	14.6	2.6	0.467	1.9	0.25
120	3/8/2007	1	5.1	7.6	9.8	0.15	1.98	0.699
	avg=	11.27	5.18	8.60	26.27	0.69	2.35	0.64
	stdev=				22.37	0.52	0.41	0.36

MP: 6A Headwaters of Johnson Run at Shawmut Road Bridge

Lat.	Long.							
Seq	Date Collected	Final Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
402	7/6/2005	198	6.3	17	28.4	1.26	7.22	0.25
523	9/15/2005	61	6.6	29.4	61.2	2.86	11.5	0.25
707	3/1/2006	302	6.4	21.4	25.4	2.9	8.626	0.25
876	7/17/2006	450	6.6	17	1.2	0.739	4.903	0.25
980	9/19/2006	421	6.4	15.8	11	0.916	5.27	0.25
119	3/8/2007	281	6.3	15.4	4	1.17	4.51	0.25
	avg=	285.50	6.43	19.33	21.87	1.64	7.00	0.25
	stdev=				22.21	0.98	2.70	0.00

MP: JR1 Mouth of Johnson Run

Lat.	Long.							
Seq	Date Collected	Final Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
361	6/14/2005	254	7.9	97.4		0.15	0.33	0.25
520	9/15/2005	230	8	94		0.15	0.169	0.25
708	3/1/2006	800	7.6	87		0.15	1.366	0.25
877	7/17/2006	1237	7.8	72.2		0.747	1.097	0.25
981	9/19/2006	1563	7.7	79		0.15	0.631	0.25
118	3/8/2007	1602	7.4	65.6		0.15	1.14	0.25
	avg=	947.6667	7.73	82.53		0.25	0.79	0.25
	stdev=					0.24	0.48	0.00

MP: LT404 Little Toby @ Route153 Deep Mine Discharge

Lat.	Long.							
Seq	Date Collected	Final Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
262	3/24/1997		5.1	9.8	20	3.31	3.33	2.14
331	4/30/1997		5.8	13.6	13.4	2.64	2.68	1.34
791	5/27/1997		6	11.2	7.4	2.36	2.35	0.963
801	6/26/1997		5.7	11.6	24	4.23	4.11	1.63
624	8/14/1997		6	13.2	7.4	2.24	3.62	0.871
860	9/17/1997		5.7	11	22	4.044	4.669	1.218
874	10/29/1997		6.2	14.6	19.2	3.3	4.12	0.783
930	11/25/1997		6.1	16	8.2	1.92	2.21	1.02
959	1/21/1998		5.3	12.2	13.4	4.21	3.82	2.75
996	2/24/1998		6	12.8	10.2	2.76	2.48	1.53
21	3/26/1998		5.6	10.8	13.4	3.26	3.2	1.94
35	4/14/1998		5.8	11.6	10.2	2.59	2.66	1.5
57	5/29/1998		4.6	10	34	4.58	5.55	2.9
90	6/29/1998		5.5	10.4	20	3.73	4.32	1.27
158	8/25/1998		4.8	9.4	16	3.62	5.46	2.59
182	10/29/1998		5.5	11	7.4	1.75	4.92	0.686
200	11/25/1998		5.8	12.4	7.4	2.4	5.06	0.664

212	12/21/1998		5.9	14	8.6	3.51	4.56	0.869
254	1/29/1999		6	11.4	7.4	1.24	1.74	0.978
275	2/19/1999		5.7	11	6	2.33	2.65	1.64
299	3/30/1999		5.7	11.6	9.4	1.66	1.57	1.14
369	4/28/1999		5.2	8.8	11.6	3.22	3.02	2.07
257	5/26/1999		6	13.4	13.2	2.94	3.12	1.18
285	6/18/1999		5	10.2	14.4	3.67	5.48	1.74
404	7/30/1999		5.9	11.8	0	0.599	4.61	0.25
436	9/3/1999		4.9	8.8	9.6	1.14	5.47	0.601
456	9/30/1999		5.3	10	17.8	6.7	3.54	2.32
443	11/2/1999		5.4	10.4	14.8	1.13	4.91	0.535
509	11/17/1999		5.9	20	2.8	2.33	3.74	0.769
511	12/22/1999		6.2	14	6	1.85	2.09	1.06
555	1/26/2000		5.9	15.2	5.8	2.28	4.01	1.97
580	2/29/2000		6	11.2	12.2	1.53	1.56	0.895
629	3/15/2000		5.9	14.2	14.2	2.04	3.25	1.69
683	4/20/2000		5	12.2	24	4.96	3.76	3.15
678	5/18/2000		5	10.6	18	2.59	5.7	3.2
772	6/20/2000		6.1	13.6	10.8	2.63	2.42	1.17
760	7/26/2000		4.8	9.2	38	6.21	5.98	3.79
790	8/23/2000		5	8.2	30	3.75	5.03	2.11
851	10/25/2000		6	13.2	8.2	2.33	3.59	0.696
863	11/7/2000		6	16.2	32	3.26	4.52	1.37
955	12/13/2000		6.3	18.2	0	2.07	1.98	0.25
919	1/31/2001		6.4	19.6	0	3.01	2.03	1.68
931	2/28/2001		6.4	19.6	2	1.62	2.66	1.45
960	3/21/2001		6.2	14.4	1.4	2.09	2.1	1.66
41	4/25/2001		5.7	11.8	7.8	2.38	2.7	1.76
27	5/23/2001		6.4	16.8	3.6	1.32	2.05	0.569
62	6/27/2001		5.8	9.6	34.4	2.86	4.54	0.95
79	7/23/2001		4.9	10.4	45.2	2.37	5.64	2.07
81	8/28/2001		4.8	9.6	52	0.432	6.51	2.9
123	10/26/2001		6.5	14.8	0	2.29	3.44	0.25
180	1/29/2002		6.2	13.6	25	1.3	2.07	1.07
229	2/26/2002		6	12.4	32.4	3.48	2.99	1.68
245	3/27/2002		5.9	11.4	38.2	3.73	1.26	1.87
266	4/25/2002		5.3	8.4	41.4	3.8	3.3	2.35
365	10/29/2002		6.6	22	0	1.24	2.86	0.763
403	11/20/2002		6.5	15.8	0	1.18	1.81	0.741
295	3/19/2003		6	9.4	41.8	2.91	1.39	1.39
336	4/23/2003		5.4	11	38.4	4.53	3.74	2.62
365	5/21/2003		6.2	15.4	42.2	4.43	1.61	1.84
360	6/14/2005	8676	6.6	25.8	20.8	1.29	3.04	0.25
511	9/13/2005	5815	7.2	41.2	8.6	0.677	2.28	0.25
711	3/1/2006	16028	6.5	22.8	32.8	5.579	3.623	1.591
843	7/6/2006	19589	6.3	28.2		1.5	2.42	0.547
984	9/20/2006	23992	6.7	25.6		2.24	2.671	0.825
117	3/8/2007	17492	6.8	26.6		3.52	1.8	0.678

avg=	15265.33	5.81	14.08	16.72	2.75	3.41	1.43
stdev=				13.47	1.30	1.32	0.81

MP: 50354 Unnamed Tributary to Little Toby Creek

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
369	6/29/2005	20	7.8	68.4		0.317	0.189	0.25
510	9/13/2005	15	7.8	62.2		0.15	0.118	0.25
712	3/1/2006	46	7.1	40.4		0.15	0.447	0.25
	avg=	27.00	7.57	57.00		0.21	0.25	0.25
	stdev=					0.10	0.17	0.00

MP: 22 Eastern Headwater Tributary to Mead Run Upstream from 16

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
411	7/6/2005	127	4.6	6.2	18	0.394	1.86	0.843
530	9/15/2005	15	4.3	5.4	71.4	0.15	6.16	2.22
704	3/1/2006	63	4.8	7.2	19	0.15	1.245	1.097
874	7/17/2006	99	4.7	6.8	10.2	0.15	2.081	0.829
979	9/19/2006	173	4.6	7.2	15.6	0.16	2.58	0.909
	avg=	95.40	4.60	6.56	26.84	0.20	2.79	1.18
	stdev=				25.14	0.11	1.95	0.59

MP: 21 Western Headwater Tributary to Mead Run Upstream from 16

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
410	7/6/2005	48	4.2	4.2	66.6	0.15	12.5	4.86
259	9/15/2005	12	4.2	4.8	118.2	0.15	15.6	5.24
703	3/1/2006	105	4.3	6.2	67.8	0.15	11.5	7.248
875	7/17/2006	132	4.3	5.4	40.4	0.15	9.92	4.12
978	9/19/2006	151	4.3	5	59	0.15	10.4	4.88
	avg=	89.60	4.26	5.12	70.40	0.15	11.98	5.27
	stdev=				28.88	0.00	2.26	1.18

Northeast Headwater Tributary to Mead Run Upstream from Shawmut Road Bridge

MP: 16

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
406	7/6/2005	471	4.3	4.8	46.6	0.15	5.13	1.31
525	9/15/2005	27	6.3	10.6	19.6	0.15	1.49	0.25
699	2/28/2006	198	4.5	7.2	52.8	0.15	3.94	2.08
869	7/17/2006	348	4.2	4.8	17.6	0.15	5.7	1.63
973	9/19/2006	508	5.4	9	9.4	0.15	2.26	0.704
	avg=	310.40	4.94	7.28	29.20	0.15	3.70	1.19
	stdev=				19.23	0.00	1.81	0.73

MP: 19 Northwestern Headwater Tributary to Mead Run Above 18 Confluence

Lat. Long.

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
409	7/6/2005	145	4.3	4.6	45.6	0.15	5.87	2.59
528	9/15/2005	26	4.3	4.8	65	0.15	7.03	2.54
702	3/1/2006	80	4.4	6.2	55.6	0.15	6.644	4.818
872	7/17/2006	170	4.2	3.8	25	0.15	7.33	2.78
977	9/19/2006	189	4.1	4.6	37.6	0.15	6.8	2.55
	avg=	122.00	4.26	4.80	45.76	0.15	6.73	3.06
	stdev=				15.53	0.00	0.55	0.99

Northwestern Headwater Tributary to Mead Run Upstream from Shawmut Road Bridge**MP: 17**

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
407	7/6/2005	372	5.3	7.8	17	0.15	1.97	0.601
526	9/15/2005	84	7.9	94.2		0.15	0.064	0.25
700	2/28/2006	483	4.9	8.6	10.2	0.15	0.025	0.25
870	7/17/2006	422	5.3	8.6	4.4	0.15	2.37	0.645
974	9/19/2006	629	4.3	6	33.4	0.15	6	1.87
	avg=	398.00	5.54	25.04	16.25	0.15	2.09	0.72
	stdev=				12.54	0.00	2.44	0.67

Unnamed Tributary to NW Headwater Tributary to Mead Run Upstream from 17**MP: 18**

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
408	7/6/2005	213	6.3	10.8	12.6	0.52	0.441	0.25
527	9/15/2005	9	6.3	15	46.8	0.47	2.23	0.25
701	3/1/2006	220	6.4	13	20.6	0.15	1.704	0.25
873	7/17/2006	233	6.7	12.6		0.31	0.504	0.25
976	9/19/2006	296	6.3	13.6	0.8	0.15	0.386	0.25
	avg=	194.20	6.40	13.00	20.20	0.32	1.05	0.25
	stdev=				19.51	0.17	0.86	0.00

MP: 15 Unnamed Tributary to Mead Run South of Shawmut Road Bridge

Lat. Long.

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
405	7/6/2005	90	7.4	72.4		0.808	0.109	0.25
524	9/15/2005	1	4.1	4.2	83.4	0.15	10.3	2.02
698	2/28/2006	105	6.9	72.4		0.15	5.86	3.22
868	7/17/2006	44	8	87.6		0.404	0.069	0.25
975	9/19/2006	80	7.1	82.6		0.15	0.076	0.25
	avg=	64.00	6.70	63.84		0.33	3.28	1.20
	stdev=					0.29	4.65	1.37

MP: 5A Unnamed Tributary to Mead Run in Horton City

Lat. Long.

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
414	7/6/2005	226	7.2	56.2		0.403	0.025	0.25
533	9/20/2005	57	6.9	81		0.15	0.025	0.25
694	2/28/2006	169	6.8	56.4		1.62	0.985	0.25
864	7/17/2006	396	7.8	63.8		0.547	0.098	0.25
968	9/12/2006	153	7.4	68		0.409	0.1	0.25
	avg=	200.20	7.22	65.08		0.63	0.25	0.25
	stdev=					0.57	0.41	0.00

MP: MRDMD Mead Run Deep Mine Discharge at Weir

Lat. Long.

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
695	2/28/2006	201	6.3	70.6		<.3	0.059	<.5
865	7/17/2006	150.7	6.5	72.8		2.58	1.09	<.5
969	9/12/2006	159.6	6.2	58.4		2.14	1.28	<.5

MP: T1 Mead Run Above Confluence with T4 in Drummond

Lat. Long.

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
413	7/6/2005	1463	6.7	14.6	34.4	0.475	2.89	0.25
532	9/20/2005	342	6.2	20.8	28.4	0.884	3.37	0.25
697	2/28/2006	958	6.1	14.8	42.6	0.15	0.069	0.25
866	7/17/2006	1385	6.6	16.2		0.425	3.21	0.25
971	9/12/2006	1217	6.4	50.2		0.529	3.6	0.25
	avg=	1073.00	6.40	23.32	35.13	0.49	2.63	0.25
	stdev=				7.13	0.26	1.45	0.00

Unnamed Tributary to Mead Run in Drummond @ Confluence with Mead Run

MP: T4

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
412	7/6/2005	276	6.9	59.8		3.2	0.143	4.49
531	9/20/2005	54	7.1	128.8		0.556	0.217	0.25
696	2/28/2006	109	6.9	72.2		0.635	3.14	1.17
867	7/17/2006	123	7.5	65.6		0.786	0.174	0.25
972	9/12/2006	137	7.2	74.2		1.11	0.248	0.613
	avg=	139.80	7.12	80.12		1.26	0.78	1.35
	stdev=					1.11	1.32	1.79

MP: 8

Mouth of Sam Star Run

Lat. *Long.*

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
416	7/6/2005	359	6.8	31.8		<.3	0.053	<.5
536	9/20/2005	73	6.7	41.8		<.3	0.05	<.5

MP: 2A

Southern Headwater Tributary to Sam Star Run

Lat. *Long.*

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
403	7/6/2005	128	6.8	23.6		<.3	<.05	<.5
535	9/20/2005	12	6.5	26.2		<3	<.05	<.5

MP: 2B

Northern Headwater Tributary to Sam Star Run

Lat. *Long.*

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
404	7/6/2005	202	7.1	36		<.3	<.05	<.5
534	9/20/2005	40	6.7	40		<.3	<.05	<.5

MP: T8

Unt To Mead Run Downstream for T2 in Shawmut

Lat. *Long.*

	Date	Final	pH	ALK	HOT A	pH	ALK	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	pH units	MG/L	MG/L
418	7/7/2005	51	7.4	45.4	-27.4	-26.3333	-43.7333	<.5
538	9/20/2005	75	7.5	47.8	-29.8	-28.8	-47.45	<.5

MP: T2 Mead Run Upstream from Confluence with T8

Lat.	Long.							
	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
417	7/7/2005	1891	7	31.6	8.8	0.327	1.11	0.25
537	9/20/2005	587	7.2	36.4		0.15	0.388	0.25
693	2/28/2006	1824	6.5	31.4	21.4	0.15	0.025	0.25
863	7/17/2006	2089	7.5	35		0.15	1.08	0.25
983	9/20/2006	1825	6.9	32.6		0.15	1.745	0.25
	avg=	1643.20	7.02	33.40	15.10	0.19	0.87	0.25
	stdev=				8.91	0.08	0.67	0.00

MP: 11 Mouth of Hipple Run

Lat.	Long.							
	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
420	7/7/2005	72	7.8	85.2		0.437	0.188	0.25
539	9/20/2005	79	7.8	91		0.34	0.186	0.25
691	2/28/2006	154	6.9	64.4		0.351	1.19	0.25
862	7/17/2006	234	7.9	76		0.15	0.113	0.25
9677	9/12/2006	322	7.5	80.2		0.365	0.163	0.25
	avg=	172.20	7.58	79.36		0.33	0.37	0.25
	stdev=					0.11	0.46	0.00

MP: 12 Mead Run Downstream from Confluence with Hipple Run

Lat.	Long.							
	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
419	7/7/2005	2109	7.2	34.2		0.15	0.546	0.25
540	9/20/2005	750	7.3	38.6		0.15	0.189	0.25
692	2/28/2006	2074	6.6	34	7.4	0.521	1.87	0.25
861	7/17/2006	3393	7.6	37		0.15	0.419	0.25
	avg=	2081.50	7.18	35.95		0.24	0.76	0.25
	stdev=					0.19	0.76	0.00

MP: 1 Mouth of Coal Hollow Run

Lat.	Long.							
	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
421	7/7/2005	14	8	106.4	-77.4	<.3	0.061	<.5
541	9/20/2005	22	8	107.8	-82.8	<.3	<.05	<.5

**Mouth of Mead
Run**

MP: MR01

Lat. *Long.*

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
359	6/14/2005	2205	7.1	43.8		0.373	0.238	0.25
542	9/20/2005	805	7.4	50.4		0.322	0.175	0.25
691	2/28/2006	2296	6.6	42.2	7.4	0.966	0.118	0.25
839	7/5/2006	4052	6.6	46.6		0.15	0.191	0.25
	avg=	2339.50	6.93	45.75		0.45	0.18	0.25
	stdev=					0.36	0.05	0.00

MP: LT402

Little Toby @ Boggy Run Road

Lat. 41-15-29 *Long.* 078-43-37

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
264	3/24/1997		5.8	10.8	10.6	2.39	2.53	1.52
329	4/30/1997		6.1	16.6	5.8	1.79	2.05	0.879
789	5/27/1997		6.4	14.8	2.2	1.38	1.58	0.538
799	6/26/1997		6.1	17.6	7.6	2.01	2.69	0.729
622	8/14/1997		6.1	15.6	1.8	1.52	2.73	0.603
862	9/17/1997							
872	10/29/1997		6.4	18	8.8	1.83	3.09	0.25
932	11/25/1997		6.3	17.2	0	1.13	1.52	0.559
961	1/21/1998		6	15.2	11.4	2.61	2.49	1.67
994	2/24/1998		6.3	16.8	2.8	1.71	1.66	1.1
19	3/26/1998		5.9	16.4	3.8	1.91	2.13	0.987
33	4/14/1998		6.2	15.6	1.8	1.6	1.89	0.898
59	5/29/1998		5.9	14	16	2.92	3.84	1.63
88	6/29/1998		6.1	13.4	9	2.41	3.47	0.528
156	8/25/1998		6	12.6	2	0.692	4.44	0.745
180	10/29/1998		6	15	1.2	0.471	4.01	0.25
198	11/25/1998		6.1	16.8	0	1.15	3.9	0.25
210	12/21/1998		6.1	22	0	1.92	3.47	0.25
252	1/29/1999		6.5	26	0	1.04	1	0.729
273	2/19/1999		6.2	15	0	1.44	1.83	1
297	3/30/1999		6.4	17	2	1.25	1.19	0.838
367	4/28/1999		6	12	3	1.98	2.04	1.2
255	5/26/1999		6.3	17.6	6.2	1.89	2.28	0.733
283	6/18/1999		5.9	12.2	4.4	2.6	3.89	0.716
402	7/30/1999		6.3	24	0	0.545	3.21	0.25
434	9/3/1999		6.3	16.8	0	0.466	4.25	0.25
454	9/30/1999		5.8	12.6	20	14.4	3.5	5.97
441	11/2/1999		6.3	16	0	0.317	3.75	0.25
511	11/17/1999		5.9	22	0	1.08	2.74	0.25
509	12/22/1999		6.4	17.6	1.4	1.14	1.48	0.64
553	1/26/2000		6.2	17	2.2	1.87	2.91	1.2
578	2/29/2000		6.3	14.4	6.4	1	1.04	0.576

627	3/15/2000		6.3	17.2	7.4	1.37	2.17	1.08
681	4/20/2000		5.6	10.4	10.8	3.12	2.6	1.97
680	5/18/2000		5.9	12.4	8.4	1.58	3.43	1.55
770	6/20/2000		6.3	17.2	1	1.57	1.72	0.82
762	7/26/2000		5.4	10.2	22	5.65	4.39	2.39
792	8/23/2000		6.1	18	6.6	1.72	2.98	0.758
853	10/25/2000		6.2	17.6	0	0.15	2	0.25
861	11/7/2000		6.2	22	22	1.68	3.15	0.25
957	12/13/2000		6.4	18.6	0	1.64	1.33	0.536
921	1/31/2001		6.5	22	0	1.96	1.23	0.994
929	2/28/2001		6.5	19	0	1.14	1.86	0.88
958	3/21/2001		6.4	17.4	0	1.47	1.33	1.09
43	4/25/2001		6.5	20	0	0.936	1.32	0.617
25	5/23/2001		6.5	20	0	3.39	1.72	1.71
60	6/27/2001		6.6	16.8	0	1.34	2.68	0.25
77	7/23/2001		5.8	12.2	30.6	1.35	4.1	0.737
79	8/28/2001		6.3	18.6	32	0.552	4.88	0.931
121	10/26/2001		6.7	30	0	1.2	2.49	0.25
178	1/29/2002		6.4	16.4	27.2	1.02	1.44	0.762
227	2/26/2002		6.4	19.6	18.6	1.9	1.91	0.921
243	3/27/2002		6.3	18.8	34.4	2.87	0.829	1.58
264	4/25/2002		5.9	13	29.8	2.25	2.11	1.36
363	10/29/2002		6.7	24	0	0.757	2.16	0.25
401	11/20/2002		6.6	18.2	0	0.776	1.2	0.25
293	3/19/2003		6.5	13	0	2.16	0.948	1.22
339	4/24/2003		6.2	12	36.8	3.32	3.16	1.87
363	5/21/2003		6.6	25.2	0	5.05	0.863	1.89
386	6/24/2003		6.5	13.6	0	3	2.9	1.24
435	7/30/2003		6.8	20.2	0	1.65	1.51	0.816
434	8/15/2003		6.8	17.4	0	1.88	2.33	0.899
464	9/25/2003		6.8	18	0	1.37	1.92	0.25
533	11/17/2003		6.9	20.4	0	2.08	1.82	0.609
511	10/27/2003		6.9	22.6	0	3.25	2.48	1.28
543	12/16/2003		6.6	20.4	0	1.49	1.52	0.706
571	3/25/2004		6.6	21.4	21.4	1.85	1.62	1.17
643	5/26/2004		6.6	21.4	35.6	1.8	1.71	0.881
667	6/29/2004		6.6	23.8	24.6	2.15	3.02	0.537
718	8/24/2004		6.6	24.8	21.6	1.23	1.48	0.563
754	9/28/2004		6.6	23.4	31	2.71	3.21	1.24
358	6/14/2005	12051	6.9	27.2	17.4	0.428	2.21	0.25
509	9/13/2005	8099	7.5	39.6	5	0.319	1.47	0.25
689	2/28/2006	18244	6.4	30.8	22.6	0.357	0.816	0.25
840	7/6/2004	34388	6.3	29.2		0.746	1.42	0.25
954	8/24/2006	13708	7.6	28.4		0.15	3.012	0.25
114	3/8/2007	20580	7	26.6		2.02	1.43	0.25
	avg=	17845.00	6.35	18.65	8.18	1.85	2.35	0.88
	stdev=				11.02	1.76	1.00	0.78

MP: 50327

Unnamed Tributary to Little Toby Creek in Brockway

<i>Lat.</i>		<i>Long.</i>						
Seq	Date Collected	Final Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
0	6/29/2005	0						
0	9/13/2005	0						
838	7/5/2006	307	7.9	165.8	-149.4	<.3	<.05	<.5
966	9/12/2006	242	8.2	175	-150.6	<.3	<.05	<.5

MP: 50325 Unnamed Tributary to Little Toby Creek

<i>Lat.</i>		<i>Long.</i>						
Seq	Date Collected	Final Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
368	6/29/2005	178	7.5	69.2		0.697	0.057	0.25
507	9/13/2005	310	7.7	74.6		0.473	0.057	0.25
544	2/22/2006	544	6.8	59.4		0.15	0.025	0.25
836	7/5/2006	1026	6.7	64.8		0.747	0.025	0.25
	avg=	514.50	7.18	67.00		0.52	0.04	0.25
	stdev=					0.27	0.02	0.00

MP: LT400 Mouth of Johnson Run

<i>Lat.</i>		<i>Long.</i>						
Seq	Date Collected	Final Flow	pH pH units	ALK MG/L	HOT A MG/L	FE MG/L	MN MG/L	AL MG/L
207	10/30/1996		6.3	17.4	3.2	1.24	1.89	0.525
266	3/24/1997		6.2	14	6	1.77	2.03	1.13
315	4/22/1997		6.3	15.8	9.6	1.76	2.06	0.976
327	4/30/1997		6.2	18.6	17	1.35	1.7	0.631
251	5/7/1997		6.1	17.8	4.6	1.16	1.41	0.56
787	5/27/1997		6.4	15.6	3.4	0.961	1.34	0.25
797	6/26/1997		6.2	18.8	2.2	1.37	1.98	0.604
620	8/14/1997		6.1	16.8	3.6	1.53	2.3	0.803
864	9/17/1997		6.1	16	3.6	0.583	3.163	0.25
870	10/29/1997		6.3	18.6	6	0.608	2.63	0.25
934	11/25/1997		6.3	18.2	1.2	0.908	1.3	0.25
963	1/21/1998		6.1	18.6	3.6	2.49	2.1	1.17
459	2/24/1998		6.3	16.6	3.2	1.37	1.46	0.945
17	3/26/1998		5.9	16.2	3.8	1.55	1.85	0.949
31	4/14/1998		6.2	15.8	1.2	1.4	1.59	0.756
61	5/29/1998		6.1	16.2	6.8	2.06	3.33	0.986
86	6/29/1998		6.2	14.2	4	0.661	2.86	0.25
154	8/25/1998		6.1	14	1.4	0.15	3.71	0.25
178	10/29/1998		6.1	17.6	0	0.311	3.49	0.25
196	11/25/1998		6.2	17.8	0	0.384	3.43	0.25
208	12/21/1998		6.2	20	0	0.705	3.12	0.25
250	1/29/1999		6.2	15	2.8	0.73	1.08	0.557
271	2/19/1999		6.2	15	0	1.24	1.63	0.858
295	3/30/1999		6.3	15.4	4.8	1.3	1.03	0.84
365	4/28/1999		6.1	13.4	2.2	1.58	1.79	1.04

253	5/26/1999		6.3	17.8	3.4	1.25	1.97	0.25
281	6/18/1999		6	12.8	1.4	0.582	3.36	0.25
730	7/13/1999		6.3	17	0	0.15	2.26	0.25
400	7/30/1999		5.9	13.4	0	0.15	2.97	0.25
432	9/3/1999		6.2	16.4	0	0.343	3.02	0.25
452	9/30/1999		6.1	15.4	19	9.33	3.76	4.99
439	11/2/1999		6.3	19.8	0	0.15	2.97	0.25
512	11/17/1999		5.9	22	0	0.615	2.59	0.25
507	12/22/1999		6.4	18.6	0.6	0.848	1.25	0.508
551	1/26/2000		6.2	17.4	2.4	1.43	2.4	0.604
576	2/29/2000		6.3	14.4	6.2	0.746	0.879	0.25
625	3/15/2000		6.4	19.4	5.4	1.1	1.96	0.882
694	4/20/2000		5.8	14	5.6	2.49	2.26	1.6
682	5/18/2000		6.1	15	3.2	1.05	2.85	0.658
768	6/20/2000		6.4	17.2	0	1.07	1.65	0.601
764	7/26/2000		5.7	10.8	9.2	1.26	3.72	0.676
794	8/23/2000		6.1	15	5.4	0.532	2.64	0.25
855	10/25/2000		6.4	22	0	0.644	2.43	0.25
859	11/7/2000		6.2	24	22	0.578	2.57	0.25
959	12/13/2000		6.5	20	0	0.94	1.18	0.25
923	1/31/2001		6.5	22	0	2.87	1.35	1.49
927	2/28/2001		6.5	19.8	0	0.891	1.57	0.891
956	3/21/2001		6.4	18	0	1.39	1.18	0.98
45	4/25/2001		6.4	17	0	1.05	1.46	0.798
23	5/23/2001		6.5	19.2	0	4.81	1.78	2.23
58	6/27/2001		6.6	15.4	0	0.455	2.24	0.25
75	7/23/2001		6.2	13.6	35.2	0.15	3.32	0.25
77	8/28/2001		6.3	15.6	24	0.15	3.86	0.25
119	10/26/2001		6.7	22	0	0.729	2.18	0.25
176	1/29/2002		6.3	17	30.8	1.03	1.37	0.609
225	2/26/2002		6.4	16.6	24.8	2.03	1.88	0.956
241	3/27/2002		6.1	13.4	44	4.51	0.938	2.25
262	4/25/2002		6	13.8	25.6	1.7	1.78	1.02
361	10/29/2002		6.8	26	0	0.481	1.81	0.25
399	11/20/2002		6.6	22	0	0.599	1.07	0.25
291	3/19/2003		6.5	13.4	0	1.42	0.75	0.815
337	4/23/2003		6.4	16	25.8	2.35	2.32	1.3
361	5/21/2003		6.3	18.4	41.4	10.1	1.34	4.32
385	6/24/2003		6.6	15	0	1.96	2.48	0.513
412	7/30/2003		6.8	18.6	0	1.62	1.36	0.866
433	8/15/2003		6.9	18	0	1.18	1.9	0.562
463	9/25/2003		6.7	17.2	0	1	1.66	0.25
510	10/27/2003		6.9	21.4	0	2.09	2.18	0.778
531	11/17/2003		6.2	11	36	2.27	3.85	1.8
532	11/17/2003		7	20.4	0	1.55	1.51	0.25
542	12/16/2003		6.6	20.2	0	1.14	1.19	0.544
570	3/25/2004		6.6	18.8	24.8	1.72	1.48	1.01
621	4/28/2004		6.7	17.4	45.6	1.38	1.2	0.716

642	5/26/2004		6.6	25.2	38.4	1.29	1.47	0.577
668	6/29/2004		6.8	25.8	24.6	0.81	2.55	0.25
719	8/24/2004		6.5	23	27	1.01	1.29	0.25
755	9/28/2004		6.6	23.8	40	1.74	2.7	0.847
357	6/14/2005	14575	6.8	27.4	16.8	0.15	1.65	0.25
508	9/13/2005	10446	7.4	40.4		0.15	1.02	0.25
688	2/28/2006	21510	6.4	29	25.2	3.23	2.36	0.93
837	7/5/2006	50411	6.4	30		0.701	1.11	0.25
953	8/24/2006	15695	7.6	35.6		0.15	2.121	0.25
104	2/1/2007	43262	7	28	25.8	2.88	2.17	0.952
	avg=	25983.17	6.37	18.57	9.17	1.44	2.08	0.73
	stdev=				13.00	1.58	0.80	0.77

MP:	RR06	Unnamed Tributary to Rattlesnake Run						
Lat.		Long.						
Seq	Date	Final	pH	ALK	HOT A	FE	MN	AL
	Collecte	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
430	7/7/2005	61	8.2	227.6		0.315	0.083	0.25
514	9/15/2005	61	8.2	250		0.15	0.025	0.25
686	2/22/2006	251	8.2	194.4		0.15	0.025	0.25
	avg=	124.3333	8.2	224.0		0.21	0.04	0.25
	stdev=					0.10	0.03	0.00

MP: RR04

Unnamed Tributary to Rattlesnake Run

Lat. *Long.*

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
429	7/7/2005	39	7.7	101.2		0.457	0.195	0.25
513	9/15/2005	19	8	137.2		0.373	0.101	0.25
685	2/22/2006	149	7	77.8		0.15	0.136	0.25
835	7/5/2006	199	6.8	83		0.613	0.203	0.25
	avg=	101.50	7.38	99.80		0.40	0.16	0.25
	stdev=					0.19	0.05	0.00

MP: RC06

Rattlesnake Creek Upstream from Confluence with Rattlesnake Run

Lat. *Long.*

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
428	7/7/2005	1265	7	32.2	19.2	0.902	0.502	0.25
512	9/15/2005	514	7.1	49.2		1.35	0.568	0.25
684	2/22/2006	4109	6.4	21.2	25.4	0.15	0.317	0.25
833	7/5/2006	6302	6.4	29.4		0.601	0.314	0.25
955	8/24/2006	634	7.4	38.4		0.967	0.465	0.25
102	2/1/2007	4111	7.2	24.4	42	0.308	0.445	0.25
	avg=	2822.5	6.92	32.47	28.87	0.71	0.44	0.25
	stdev=				11.79	0.45	0.10	0.00

MP: RC03

Rattlesnake Creek Upstream from Confluence with RC02 Tributary

Lat. *Long.*

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
426	7/7/2005	3069	7.5	74.6		1.03	0.381	0.25
516	9/15/2005	1646	7.8	113.4		0.97	0.339	0.25
682	2/22/2006	9292	6.9	70.4		0.459	0.327	0.25
	avg=	4669.00	7.40	86.13		0.82	0.35	0.25
	stdev=					0.26	0.02	0

MP: RC02

Unnamed Tributary to Rattlesnake Creek Downstream from RC03

Lat. *Long.*

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
427	7/7/2005	207	8.2	252.8	-216.6	<.3	<.05	<.5
515	9/15/2005	226	8.2	265.8	-224	<.3	<.05	<.5

MP: RC01 Mouth of Rattlesnake Creek

Lat. Long.

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
425	7/7/2005	3752	7.6	86.2		0.779	0.313	0.25
517	9/15/2005	1877	8	128.2		0.538	0.212	0.25
683	2/22/2006	9783	7	83.4		0.411	0.308	0.25
834	7/5/2006	18819	6.8	91.6		1.15	0.317	0.25
103	2/1/2007	12211	7.9	90.4	11.2	0.52	0.406	0.25
	avg=	9288.4	7.46	95.96	11.2	0.6796	0.3112	0.25
	stdev=				#DIV/0!	0.30	0.07	0.00

MP: 50218 Unnamed Tributary to Little Toby Creek in Brockway

Lat. Long.

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
0	6/29/2005	0						
0	9/13/2005	0						
681	2/22/2006	4.5	7	69.8	-43	<.3	0.065	<.5
832	7/5/2006	5	7.3	116.8	-84.6	0.68	<.05	<.5

MP: LT05 Little Toby Creek @ Blue Rock

Lat. 41-18-39 Long. 078-50-15

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
506	9/13/2005	16253	7.7	59.4	-25.8	<.3	0.338	<.5

MP: LT01 Mouth of Little Toby Creek

Lat. 41-21-49 Long. 078-49-19

	Date	Final	pH	ALK	HOT A	FE	MN	AL
Seq	Collected	Flow	pH units	MG/L	MG/L	MG/L	MG/L	MG/L
214	9/29/2004	99156	7.6	42	12.8	0.478	1.26	0.25
356	6/14/2005	28315	7.2	40.8		1.5	0.288	0.25
505	9/13/2005	17740	7.8	52.2		1.5	0.025	0.25
680	2/22/2006	66253	6.6	35	15.4	0.702	0.855	0.25
847	7/7/2006	67123	7.7	43.8		0.428	0.417	0.25
943	8/24/2006	20601	7.8	48.6		1.5	0.178	0.25
101	2/1/2007	60025	7.5	41		0.771	1.24	0.25
	avg=	51316.14	7.46	43.34	14.10	0.98	0.61	0.25
	stdev=				1.84	0.50	0.51	0.00

Attachment F
TMDLs and NPDES Permitting Coordination

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

Load Tracking Mechanisms

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

Options for Permittees in TMDL Watersheds

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

Options identified

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

Other possible options

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

- Issue the permit with in-stream water quality criteria values as the effluent limits. The in-stream criteria value would represent the monthly average, with the other limits adjusted accordingly (e.g., for Fe, the limits would be 1.5 mg/L monthly average, 3.0 mg/L daily average and 4.0 instantaneous max mg/L).
- The applicant would agree to treat an existing source (point or non-point) where there is no responsible party and receive a WLA based on a portion of the load reduction to be achieved. The result of using these types of offsets in permitting is a net improvement in long-term water quality through the reclamation or treatment of an abandoned source.

Attachment G
Little Toby Creek Sediment Calculations

Little Toby Creek Sediment TMDL Calculations

The AVGWLF model produced information on watershed size, land use, and sediment loading. The sediment loads represent an annual average over the 21 years simulated by the model (1975 to 1996). This information was then used to calculate existing unit area loading rates for the Little Toby Creek and West Branch Clarion River Watersheds.

Table A. Existing Loading Values for Little Toby Creek (impaired)			
Source	Area (ac)	Sediment (lbs)	Unit Area Load (lbs/ac/yr)
<i>HAY/PAST</i>	5,656	756,200	134
<i>CROPLAND</i>	8,542	17,235,200	2,018
<i>FOREST</i>	51,059	502,800	10
<i>WETLAND</i>	52	0	0
<i>QUARRY</i>	1,443	2,098,800	1,454
<i>COAL_MINES</i>	410	527,800	1,287
<i>TURF_GRASS</i>	148	8,200	55
<i>UNPAVED_RD</i>	77	760,400	9,875
<i>TRANSITION</i>	2,740	21,934,400	8,005
<i>LO_INT_DEV</i>	1,270	32,800	26
<i>HI_INT_DEV</i>	151	800	5
<i>Stream Bank</i>		24,802,600	
total	71,548	68,660,000	960

Table B. Existing Loading Values for West Branch Clarion River (reference)			
Source	Area (ac)	Sediment (lbs.)	Unit Area Load (lb/ac/yr)
<i>HAY/PAST</i>	3,047	109,800	36
<i>CROPLAND</i>	3,766	3,429,200	911
<i>FOREST</i>	49,045	567,200	12
<i>WETLAND</i>	40	0	0
<i>QUARRY</i>	72	11,400	158
<i>TURF_GRASS</i>	82	600	7
<i>UNPAVED_RD</i>	37	255,800	6,914
<i>TRANSITION</i>	2,748	14,404,000	5,242
<i>LO_INT_DEV</i>	830	14,800	18
<i>HI_INT_DEV</i>	40	200	5
<i>Stream Bank</i>		19,511,600	
total	59,707	38,304,600	642

The TMDL target sediment load for Little Toby Creek is the product of the unit area sediment-loading rate in the reference watershed (West Branch Clarion River) and the total area of the impaired watershed (Little Toby Creek). These numbers and the resulting TMDL target load are shown in Table C on the following page.

TABLE C. TMDL TOTAL LOAD COMPUTATION			
Pollutant	Unit Area Loading Rate in West Branch Clarion River Watershed (lbs/acre/yr)	Total Watershed Area in Little Toby Creek (acres)	TMDL Total Load (lbs/year)
Sediment	642	71,548	45,901,109

Targeted TMDL values were used as the basis for load allocations and reductions in the Little Toby Creek Watershed, using the following equation

1. $TMDL = LA + WLA + MOS$
2. $LA = ALA - LNR$

Where:

TMDL = Total Maximum Daily Load
 LA = Load Allocation
 ALA = Adjusted Load Allocation
 LNR = Loads Not Reduced
 WLA = Waste Load Allocation
 MOS = Margin of Safety

Margin of Safety

The margin of safety (MOS) is that portion of the pollution loading that is reserved to account for any uncertainty in the data and computational methodology used for the analysis. The Margin of Safety (MOS) for this analysis is explicit. Ten percent of the TMDL was reserved as the MOS.

$$MOS = 0.1 * 45,901,109$$

$$MOS = 4,590,111 \text{ lbs/yr}$$

Load Allocation

The Load Allocation (LA), the portion of the load consisting of all nonpoint sources in the watershed, was computed by subtracting the Margin of Safety from the TMDL total load.

$$LA = TMDL - MOS - WLA$$

$$LA = 45,901,109 - 4,590,111 - 536,985$$

$$LA = 40,774,013 \text{ lbs/yr}$$

WLA

There are numerous NPDES permits in the Little Toby Creek Watershed with total suspended solids (TSS) effluent limits. The WLA from all permits was calculated as 77,974 lbs/year or 214 lbs/day. Included in the total WLA is a 1% bulk reserve for future WLAs in the Little Toby Creek Watershed as well as the current permits. The total WLA is calculated at 536,985 lbs/year or 1,471.19 lbs/day. The following table lists all NPDES permits included in this WLA.

Table D. Suspended Solids Waste Load Allocations in the Little Toby Creek Watershed				
	Total Suspended Solids Monthly Avg. Allowable Conc. (mg/L)	Average Flow	Wasteload Allocation	Wasteload Allocation
		(MGD)	(lbs/year)	(lbs/day)
PA0241857	Energy Resources, Inc.			
	35	0.014	1491.61	4.09
PA0227919	Fairview Coal Company			
	35	0.013	1385.07	3.79
PA0242454	Hepburnia Coal Company			
	35	0.001	106.54	0.29
PA0242268	Hepburnia Coal Company			
	35	0.006	639.26	1.75
PA0242306	Tamburlin Bros. Coal Co., Inc.			
	35	0.007	745.8	2.04
PA0127566	Fairview Coal Company			
	35	0.06	6392.61	17.51
PA0227871	Tamburlin Bros. Coal Co., Inc.			
	35	0.045	4794.46	13.14
PA0241580	Tamburlin Bros. Coal Co., Inc.			
	35	0.049	5220.63	14.30
PA0208001	Energy Resources, Inc.			
	35	0.05	5327.18	14.60
PA0227781	Tamburlin Bros. Coal Co., Inc.			

	35	0.134	14276.83	39.11
PA0242012	Waroquier Coal Company			
	35	0.015	1598.15	4.38
PA0235466	Rosebud Mining			
	35	0.09	9588.92	26.27
PA0104779	Energy Resources, Inc.			
	35	0.04	4261.74	11.68
PA0207837	Hepburnia Coal Company			
	35	0.15	16370.73	44.85
PA0258555	Hepburnia Coal Company			
	35	0.007	787.04	2.16
PA0257974	North Star Aggregates, Inc.			
	35	0.002	209.89	0.58
PA0258318	Marquise Mining Corporation			
	35	0.04	4344.52	11.90
SMP24020301	Veolia ES Greentree Landfill, LLC			
	35	0.004	432.90	1.19

Adjusted Load Allocation

The adjusted load allocation (ALA) is the actual portion of the LA distributed among those non-point sources receiving reductions. It is computed by subtracting those non-point source loads that are not being considered for reductions (loads not reduced or LNR) from the LA. Reductions in the Little Toby Creek Watershed were applied to STREAMBANK, TRANSITIONAL LAND, QUARRY/COAL and CROPLAND sources for sediment. Those land uses/sources for which existing loads were not reduced (FOREST, WETLAND, TURF_GRASS, UNPAVED_RD, LO_INT_DEV, HI_INT_DEV and HAY/PAST) kept their current loading values, Table E. The ALA for sediment is 38,712,813 lbs/yr.

Table E. Load Allocation, Loads Not Reduced and Adjusted Load Allocations for the Little Toby Creek Sediment TMDL		
	Sediment (lbs./yr)	Sediment (lbs./day)
Load Allocation	40,774,013	111,710
Loads Not Reduced	2,061,200	5,647
FOREST	502,800	1,378
WETLAND	0	0
TURF_GRASS	8,200	22
UNPAVED_RD	760,400	2,083
LO_INT_DEV	32,800	90

HI_INT_DEV	800	2
hay/past	756,200	2,072
Adjusted load allocation	38,712,813	106,063

TMDL

The sediment TMDL for the Little Toby Creek Watershed consists of a Load Allocation and a Margin of Safety (MOS). The individual components of the TMDL are summarized in Table F.

Table F. TMDL, WLA, MOS, LA, LNR and ALA for Little Toby Creek Sediment TMDL		
Component	Sediment (lbs/yr)	Sediment (lbs/day)
TMDL (Total Maximum Daily Load)	45,901,109	125,756
WLA (Waste Load Allocation)	536,985	1,471
MOS (Margin of Safety)	4,590,111	12,576
LA (Load Allocation)	40,774,013	111,710
LNR (Loads Not Reduced)	2,061,200	5,647
ALA (Adjusted Load Allocation)	38,712,813	106,063

Calculation of Sediment Load Reductions

Adjusted Load Allocations established in the previous section represents the sediment load that is available for allocation between contributing sources in the Little Toby Creek Watershed. Data needed for load reduction analysis, including land use distribution, was obtained by GIS analysis. The Equal Marginal Percent Reduction (EMPR) allocation method (Attachment G) was used to distribute the ALA between the appropriate contributing land uses.

Table G contains the results of the sediment EMPR analysis for the appropriate contributing land uses in the Little Toby Creek Watershed. The load allocation for each land use is shown, along with the percent reduction of current loads necessary.

Table G. Sediment Load Allocations & Reductions for the Little Toby Creek Watershed						
Pollutant Source	Acres	Unit Area Loading Rate (lbs/ac/yr)		Pollutant Loading (lbs/yr)		Percent Reduction
		Current	Allowable	Current	Allowable	
STREAMBANK				24,802,600	14,417,353	42%
CROPLAND	8,542	2017.70	1172.86	17,235,200	10,018,545	42%
QUARRY/COAL	1,853	1417.49	823.96	2,626,600	1,526,800	42%
TRANSITIONAL	2,740	8005.26	4653.33	21,934,400	12,750,115	42%
TOTAL				66,598,800	38,712,813	42%

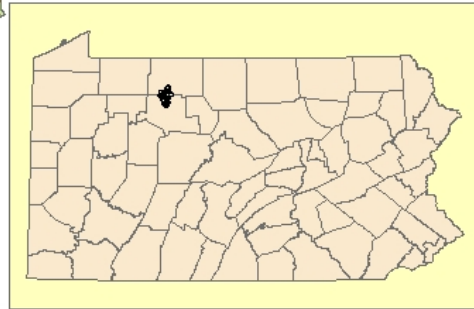
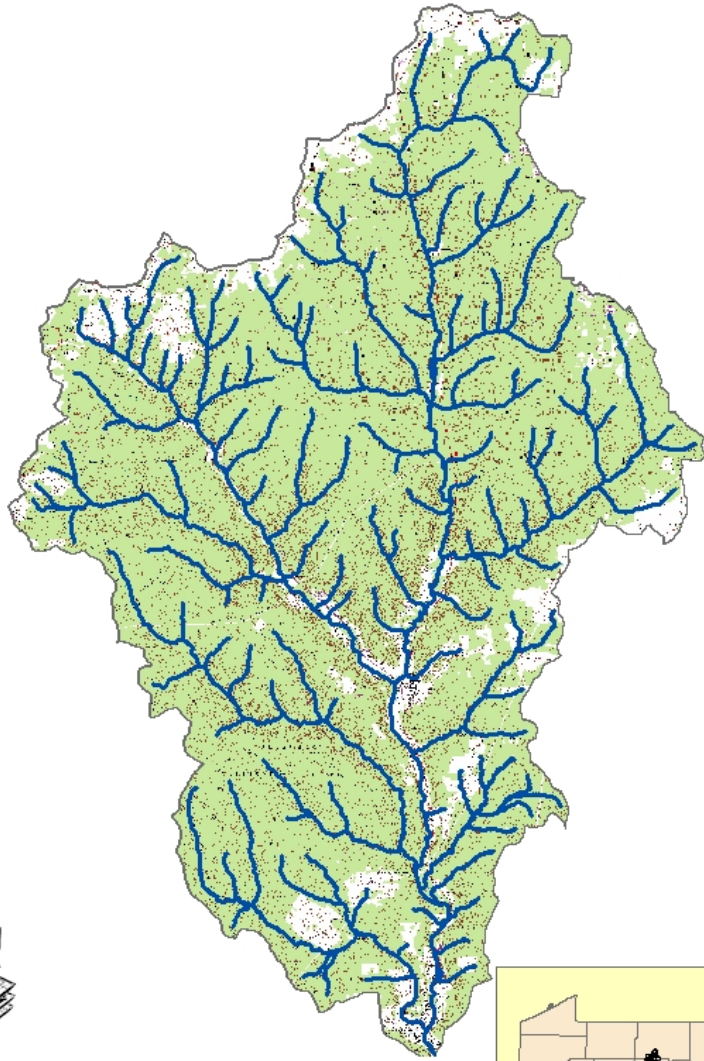
Consideration of Critical Conditions

The AVGWLF model is a continuous simulation model, which uses daily time steps for weather data and water balance calculations. Monthly calculations are made for sediment loads based on the daily water balance accumulated to monthly values. Therefore, all flow conditions are taken into account for loading calculations. Because there is generally a significant lag time between the introduction of sediment to a waterbody and the resulting impact on beneficial uses, establishing these TMDLs using average annual conditions is protective of the waterbody.

Consideration of Seasonal Variations

The continuous simulation model used for this analysis considers seasonal variation through a number of mechanisms. Daily time steps are used for weather data and water balance calculations. The model requires specification of the growing season and hours of daylight for each month. The model also considers the months of the year when manure is applied to the land. The combination of these actions by the model accounts for seasonal variability.

Map of Reference Watershed West Branch Clarion River



West Branch Clarion River

AVGWLF Model Overview & GIS-Based Derivation of Input Data

TMDLs for the Little Toby Creek Watershed were developed using the Generalized Watershed Loading Function or GWLF model. The GWLF model provides the ability to simulate runoff, sediment, and nutrient (N and P) loadings from watershed given variable-size source areas (e.g., agricultural, forested, and developed land). It also has algorithms for calculating septic system loads, and allows for the inclusion of point source discharge data. It is a continuous simulation model, which uses daily time steps for weather data and water balance calculations. Monthly calculations are made for sediment and nutrient loads, based on the daily water balance accumulated to monthly values.

GWLF is a combined distributed/lumped parameter watershed model. For surface loading, it is distributed in the sense that it allows multiple land use/cover scenarios. Each area is assumed to be homogenous in regard to various attributes considered by the model. Additionally, the model does not spatially distribute the source areas, but aggregates the loads from each area into a watershed total. In other words, there is no spatial routing. For sub-surface loading, the model acts as a lumped parameter model using a water balance approach. No distinctly separate areas are considered for sub-surface flow contributions. Daily water balances are computed for an unsaturated zone as well as a saturated sub-surface zone, where infiltration is computed as the difference between precipitation and snowmelt minus surface runoff plus evapotranspiration.

GWLF models surface runoff using the Soil Conservation Service Curve Number (SCS-CN) approach with daily weather (temperature and precipitation) inputs. Erosion and sediment yield are estimated using monthly erosion calculations based on the Universal Soil Loss Equation (USLE) algorithm (with monthly rainfall-runoff coefficients) and a monthly composite of KLSCP values for each source area (e.g., land cover/soil type combination). The KLSCP factors are variables used in the calculations to depict changes in soil loss erosion (K), the length slope factor (LS) the vegetation cover factor (C) and conservation practices factor (P). A sediment delivery ratio based on watershed size and transport capacities based on average daily runoff are applied to the calculated erosion to determine sediment yield for each source area. Surface nutrient losses are determined by applying dissolved N and P coefficients to surface runoff and a sediment coefficient to the yield portion for each agricultural source area. Point source discharges can also contribute to dissolved losses to the stream and are specified in terms of kilograms per month. Manured areas, as well as septic systems, can also be considered. Urban nutrient inputs are all assumed to be solid-phase, and the model uses an exponential accumulation and washoff function for these loadings. Sub-surface losses are calculated using dissolved N and P coefficients for shallow groundwater contributions to stream nutrient loads, and the sub-surface sub-model only considers a single, lumped-parameter contributing area. Evapotranspiration is determined using daily weather data and a cover factor dependent upon land use/cover type. Finally, a water balance is performed daily using supplied or computed precipitation, snowmelt, initial unsaturated zone storage, maximum available zone storage, and evapotranspiration values. All of the equations used by the model can be viewed in GWLF Users Manuel, available from the Department's Bureau of Watershed Management.

For execution, the model requires three separate input files containing transport-, nutrient-, and weather-related data. The transport (TRANSPRT.DAT) file defines the necessary parameters for

each source area to be considered (e.g., area size, curve number, etc.) as well as global parameters (e.g., initial storage, sediment delivery ratio, etc.) that apply to all source areas. The nutrient (NUTRIENT.DAT) file specifies the various loading parameters for the different source areas identified (e.g., number of septic systems, urban source area accumulation rates, manure concentrations, etc.). The weather (WEATHER.DAT) file contains daily average temperature and total precipitation values for each year simulated.

The primary sources of data for this analysis were geographic information system (GIS) formatted databases. A specially designed interface was prepared by the Environmental Resources Research Institute of the Pennsylvania State University in ArcView (GIS software) to generate the data needed to run the GWLF model, which was developed by Cornell University. The new version of this model has been named AVGWLF (ArcView Version of the Generalized Watershed Loading Function).

In using this interface, the user is prompted to identify required GIS files and to provide other information related to “non-spatial” model parameters (e.g., beginning and end of the growing season, the months during which manure is spread on agricultural land and the names of nearby weather stations). This information is subsequently used to automatically derive values for required model input parameters, which are then written to the TRANSPRT.DAT, NUTRIENT.DAT and WEATHER.DAT input files needed to execute the GWLF model. For use in Pennsylvania, AVGWLF has been linked with statewide GIS data layers such as land use/cover, soils, topography, and physiography; and includes location-specific default information such as background N and P concentrations and cropping practices. Complete GWLF-formatted weather files are also included for eighty weather stations around the state. The following table lists the statewide GIS data sets and provides an explanation of how they were used for development of the input files for the GWLF model.

GIS Data Sets	
DATASET	DESCRIPTION
Censustr	Coverage of Census data including information on individual homes septic systems. The attribute <i>usew_sept</i> includes data on conventional systems, and <i>sew_other</i> provides data on short-circuiting and other systems.
County	The County boundaries coverage lists data on conservation practices, which provides C and P values in the Universal Soil Loss Equation (USLE).
Gwnback	A grid of background concentrations of N in groundwater derived from water well sampling.
Landuse5	Grid of the MRLC that has been reclassified into five categories. This is used primarily as a background.
Majored	Coverage of major roads. Used for reconnaissance of a watershed.
MCD	Minor civil divisions (boroughs, townships and cities).
Npdespts	A coverage of permitted point discharges. Provides background information and cross check for the point source coverage.
Padem	100-meter digital elevation model. This used to calculate landslope and slope length.
Palumrlc	A satellite image derived land cover grid that is classified into 15 different landcover categories. This dataset provides landcover loading rate for the different categories in the model.
Pasingle	The 1:24,000 scale single line stream coverage of Pennsylvania. Provides a complete network of streams with coded stream segments.
Physprov	A shapefile of physiographic provinces. Attributes <i>rain_cool</i> and <i>rain_warm</i> are used to set recession coefficient
Pointsrc	Major point source discharges with permitted N and P loads.
Refwater	Shapefile of reference watersheds for which nutrient and sediment loads have been calculated.
Soilphos	A grid of soil phosphorous loads, which has been generated from soil sample data. Used to help set phosphorus and sediment values.
Smallsheds	A coverage of watersheds derived at 1:24,000 scale. This coverage is used with the stream network to delineate the desired level watershed.
Statsgo	A shapefile of generalized soil boundaries. The attribute <i>mu_k</i> sets the k factor in the USLE. The attribute <i>mu_awc</i> is the unsaturated available capacity., and the <i>muhs_g_dom</i> is used with landuse cover to derive curve numbers.
Strm305	A coverage of stream water quality as reported in the Pennsylvania's 305(b) report. Current status of assessed streams.
Surfgeol	A shapefile of the surface geology used to compare watersheds of similar qualities.
T9sheds	Data derived from a DEP study conducted at PSU with N and P loads.
Zipcode	A coverage of animal densities. Attribute <i>aeu_acre</i> helps estimate N & P concentrations in runoff in agricultural lands and over manured areas.
Weather Files	Historical weather files for stations around Pennsylvania to simulate flow.

Equal Marginal Percent Reduction (EMPR) (An Allocation Strategy)

The Equal Marginal Percent Reduction (EMPR) allocation method was used to distribute Adjusted Load Allocations (ALAs) between the appropriate contributing nonpoint sources. The load allocation and EMPR procedures were performed using a MS Excel spreadsheet. The 5 major steps identified in the spreadsheet are summarized below:

Step 1: Calculation of the TMDL based on impaired watershed size and unit area loading rate of reference watershed.

Step 2: Calculation of Adjusted Load Allocation based on TMDL, Margin of Safety, and existing loads not reduced.

Step 3: Actual EMPR Process:

- a. Each land use/source load is compared with the total ALA to determine if any contributor would exceed the ALA by itself. The evaluation is carried out as if each source is the only contributor to the pollutant load of the receiving waterbody. If the contributor exceeds the ALA, that contributor would be reduced to the ALA. If a contributor is less than the ALA, it is set at the existing load. This is the baseline portion of EMPR.
- b. After any necessary reductions have been made in the baseline, the multiple analyses are run. The multiple analyses will sum all of the baseline loads and compare them to the ALA. If the ALA is exceeded, an equal percent reduction will be made to all contributors' baseline values. After any necessary reductions in the multiple analyses, the final reduction percentage for each contributor can be computed.

Step 4: Calculation of total loading rate of all sources receiving reductions.

Step 5: Summary of existing loads, final load allocations, and % reduction for each pollutant source.

Equal Marginal Percent Reduction Calculations in Lbs. for Little Toby Creek

Microsoft Excel - 1empr.xls

File Edit View Insert Format Tools Data Window Help Adobe PDF

Arial 10 B I U

H2 $=((B3-(B3^0.1))-(lbsstreambank118)-(lbsstreambank134))$

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Step 1:	TMDL Total Load				Step 2:	Adjusted LA = (TMDL total load - ((MOS) - WLA - loads not reduced)							
2		Load = TP loading rate in ref. * Acres in Impaired					39171824	39171824						
3		45901109												
4														
5														
6			Annual Average									% reduction		Allowable
7	Step 3:		Load	Load Sum	Check	Initial Adjust	Recheck	allocation	Load Reduct	Initial LA	Acres	Loading Rate	% Reduction	
8		stream bank	24802600.0	66598800.0	good	24802600	ADJUST	0.37	10214303	14588297		#DIV/0!	41.2%	
9							27426976							
10		CROPLAND	17235200.0		good	17235200		0.26	7097867	10137333	8542	1186.76	41.2%	
11														
12		QUARRY/COA	2626600.0		good	2626600		0.04	1081697	1544903	1853	833.73	41.2%	
13														
14		TRANSITION	21934400.0		good	21934400		0.33	9033110	12901290	2740	4708.50	41.2%	
15														
16						66598800		1.00		39171824				
17														
18		All Ag. Loading	2982.25											
19	Step 4:													
20			Allowable (Target)			Current								
21		Acres	loading rate	Final LA	Loading Rates	Current Load	% Red.							
22	Step 5:	stream bank		14588297		24802600	41%							
23														
24		CROPLAND	8542	1186.76	10137333	2017.70	17235200	41%						
25														
26		QUARRY/COA	1853	833.73	1544903	1417.49	2626600	41%						
27														
28		TRANSITION	2740	4708.50	12901290	8005.26	21934400	41%						
29														
30					39171824		66598800	41%						
31														
32														
33														
34														
35														
36														
37														
38														
39														

Ready NUM

AVGWLF Transport File and Model Output for Little Toby Creek

GWLF Edit Transport File

Rural LU	Area (ha)	CN	K	LS	C	P
HAY/PAST	2289	75	0.26	2.883	0.03	0.45
CROPLAND	3457	82	0.26	3.108	0.42	0.45
FOREST	20663	73	0.25	2.868	0.002	0.52
WETLAND	21	87	0.306	0.193	0.01	0.1
QUARRY	584	89	0.25	5.505	0.8	0.1
COAL_MINES	166	87	0.253	4.812	0.8	0.1
TURF_GRASS	60	71	0.3	0.866	0.08	0.2

Bare Land	Area (ha)	CN	K	LS	C	P
UNPAVED_RD	31	87	0.253	3.713	0.8	1
TRANSITION	1109	87	0.253	3.67	0.8	0.8

Urban LU	Area (ha)	CN	K	LS	C	P
LO_INT_DEV	514	93	0.268	0.627	0.08	0.2
HI_INT_DEV	61	93	0.306	0.162	0.08	0.2

Month	Ket	Day Hours	Season	Eros Coef	Stream Extract	Ground Extract
APR	0.67	13	0	0.26	0	0
MAY	0.82	14	1	0.26	0	0
JUN	0.92	15	1	0.26	0	0
JUL	0.97	15	1	0.26	0	0
AUG	1.0	14	1	0.26	0	0
SEP	1.02	12	1	0.08	0	0
OCT	0.88	11	0	0.08	0	0
NOV	0.8	10	0	0.08	0	0
DEC	0.75	9	0	0.08	0	0
JAN	0.58	9	0	0.08	0	0
FEB	0.62	10	0	0.08	0	0
MAR	0.65	12	0	0.08	0	0

Antecedent Moisture Condition

Day 1	Day 2	Day 3	Day 4	Day 5
0	0	0	0	0

Init Unsat Stor (cm) Initial InitSnow (cm)

Init Sat Stor (cm) Sed Delivery Ratio

Recess Coef (1/dia) Sediment A Factor

Seepage Coef (1/dia) Unsat Avail Wat (cm)

Tile Drain Density Tile Drain Ratio

GWLF Total Loads for **impaired_littleto**
 Period of analysis: **21 years, from Apr 1975 to Mar 1996**

Source	Area (Acres)	Runoff (in)	Tons		Total Loads (Pounds)			
			Erosion	Sediment	Dis N	Total N	Dis P	Total P
HAY/PAST	5656.2	2.5	4554.9	378.1	9259.4	11527.7	396.5	616.5
CROPLAND	8542.4	4.5	103826.3	8617.6	24697.7	76403.2	1105.8	6121.2
FOREST	51059.3	2.1	3029.3	251.4	4716.9	6225.5	148.9	295.3
WETLAND	51.9	6.9	0.2	0.0	15.4	15.5	0.5	0.5
QUARRY	1443.1	8.3	12643.3	1049.4	32.5	6328.9	5.2	615.9
COAL_MINES	410.2	6.9	3179.2	263.9	7.7	1591.0	1.2	154.8
TURF_GRASS	148.3	1.8	49.0	4.1	152.1	176.5	5.8	8.2
UNPAVED_RD	76.6	6.9	4581.0	380.2	346.9	2628.3	23.9	245.2
TRANSITION	2740.4	6.9	132134.9	10967.2	12410.0	78213.2	855.9	7238.8
LO_INT_DEV	1270.1	4.9	271.9	16.4	0.0	76.2	0.0	10.2
HI_INT_DEV	150.7	12.6	9.5	0.4	0.0	5.2	0.0	0.6
Tile Drainage				0.0		0.0		0.0
Stream Bank				12401.3		1240.1		545.7
Groundwater					114569.1	114569.1	4968.0	4968.0
Point Sources					39996.1	39996.1	441.0	441.0
Septic Systems					245.0	245.0	54.5	54.5
Totals	71549.3	2.90	264279.6	34329.9	206448.9	339241.5	8007.2	21316.3

Attachment H
Comment and Response

No comments were received.