FINAL

Scrubgrass Creek Watershed TMDL

Venango and Butler Counties, Pennsylvania

<u>Prepared by</u>:

Pennsylvania Department of Environmental Protection

March 17, 2008

TABLE OF CONTENTS

TABLES

ATTACHMENTS

FINAL TMDL
Scrubgrass Creek Watershed
Venango and Butler Counties, Pennsylvania

Introduction

This Total Maximum Daily Load (TMDL) calculation has been prepared for segments in the Scrubgrass 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

State Water Plan (SWP) Subbasin: 16G

Year	Miles	Segment ID	DEP Stream Code	Stream Name	Desig-nated Use	Data Source	Source	EPA 305(b) Cause Code
1996	6.6	5461	51243	Scrubgrass Creek	CWF	303 (d) List	Resource Extraction	Metals & *Other Inorganics
1998	11.73	5461	51243	Scrubgrass Creek	CWF	SWMP	AMD	Metals & *Other Inorganics
2002	11.7	5461	51243	Scrubgrass Creek	CWF	SWMP	AMD	Metals & *Other Inorganics
2004	11.7	5461	51243	Scrubgrass Creek	CWF	SWMP	AMD	Metals & *Other Inorganics
2006	11.8	7744	51243	Scrubgrass Creek	CWF	SWMP	AMD	Metals
2006	0.33	5780	51243	Scrubgrass Creek	CWF	SWMP	AMD	Metals
2004	1.6	20030918-1000-SMD	51270	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals, pH
2006	1.58	5832	51270	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals, pH
2004	1.3	20030918-1000-SMD	51271	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals, pH
2006	1.27	5832	51271	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals, pH
2004	4.1	20030805-1300-SMD	51272	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	4.48	5476	51272	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	1.2	20030805-1300-SMD	51273	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	1.17	5476	51273	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.5	20030805-1300-SMD	51274	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals

2006	0.47	5476	51274	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	1.7	20030701-1105-SMD	51275	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	1.73	5174	51275	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.7	20030701-1105-SMD	51276	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	0.71	5174	51276	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	1.5	20030805-1300-SMD	51277	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	1.75	5476	51277	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	1.5	20030805-1300-SMD	51278	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	1.66	5476	51278	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	1.2	20030701-0815-SMD	51279	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	1.23	5167	51279	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.7	20030805-1300-SMD	51280	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	0.7	5476	51280	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.5	20030805-1300-SMD	51281	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	0.48	5476	51281	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.3	20030805-1300-SMD	51282	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	1.56	5476	51282	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.5	20030805-1130-SMD	51283	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals, pH
2006	0.46	5474	51283	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals, pH
2004	0.6	20030805-1130-SMD	51284	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals, pH
2006	0.65	5474	51284	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.5	20030805-1000-SMD	51290	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	0.47	5469	51290	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.4	20030828-0930-SMD	51291	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	0.44	5674	51291	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
1996	0.07	5461	51292	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	2.1	20030828-0930-SMD	51292	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	2.02	5674	51292	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	1.6	20030828-1030-SMD	51293	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	1.58	5679	51293	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals

2004	0.5	20030828-1030-SMD	51294	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	0.48	5679	51294	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	1.4	20030828-1130-SMD	51295	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	1.36	5682	51295	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.4	20030828-0930-SMD	51296	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	0.39	5674	51296	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.5	20030828-1130-SMD	51297	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	0.51	5682	51297	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.5	20030805-1000-SMD	51289	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	0.49	5469	51298	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.7	20030828-1130-SMD	51299	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	0.66	5682	51299	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	1.2	20030916-0900-SMD	51300	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	Delisted		51300					
2004	1.1	20030916-0900-SMD	51301	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2006	1.06	5780	51301	Scrubgrass Creek, Unt	CWF	SWMP	AMD	Metals
2004	0.7	20030414-1130-SMD	51244	Bullion Run	CWF	SWMP	AMD	Metals
2006	0.77	4662	51244	Bullion Run	CWF	SWMP	AMD	Metals
2004	0.6	20030414-1130-SMD	51248	Bullion Run, Unt	CWF	SWMP	AMD	Metals
2006	0.57	4662	51248	Bullion Run, Unt	CWF	SWMP	AMD	Metals
2004	1.1	20030414-1130-SMD	51249	Bullion Run, Unt	CWF	SWMP	AMD	Metals
2006	1.11	4662	51249	Bullion Run, Unt	CWF	SWMP	AMD	Metals
2004	0.4	20030414-1130-SMD	51250	Bullion Run, Unt	CWF	SWMP	AMD	Metals
2006	0.36	4662	51250	Bullion Run, Unt	CWF	SWMP	AMD	Metals
2004	3.1	20030805-1000-SMD	51285	Gilmore Run	CWF	SWMP	AMD	Metals
2006	3.16	5469	51285	Gilmore Run	CWF	SWMP	AMD	Metals
2004	0.5	20030805-1000-SMD	51286	Gilmore Run, Unt	CWF	SWMP	AMD	Metals
2006	0.47	5469	51286	Gilmore Run, Unt	CWF	SWMP	AMD	Metals
2004	0.4	20030805-1000-SMD	51287	Gilmore Run, Unt	CWF	SWMP	AMD	Metals
2006	0.45	5469	51287	Gilmore Run, Unt	CWF	SWMP	AMD	Metals
2004	0.5	20030805-1000-SMD	51288	Gilmore Run, Unt	CWF	SWMP	AMD	Metals
2006	0.48	5469	51288	Gilmore Run, Unt	CWF	SWMP	AMD	Metals
2004	0.8	20030805-1000-SMD	51289	Gilmore Run, Unt	CWF	SWMP	AMD	Metals

2006	0.84	5469	51289	Gilmore Run, Unt	CWF	SWMP	AMD	Metals
2004	1.7	20030616-0948-RLH	51257	Trout Run	CWF	SWMP	AMD	Metals, pH
2006	1.69	5061	51257	Trout Run	CWF	SWMP	AMD	Metals, pH
2004	0.5	20030916-1245-SMD	51257	Trout Run	CWF	SWMP	AMD	Metals, pH
2006	0.65	5794	51257	Trout Run	CWF	SWMP	AMD	Metals, pH
2006	0.32	6029	Unt 51258	Trout Run, Unt	CWF	SWMP	AMD	Metals, pH
2006	0.29	5202	Unt 51260	Trout Run, Unt	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 Scrubgrass Creek Watershed

The Scrubgrass Creek Watershed is approximately 40.0 square miles in area and is located in Irwin and Clinton Townships, Venango County and Marion and Venango Townships, Butler County. The watershed can be located on the U. S. Geological Service (USGS) 7.5-minute quadrangles of Barkeyville, Eau Claire, Kennerdell and Polk. Scrubgrass Creek flows approximately 12.5 miles from its headwaters near the town of Wesley in Irwin Township, Venango County to its confluence with the Allegheny River just south of the town of Kennerdell in Clinton Township, Venango County. Major tributaries to Scrubgrass Creek include Bullion Run, Gilmore Run and Trout Run.

To access the Scrubgrass Creek Watershed take exit 29 off of Interstate 80 (I-80). Turn onto Route 8 North and travel for approximately 2.8 miles. The headwaters of Scrubgrass Creek flow under Rt. 8 at this point. Continue traveling north on Rt. 8 for approximately 2.2 miles and get off at the Pearl/Bullion, State Route 308 (SR308) exit. Take a right onto SR308 South and travel for approximately 2.6 miles past the town of Bullion. Take a left onto SR3008 towards Kennerdell and travel for approximately 2.2 miles. Trout Run flows under SR3008 and into Scrubgrass Creek at this point. Continue on SR3008 for approximately 0.3 miles and Bullion Run flows under SR3008 into Scrubgrass Creek at this point. Travel approximately 1.9 miles further on SR3008 and Scrubgrass Creek flows into the Allegheny River on the right side of the road across from the town of Kennerdell.

Segments addressed in this TMDL

The Scrubgrass Creek Watershed is affected by pollution from AMD. This pollution has caused high levels of metals throughout the Scrubgrass Creek Watershed, including Bullion Run, Gilmore Run, Trout Run and the mainstem of Scrubgrass Creek. Table 1 and Map 1 give an explanation and locations of the AMD allocation points.

There are currently eight surface mining permits issued in the Scrubgrass Creek Watershed. Two of these permits (William A. Guiste SMP#61012802 and William A. Guiste SMP# 61960801) are small non-coal mining operations that are not issued NPDES permits and therefore are not required to have Waste Load Allocations (WLAs) assigned to them. Mining has been completed on two issued surface mining permits in the watershed (Ben Hal Mining Company SMP#61020101 and Ben Hal Mining Company SMP#61050101); therefore, a WLA will not be required for these permits. The remaining four permits issued in the Scrubgrass Creek Watershed are currently active and will be assigned WLAs (Ben Hal Mining Company SMP#61970101 (NPDES PA0227358), Rusnak Coal Company SMP#61970102 (NPDES PA022759), Ben Hal Mining Company SMP#61980103 (NPDES PA0227846) and Ben Hal Mining Company SMP#61040102 (NPDES PA0242560).

All of the remaining discharges in the watershed are from abandoned mines and will be treated as non-point sources. The distinction between non-point and point sources in this case is determined on the basis of whether or not there is a responsible party for the discharge. 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 Scrubgrass Creek Watershed TMDL.

Watershed History

Historical data shows that underground mining in the form of drift mines was being conducted on a small scale until the 1960s in the Scrubgrass Creek Watershed. Surface mining has been documented throughout the watershed as early as the 1930s and continues on a small scale today. The date of the earliest mining within this watershed is not known. 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 on the Upper and Lower Clarion, Brookville and Middle and Lower Kittanning Coal seams.

The majority of well-documented mining in the Scrubgrass Creek watershed occurred in the 1970's and 1980's. Currently, there are several active surface coal mining and industrial mineral mining operations in the watershed. The following provides a brief outline of the mining history of the Scrubgrass Creek watershed. Although most of the files no longer exist, some information has been saved through microfiche:

Table 2. Scrubgrass Creek Watershed Mining History

Company Name	Permit Number	Mine Name	Date Issued	Acerage	Coal Seam(s)	Status
William O. Goetz	2566BSM9	Goetz No. 3 Strip Mine	4/25/1966	36.7	LC, UC	Inactive
William O. Goetz	2566BSM10	GoetzNo. 2 Strip Mine	1/18/1966	14.2	LC, UC	Inactive
Lucas Coal Co.	2566BSM15	Roeder	7/20/1966	45.0	C	Inactive
Winger Coal Co.	2566BSM26	Winger No. 1 Mine	9/23/1969	196.6	B, C	Inactive
Neil Atwell	2566BSM58	Atwell	7/20/1967		MK	Inactive

Pengrove Coal Co.	2567BSM10	Pengrove No. 5 Strip Mine	9/21/1976	32.5	LK	Inactive
Allied Fuel and Materials, Inc.	2568BSM15	No. 4 Strip Mine	1/23/1969	136.6	LK	Inactive
Winger Coal Co.	2568BSM16	Jones-Mayes	11/21/1968	120.1	B, K	Inactive
Lucas Coal Co.	2568BSM22	R.E. Scott Mine	8/31/1968	27.3	Sharon	Inactive
Allied Fuel and Materials, Inc.	2568BMS26	Allied No.5 Strip Mine	7/18/1974	250.1	B	Inactive
Winger Coal Co.	3771BSM1	Winger No. 2 Mine	5/5/1971	144.5	LK, MK	Inactive
Winger Coal Co.	3771BSM3	Winger No. 3 Mine	12/12/1972	181.5	B, LK	Inactive
B&D Coal Co.	3771BSM5	B&D No. 3 Strip Mine	5/4/1972	53.0	LK	Inactive
Winger Coal Co.	3771BSM1	Winger No. 4 Mine	6/1/1976	175.0	LK, MK, B	Stage III (8/25/1987)
Pengrove Coal Co.	3771BSM6	Pengrove No. 8 Strip Mine	10/8/1971	31.0	B	Inactive
Miller and McKnight Coal Co.	3772BSM1	McBride Mine		166.3	LK, MK, B	Inactive
Chutz Coal Co.	3774SM20	Chutz No. 2 Strip Mine	2/25/1975	69.0	B, LK	Inactive
Pengrove Coal Co.	3774SM26	Pengrove No. 10 Mine	3/11/1977	355.5	B	Inactive
C&K Coal Co.	3774SM29	No. 89 Strip Mine	11/10/1975	34.6	B	Inactive
Romanko Bros. Enterprises, Inc.	3775SM19	Romanko No. 1 Mine				Transferred to 617530109
Romanko Bros. Enterprises, Inc.	61753019	Romanko No. 1 Mine	6/24/1985	136.3	B, LK	Stage III (5/10/1993)
C&K Coal Co.	3775SM20	No. 100 Strip and Auger Mine	1/17/1977	37.0	B	Inactive
Pengrove Coal Co.	3776SM09	Pengrove No. 11 Strip Mine	7/26/1976	183.0	B	Inactive
FW & RR Inc.	3776SM10	Clintonville Strip Mine	6/15/2006	8.9	LK, MK	Inactive
C&K Coal Co.	3776SM15	No. 119 Mine	9/6/1977	82.8	B, C	Inactive
Oil City Coal Inc.	3776SM17	Sterrett-Jacobs Mine	7/21/1977	184.0	LK, MK, B, C	Inactive
FW & RR Inc.	3777SM2	Ivell Mine	5/10/1977	22.0	C	Inactive
Pengrove Coal Co.	3777SM4	Sterrett Mine				Bonds Forfeited - BAMR treatment system
W.A. Cotterman	3777SM30	Hovis Mine	3/9/1978	330.0	LC, UC	Stage III (12/19/1985)
Oil City Coal Inc.	3778BC16	Milberg Mine	8/21/1979	144.5	B, LK	Inactive
FW & RR Inc.	6179104	Hovis Mine	11/18/1981	78.0	LC, UC	Stage III (6/22/89)
Chernicky Coal Co., Inc.	6179106	Gellett Mine		123.0	LC, UC	Inactive
FW & RR Inc.	6197017	Burke Mine	11/21/1979	50.0	B	Stage III (5/20/1987)
Sunbeam Coal Corp.	61813004	Means Mine	10/2/1984	144.6		Stage III (10/7/1994)
H&D Coal Co.	61810109	Surrena Mine	6/26/1984	89.0	LK, MK	Stage III (1/30/1995)
H&D Coal Co.	61820102	Merola Mine	7/13/1984	236.0	B	Bonds Forfeited - Passive Treatment
Pengrove Coal Co.	61820104	Hamilton Mine	5/1/1984	35.0	B	Stage III (12/13/1990)
Pengrove Coal Co.	61820105	Martin Mine	2/23/1984	554.0	MK, C	Bonds Forfeited - Post mining discharge
H&D Coal Co.	61820109	Kochanowic Mine	11/28/1983	249.0	C	Stage III (2/7/1995)
Glacial Minerals, Inc.	61820111	Shaw Mine	10/17/1984	28.9	UC	Stage III (10/9/1996)
Pengrove Coal Co.	61840102	Poole Mine	5/29/1984	28.9	LK	Stage III (6/20/1991)
Pengrove Coal Co.	61840104	Marshall Mine			C	Bonds Forfeited - Transferred to Amerikohl
Amerikohl Mining, Inc.	61840106	Shull Mine	9/30/1985	215.0	C	Stage III (9/20/1991)
Amerikohl Mining, Inc.	61850101	McBride Mine	4/24/1986	64.0	C, LK, MK	Stage III (7/12/1994)
Pengrove Coal Co.	61850102	Clemente Mine	2/24/1986	134.5	LK	Stage III (10/24/1995)
H&D Coal Co.	61850104	Vogus Mine	4/18/1986	130.0	C, LK	Stage III (7/12/1994)
Amerikohl Mining, Inc.	61860101	Adams Mine	3/16/1987	42.0	C, LK	Stage III (8/1/1995)
Amerikohl Mining, Inc.	61880105	Burton Mine	2/17/1989	155.5	C, LK	Stage III (11/1/1996)
Pengrove Coal Co.	61870101	Gibb Mine	5/26/1988	49.4	B	Stage III (10/22/1992)
Amerikohl Mining, Inc.	61880104	Simpkins Mine	11/30/1988	69.0	B	Stage III (6/2/1995)

Amerikohl Mining, Inc.	61890101	Meyer Mine	6/19/1989	150.5	B, C	Stage III (7/25/1996)
Sunbeam Coal Corp.	61890104	Walters Mine	7/3/1990	124.2	LK, MK	Stage III (8/19/1998)
Ben Hal Mining Co.	61950102	Nectarine Mine	2/6/1996	73.5	LK, MK	Stage III (6/3/2003)
William A. Guiste	61960801	Turkey Ridge Mine	1/4/1996	2.0	Sandstone	Active Small Non-coal
Ben Hal Mining Co.	61970101	Nectarine No. 2 Mine	5/30/1997	66.5	LK, MK	Active
Rusnak Coal Company	61970102	Hawk Mine	6/12/1998	54.5	LK	Active
Ben Hal Mining Co.	10970104	Fehl Mine	3/23/1989	130.8	MK	Stage III (10/30/2006)
Ben Hal Mining Co.	61980103	Nectarine No. 3 Mine	2/19/1999	111.0	LK, MK	Active
Ben Hal Mining Co.	61990102	Clintonville No. 1 Mine	2/23/2000	40.7	MK	Stage III (10/30/2006)
William A. Guiste	61012802	Coblentz No. 1 Mine	5/22/2001	5.0	Sandstone	Active Small Non-coal
Ben Hal Mining Co.	61020101	Hoffman Mine	10/21/2002	25.5	LK	Active - Stage II
Ben Hal Mining Co.	61040102	Winger Mine	1/10/2005	58.0	LK	Active
Ben Hal Mining Co.	61050101	Homick Mine	10/21/2005	13.1	LK	Active - Stage II

In October 1970, a study known as the Big Scrubgrass Creek Mine Drainage Pollution Abatement Project (SL-147) was initiated under Pennsylvania's Operation Scarlift program in order to identify the sources and determine the extent of stream pollution in the Scrubgrass Creek watershed produced by coal mining. Completed by Pantech Engineers, Inc. of Franklin, Pennsylvania, the study established seventy water quality sampling stations within the watershed and identified seven sub watersheds (Big Scrubgrass, Bullion Run, Trout Run, Brink Run, Gilmore Run, Upper Main Stem and Southwest Tributaries) that contribute to the acidity loading in the stream. Most sources of the acidity loading in the watershed were identified to be abandoned strip mines. Source abatement plans were developed for the seven sub watersheds including specific reclamation plans along with cost estimates for each proposed project area within the sub watersheds. A copy of this report can be found on the Abandoned Mine Reclamation Clearing House Website at the following link: http://amrclearinghouse.org/Sub/SCARLIFTReports/BigScrubgrassCreek/BigScrubgrassCreek.htm

The Scrubgrass Creek Rivers Conservation Plan was completed in December 2001 for the Scrubgrass Creek Watershed under the Department of Conservation and Natural Resources (DCNRs) Pennsylvania Rivers Conservation Program. The purpose of the study was to address local issues and concerns and recommend management options designed to protect the watershed. A copy of the plan can be found on the DCNR web page at the following link: http://www.dcnr.state.pa.us/brc/rivers/riversconservation/registry/39scrubgrass.aspx

In 1999, the Venango County Commissioners were awarded a $229,520.00 Growing Greener grant in order to establish baseline data for current water quality and stream health in the Scrubgrass Creek Watershed. The data of this study includes eighteen months of stream water quality sampling and fishery data along with twenty months of water quality monitoring on one hundred and six discharges located throughout the watershed. The data was analyzed in order to establish a ranking of the sites relative to stream degradation, facilitate future cost-benefit analysis and long term monitoring. An engineering analysis was performed in order to determine the most cost effective ways to treat the discharges in each sub watershed. This project is part of a multi-phase project to restore Scrubgrass Creek and its tributaries so that the waters will be able to support aquatic life. Phases I and II include identification of water quality and aquatic life, inventory of acid mine drainage, design of treatment systems for well and mine discharges, municipal land rights acquisition and completion of a watershed plan. Phases III and IV will include restoration and monitoring activities.

Abandoned oil and gas wells discharging AMD were also identified as a major source of pollution in the Scrubgrass Creek Watershed. Several well plugging efforts have been initiated in order to remediate these discharges. The Alliance for Wetlands and Wildlife, Inc. received a $166,342.00 Growing Greener grant in 2002 in order to plug 15 abandoned oil and gas wells discharging into Scrubgrass Creek. More recently, the Venango Conservation District received an $87,391.00 Growing Greener II Watershed Protection Grant in 2005 in order to plug ten abandoned oil wells in the watershed. The Venango Conservation district also received a $25,000.00 Growing Greener II Watershed Protection Grant in 2006 in order to plug 4 abandoned oil wells on Scrubgrass Creek, South Branch and Trout Run. A portion of the grant money received in 2006 will also be used to assist in conducting well logging through the watershed.

Utilizing forfeited bond money from abandoned mining operations the Bureau of Abandoned Mine Reclamation (BAMR) has constructed several passive treatment systems in the Scrubgrass Creek Watershed in order to remediate post-mining discharges. Passive treatment systems have been installed at the Pengrove Coal Company Sterrett mine site (SMP#3777SM4) and the H&D Coal Company Merola mine site (SMP#61820102).

AMD Methodology

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

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

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

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

PR = required percent reduction for the current iteration

Cc = criterion in mg/l

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

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

Mean = average observed concentration

Standard Deviation = standard deviation of observed data

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

LTA = Mean * (1 – PR99) where (2)

LTA = allowable LTA source concentration in mg/l

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

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

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

---

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

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

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

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

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

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:

Flow (MGD) X BAT limit (mg/l) X 8.34 = 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 unregraded area following the pit's progression through the site. Groundwater seepage reporting to the pit is considered negligible compared to the flow rates resulting from precipitation.

In an active mining scenario, a mine operator pumps pit water to the ponds for chemical treatment. Pit water is often acidic with dissolved metals in nature. At the treatment ponds, alkaline chemicals are added to increase the pH and encourage dissolved metals to precipitate and settle. Pennsylvania averages 41.4 inches of precipitation per year (Mid-Atlantic River Forecast Center, National Weather Service, State College, PA, 1961-1990, ttp://www.dep.state.pa.us/dep/subject/hotopics/drought/PrecipNorm.htm). A maximum pit dimension without special permit approval is 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 in. precip/yr x 0.95 x 1 ft/12/in. x 1,500'x300'/pit x 7.48 gal/ft^3 x 1yr/365days x 1day/24hr x 1hr/60 min =

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

Pit water also can result from runoff from the unregraded and revegetated area following the pit. In the case of roughly backfilled and highly porous spoil, there is very little surface runoff. It is estimated that 80 percent of precipitation on the roughly regraded mine spoil infiltrates, 5 percent evaporates, and 15 percent may run off to the pit for pumping and potential treatment (Jay Hawkins, Office of Surface Mining, Department of the Interior, Personal Communications, 2003). Regrading and revegetation of the mine spoil is conducted as the mining progresses. 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 unregraded and unrevegetated spoil area.

41.4 in. precip/yr x 3 pit areas x 1 ft/12/in. x 1,500'x300'/pit x 7.48 gal/ft^3 x 1yr/365days x 1day/24hr x 1hr/60 min x 15 in. runoff/100 in. precip =

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

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

Total Average Flow = Direct Pit Precipitation + Spoil Runoff

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

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

Allowable Aluminum WLA:
30.9 gal/min x 0.75 mg/l x 0.01202 = 0.3 lbs/day

Allowable Iron WLA:
30.9 gal/min x 3 mg/l x 0.01202 = 1.1 lbs/day

Allowable Manganese WLA:
30.9 gal/min x 2 mg/l x 0.01202 = 0.7 lbs/day

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

There is little or no documentation available to quantify the actual amount of water that is typically pumped from active pits to treatment ponds. Experience and observations suggest that the above approach is very conservative and overestimates the quantity of water, creating a large margin of safety (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 gal/min X 2 (assume two pits) X 0.00144 = 0.09 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 2 shows the water quality criteria for the selected parameters.

Table 3 Applicable Water Quality Criteria

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

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

TMDL Elements (WLA, LA, MOS)

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

TMDL Allocations Summary

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

Allocation Summary

This TMDL will focus remediation efforts on the identified numerical reduction targets for each watershed. The reduction schemes in Table 3 for each segment are based on the assumption that all upstream allocations are achieved and take 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–Scrubgrass 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 %
22	Mouth of Unt (51300) Scrubgrass Creek						
	Al	0.13	0.13	0.0	0.13	0	0
	Fe	0.42	0.42	0.0	0.42	0	0
	Mn	0.11	0.11	0.0	0.11	0	0
	Acidity	0.0	0.0	0.0	0.0	07	0
21	Mouth of Unt (51301) Scrubgrass Creek						
	Al	2.9	1.5	*0.56*	0.94	1.4	49
	Fe	30.4	4.0	*2.25*	1.75	26.4	87
	Mn	78.8	3.9	*1.5*	2.4	74.9	95
	Acidity	126.0	15.1	0.0	15.1	110.9	88
20	Most Upstream Sample Point on Scrubgrass Creek						
	Al	4.5	1.0	0.0	1.0	3.5	78
	Fe	0.6	0.6	0.0	0.6	0.0	0
	Mn	0.9	0.9	0.0	0.9	0.0	0
	Acidity	44.1	0.1	0.0	0.1	44.0	99.7
19	Scrubgrass Creek Upstream of Confluence with Unt (51297)						
	Al	49.0	5.9	*2.8*	3.1	38.2	87
	Fe	40.7	12.2	*11.25*	0.95	2.0	14
	Mn	157.9	11.1	*7.5*	3.6	72.0	87
	Acidity	498.4	5.0	0.0	5.0	338.6	99
18	Scrubgrass Creek Upstream of Confluence with Unt (51292)						
	Al	46.4	12.5	*2.8*	9.7	0.0	05
	Fe	105.1	26.3	*11.25*	15.05	50.3	66
	Mn	187.3	18.7	*7.5*	11.2	21.7	54
	Acidity	707.2	0.0	0.0	0.0	213.8	100
17	Mouth of Unt (51295) Scrubgrass Creek						
	Al	0.15	0.14	0.0	0.14	0.01	4
	Fe	0.03	0.03	0.0	0.03	0.0	0
	Mn	0.3	0.2	0.0	0.2	0.0	14
	Acidity	0.9	0.7	0.0	0.7	0.2	22
16	Unt (51292) Upstream of Confluence with Unt (51295)						
	Al	0.8	0.74	0.75	0.0	0.06	7
	Fe	0.4	0.4	0.3	0.1	0.4	0
	Mn	3.3	1.1	0.2	0.9	2.2	65
	Acidity	0.0	0.0	0.0	0.0	0.0	0
15	Mouth of Unt (51293) Upsream of Confluence with Unt (51292)						
	Al	2.3	0.5	0.03	0.47	1.8	80
	Fe	0.7	0.7	0.15	0.55	0.0	0
	Mn	1.4	0.8	0.1	0.7	0.6	46
	Acidity	0.0	0.0	0.0	0.0	0.0	0
14	Unt (51289)						
	Al	2.0	0.5	0.0	0.5	1.5	74
	Fe	0.3	0.3	0.0	0.3	0.0	0
	Mn	3.0	0.8	0.0	0.8	2.2	74
	Acidity	18.5	0.2	0.0	0.2	18.3	99
13	Unt (51285)						
	Al	2.7	0.8	NA	0.8	1.9	70
	Fe	1.7	1.7	0.0	1.7	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	1.3	1.3	0.0	1.3	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
12	Unt (51285) Upstream of the Confluence with Scrubgrass Creek						
	Al	5.5	4.4	*2.24*	2.16	0.0	0
	Fe	9.8	9.8	*9.0*	0.8	0.0	0
	Mn	18.5	11.1	*6.0*	5.1	5.2	32
	Acidity	0.0	0.0	0.0	0.0	0.0	0
8	Scrubgrass Creek Upstream of Confluence with Unt (51272) of Scrubgrass Creek						
	Al	38.7	37.9	*2.8* + 0.09	35.01	0.0	0
	Fe	140.2	57.5	*11.25* + 0.35	45.9	0.0	0
	Mn	213.2	40.5	*7.5* + 0.23	32.77	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
11A	Most Upstream Sample Point on Unt (51272) of Scrubgrass Creek						
	Al	1.4	1.1	*0.56*	0.54	0.3	20
	Fe	3.8	3.8	*2.25*	1.55	0.0	0
	Mn	2.6	2.1	*1.5*	0.6	0.5	20
	Acidity	0.0	0.0	0.0	0.0	0.0	0
11	Mouth of Unt (51279) Downstream of Sample Point 11A						
	Al	14.8	0.6	0.0	0.6	14.2	96
	Fe	0.6	0.6	0.0	0.6	0.0	0
	Mn	20.4	0.8	0.0	0.8	19.6	96
	Acidity	104.3	0.0	0.0	0.0	104.3	100
10	Unt (51272) Upstream of Confluence With Unt (51275)						
	Al	7.2	4.6	*1.12*	3.48	0.0	0
	Fe	5.5	5.5	*4.5*	1.0	0.0	0
	Mn	29.9	8.4	*3.0*	5.4	1.4	15
	Acidity	0.0	0.0	0.0	0.0	0.0	0
9	Unt (51272) Upstream of Confluence with Scrubgrass Creek						
	Al	4.6	4.6	*1.68* + 0.31	2.61	0.0	0
	Fe	9.9	9.9	*6.75* + 1.1	2.05	0.0	0
	Mn	26.6	12.5	*4.5* + 0.93	7.07	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
7	Mouth of Unt (51272) at Confluence with Scrubgrass Creek						
	Al	8.6	5.1	*1.68*	3.42	3.4	40
	Fe	30.5	11.6	*6.75*	4.85	18.9	62
	Mn	39.1	5.9	*4.5*	1.4	19.1	77
	Acidity	0.0	0.0	0.0	0.0	0.0	0
5	Scrubgrass Creek Upstream of Confluence with Unt (51262) of Scrubgrass Creek						
	Al	47.6	47.6	*2.8*	44.8	0.0	0
	Fe	110.6	79.6	*11.25*	68.35	12.1	13
	Mn	226.0	83.6	*7.5*	76.1	101.8	55
	Acidity	0.0	0.0	0.0	0.0	0.0	0
24	Mouth of Unt (51262) of Scrubgrass Creek						
	Al	0.9	0.9	0.0	0.9	0.0	0
	Fe	1.0	1.0	0.0	1.0	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
4	Mouth of Trout Run (51257)						
	Al	3.2	2.0	*0.56*	1.44	1.2	36

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
	Fe	12.7	4.7	*2.25*	2.45	8.0	63
	Mn	5.1	5.1	*1.5*	3.6	0.0	0
	Acidity	34.7	10.4	0.0	10.4	24.3	70
3	Mouth of Unt (51249) of Bullion Run						
	Al	3.0	3.0	*1.12*	1.88	0.0	0
	Fe	9.2	5.3	*4.5*	0.8	3.9	42
	Mn	6.0	6.0	*3.0*	3.0	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
2	Bullion Run Dowstream of Unt (51249) of Bullion Run						
	Al	2.7	2.7	*1.68*	1.02	0.0	0
	Fe	11.3	11.3	*6.75*	4.55	0.0	0
	Mn	5.5	5.5	*4.5*	1.0	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
23	Mouth of Bullion Run Upstream of Sample Point 1						
	Al	6.6	6.6	0.0	6.6	0.0	0
	Fe	4.1	4.1	0.0	4.1	0.0	0
	Mn	1.1	1.1	0.0	1.1	0.0	0
	Acidity	0.0	0.0	0.0	0.0	0.0	0
1	Mouth of Scrubgrass Creek Upstream of Confluence with Allegheny River						
	Al	41.8	41.8	*2.8*	39.0	0.0	0
	Fe	67.3	67.3	*11.25*	56.05	0.0	0
	Mn	192.8	102.2	*7.5*	94.7	0.0	0
	Acidity	0.0	0.0	0.0	0.0	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 16 (Rusnak Coal Co. Hawk Run Mine) 15 (Ben Hal {4} Nectarine III Mine TA, TB and TC), 9 (Ben Hal {2} Nectarine II Mine TA-1, Ben Hal {3} Winger Mine TA and TC) and 8 (Ben Hal {3} Winger Mine TB and Ben Hal {4} Necterine III Mine TD). 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 met the TMDL or there is available assimilation capacity. All necessary reductions are assigned to non-point sources.

The Rusnak Coal Co., Inc Hawk Run Mine (SMP#61970102) has a non-standard pit size of 600 feet in length and a width of 100 feet. In addition there are two pits of this size. This pit size was used in the Method to Quantify Treatment Pond Pollutant Load calculation example shown below:

41.4 in. precip/yr x 0.95 x 1 ft/12/in. x 600’x 100’/pit x 7.48 gal/ft^3 x 1yr/365days x 1day/24hr x 1hr/60 min = 2.8 gal/min average discharge from direct precipitation into the open mining pit area. There are two pits of this size so the total is 5.6 gal/min.

41.4 in. precip/yr x 3 pit areas x 1 ft/12/in. x 600'x100'/pit x 7.48 gal/ft^3 x 1yr/365days x 1day/24hr x 1hr/60 min x 15 in. runoff/100 in. precip = 1.3 gal/min average discharge from spoil runoff into the pit area. There are two pits of this size so the total is 2.7 gal/min.

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

Total Average Flow = Direct Pit Precipitation + Spoil Runoff

Total Average Flow = 5.68 gal./min. + 2.65 gal./min. = 8.33 gal./min.

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

Allowable Aluminum Waste Load Allocation:
8.33 gal./min. x 0.75 mg/l x 0.01202 = 0.075 lbs./day

Allowable Iron Waste Load Allocation:
8.33 gal./min. x 3 mg/l x 0.01202 = 0.30 lbs./day

Allowable Manganese Waste Load Allocation:
8.33 gal./min. x 2 mg/l x 0.01202 = 0.20 lbs./day

The Rusnak Mining Co., Inc Hawk Run Mine (permit SMP#61970102) is actively mining coal treatment pond TA has been constructed. Two non-standard pit sizes for Pit 1 and Pit 2 are each 600 feet in length with a width of 100 feet. These pit sizes were used in the Method to Quantify Treatment Pond Pollutant Load calculation and are shown in Table 5.

The Ben Hal (2) Mining Co., Inc Necterine II Mine (permit SMP#61970101) is no longer actively mining coal and treatment pond TA-2 was not constructed. TA-1 remains but is not in use. However, a WLA is required because the treatment pond is in existence and the bond has not been released. Two non-standard pit sizes for Pit 1 and Pit 2 were each 800 feet in length with a width of 200 feet. These pit sizes were used in the Method to Quantify Treatment Pond Pollutant Load calculation example are shown in Table 5. For aluminum and iron the permit limits were set at 0.6 mg/l for aluminum and 1.8 mg/l iron due to elevated instream concentrations.

The Ben Hal (3) Mining Co., Inc Winger Mine (permit SMP#61040102) is actively mining coal treatment pond TA has been constructed. Treatment ponds TB and TC will be constructed and all three will be in use so three WLAs are necessary. Two non-standard pit sizes for Pit 1 and Pit 2 are each 100 feet in length with a width of 60 feet. These pit sizes were used in the Method to Quantify Treatment Pond Pollutant Load calculation and are shown in Table 5.

The Ben Hal (4) Mining Co., Inc Necterine III Mine (permit SMP#61980103) is actively mining coal. Treatment ponds TA, TB, TC and TD will all be constructed and in use at the same time and WLAs are required for each. Two non-standard pit sizes for Pit 1 and Pit 2 were each 100 feet in length with a width of 100 feet. These pit sizes were used in the Method to Quantify

Treatment Pond Pollutant Load calculation and are shown in Table 5. For aluminum the permit limit was set at 0.55 mg/l for aluminum due to elevated instream concentrations.

Table 5. Waste Load Allocation of Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Rusnak	**Hawk Run Mine**		
Al	0.75	0.0012	0.075
Fe	3.0	0.0012	0.3
Mn	2.0	0.0012	0.2
Ben Hal (2), Necterine II Mine, SMP61970101			
TA-1			
Al	0.6	0.032	0.16
Fe	1.8	0.032	0.48
Mn	2.0	0.032	0.53
TA-2	Treatment pond not constructed.		
Al	0.75	-	-
Fe	3.0	-	-
Mn	2.0	-	-
Ben Hal (3), Winger Mine, SMP61040102			
TA			
Al	0.75	0.0012	0.075
Fe	3.0	0.0012	0.3
Mn	2.0	0.0012	0.2
TB			
Al	0.75	0.0012	0.075
Fe	3.0	0.0012	0.3
Mn	2.0	0.0012	0.2
TC			
Al	0.75	0.0012	0.075
Fe	3.0	0.0012	0.3
Mn	2.0	0.0012	0.2
Ben Hal (4), Nectarine III Mine, SMP61980103			
TA			
Al	0.75	0.002	0.013
Fe	3.0	0.002	0.05
Mn	2.0	0.002	0.033
TB			
Al	0.55	0.002	0.009
Fe	3.0	0.002	0.05
Mn	2.0	0.002	0.033
TC			

Al	0.55	0.002	0.009
Fe	3.0	0.002	0.05
Mn	2.0	0.002	0.033
TD			
Al	0.75	0.002	0.013
Fe	3.0	0.002	0.05
Mn	2.0	0.002	0.033

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 Scrubgrass Creek Watershed Association (SCWA) has been established in the Scrubgrass Creek Watershed since the 1970s. The SCWA has partnered with the Venango Conservation District on several grant funded projects throughout the watershed, including various education and outreach projects, watershed assessment activities and abandoned oil and gas well plugging projects. The SCWA hold their meetings on the first Tuesday of each month at the Comfort Inn in Barkeyville, Pennsylvania at 7:00 pm. The SCWA and Venango Conservation District will continue to work to implement projects to achieve the reductions recommended in this TMDL document.

Also see the Watershed History section on page 12.

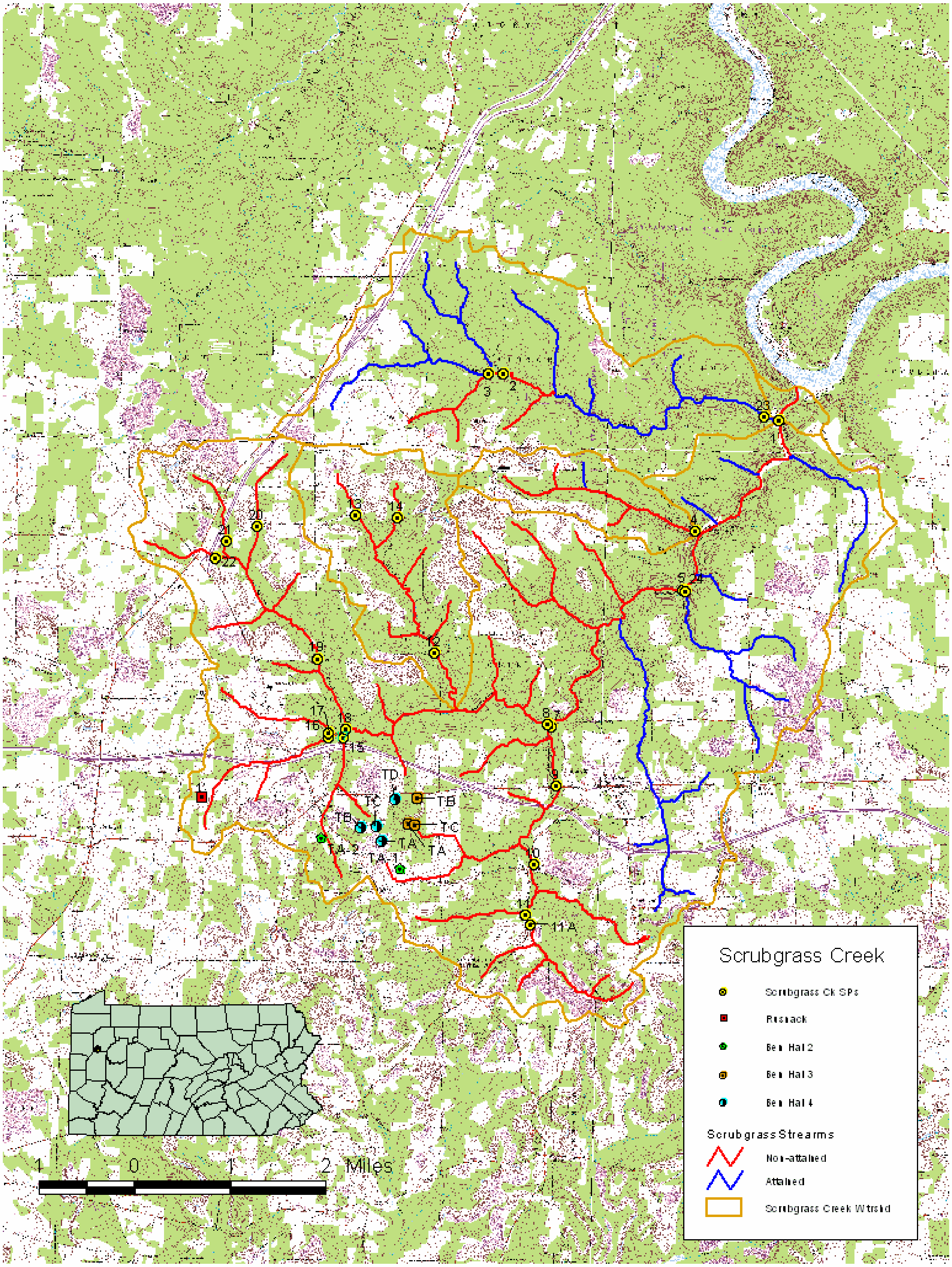
Candidate or federally-listed threatened and endangered species may occur in or near the watershed. While implementation of the TMDL should result in improvements to water quality, they could inadvertently destroy habitat for candidate or federally-listed species. TMDL implementation projects should 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

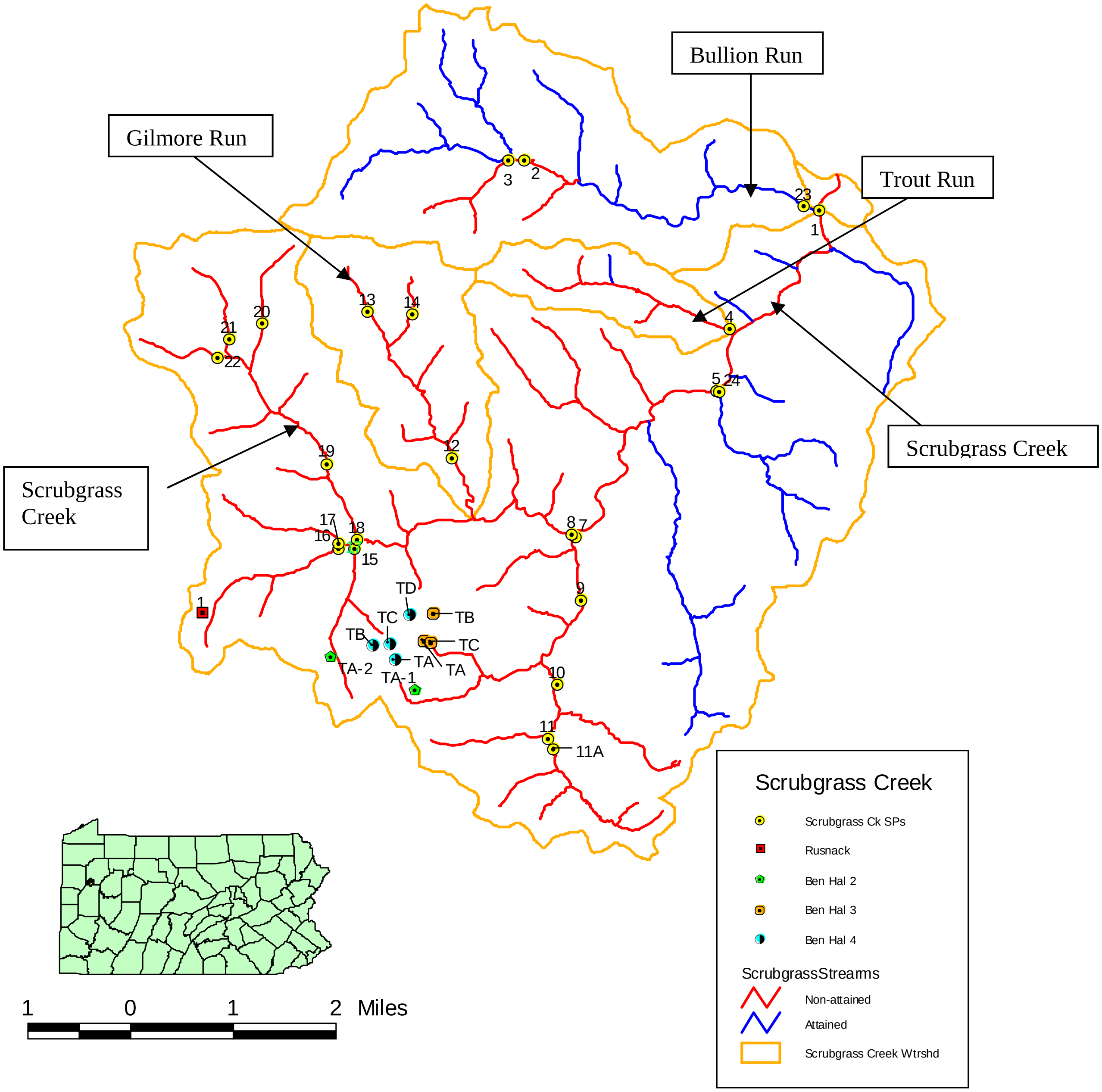
Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on February 8, 2008 and the Derric on February 21, 2008 to foster public comment on the allowable loads calculated. A public meeting was held on February 26, 2008 beginning at 9:00 a.m., at the Knox District Mining Office in Knox, PA, to discuss the proposed TMDL.

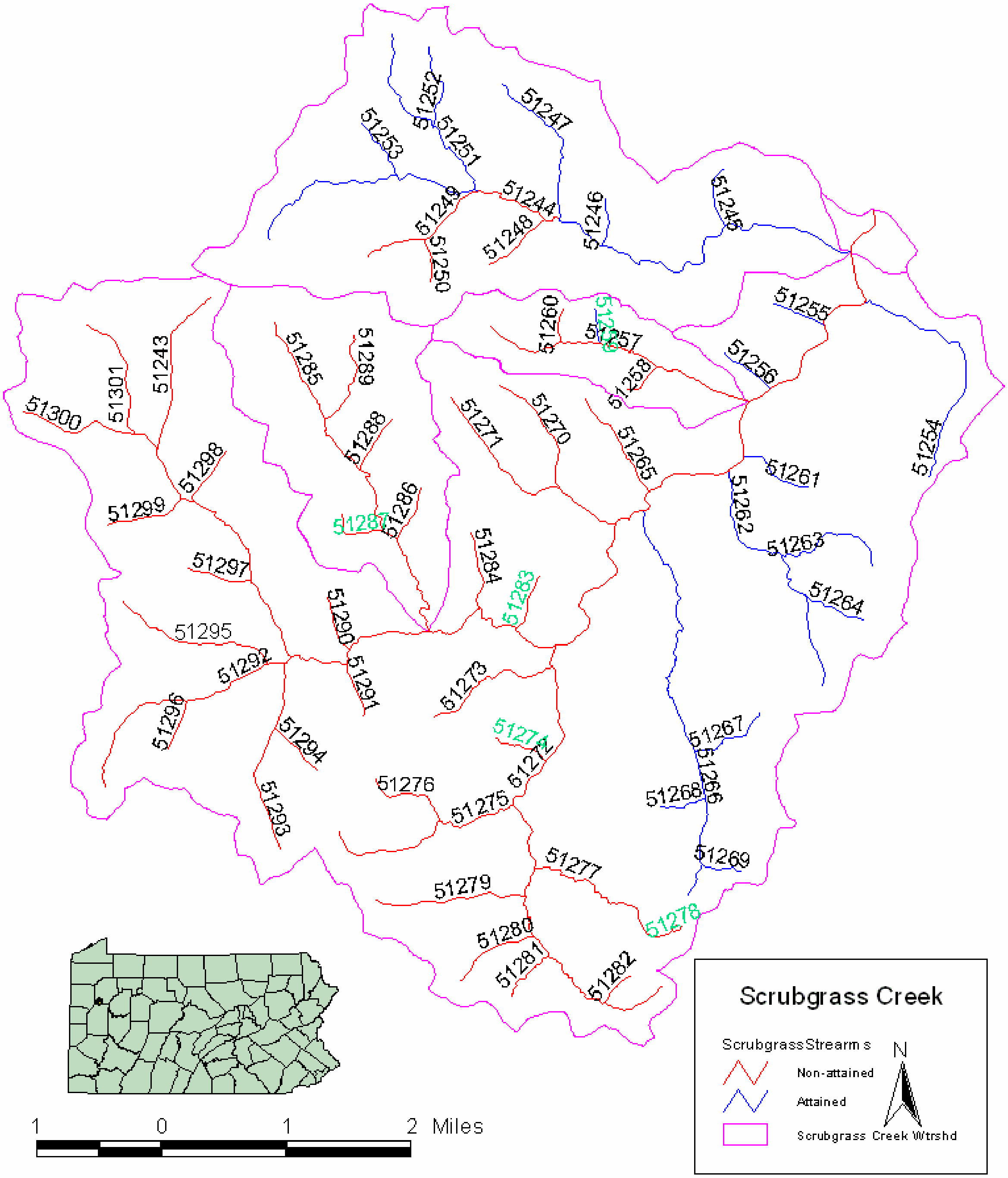
Attachment A

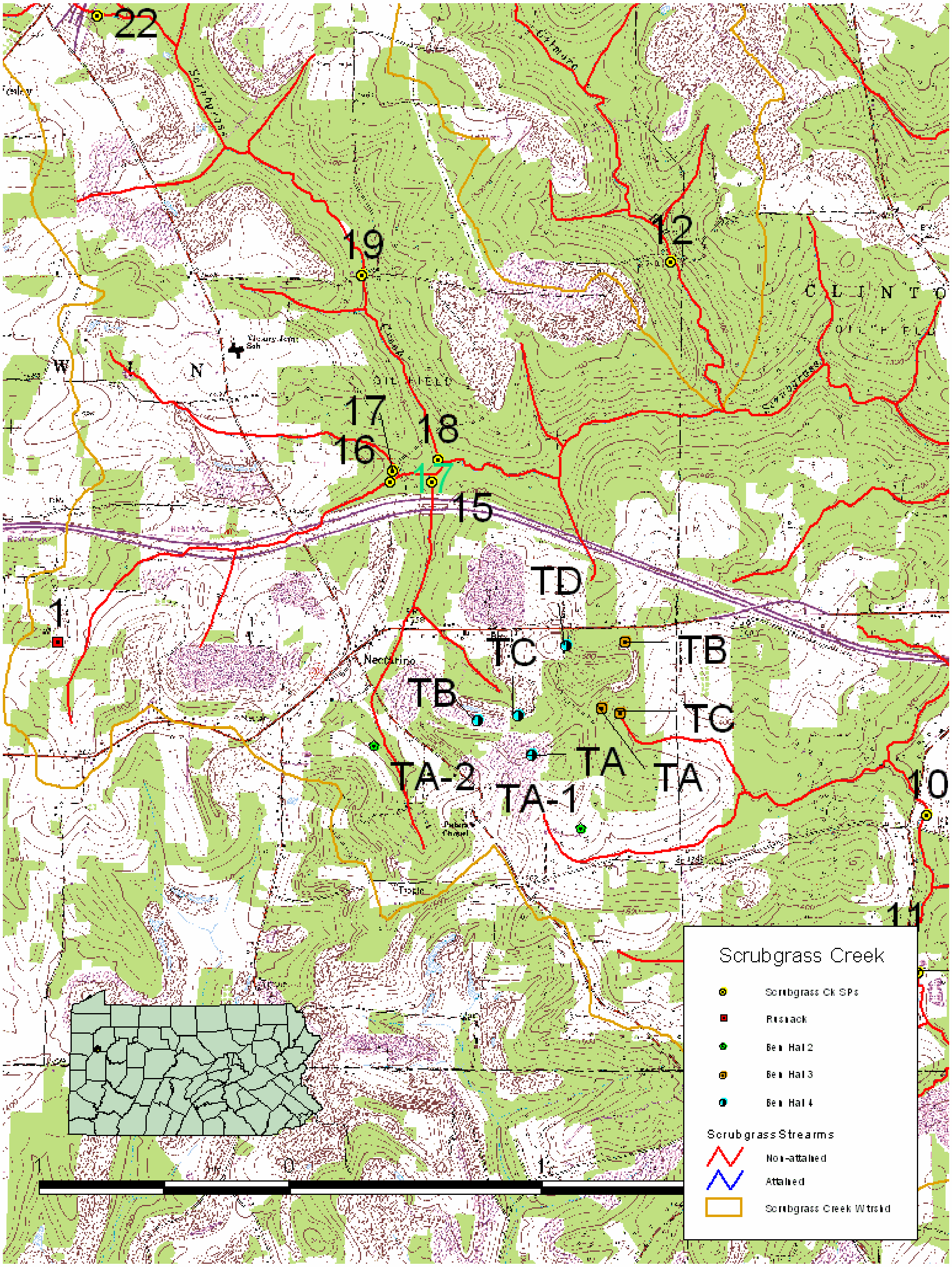
Scrubgrass Creek Watershed Maps



3
2
23
1
4
5
24
13
14
20
21
22
19
12
17
16
18
15
8
7
9
10
11
11A
1
TD
TC
TB
TB
TC
TA
TA
TA-2
TA-1
1 0 1 2 Miles
Scrubgrass Creek
Scrubgrass Ck SPs
Rusnack
Ben Hal 2
Ben Hal 3
Ben Hal 4
Scrubgrass Streams
Non-attained
Attained
Scrubgrass Creek Wtrshd


Bullion Run
Gilmore Run
Trout Run
Scrubgrass Creek
Scrubgrass Creek
1
2
3
4
5
7
8
9
10
11
11A
12
13
14
15
16
17
18
19
20
21
22
23
24
1
TA
TA
TA-1
TA-2
TB
TB
TC
TC
TD
Scrubgrass Creek
⊙ Scrubgrass Ck SPs
■ Rusnack
⬟ Ben Hal 2
▣ Ben Hal 3
◐ Ben Hal 4
ScrubgrassStreams
Non-attained
Attained
Scrubgrass Creek Wtrshd
1
0
1
2
Miles


51252
51253
51251
51247
51249
51244
51246
51245
51248
51250
51255
51260
51259
51257
51256
51258
51285
51289
51243
51301
51300
51288
51271
51270
51265
51261
51254
51298
51299
51287
51286
51262
51263
51297
51284
51283
51264
51290
51295
51292
51291
51273
51296
51294
51274
51267
51272
51276
51266
51268
51293
51275
51269
51277
51279
51278
51280
51281
51282
Scrubgrass Creek
Scrubgrass Streams
Non-attained
Attained
Scrubgrass Creek Wtrshd
N
1
0
1
2
Miles


22
19
12
17
18
16
17
15
TD
1
TC
TB
TB
TC
TA
TA
TA-2
TA-1
10
11
Nectarine
Scrubgrass Creek
Scrubgrass Ck SPs
Rusnack
Ben Hal 2
Ben Hal 3
Ben Hal 4
Scrubgrass Streams
Non-attained
Attained
Scrubgrass Creek Wtrshd

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.*

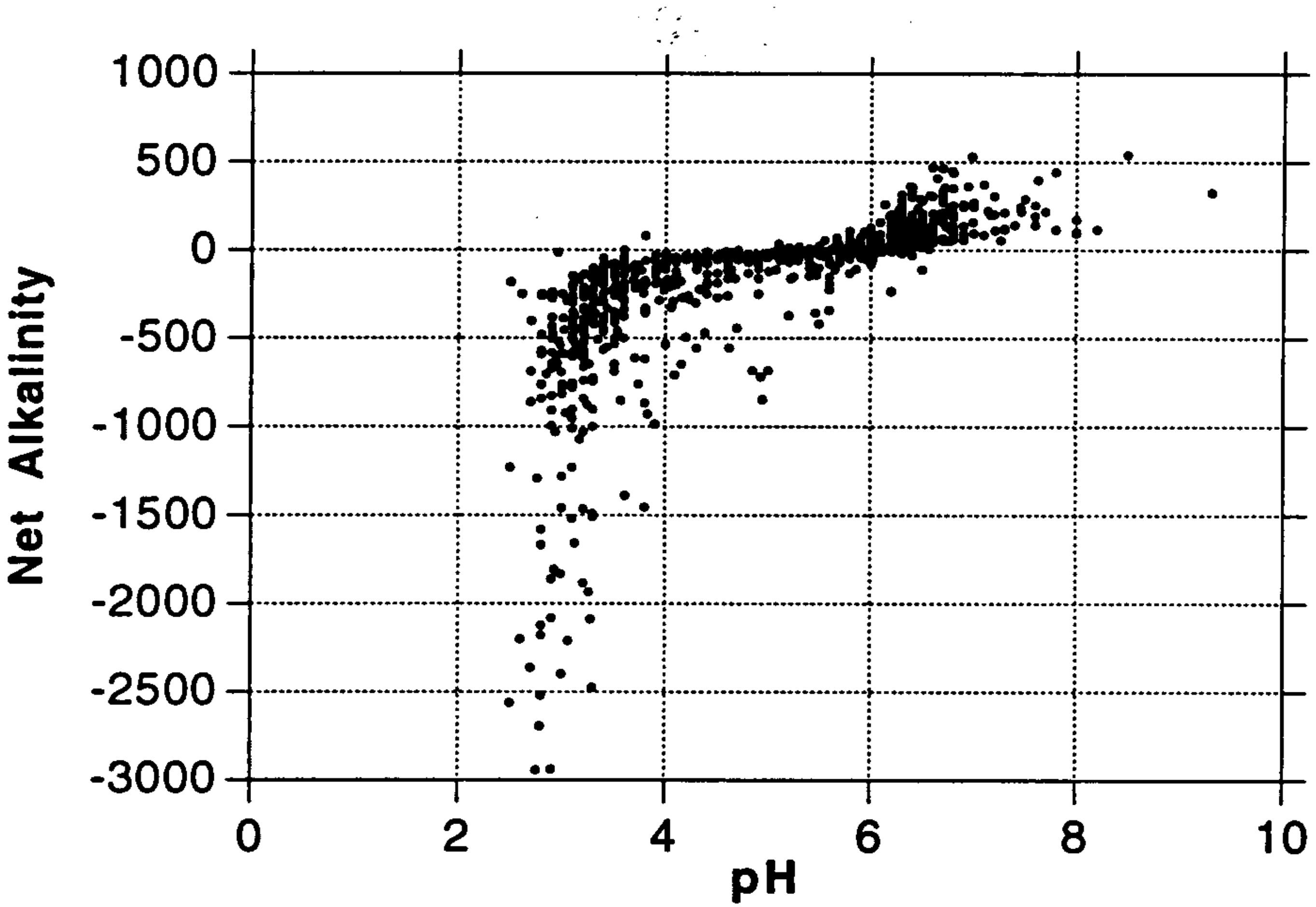


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Attachment C

TMDLs By Segment

Scrubgrass Creek

The TMDL for Scrubgrass Creek consists of load allocations for twenty four sampling sites along Scrubgrass Creek, Gilmore Run, Bullion Run, Trout Run and various unnamed tributaries.

Scrubgrass 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.

22 Mouth of Unt (51300) of Scrubgrass Creek

The TMDL for this sample point on Scrugbrass 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 22. The average flow, measured at the sampling point 22 (0.10 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 22 shows pH ranging between 7.0 and 7.2, pH will not be addressed in this TMDL because the segment is net alkaline.

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 21.

Table C1. Load Allocations for Point 22				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day
Al	0.15	0.13	0.15	0.13
Fe	0.49	0.42	0.49	0.42
Mn	0.13	0.11	0.13	0.11
Acid	0.00	0.0	0.00	0.0
Alk	45.48	38.3		

Table C2. Calculation of Load Reductions Necessary at Point 22				
	Al (lbs/day)	(Fe lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	0.13	0.42	0.11	0.0
Allowable Load = TMDL	0.13	0.42	0.11	0.0
Load Reduction	0.0	0.0	0.0	0.0
% Reduction Segment	0%	0%	0%	0%

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (21) allowing for one operation with two active pits (1500’ x 300’) to be permitted in the future on this segment (see page 15 for the method used to quantify treatment pond load).

Table C3. 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

21 Mouth of Unt (51301) of Scrubgrass Creek

The TMDL for this sample point on Scrubgrass Creek consists of a load allocation to all of the 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 (0.66 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 22 shows pH ranging between 4.4 and 6.2; pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C4. Load Allocations for Point 21

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day
Al	0.53	2.9	0.27	1.5
Fe	5.56	30.4	0.72	4.0
Mn	14.40	78.8	0.72	3.9
Acid	23.02	126.0	2.76	15.1
Alk	4.58	25.1		

Table C5. Calculation of Load Reductions Necessary at Point 21

	Al (lbs/day)	(Fe lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	2.9	30.4	78.8	126.0
Allowable Load = TMDL	1.5	4.0	3.9	15.1
Load Reduction	1.4	26.4	74.9	110.9
% Reduction Segment	49%	87%	95%	88%

20 Most Upstream Sample Point on Scrubgrass Creek

The TMDL for this sample point on Scrubgrass Creek consists of a load allocation to all of the area upstream of sample point 20. The load allocation for this segment was computed using water-quality sample data collected at point 20. The average flow, measured at the sampling point 20 (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 20 shows pH ranging between 3.7 and 4.3; pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for iron and manganese because WQS were met, TMDLs for iron and manganese are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 19.

Table C6. Load Allocations for Point 20				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day
Al	2.43	4.5	0.53	1.0
Fe	0.30	0.6	0.30	0.6
Mn	0.46	0.9	0.46	0.9
Acid	23.60	44.1	0.07	0.1
Alk	0.12	0.2		

Table C7. Calculation of Load Reductions Necessary at Point 20				
	Al (lbs/day)	(Fe lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	4.5	0.6	0.9	44.1
Allowable Load = TMDL	1.0	0.6	0.9	0.1
Load Reduction	3.5	0.0	0.0	44.0
% Reduction Segment	78%	0%	0%	99.7%

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (19) allowing for five operations with two active pits (1500’ x 300’) to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

Table C8. 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

19 Scrubgrass Creek Upstream of Confluence with Unt (51297)

The TMDL for this sample point on Scrubgrass Creek consists of a load allocation to all of the area between sample points 22, 21, 20 and 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 (2.22 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 19 shows pH ranging between 3.9 and 4.6; pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C9. Load Allocations for Point 19

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. mg/l	Load Lbs/day
Al	2.65	49.0	0.32	5.9
Fe	2.20	40.7	0.66	12.2
Mn	8.53	157.9	0.60	11.1
Acid	26.93	498.4	0.27	5.0
Alk	0.37	6.8		

The calculated load reductions for all the loads that enter point 19 must be accounted for in the calculated reductions at sample point 19 shown in Table C10. A comparison of measured loads between points 22, 21, 20 and 19 shows that there is additional loading entering the segment for aluminum, iron, manganese and acidity. The total segment aluminum, iron, manganese and acidity loads are the sum of the upstream allocated loads and any additional loading within the segment.

Table C10. Calculation of Load Reduction at Point 19

	Al	Fe	Mn	Acidity
Existing Load	49.0	40.7	157.9	498.4
Difference in Existing Load between 22, 21, 20 & 19	41.5	9.3	78.2	328.4
Load tracked from 22, 21 & 20	2.6	4.9	4.9	15.2
Percent loss due to instream process	-	-	-	-
Percent load tracked from 22, 21 & 20	-	-	-	-
Total Load tracked from 22, 21 & 20	44.1	14.2	83.1	343.6
Allowable Load at 19	5.9	12.2	11.1	5.0
Load Reduction at 19	38.2	2.0	72.0	338.6
% Reduction required at 19	87	14	87	99

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (18) allowing for five operations with two active pits (1500’ x 300’) to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

Table C11. 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

18 Scrubgrass Creek Upstream of Confluence with Unt 51292

The TMDL for this unnamed tributary of Scrubgrass Creek consists of a load allocation to the watershed area between sample points 19 and 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 (2.85 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 18 shows pH ranging between 4.0 and 4.6; pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Table C12. Load Allocations at Point 18				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	1.96	46.4	0.53	12.5
Fe	4.43	105.1	1.11	26.3
Mn	7.89	187.3	0.79	18.7
Acid	29.78	707.2	0.00	0.0
Alk	0.00	0.0		

The calculated load reductions for all the loads that enter point 18 must be accounted for in the calculated reductions at sample point 18 shown in Table C13. A comparison of measured loads between points 19 and 18 shows that there is no additional loading entering the segment for aluminum. For aluminum the percent decrease in existing load is applied to the allowable upstream load entering the segment. There is additional loading entering the segment for iron, manganese and acidity. The total segment iron, manganese and acidity loads are the sum of the upstream allocated loads and any additional loading within the segment.

Table C13. Calculation of Load Reduction at Point 18				
	Al	Fe	Mn	Acidity
Existing Load	46.4	105.1	187.3	707.2
Difference in Existing Load between 19 & 18	-2.6	64.4	29.4	208.8
Load tracked from 19 & 18	5.9	12.2	11.1	5.0
Percent loss due to instream process	18	-	-	-
Percent load tracked from 19	82	-	-	-
Total Load tracked from 19	4.9	76.6	40.5	213.8
Allowable Load at 18	12.5	26.3	18.7	0.0
Load Reduction at 18	0.0	50.3	21.7	213.8
% Reduction required at 18	0	66	54	100

17 Mouth of Unt (51295) Scrubgrass Creek

The TMDL for sampling point 17 consists of a load allocation to the area upstream of point 17. The load allocation for this tributary was computed using water-quality sample data collected at point 17. The average flow, measured at the sampling point 17 (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 17 shows pH ranging between 5.9 and 6.2; pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for iron because WQS were met, a TMDL for iron is not necessary. Although a TMDLs is not necessary, the measured load is considered at the next downstream point 16.

Table C14. Load Allocations at Point 17

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.26	0.15	0.24	0.14
Fe	0.05	0.03	0.05	0.03
Mn	0.48	0.3	0.41	0.2
Acid	1.55	0.9	1.21	0.7
Alk	4.18	2.5		

Table C15. Calculation of Load Reduction Necessary at Point 17

	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	0.15	0.03	0.3	0.9
Allowable Load=TMDL	0.14	0.03	0.2	0.7
Load Reduction	0.01	0.0	0.1	0.2
Total % Reduction	4	0	14	22

Waste Load Allocations– Permitted Discharges

The Rusnak Coal Co., Inc. SMP 61970102, Hawk Run Mine has one permitted treatment pond, TA, that discharges to Unt (51292) of Scrubgrass Creek. 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 combined pit area of 120,000 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLA for TA is evaluated at point 16.

Table C16. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Rusnak			
Al	0.75	0.0012	0.075
Fe	3.0	0.0012	0.3
Mn	2.0	0.0012	0.2

16 Unt (51292) Upstream of Confluence with Unt (51295)

The TMDL for sampling point 16 consists of a load allocation to all of the area upstream of point 16. The load allocation for this tributary was computed using water-quality sample data collected at point 16. The average flow, measured at the sampling point 16 (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 16 shows pH ranging between 6.7 and 7.0, 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.

Allocations were not calculated for iron and acidity because WQS were met and there was no acidity present, TMDLs for iron and acdity are not necessary. Although TMDLs are not necessary, the measured load is considered at the next downstream point 15.

Table C17. Load Allocations at Point 16

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.29	0.8	0.27	0.74
Fe	0.16	0.4	0.16	0.4
Mn	1.20	3.3	0.42	1.1
Acid	0.00	0.0	0.0	0.0
Alk	19.33	52.7		

Table C18. Calculation of Load Reduction Necessary at Point 16

	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	0.8	0.4	3.3	0.0
Allowable Load=TMDL	0.74	0.4	1.1	0.0
Load Reduction	0.06	0.0	2.2	0.0
Total % Reduction	7	0	65	0

Waste Load Allocations– Permitted Discharges

The BenHal Mining Co. SMP 61980103, Necterine III Mine has four permitted treatment ponds, TA, TB, TC and TD, that discharge to Unt (51293) of Scrubgrass Creek. The waste load allocations 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 WLAs for TA, TB and TC are evaluated at point 15. Treatment plant TD will be evaluated at sample point 9.

The following table contains the waste load allocations for each discharge.

Table C19. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Ben Hal (4), Nectarine III Mine, SMP61980103			
TA			
Al	0.75	0.002	0.013
Fe	3.0	0.002	0.05
Mn	2.0	0.002	0.033
TB			
Al	0.55	0.002	0.009
Fe	3.0	0.002	0.05
Mn	2.0	0.002	0.033
TC			
Al	0.55	0.002	0.009
Fe	3.0	0.002	0.05
Mn	2.0	0.002	0.033

15 Mouth of Unt (51293) Upstream of Confluence with Unt (51292)

The TMDL for sampling point 15 consists of a load allocation to the all of the area upstream of point 15. The load allocation for this tributary was computed using water-quality sample data collected at point 15. The average flow, measured at the sampling point 15 (0.47 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 5B shows pH ranging between 7.4 and 7.7, 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.

Allocations were not calculated for iron and acidity because WQS were met and there is not acidity present, TMDLs for iron and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 8.

Table C20. Load Allocations at Point 15

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.58	2.3	0.12	0.5
Fe	0.19	0.7	0.19	0.7
Mn	0.36	1.4	0.19	0.8
Acid	0.00	0.0	0.00	0.0
Alk	42.23	164.8		

Table C21. Calculation of Load Reduction Necessary at Point 15

	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	2.3	0.7	1.4	0.00
Allowable Load=TMDL	0.5	0.7	0.8	0.0
Load Reduction	1.8	0.0	0.6	0.0
Total % Reduction	80	0	46	0

14 Unt (51289)

The TMDL for this Unt of Scrubgrass Creek consists of a load allocation to the area upstream of sample point 14. The load allocation for this segment was computed using water-quality sample data collected at point 14. The average flow, measured at the sampling point 14 (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 14 shows pH ranging between 4.5 and 4.6; pH will be addressed in this

TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for 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 12.

Table C22. Load Allocations at Point 14

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	1.74	2.0	0.45	0.5
Fe	0.26	0.3	0.26	0.3
Mn	2.56	3.0	0.67	0.8
Acid	15.98	18.5	0.16	0.2
Alk	0.34	0.4		

Table C23. Calculation of Load Reduction Necessary at Point 14

	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	2.0	0.3	3.0	18.5
Allowable Load=TMDL	0.5	0.3	0.8	0.2
Load Reduction	1.5	0.0	2.2	18.3
Total % Reduction	74	0	74	99

13 Unt (51285)

The TMDL for this Unt of Scrubgrass Creek consists of a load allocation to the area upstream of sample point 13. The load allocation for this segment was computed using water-quality sample data collected at point 13. The average flow, measured at the sampling point 13 (0.34 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 13 shows pH ranging between 7.3 and 7.8, 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 iron, manganese and acidity because WQS were met and ther was no acidity present, TMDLs for iron, manganese and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 12.

Table C24. Load Allocations at Point 13				
	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.96	2.7	0.29	0.8
Fe	0.58	1.7	0.58	1.7
Mn	0.46	1.3	0.46	1.3
Acid	0.00	0.0	0.00	0.0
Alk	90.12	259.2		

Table C25. Calculation of Load Reduction Necessary at Point 13				
	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	2.7	1.7	1.3	0.0
Allowable Load=TMDL	0.8	1.7	1.3	0.0
Load Reduction	1.9	0.0	0.0	0.0
Total % Reduction	70	0	0	0

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (12) allowing for four operations with two active pits (1500’ x 300’) to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

Table C26. 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

12 Unt (51285) Upstream of Confluence with Scrubgrass Creek

The TMDL for this Unt of Scrubgrass Creek consists of a load allocation to the area between sample points 14, 13 & 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 (2.05 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 6.7 and 7.2, 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 iron and acidity because WQS were met and there was no acidity present, TMDLs for iron and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 8.

Table C27. Load Allocations for Point 12

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.32	5.5	0.26	4.4
Fe	0.58	9.8	0.58	9.8
Mn	1.08	18.5	0.65	11.1
Acid	0.00	0.0	0.00	0.0
Alk	31.47	539.0		

The calculated load reductions for all the loads that enter point12 must be accounted for in the calculated reductions at sample point 12 shown in Table C28. A comparison of measured loads between points 14, 13 and 12 shows that 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 loads and any additional loading within the segment.

Table C28 Calculation of Load Reduction at Point 12

	Al	Fe	Mn	Acidity
Existing Load	5.5	9.9	18.5	0.0
Difference in Existing Load between 14, 13 & 12	0.8	7.9	14.2	0.0
Load tracked from 14 & 13	1.3	2.0	2.1	0.0
Percent loss due to instream process	-	-	-	-
Percent load tracked from 14 & 13	-	-	-	-
Total Load tracked from 14 & 13	2.1	9.8	16.3	0.0
Allowable Load at 12	4.4	9.9	11.1	0.0
Load Reduction at 12	0.0	0.0	5.2	0.0
% Reduction required at 12	0	0	32	0

Waste Load Allocations– Permitted Discharges

The BenHal Mining Co. SMP 61040102, Winger Mine has three permitted treatment ponds, TA, TB and TC, that discharge to Scrubgrass Creek. The waste load allocations 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 12,000 square feet. Included in the permit are limits for iron and manganese. Although aluminum is not included in the permit, waste load allocations are calculated to allow for the discharge of aluminum. The standard BAT limit of 2.0 mg/L is used for the calculations. The WLAs for TB are evaluated at point 8. Treatment plants TA and TC will be evaluated at sample point 9.

The BenHal Mining Co. SMP 61980103, Necterine III Mine has four permitted treatment ponds, TA, TB, TC and TD, that discharge to Unt (51272) of Scrubgrass Creek. The waste load allocations 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 WLAs for TD are evaluated at point 8. Treatment plant TA, TB and TC were evaluated at sample point 15.

The following table contains the waste load allocations for each discharge.

Table C29. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Ben Hal(3), Winger Mine, SMP61040102			
TB			
Al	0.75	0.0012	0.075
Fe	3.0	0.0012	0.3
Mn	2.0	0.0012	0.2
Ben Hal (4), Necterine III Mine, SMP61980103			
TD			
Al	0.75	0.002	0.013
Fe	3	0.002	0.049
Mn	2	0.002	0.033

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (8) allowing for five operations with two active pits (1500’ x 300’) to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

Table C30. 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

8 Scrubgrass Creek Upstream of Confluence with Unt (51272) to Scrubgrass Creek

The TMDL for this segment of Scrubgrass Creek consists of a load allocation to the area between sample points 18, 17, 16, 15, 12 and 8. The load allocation for this segment was computed using water-quality sample data collected at point 8. The average flow, measured at the sampling point 8 (10.23 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 8 shows pH ranging between 6.6 and 7.0, 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 acidity because there was not 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 5.

Table C31. Load Allocations for Point 8				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.45	38.7	0.44	37.9
Fe	1.64	140.2	0.67	57.5
Mn	2.50	213.2	0.48	40.5
Acid	0.00	0.0	0.00	0.0
Alk	19.67	1677.4		

The calculated load reductions for all the loads that enter point 8 must be accounted for in the calculated reductions at sample point 8 shown in Table C32. A comparison of measured loads between points 18, 17, 16, 15, 12 and 8 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.

Table C32. Calculation of Load Reduction at Point 8				
	Al	Fe	Mn	Acidity
Existing Load	5.5	9.9	18.5	0.0
Difference in Existing Load between 18, 17, 16, 15, 12 & 8	-49.7	-106.3	-192.3	0.0
Load tracked from 18, 17, 16, 15 & 12	13.9	27.5	20.9	0.0
Percent loss due to instream process	90	92	91	-
Percent load tracked from 18, 17, 16, 15 & 12	10	8	9	-
Total Load tracked from 18, 17, 16, 15 & 12	1.4	2.3	1.8	0.0
Allowable Load at 8	4.4	9.9	11.1	0.0
Load Reduction at 8	0.0	0.0	0.0	0.0
% Reduction required at 8	0	0	0	0

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (11A) allowing for one operations with two active pits (1500’ x 300’) to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

Table C33. 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

11A Most Upstream Sample Point on Unt (51272) of Scrubgrass Creek

The TMDL for this unnamed tributary of Scrubgrsss Creek consists of a load allocation to all of the watershed area upstream of sample point 11A. The load allocation for this segment was computed using water-quality sample data collected at point 11A. The average flow, measured at the sampling point 11A (0.58 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 11A shows pH ranging between 6.9 and 7.1, 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 iron and acidity because WQS were met and there was no acidity present. Because WQS were met, TMDLs for iron and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 11.

Table C34. Load Allocations at Point 11A				
	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.29	1.4	0.23	1.1
Fe	0.80	3.8	0.80	3.8
Mn	0.54	2.6	0.43	2.1
Acid	0.00	0.0	0.0	0.0
Alk	84.10	404.5		

Table C35 Calculation of Load Reduction Necessary at Point 11A				
	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	1.4	3.8	2.6	0.0
Allowable Load=TMDL	1.1	3.8	2.1	0.0
Load Reduction	0.3	0.0	0.5	0.0
Total % Reduction	20	0	20	0

11 Mouth of Unt (51279) Downstream of Sample Point 11A

The TMDL for this unnamed tributary of Scrubgrsss Creek consists of a load allocation to the entire watershed upstream of sample point 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 (0.26 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 4.2 and 4.4, pH will be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for iron because WQS were met, TMDLs for iron are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 10.

Table C36. Load Allocations at Point 11				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	6.88	14.8	0.28	0.6
Fe	0.30	0.6	0.30	0.6
Mn	9.52	20.4	0.38	0.8
Acid	48.62	104.3	0.00	0.0
Alk	0.00	0.0		

Table C37 Calculation of Load Reduction Necessary at Point 11				
	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	14.8	0.6	20.4	104.3
Allowable Load=TMDL	0.6	0.6	0.8	0.0
Load Reduction	14.2	0.0	19.6	104.3
Total % Reduction	96	0	96	100

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (10) allowing for two operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

Table C38. 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

10 Unt (51272) Upstream of the Confluence with Unt 51275

The TMDL for sampling point 10 consists of a load allocation of the area between sample point's 11A, 11 and 10. The load allocation for this tributary was computed using water-quality sample data collected at point 10. The average flow, measured at the sampling point 10 (1.48 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 10 shows pH ranging between 7.1 and 7.4, 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 iron and acidity because WQS were met and there was no acidity present, TMDLs for iron and acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 9.

Table C39 Load Allocations for Point 10				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.58	7.2	0.37	4.6
Fe	0.44	5.5	0.44	5.5
Mn	2.42	29.9	0.68	8.4
Acid	0.00	0.0	0.0	0.0
Alk	47.28	585.6		

The calculated load reductions for all the loads that enter point 10 must be accounted for in the calculated reductions at sample point 10 shown in Table C40. A comparison of measured loads between points 11A, 11 and 10 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 and manganese. The total segment iron and manganese load is the sum of the upstream allocated load and any additional loading within the segment.

Table C40. Calculation of Load Reduction at Point 10				
	Al	Fe	Mn	Acidity
Existing Load	7.2	5.5	29.9	0
Difference in Existing Load between 11A, 11 & 10	-9.0	1.0	6.9	0.0
Load tracked from 11A & 11	1.7	4.5	2.9	0.0
Percent loss due to instream process	56	-	-	-
Percent load tracked from 11A & 11	44	-	-	-
Total Load tracked from 11A & 11	0.8	5.5	9.8	0.0
Allowable Load at 10	4.6	5.5	8.4	0.00
Load Reduction at 10	0.0	0.0	1.4	0.0
% Reduction required at 10	0	0	15	0

Waste Load Allocations– Permitted Discharges

The BenHal Mining Co. SMP 61970103, Necterine II Mine had two permitted treatment ponds, TA-1 and TA-2, that discharge to Unt (51272) to Scrubgrass Creek. Mining is complete but treatment pond TA-1 has not been dismantled a WLA is needed. Treatment pond TA-2 was not constructed. The waste load allocations for the discharge was 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 12,000 square feet. Included in the permit are limits for aluminum, iron and manganese. The WLAs for TA-1 is evaluated at point 9.

The BenHal Mining Co. SMP 61040102, Winger Mine has three permitted treatment ponds, TA, TB and TC, that discharge to Scrubgrass Creek. The waste load allocations 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 12,000 square feet. Included in the permit are limits for iron and manganese. Although aluminum is not included in the permit, waste load allocations are calculated to allow for the discharge of aluminum. The standard BAT limit of 2.0 mg/L is used for the calculations. The WLAs for TA and TC are evaluated at point 9. Treatment plant TB was evaluated at sample point 8.

The following table contains the waste load allocations for each discharge.

Table C41. Waste Load Allocations for Permitted Discharges

Parameter	Allowable Average Monthly Conc. (mg/l)	Calculated Average Flow (MGD)	WLA (lbs/day)
Ben Hal (2), Necterine II Mine, SMP61970101			
TA-1			
Al	0.6	0.032	0.16
Fe	1.8	0.032	0.48
Mn	2.0	0.032	0.53
Ben Hal(3), Winger Mine, SMP61040102			
TA			
Al	0.75	0.0012	0.075
Fe	3	0.0012	0.3
Mn	2	0.0012	0.2
TC			
Al	0.75	0.0012	0.075
Fe	3	0.0012	0.3
Mn	2	0.0012	0.2

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (9) allowing for three operations with two active pits (1500’ x 300’) to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

Table C42. 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

9 Unt (51272) Upstream of the Confluence with Scrubgrass Creek

The TMDL for this segment of Scrubgrass Creek consists of a load allocation to all of the watershed area between sample points 10 and 9. The load allocation for this segment was computed using water-quality sample data collected at point 9. The average flow, measured at the sampling point 9 (2.60 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 9 shows pH ranging between 7.5 and 8.1, 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 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 7.

Table C43. Load Allocations for Point 9				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.21	4.6	0.21	4.6
Fe	0.46	9.9	0.46	9.9
Mn	1.23	26.6	0.58	12.5
Acid	0.00	0.0	0.00	0.0
Alk	66.62	1445.3		

The calculated load reductions for all the loads that enter point 9 must be accounted for in the calculated reductions at sample point 9 shown in Table C44. A comparison of measured loads between points 10 and 9 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. The total segment iron load is the sum of the upstream allocated load and any additional loading within the segment.

Table C44. Calculation of Load Reduction at Point 9				
	Al	Fe	Mn	Acidity
Existing Load	4.6	9.9	26.6	0.0
Difference in Existing Load between 10 & 9	-2.5	4.5	-3.4	0.0
Load tracked from 10	4.6	5.5	8.4	0.0
Percent loss due to instream process	20	-	7	-
Percent load tracked from 10	80	-	93	-
Total Load tracked from 10	3.7	9.9	7.8	0.00
Allowable Load at 9	4.6	9.9	12.5	0.00
Load Reduction at 9	0.0	0.0	0.0	0.0
% Reduction required at 9	0	0	0	0.0

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (7) allowing for three operations with two active pits (1500’ x 300’) to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

Table C45. 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
Mn	2.0	0.090	1.50

7 Mouth of Unt (51272) Upstream of Confluence with Scrubgrass Creek

The TMDL for this segment of Scrubgrass Creek consists of a load allocation to all of the watershed area between sample points 9 and 7. The load allocation for this segment was computed using water-quality sample data collected at point 7. The average flow, measured at the sampling point 7 (3.28 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 7 shows pH ranging between 6.7 and 7.7, 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 acidity because there was no acidity present in this segment. Because WQS were met, TMDLs for acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 5.

Table C46. Load Allocations for Point 7				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.31	8.6	0.19	5.1
Fe	1.11	30.5	0.42	11.6
Mn	1.43	39.1	0.21	5.9
Acid	0.00	0.0	0.0	0.0
Alk	62.38	1707.7		

The calculated load reductions for all the loads that enter point 7 must be accounted for in the calculated reductions at sample point 7 shown in Table C47. A comparison of measured loads between points 9 and 7 shows that 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 C47 Calculation of Load Reduction at Point 7				
	Al	Fe	Mn	Acidity
Existing Load	8.6	30.5	39.1	0.0
Difference in Existing Load between 9 & 7	3.9	20.5	12.5	0.0
Load tracked from 9	4.6	9.9	12.5	0.0
Percent loss due to instream process	-	-	-	-
Percent load tracked from 9	-	-	-	-
Total Load tracked from 9	8.6	30.5	25.0	0.00
Allowable Load at 7	5.1	11.6	5.9	0.00
Load Reduction at 7	3.4	18.9	19.1	0.0
% Reduction required at 7	40	62	77	0.0

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (5) allowing for five operations with two active pits (1500’ x 300’) to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

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

5 Scrubgrass Creek Upstream of Confluence with Unt (51262) of Scrubgrass Creek

The TMDL for this segment of Scrubgrass Creek consists of a load allocation to all of the watershed area between sample points 8, 7 and 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 (15.63 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 7.0 and 7.7, 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, TMDLs for aluminum acidity are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point 1.

Table C49. Load Allocations for Point 5				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.37	47.6	0.37	47.6
Fe	0.85	110.6	0.61	79.6
Mn	1.73	226.0	0.64	83.6
Acid	0.00	0.0	0.00	0.0
Alk	29.88	3896.5		

The calculated load reductions for all the loads that enter point 5 must be accounted for in the calculated reductions at sample point 5 shown in Table C50. A comparison of measured loads between points 8, 7 and 5 shows that 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 loads and any additional loading within the segment.

Table C50. Calculation of Load Reduction at Point 5				
	Al	Fe	Mn	Acidity
Existing Load	47.6	110.6	226.0	0.0
Difference in Existing Load between 8, 7 & 5	33.5	70.3	168.5	0.0
Load tracked from 8 & 7	9.6	21.4	16.9	0.0
Percent loss due to instream process	-	-	-	-
Percent load tracked from 8 & 7	-	-	-	-
Total Load tracked from 8 & 7	43.1	91.7	185.4	0.0
Allowable Load at 5	47.6	79.6	83.6	0.0
Load Reduction at 5	0.0	12.1	101.8	0.0
% Reduction required at 5	0	13	55	0

24 Mouth of Unt (51262) of Scrubgrass Creek

The TMDL for this segment of Scrubgrass Creek consists of a load allocation to all of the watershed area upstream of sample point 24. The load allocation for this segment was computed using water-quality sample data collected at point 24. The average flow, measured at the sampling point 24 (0.64 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 24 shows pH ranging between 7.4 and 7.8, 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, 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 1.

Table C51. Load Allocation at Point 24

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.17	0.9	0.17	0.9
Fe	0.18	1.0	0.18	1.0
Mn	0.03	0.2	0.03	0.2
Acid	0.00	0.0	0.00	0.0
Alk	35.40	190.1		

Table C52. Calculation of Load Reduction Necessary at 24

	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	0.9	1.0	0.2	0.0
Allowable Load=TMDL	0.9	1.0	0.2	0.0
Load Reduction	0.0	0.0	0.0	0.0
Total % Reduction	0	0	0	0

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (4) allowing for two operations with two active pits (1500’ x 300’) to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

Table C53. 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

4 Mouth of Trout Run (51257)

The TMDL for this segment of Trout Run consists of a load allocation to all of the watershed area upstream of sample point 4. The load allocation for this segment was computed using water-quality sample data collected at point 4. The average flow, measured at the sampling point 4 (1.09 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 16 shows pH ranging between 5.7 and 6.4, pH be addressed in this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range and keep a net alkalinity above zero, 99% of the time. The result of this analysis is an acid loading reduction that equates to meeting standards for pH (see TMDL Endpoint section in the report, Table 2). The method and rationale for addressing pH is contained in Attachment B.

Allocations were not calculated for manganese because WQS were met, a TMDL for manganese is not necessary. Although a TMDL is not necessary, the measured loads are considered at the next downstream point 1.

Table C54. Load Allocations for Point 4				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.35	3.2	0.22	2.0
Fe	1.39	12.7	0.51	4.7
Mn	0.55	5.1	0.55	5.1
Acid	3.80	34.7	1.14	10.4
Alk	2.53	23.1		

Table C55. Calculation of Load Reduction Necessary at 4				
	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	3.2	12.7	5.1	34.7
Allowable Load=TMDL	2.0	4.7	5.1	10.4
Load Reduction	1.2	8.0	0.0	24.3
Total % Reduction	36	63	0	70

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (3) allowing for two operations with two active pits (1500’ x 300’) to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

Table C56. 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

3 Mouth of Unt (51249) to Bullion Run

The TMDL for this segment of Bullion Run consists of a load allocation to all of the watershed area upstream of sample point 3. The load allocation for this segment was computed using water-quality sample data collected at point 3. The average flow, measured at the sampling point 3 (1.35 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 3 shows pH ranging between 7.0 and 7.4, 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, manganese and acidity because WQS were met and there was not 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 2.

Table C57. Load Allocations for Point 3				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.27	3.0	0.27	3.0
Fe	0.81	9.2	0.47	5.3
Mn	0.53	6.0	0.53	6.0
Acid	0.00	0.0	0.00	0.0
Alk	51.35	578.4		

Table C58. Calculation of Load Reduction Necessary at 3				
	Al	Fe	Mn	Acidity
	(#/day)	(#/day)	(#/day)	(#/day)
Existing Load	3.0	9.2	6.0	0.0
Allowable Load=TMDL	3.0	5.3	6.0	0.0
Load Reduction	0.0	3.9	0.0	0.0
Total % Reduction	0	42	0	0

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (2) allowing for three operations with two active pits (1500’ x 300’) to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

Table C59. 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
Mn	2.0	0.090	1.50

2 Bullion Run Downstream of Unt (51249) to Bullion Run

The TMDL for this segment of Bullion Run consists of a load allocation to all of the watershed area between sample points 3 and 2. The load allocation for this segment was computed using water-quality sample data collected at point 2. The average flow, measured at the sampling point 2 (1.95 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 2 shows pH ranging between 6.8 and 7.3, 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, 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 23.

Table C60. Load Allocations for Point 2				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.16	2.7	0.16	2.7
Fe	0.69	11.3	0.69	11.3
Mn	0.34	5.5	0.34	5.5
Acid	0.00	0.0	0.00	0.0
Alk	33.73	549.1		

The calculated load reductions for all the loads that enter point 2 must be accounted for in the calculated reductions at sample point 2 shown in Table C61. A comparison of measured loads between points 3 and 2 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. The total segment iron load is the sum of the upstream allocated load and any additional loading within the segment.

Table C61. Calculation of Load Reduction at Point 2				
	Al	Fe	Mn	Acidity
Existing Load	2.7	11.3	5.5	0.0
Difference in Existing Load between 3 & 2	-0.4	2.1	-0.4	0.0
Load tracked from 3	3.0	5.3	6.0	0.0
Percent loss due to instream process	12	-	7	-
Percent load tracked from 3	88	-	93	-
Total Load tracked from 3	2.7	7.4	5.5	0.0
Allowable Load at 2	2.7	11.3	5.5	0.0
Load Reduction at 2	0.0	0.0	0.0	0.0
% Reduction required at 2	0	0	0	0

23 Mouth of Bullion Run Uptream of Sample Point 1

The TMDL for this segment of Bullion Run consists of a load allocation to all of the watershed area between sample points 2, and 23. The load allocation for this segment was computed using water-quality sample data collected at point 23. The average flow, measured at the sampling point 23 (5.46 MGD), is used for these computations.

There currently is no entry for this segment on the Pa Section 303(d) list for impairment due to pH. Sample data at point 18 shows pH ranging between 6.9 and 7.3, 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.

Allocations were not calculated for aluminum, iron, manganese and acidity WQS were met and there is 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 1.

Table C62. Load Allocations at Point 23

	Measured Sample Data		**Allowable**	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.15	6.6	0.15	6.6
Fe	0.09	4.1	0.09	4.1
Mn	0.02	1.1	0.02	1.1
Acid	0.00	0.0	0.0	0.0
Alk	18.78	855.1		

The calculated load reductions for all the loads that enter point 23 must be accounted for in the calculated reductions at sample point 23 shown in Table C63. A comparison of measured loads between point's 2 and 23 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. The total segment aluminum load is the sum of the upstream allocated load and any additional loading within the segment.

Table C63. Calculation of Load Reduction at Point 23

	Al	Fe	Mn	Acidity
Existing Load	6.6	4.1	1.1	0.0
Difference in Existing Load between 2 & 23	3.9	-7.2	-4.4	0.0
Load tracked from 2	2.7	11.3	5.5	0.0
Percent loss due to instream process	-	64	81	-
Percent load tracked from 2	-	36	19	-
Total Load tracked from 2	6.6	4.1	1.1	0.0
Allowable Load at 23	6.6	4.1	1.1	0.0
Load Reduction at 23	0.0	0.0	0.0	0.0
% Reduction required at 23	0	0	0	0

A waste load allocation for future mining was included for this segment of Scrubgrass Creek (1) allowing for five operations with two active pits (1500' x 300') to be permitted in the future on this segment (page 15 for the method used to quantify treatment pond load).

Table C64. 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

1 Mouth of Scrubgrass Creek Upstream of Confluence with the Allegheny River

The TMDL for this segment of Scrubgrass Creek consists of a load allocation to all of the watershed area between sample points 5, 24, 4, 23 and 1. The load allocation for this segment was computed using water-quality sample data collected at point 1. The average flow, measured at the sampling point 1 (19.54 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 1 shows pH ranging between 7.2 and 7.5, 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 is no acidity present; TMDLs for aluminum, iron and acidity are not necessary.

Table C65. Load Allocations at Point 1

	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	Conc. (mg/l)	Load (lbs/day)
Al	0.26	41.8	0.26	41.8
Fe	0.41	67.3	0.41	67.3
Mn	1.18	192.6	0.63	102.2
Acid	0.00	0.0	0.0	0.0
Alk	25.50	4154.8		

The calculated load reductions for all the loads that enter point 1 must be accounted for in the calculated reductions at sample point 1 shown in Table C66. A comparison of measured loads between point's 5, 24, 4, 23 and 1 shows that there is no additional loading entering the segment for aluminum, iron and manganese. For aluminum, iron and manganese the percent decrease in existing loads are applied to the allowable upstream loads entering the segment.

Table C66. Calculation of Load Reduction at Point 1

	Al	Fe	Mn	Acidity
Existing Load	41.8	67.3	192.8	0.0
Difference in Existing Load between 5, 24, 4, 23 & 1	-16.5	-61.0	-39.5	0.0
Load tracked from 5, 24, 4 & 23	57.1	89.4	89.9	0.0
Percent loss due to instream process	28	48	17	-
Percent load tracked from 5, 24, 4 & 23	72	52	83	-
Total Load tracked from 5, 24, 4 & 23	41.0	46.9	74.6	0.0
Allowable Load at 1	41.8	67.3	102.2	0.0
Load Reduction at 1	0.0	0.0	0.0	0.0
% Reduction required at 1	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 mange from an historical tracking perspective. The fixed segment methods will remedy that problem. The stream assessment data management has gone through many changes over the years as system requirements and software changed. It is hoped that with the shift to the NHD and OIT's (Office of Information Technology) fulltime staff to manage and maintain SLIMS the systems and formats will now remain stable over many Integrated Listing cycles.

Attachment E

Water Quality Data Used In TMDL Calculations

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
22	050422-1450	56	7.15	-39.6	41.5	0.13	0.69	0.07
22	050502-1205	174	6.98	-23.5	29.0	0.12	0.26	0.03
22	050511-1255	80	7.14	-36.1	41.0	0.09	0.49	0.07
22	050519-1750	70	7.03	-43.2	48.3	0.18	0.63	0.22
22	050524-1650	36	7.09	-44.8	50.0	0.32	0.40	0.20
22	050607-1500	5	7.19	-57.3	63.1	0.08	0.49	0.19
	avg=	70.17	7.10	-40.75	45.48	0.15	0.49	0.13
	stdev=			11.11		0.09	0.16	0.08

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
21	ND							
21	050502-1220	656	6.16	14.2	7.4	0.83	4.6	11
21	050511-1245	230	6.16	24.7	6.0	0.73	7.2	16
21	050519-1745	547	5.73	28.8	4.1	0.12	6.9	15
21	050524-1640	491	5.85	23.0	5.4	0.49	6.4	15
21	050607-1512	354	4.37	24.4	0.0	0.46	2.7	15
	avg=	455.60	5.65	23.02	4.58	0.53	5.56	14.40
	stdev=			5.38		0.28	1.89	1.95

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
20	050422-1500	125	3.82	22.1	0.0	2.7	0.24	0.45
20	050502-1230	443	4.32	17.4	0.0	1.7	0.17	0.28
20	050511-1235	140	3.73	24.6	0.7	2.5	0.13	0.42
20	050519-1735	111	3.76	26.0	0.0	2.4	0.28	0.63
20	050524-1620	83	3.84	23.3	0.0	2.5	0.37	0.45
20	050607-1519	32	3.65	28.2	0.0	2.8	0.61	0.54
	avg=	155.67	3.85	23.60	0.12	2.43	0.30	0.46
	stdev=			3.71		0.39	0.17	0.12

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (ppm)	Fe (ppm)	Mn (ppm)
19	050422-1430	1461	4.22	28.3	0.0	3.7	1.3	9.8
19	050502-1130	3018	4.61	18.1	0.6	1.7	2.3	5.1
19	050511-1313	1510	4.22	27.1	0.0	2.6	1.3	8.9
19	050519-1620	1265	4.63	30.3	0.6	2.2	3.1	8.3
19	050524-1600	1360	4.61	25.6	1.0	1.51	3.3	9.1
19	050607-1445	632	3.88	32.2	0.0	4.24	1.9	10.0
	avg=	1541.00	4.36	26.93	0.37	2.65	2.20	8.53
	stdev=			4.91		1.10	0.86	1.79

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
18	ND							
18	ND							
18	050511-1116	2770	4.60	27.4	0	2.1	4.2	7.3
18	050519-1050	2133	4.29	28.2	0	1.73	4.3	7.0
18	050524-1100	1848	4.47	31.40	0	1.65	5.3	8.6
18	050607-1105	1160	4.03	32.10	0	2.34	3.9	8.7
	avg=	1977.75	4.3475	29.775	0	1.955	4.425	7.8875
	stdev=			2.32		0.32	0.61	0.89

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
17	ND							
17	ND							
17	050511-1020	65	6.23	0.50	4.2	0.03	0.02	0.53
17	050519-1015	62	6.21	1.40	4.4	0.32	0.00	0.45
17	050524-1000	63	6.23	1.30	4.8	0.34	0.06	0.72
17	050607-1040	10	5.90	3.00	3.3	0.33	0.10	0.21
	avg=	50.00	6.14	1.55	4.18	0.26	0.05	0.48
	stdev=			1.05		0.15	0.04	0.21

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
16	ND	Note: couldn't find access to this site until the 3rd sampling trip						
16	ND							
16	050511-1020	380	6.71	-6.6	13.2	0.08	0.07	1.80
16	050519-1020	252	6.98	-17.2	22.6	0.36	0.09	1.30
16	050524-1010	212	6.90	-14.0	20.7	0.30	0.19	1.10
16	050607-1100	64	6.79	-15.10	20.8	0.43	0.28	0.58
	avg=	227.00	6.85	-13.23	19.33	0.29	0.16	1.20
	stdev=			4.61		0.15	0.10	0.50

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
15	ND							
15	050502-1420	480	7.69	-36.7	41.1	0.20	0.30	0.80
15	050511-1040	150	7.51	-36.2	44.6	0.05	0.18	0.11
15	050519-1035	345	7.39	-36.6	41	1.50	0.08	0.17
15	ND							
	avg=	325.00	7.53	-36.50	42.23	0.58	0.19	0.36
	stdev=			0.26		0.80	0.11	0.38

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
14	ND	Note: Added as additional site at 2nd sampling trip.						
14	050502-1200	240	4.56	3.3	0.5	2.0	0.39	2.0
14	050511-1225	145	4.49	20.5	0.0	2.1	0.21	2.4
14	050519-1714	15	4.59	18.7	0.6	2.0	0.21	2.5
14	050524-1710	46	4.53	19.6	0.3	1.2	0.19	2.6
14	050607-1245	37	4.56	17.8	0.3	1.4	0.29	3.3
	avg=	96.60	4.55	15.98	0.34	1.74	0.26	2.56
	stdev=			7.16		0.41	0.08	0.47

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
13	050422-1530	217	7.52	-69.4	76.1	1.60	0.75	0.60
13	050502-1155	482	7.29	-35.7	44.0	1.20	0.75	0.40
13	050511-1215	295	7.59	-72.4	78.7	0.34	0.13	0.36
13	050519-1700	147	7.61	-93.1	99.6	0.83	0.54	0.46
13	050524-1700	200	7.74	-93.9	99.4	1.20	0.55	0.51
13	050607-1230	96	7.82	-138.2	142.9	0.56	0.73	0.41
	avg=	239.50	7.60	-83.78	90.12	0.96	0.58	0.46
	stdev=			34.06		0.47	0.24	0.09

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
12	050422-1410	1246	7.09	-23.7	29.8	0.36	0.83	1.33
12	050502-1145	2983	6.69	-11.6	17.8	0.47	0.75	0.77
12	050511-1328	1700	6.99	-23.2	29.7	0.12	0.39	0.87
12	050519-1220	913	6.95	-26.5	32.9	0.45	0.54	1.10
12	050524-1225	1101	7.04	-25.6	34.4	0.46	0.54	1.20
12	050607-1430	615	7.16	-38.4	44.2	0.08	0.40	1.20
	avg=	1426.33	6.99	-24.83	31.47	0.32	0.58	1.08
	stdev=			8.56		0.18	0.18	0.22

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
8	050422-1320	7050	6.63	-10.8	16.2	0.60	2.20	2.90
8	050502-1535	12006	6.58	-6.4	15.1	0.50	2.00	2.10
8	050511-1520	6629	6.59	-10.7	18.2	0.42	1.90	3.10
8	050519-1210	6433	7.00	-14.6	21.0	0.53	2.00	2.80
8	050524-1540	6525	6.72	-13.8	21.1	0.35	0.56	0.80
8	050607-1320	3969	6.91	-21.7	26.4	0.32	1.20	3.30
	avg=	7102.00	6.74	-13.00	19.67	0.45	1.64	2.50
	stdev=			5.15		0.11	0.63	0.93

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
11A	050422-1230							
11A	050502-1010							
11A	050511-1420	545	7.08	-75.9	81.0	0.03	0.55	0.32
11A	050519-1200	504	7.14	-76.9	80.4	0.33	0.89	0.47
11A	050524-1450	405	6.91	-76.0	80.8	0.32	0.86	0.85
11A	050607-1230	148	7.04	-82.8	94.2	0.46	0.89	0.51
	avg=	400.50	7.04	-77.90	84.10	0.29	0.80	0.54
	stdev=			3.30		0.18	0.17	0.22

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
11	050422-1230	140	4.18	91.5	0.0	14.0	0.25	17.0
11	050502-1010	432	4.30	36.2	0.0	5.7	0.30	6.2
11	050511-1420	188	4.44	55.5	0.0	7.5	0.32	11.0
11	050519-1150	95	4.38	40.8	0.0	6.0	0.34	8.1
11	050524-1440	153	4.34	42.9	0.0	5.4	0.34	7.9
11	050607-1215	64	4.42	24.8	0.0	2.7	0.24	6.9
	avg=	178.67	4.34	48.62	0.00	6.88	0.30	9.52
	stdev=			23.24		3.81	0.04	4.02

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
10	050422-1250	797	7.40	-44.0	49.9	0.66	0.44	3.2
10	050502-1030	2098	7.10	-28.0	33.7	0.85	0.53	2.2
10	050511-1400	1160	7.35	-44.9	51.4	0.26	0.34	2.2
10	050519-1140	990	7.22	-36.2	49.7	0.60	0.37	2.2
10	050524-1500	829	7.20	-41.1	46.9	0.60	0.54	2.6
10	050607-1200	313	7.26	-45.5	52.1	0.50	0.43	2.1
	avg=	1031.17	7.26	-39.95	47.28	0.58	0.44	2.42
	stdev=			6.78		0.19	0.08	0.42

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
9	050422-1300	1608	7.89	-65.5	68.2	0.12	0.55	1.80
9	050502-1045	3609	7.57	-27.8	50.5	0.32	0.53	1.20
9	050511-1340	2330	8.11	-67.0	73.8	0.09	0.40	1.10
9	050519-1125	1671	7.77	-65.4	69.8	0.33	0.38	0.98
9	050524-1420	1300	7.60	-58.9	67.6	0.35	0.38	1.30
9	050607-1140	321	7.48	-60.1	69.8	0.07	0.51	0.97
	avg=	1806.50	7.74	-57.45	66.62	0.21	0.46	1.23
	stdev=			14.88		0.13	0.08	0.31

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
7	050422-1320	1720	7.69	-76.2	78.2	0.60	2.20	2.90
7	050502-1515	3696	7.46	-38.1	45.4	0.21	0.54	0.95
7	050511-1522	2431	6.73	-56.4	62.4	0.07	0.71	0.49
7	050519-1320	2059	7.56	-54.2	61.1	0.38	0.56	0.43
7	050524-1315	2338	7.47	-54.8	61.0	0.59	2.00	3.40
7	050607-1300	1432	7.38	-60.2	66.2	0.03	0.67	0.39
	avg=	2279.33	7.38	-56.65	62.38	0.31	1.11	1.43
	stdev=			12.23		0.25	0.77	1.36

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
5	050422-1800	10879	7.47	-25.1	26.4	0.44	1.40	2.3
5	050502-1625	19466	7.01	-13.7	20.6	0.40	1.20	1.4
5	050511-1456	9969	7.21	-20.3	26.4	0.16	0.85	1.8
5	050519-1330	9774	7.37	-22.7	27.7	0.32	0.54	1.5
5	050524-1745	9205	7.42	-22.9	30.2	0.38	0.66	1.9
5	050607-1730	5850	7.67	-42.5	48.0	0.49	0.44	1.5
	avg=	10857.17	7.36	-24.53	29.88	0.37	0.85	1.73
	stdev=			9.64		0.12	0.38	0.34

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg.l)	Fe (mg/l)	Mn (mg/l)
24	050422-1805	475	7.76	-32.3	36.8	0.06	0.28	0.02
24	050502-1610	713	7.37	-19.6	24.6	0.11	0.21	0.08
24	050511-1445	510	7.61	-28.7	33.9	0.02	0.12	0.02
24	050519-1315	401	7.45	-21.0	29.8	0.30	0.11	0.02
24	050524-1730	375	7.66	-34.1	39.3	0.29	0.19	0.02
24	050607-1745	209	7.67	-42.5	48.0	0.26	0.16	0.04
	avg=	447.17	7.59	-29.70	35.40	0.17	0.18	0.03
	stdev=			8.59		0.12	0.06	0.02

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
4	050422-1615	553	5.80	3.4	2.2	0.58	2.80	0.64
4	050502-1705	1214	5.73	6.6	1.7	0.51	1.20	0.48
4	050511-1602	720	5.70	3.7	2.1	0.34	1.50	0.55
4	050519-1525	705	5.91	3.4	1.2	0.11	0.97	0.50
4	050524-1720	650	6.04	3.6	2.8	0.03	1.30	0.57
4	050607-1720	720	6.44	2.1	5.2	0.50	0.57	0.58
	avg=	760.33	5.94	3.80	2.53	0.35	1.39	0.55
	stdev=			1.49		0.23	0.76	0.06

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
3	050422-1600	870	7.08	-27.3	48.6	0.27	1.60	0.61
3	050502-1340	1756	6.99	-25.1	31.5	0.27	0.60	0.35
3	050511-1155	1175	7.42	-43.4	48.9	0.02	0.15	0.41
3	050519-1455	890	7.14	-52.2	56.2	0.34	0.91	0.57
3	050524-1130	563	7.32	-55.5	61.5	0.36	0.52	0.62
3	050607-1620	373	7.01	-56.1	61.4	0.35	1.10	0.61
	avg=	937.83	7.16	-43.27	51.35	0.27	0.81	0.53
	stdev=			13.99		0.13	0.51	0.12

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
2	050422-1540	1017	7.19	-25.2	30.6	0.13	0.96	0.36
2	050502-1310	3267	6.76	-21.2	19.0	0.17	0.55	0.17
2	050511-1204	1470	7.31	-24.9	30.3	0.02	0.56	0.31
2	050519-1445	1059	6.94	-27.6	34.6	0.32	0.59	0.34
2	050524-1140	805	7.03	-32.1	38.2	0.30	0.65	0.40
2	050607-1552	515	7.03	-45.2	49.7	0.04	0.85	0.45
	avg=	1355.5	7.04	-29.37	33.73	0.16	0.69	0.34
	stdev=			8.55		0.13	0.17	0.10

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
23	050422-1640	3205	7.27	-23.7	29.8	0.07	0.02	0.02
23	050502-1720	8343	6.94	-5.2	10.4	0.21	0.17	0.04
23	050511-1613	4320	7.08	-8.3	14.6	0.02	0.02	0.02
23	050519-1435	3320	7.16	-10.8	16.1	0.30	0.04	0.02
23	050524-1805	2333	7.10	-8.1	18.7	0.23	0.03	0.02
23	050607-1636	1223	7.18	-16.2	23.1	0.04	0.26	0.02
	avg=	3790.7	7.1	-12.1	18.8	0.15	0.09	0.02
	stdev=			6.8		0.12	0.10	0.01

New site #	Date-time	Flow (gpm)	pH	Acidity (mg/L)	Alk (mg/L)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
1	050422-1700	12858	7.52	-18.0	24.0	0.25	0.55	1.60
1	050502-1740	27954	7.20	-13.0	18.6	0.22	0.56	0.99
1	050511-1613	11068	7.38	-18.3	23.9	0.07	0.32	1.20
1	050519-1430	10750	7.39	-19.6	25.2	0.29	0.28	1.12
1	050524-1830	11848	7.45	-21.7	27.5	0.36	0.52	1.30
1	050607-1650	6924	7.39	-25.7	33.8	0.35	0.25	0.89
	avg=	13567	7.4	-19.4	25.5	0.26	0.41	1.18
	stdev=			4.2		0.11	0.14	0.25

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

Comment and Response