TURTLE CREEK WATERSHED TMDL
Allegheny and Westmoreland Counties

For Mine Drainage Affected Segments

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Pennsylvania Department of Environmental Protection

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Introduction

This report presents the Total Maximum Daily Loads (TMDLs) developed for segments in the Turtle Creek Watershed (Attachment A). These were done to address the impairments noted on the 1996 Pennsylvania Section 303(d) list of impaired waters, required under the Clean Water Act, and covers one segment on that list and additional segments on later lists/reports. Turtle Creek was listed as impaired for metals. All impairments resulted from drainage from abandoned coalmines. The TMDL addresses two primary metals associated with abandoned mine drainage (iron and aluminum) and pH. Manganese, while a metal associated with mine drainage, is not included in this TMDL document[2].

Table 1. 303(d) Listed Segments										
State Water Plan (SWP) Subbasin: 19A										
HUC: 05020005 Lower Monongahela River										
Year	Miles	Use Designation Assessed	Assessment ID	Segment ID	DEP Stream Code	Stream Name	Desig-nated Use	Data Source	Source	EPA 305(b) Cause Code
1996	16.5	*	*	4705	37204	Turtle Creek	TSF; WWF[3]	305(b) Report	RE	Metals
1998	15.95	*	*	4705	37204	Turtle Creek	TSF; WWF	SWMP	AMD	Metals
2002	3.7 7.5 4.5	*	*	4705 990102-1010-TVP 990302-1200-ALF	37204	Turtle Creek	TSF; WWF	SWMP	AMD	Metals Metals; pH Metals

[1] Pennsylvania's 1996, 1998, and 2002 Section 303(d) lists and the 2004 and 2006 Integrated Water Quality Report were approved by the Environmental Protection Agency (EPA). The 1996 Section 303(d) list provides the basis for measuring progress under the 1997 lawsuit settlement of *American Littoral Society and Public Interest Group of Pennsylvania v. EPA.*

[2] Pennsylvania Code 25 § 93.9v deletes the potable water supply designation from all waters contained in this watershed. The critical use for the total manganese criterion is potable water supply; Pennsylvania does not have total manganese criteria for aquatic life uses. Therefore, because the potable water supply use has been deleted, the criterion does not apply to the watershed and, thus, no TMDLs are necessary for total manganese.

[3] TSF – Source to Brush Creek; WWF – Brush Creek to mouth

2008	4.30 3.06 1.53 4.58 2.8	Aquatic Life	10048 10049 10111 10114 11477	* * * * *	37204	Turtle Creek	TSF; WWF	SWMP	AMD	Metals; pH Metals; pH Metals Metals Metals
2008	1.3	Aquatic Life	6473	*	37207	Turtle Creek, Unt	TSF; WWF	SWMP	AMD	pH
2008	0.20	Aquatic Life	6473	*	37208	Turtle Creek, Unt	TSF; WWF	SWMP	AMD	pH
2008	1.57	Aquatic Life	7314	*	37234	Turtle Creek, Unt	TSF; WWF	SWMP	AMD	pH
2008	1.39	Aquatic Life	7305	*	37425	Turtle Creek, Unt	TSF; WWF	SWMP	AMD	pH
2008	0.59	Aquatic Life	7305	*	37426	Turtle Creek, Unt	TSF; WWF	SWMP	AMD	pH
2008	0.58	Aquatic Life	7305	*	37427	Turtle Creek, Unt	TSF; WWF	SWMP	AMD	pH
2008	1.03	Aquatic Life	7304	*	37435	Turtle Creek, Unt	TSF; WWF	SWMP	AMD	pH

Resource Extraction=RE
Trout Stocked Fish = TSF
Warm Water Fish = WWF
Surface Water Monitoring Program = SWMP
Abandoned Mine Drainage = AMD
See Attachment D, *Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists and the 2004 and 2006 Integrated Water Quality Report*. The use designations for the stream segments in this TMDL can be found in PA Title 25 Chapter 93.

Directions to the Turtle Creek Watershed

The Turtle Creek Watershed is located in Allegheny and Westmoreland Counties in southwestern Pennsylvania. The watershed can be accessed by traveling the Pennsylvania Turnpike until its intersection with Route 819 north at the New Stanton exit. Route 819 intersects Route 30, which provides access via smaller township roads along most of Turtle Creek. Additional access is provided by Route 130, Route 22, Route 993 and a number of smaller state roads.

Watershed Characteristics

The Turtle Creek Watershed is located in Westmoreland and Allegheny Counties in Southwestern Pennsylvania. The area within the watershed encompasses approximately 150 $miles^2$. Land use in the watershed includes forestland, cropland, rural residential lands, low and high intensity urban lands, and abandoned mine lands.

Turtle Creek originates near Delmont in Westmoreland County. It flows westward to its confluence with the Monongahela River in North Versailles Township, Allegheny County. The watershed is situated in the Western Allegheny Plateau Ecoregion. It is located in the Pittsburgh Low Plateau Section of the Appalachian Plateaus Physiographic Province. The headwaters of

Turtle Creek have an approximate elevation of 1520 feet above sea level. The confluence of Turtle Creek with the Monongahela River has an elevation of approximately 720 feet above sea level.

Coal mining took place in the watershed for approximately 100 years (1850s-1950s). The Pittsburgh coal seam has been extensively (95%) mined using the room-and-pillar methods throughout the watershed. Other mined coals in the watershed include the Redstone coal seam (near Greensburg, Irwin, Monroeville, and North Versailles) and the Upper Freeport coal seam (near Abers Creek and Thompson Run). According to a 2002 Rivers Conservation Plan prepared for the Turtle Creek Watershed, AMD remains one of the top concerns in the watershed. AMD discharges throughout the watershed include Export, Delmont, Catranel, Ringertown, Kistler Road, Italy Road (upper Turtle Creek); Heidekat North, Heidekat South, and Snyder Road West (Lyons Run); and Irwin, Coal Run, Coal Run North, Scotch Valley, Frog Road (Brush Creek).

Segments addressed in this TMDL

Turtle Creek is affected by pollution from AMD. This pollution has caused high levels of metals in the watershed. The 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 Table 3 for TMDL calculations and see Attachment C for TMDL explanations.

Clean Water Act Requirements

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

Additionally, the federal Clean Water Act and the Environmental Protection Agency’s (EPA) implementing regulations (40 CFR Part 130) require:

- States to develop lists of impaired waters for which current pollution controls are not stringent enough to meet water quality standards (the list is used to determine which streams need TMDLs);

- States to establish priority rankings for waters on the lists based on severity of pollution and the designated use of the waterbody; states must also identify those waters for which TMDLs will be developed and a schedule for development;

- States to submit the list of waters to EPA every two years (April 1 of the even numbered years);

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

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

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

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

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

Section 303(d) Listing Process

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

The primary method adopted by the Pennsylvania Department of Environmental Protection (DEP) for evaluating waters changed between the publication of the 1996 and 1998 Section 303(d) lists. Prior to 1998, data used to list streams were in a variety of formats, collected under differing protocols. Information also was gathered through the Section 305(b)[4] reporting process. DEP is now using the Statewide Surface Waters Assessment Protocol (SSWAP), a modification of the EPA's 1989 Rapid Bioassessment Protocol II (RBP-II), as the primary mechanism to assess Pennsylvania's waters. The SSWAP provides a more consistent approach to assessing Pennsylvania's streams.

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

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

After the survey is completed, the biologist determines the status of the stream segment. The decision is based on habitat scores and a series of narrative biological statements used to evaluate the benthic macroinvertebrate community. If the stream is determined to be impaired, the source and cause of the impairment is documented. An impaired stream must be listed on the state's Section 303(d) list with the source and cause. A TMDL must be developed for the stream segment and each pollutant. In order for the process to be more effective, adjoining stream segments with the same source and cause listing are addressed collectively, and on a watershed basis.

Basic Steps for Determining a TMDL

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

1. Collection and summarization of pre-existing data (watershed characterization, inventory contaminant sources, determination of pollutant loads, etc.);
2. Calculating the TMDL for the waterbody using EPA approved methods and computer models;
3. Allocating pollutant loads to various sources;
4. Determining critical and seasonal conditions;
5. Public review and comment and comment period on draft TMDL;
6. Submittal of final TMDL; and
7. EPA approval of the TMDL.

AMD Methodology

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

The statistical analysis described below can be applied to situations where all of the pollutant loading is from non-point sources as well as those where there are both point and non-point sources. The following defines what are considered point sources and non-point sources for the purposes of our evaluation; point sources are defined as permitted discharges or a discharge that has a responsible party, non-point sources are then any pollution sources that are not point sources. For situations where all of the impact is due to non-point 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 non-point 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[5] 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

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

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

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

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

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

TMDL Endpoints

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

Because the pollution sources in the watershed are nonpoint sources, the TMDLs' component makeup will be load allocations (LAs) with waste load allocations (WLAs) for permitted discharges. All allocations will be specified as long-term average daily concentrations. These long-term average concentrations are expected to meet water-quality criteria 99% of the time as required in PA Title 25 Chapter 96.3(c). The following table shows the applicable water-quality criteria for the selected parameters.

Table 2. Applicable Water Quality Criteria

Parameter	*Criterion Value (mg/l)*	*Total Recoverable/Dissolved*
Aluminum (Al)	0.75	Total Recoverable
Iron (Fe)	1.50	30 day average; Total Recoverable
Manganese (Mn)	1.00	Total Recoverable
pH *	6.0-9.0	N/A

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

TMDL Elements (WLA, LA, MOS)

$$TMDL = WLA + LA + MOS$$

A TMDL equation consists of a waste load allocation (WLA), load allocation (LA), and a margin of safety (MOS). The waste load allocation is the portion of the load assigned to point sources. The load allocation is the portion of the load assigned to non-point sources. The margin of safety is applied to account for uncertainties in the computational process. The margin of safety may be expressed implicitly (documenting conservative processes in the computations) or explicitly (setting aside a portion of the allowable load). The TMDL allocations in this report are based on available data. Other allocation schemes could also meet the TMDL.

Allocation Summary

These TMDLs will focus remediation efforts on the identified numerical reduction targets for each watershed. The reduction schemes in Table 3 for each segment are based on the assumption that all upstream allocations are implemented and take into account all upstream reductions. Attachment D 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 average flow and a conversion factor at each sample point. The allowable load is the TMDL at that point.

Waste load allocations have also been included at some points for future mining operations. The difference between the TMDL and the WLA at each point is the load allocation (LA) at the point. The LA at each point includes all loads entering the segment, including those from upstream allocation points. The percent reduction is calculated to show the amount of load that needs to be reduced from nonpoint sources within a segment in order for water quality standards to be met at the point.

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

Table 3. Turtle Creek Watershed Summary Table

Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	NPS Load Reduction (lbs/day)	NPS % Reduction
Delmont – Delmont Deep Mine Discharge						
Aluminum (lbs/day)	6.44	2.64	-	2.64	3.80	59%
Iron (lbs/day)	260.81	5.22	-	5.22	255.59	98%
Acidity (lbs/day)	1733.71	121.36	-	121.36	1612.35	93%
Export – Export Deep Mine Discharge						
Aluminum (lbs/day)	94.85	1.89	-	1.89	92.56	98%
Iron (lbs/day)	18.88	6.61	-	6.61	12.27	65%
Acidity (lbs/day)	1876.40	0.00	-	0.00	1876.40	100%
TC8 – Turtle Creek at intersection of Old Lincoln Highway and Italy Road in Export						
Aluminum (lbs/day)	425.32	21.27	*1.12*	20.15	307.69*	94%*
Iron (lbs/day)	433.71	73.73	*4.50*	69.23	92.12*	56%*
Acidity (lbs/day)	3219.32	193.16	-	193.16	0*	0%*
TCT2 - Italy Run upstream of confluence with Turtle Creek						
Aluminum (lbs/day)	52.98	0.53	-	0.53	52.45	99%
Iron (lbs/day)	18.97	1.14	-	1.14	17.83	94%
Acidity (lbs/day)	520.07	0.0	-	0.0	520.07	100%
TC7 – Turtle Creek downstream of Trafford Road bridge in Murrysville						
Aluminum (lbs/day)	199.77	9.99	-	6.62	0*	0%*
Iron (lbs/day)	130.21	18.23	-	9.23	2.73*	13%*
Acidity (lbs/day)	993.52	258.32	-	258.32	0*	0%*
TC6 – Turtle Creek upstream of Abers Creek						
Aluminum (lbs/day)	143.05	11.44	*0.56*	10.88	0*	0%*
Iron (lbs/day)	108.05	24.85	*2.26*	22.59	0*	0%*
Acidity (lbs/day)	-2709.20	-2709.20	NA	NA	NA	NA
AC1 – Abers Creek at mouth						
Aluminum (lbs/day)	10.42	10.42	NA	NA	NA	NA
Iron (lbs/day)	10.01	10.01	NA	NA	NA	NA
Acidity (lbs/day)	-90.25	-90.25	NA	NA	NA	NA
TC4 – Turtle Creek downstream of Saunders Station Road bridge						
Aluminum (lbs/day)	149.27	22.39	-	22.39	0*	0%*
Iron (lbs/day)	114.21	51.40	-	51.40	0*	0%*
Acidity (lbs/day)	-6376.45	-6376.45	NA	NA	NA	NA
TC3 – Turtle Creek upstream of confluence with Brush Creek in Trafford						
Aluminum (lbs/day)	135.08	6.75	*1.12*	5.63	13.40*	67%*
Iron (lbs/day)	100.31	17.05	*4.50*	12.55	28.18*	63%*
Acidity (lbs/day)	-8592.57	-8592.57	NA	NA	NA	NA
BC4 – Brush Creek at PA Turnpike overpass in Shafton						
Aluminum (lbs/day)	33.07	33.07	NA	NA	NA	NA

Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	NPS Load Reduction (lbs/day)	NPS % Reduction
Iron (lbs/day)	28.81	28.81	NA	NA	NA	NA
Acidity (lbs/day)	-9683.87	-9637.87	NA	NA	NA	NA
BCT2 – Coal Run at railroad tunnel						
Aluminum (lbs/day)	4.46	4.46	NA	NA	NA	NA
Iron (lbs/day)	113.05	4.52	-	4.52	108.53	96%
Acidity (lbs/day)	-674.09	-674.09	NA	NA	NA	NA
BCT1 – Unnamed tributary to Brush Creek at Alfieri Metals in Irwin						
Aluminum (lbs/day)	5.86	5.86	NA	NA	NA	NA
Iron (lbs/day)	1176.82	23.54	-	23.54	1153.28	98%
Acidity (lbs/day)	-398.37	-398.37	NA	NA	NA	NA
BC3 – Brush Creek downstream of Irwin						
Aluminum (lbs/day)	56.68	56.68	NA	NA	NA	NA
Iron (lbs/day)	4952.40	137.77	-	137.77	3192.82*	96%*
Acidity (lbs/day)	-10378.01	-10378.01	NA	NA	NA	NA
BC2 – Brush Creek at SR4019 near Ardara in Acerman Natural Area						
Aluminum (lbs/day)	105.42	5.27	*1.12*	4.15	100.15*	95%*
Iron (lbs/day)	1522.85	258.88	*4.50*	254.38	0*	0%*
Acidity (lbs/day)	-9091.71	-9091.71	NA	NA	NA	NA
BC1 – Brush Creek at Irwin Street Bridge upstream of Trafford						
Aluminum (lbs/day)	104.74	5.24	-	5.24	0*	0%*
Iron (lbs/day)	840.03	142.80	-	142.80	0*	0%*
Acidity (lbs/day)	-17748.91	-17748.91	NA	NA	NA	NA
TC1.5 – Turtle Creek near gauging station in Wilmerding						
Aluminum (lbs/day)	343.94	120.38	*1.12*	119.26	0*	0%*
Iron (lbs/day)	870.53	261.16	*4.50*	256.66	0*	0%*
Acidity (lbs/day)	-26755.95	-26755.95	NA	NA	NA	NA
TR2 – Thompson Run in Turtle Creek						
Aluminum (lbs/day)	141.22	7.06	-	7.06	134.16*	95%*
Iron (lbs/day)	34.36	24.39	-	24.39	9.97*	29%*
Acidity (lbs/day)	-1578.77	-1578.77	NA	NA	NA	NA
TC1 – Turtle Creek at mouth						
Aluminum (lbs/day)	522.17	104.43	-	104.43	60.02*	37%*
Iron (lbs/day)	914.14	310.81	-	310.81	0*	0%*
Acidity (lbs/day)	-28756.82	-28756.82	NA	NA	NA	NA

NA = not applicable ND = not detected

* Takes into account load reductions from upstream sources.

References

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Recommendations

Statewide Reclamation Efforts

Since the 1960s, Pennsylvania has been a national leader in establishing laws and regulations to ensure mine reclamation and well plugging occur after active operation is completed. Mine reclamation and well plugging refer to the process of cleaning up environmental pollutants and safety hazards associated with a site and returning the land to a productive condition, similar to PADEP's Brownfields Program. Pennsylvania is striving for complete reclamation of its abandoned mines and plugging of its orphan wells. These concepts include legislative, policy, and land management initiatives designed to enhance mine operator/volunteer/PADEP reclamation efforts.

Various methods to eliminate or treat pollutant sources provide a reasonable assurance that the proposed TMDLs can be met. 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 that are currently being used for projects designed to achieve TMDL reductions include the USEPA 319 grant program and Pennsylvania's Growing Greener Program. Federal funding is through the Department of the Interior's Office of Surface Mining (OSM) for reclamation and mine drainage treatment through the Appalachian Clean Streams Initiative and through Watershed Cooperative Agreements.

The PADEP Bureau of District Mining Operations (DMO) administers an environmental regulatory program for all mining activities, including mine subsidence regulation, mine subsidence insurance, and coal refuse disposal. PADEP DMO also conducts a program to ensure safe underground bituminous mining and protect certain structures from subsidence; administers a mining license and permit program; administers a regulatory program for the use, storage, and handling of explosives; and provides for training, examination, and certification of applicants' blaster's licenses. In addition, PADEP Bureau of Mining & Reclamation administers a loan program for bonding anthracite underground mines and for mine subsidence, the Small Operator's Assistance Program (SOAP), and the Remining Operator's Assistance Program (ROAP).

Regulatory programs are assisting in the reclamation and restoration of Pennsylvania's land and water. PADEP has been effective in implementing the NPDES program for mining operations throughout the Commonwealth. This reclamation was done through the use of remining permits that have the potential for reclaiming abandoned mine lands, at no cost to the Commonwealth or the federal government. Long-term agreements were initialized for facilities/operators that need to assure treatment of post-mining discharges or discharges they degraded. These agreements 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." Acidity loads from abandoned discharges have been observed to decrease by an average of 61 percent when remined (Smith, Brady, and Hawkins, 2002. "Effectiveness of Pennsylvania's remining program in abating abandoned mine drainage: water quality impacts" in Transactions of the Society for Mining, Metallurgy, and Exploration, Volume 312, p. 166-170).

PADEP BAMR, which administers the program to address the Commonwealth's abandoned mine reclamation program, 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 PADEP, 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 Attachment G).

- 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.

The Commonwealth is exploring all identified 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:

- 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 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 into the Upper West Branch Susquehanna River), and the Wadesville Deep Mine Pool (Exelon Generation in Schuylkill County).

Turtle Creek Watershed Reclamation Efforts

There is an active watershed group in the Turtle Creek Watershed. They have implemented many projects to assess AMD and other types of pollution in the Turtle Creek Watershed. These projects and more information on the Turtle Creek Watershed Association can be found on the organization website at www.tcwa.org. It is recommended that agencies work with these local stakeholder groups to implement best management practices to achieve the reductions called for in this TMDL.

The Turtle Creek Watershed Association was incorporated in 1971 and has been working on watershed issues since that time. The initial focus of the group was soil erosion, flooding, sewage, and mine drainage problems. Currently, the two highest priority issues confronting the watershed are AMD and stormwater pollution. Evaluation of the Delmont and Export Mine Pool discharges are current projects for the group.

Candidate or federally-listed threatened and endangered species may occur in or near the watershed. While implementation of the TMDL may result in improvements to water quality, 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 PADEP'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 October 24, 2008 to foster public comment on the allowable loads calculated. The public comment period on this TMDL was open from October 24, 2008 to December 24, 2008. A public meeting was held on

October 28, 2008 at the Westinghouse Castle, 325 Commerce Street, Wilmerding to discuss the proposed TMDL.

Future TMDL Modifications

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

Changes in TMDLs That May Require EPA Approval

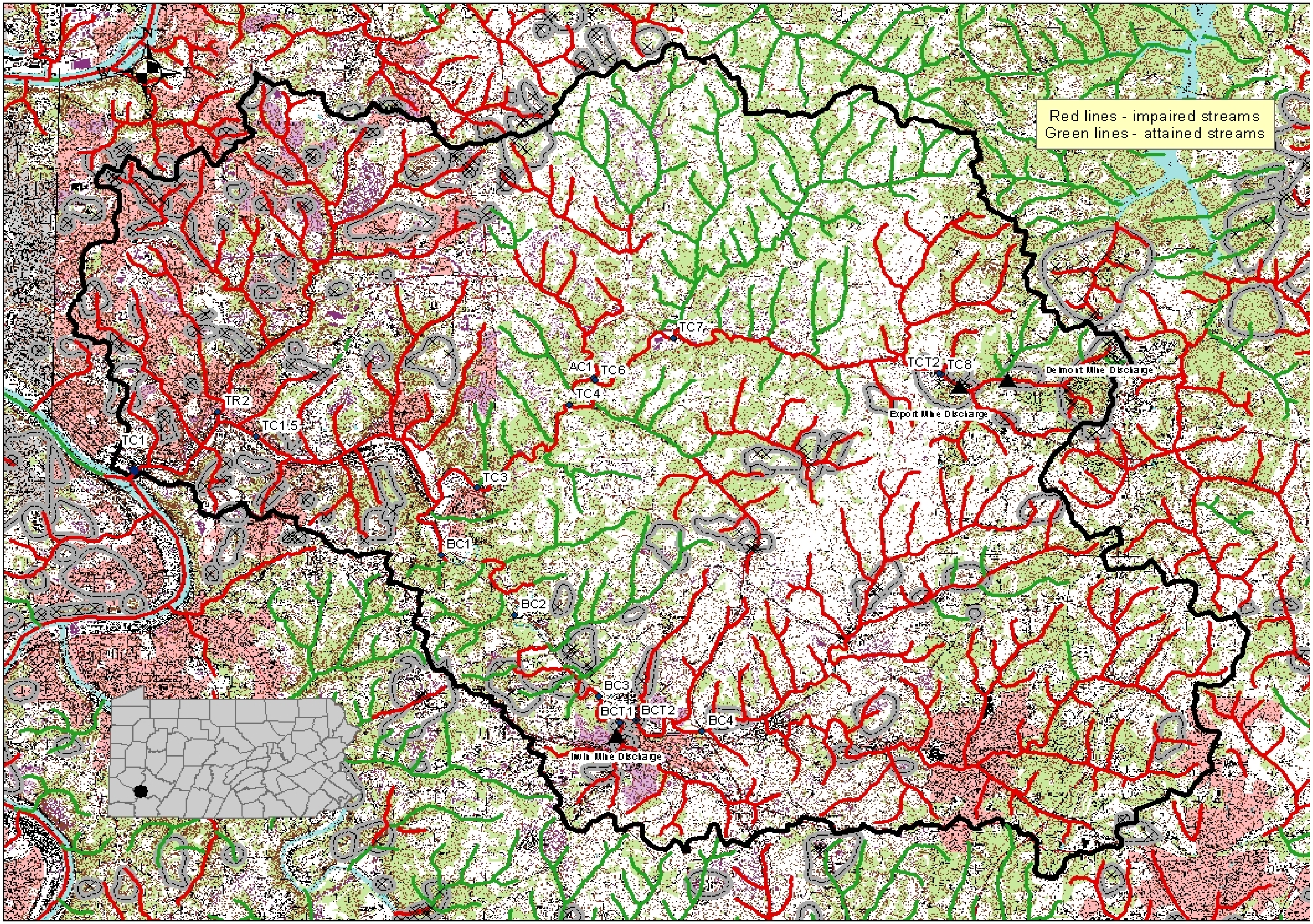
- Increase in total load capacity.
- Transfer of load between point (WLA) and nonpoint (LA) sources.
- Modification of the margin of safety (MOS).
- Change in water quality standards (WQS).
- Non-attainment of WQS with implementation of the TMDL.
- Allocations in trading programs.

Changes in TMDLs That May Not Require EPA Approval

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

Attachment A

Turtle Creek Watershed Maps



Red lines - impaired streams
Green lines - attained streams
TC7
AC1
TC6
TC4
TCT2
TC8
Delmont Mine Discharge
Export Mine Discharge
TR2
TC1.5
TC1
TC3
BC1
BC2
BC3
BCT1
BCT2
BC4
Irwin Mine Discharge

Attachment B

Method for Addressing Section 303(d) Listings for pH

Method for Addressing Section 303(d) Listings for pH

There has been a great deal of research conducted on the relationship between alkalinity, acidity, and pH. Research published by the 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. When acidity in a stream is neutralized or is restored to natural levels, pH will be acceptable. Therefore, the measured instream alkalinity at the point of evaluation in the stream will serve as the goal for reducing total acidity at that point. The methodology that is applied for alkalinity (and therefore pH) is the same as that used for other parameters such as iron, aluminum, and manganese that have numeric water quality criteria.

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

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

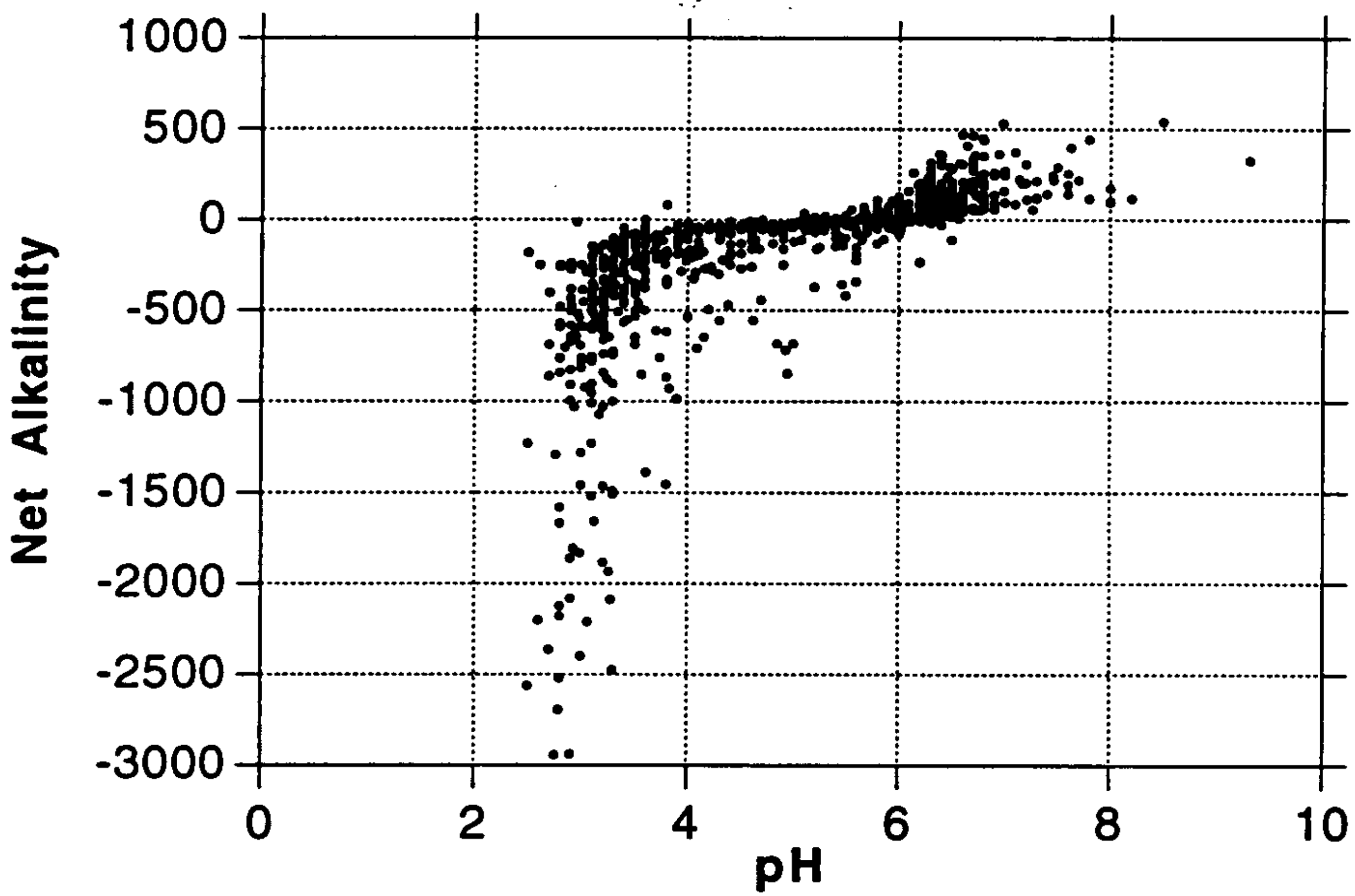


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Attachment C

TMDLs By Segment

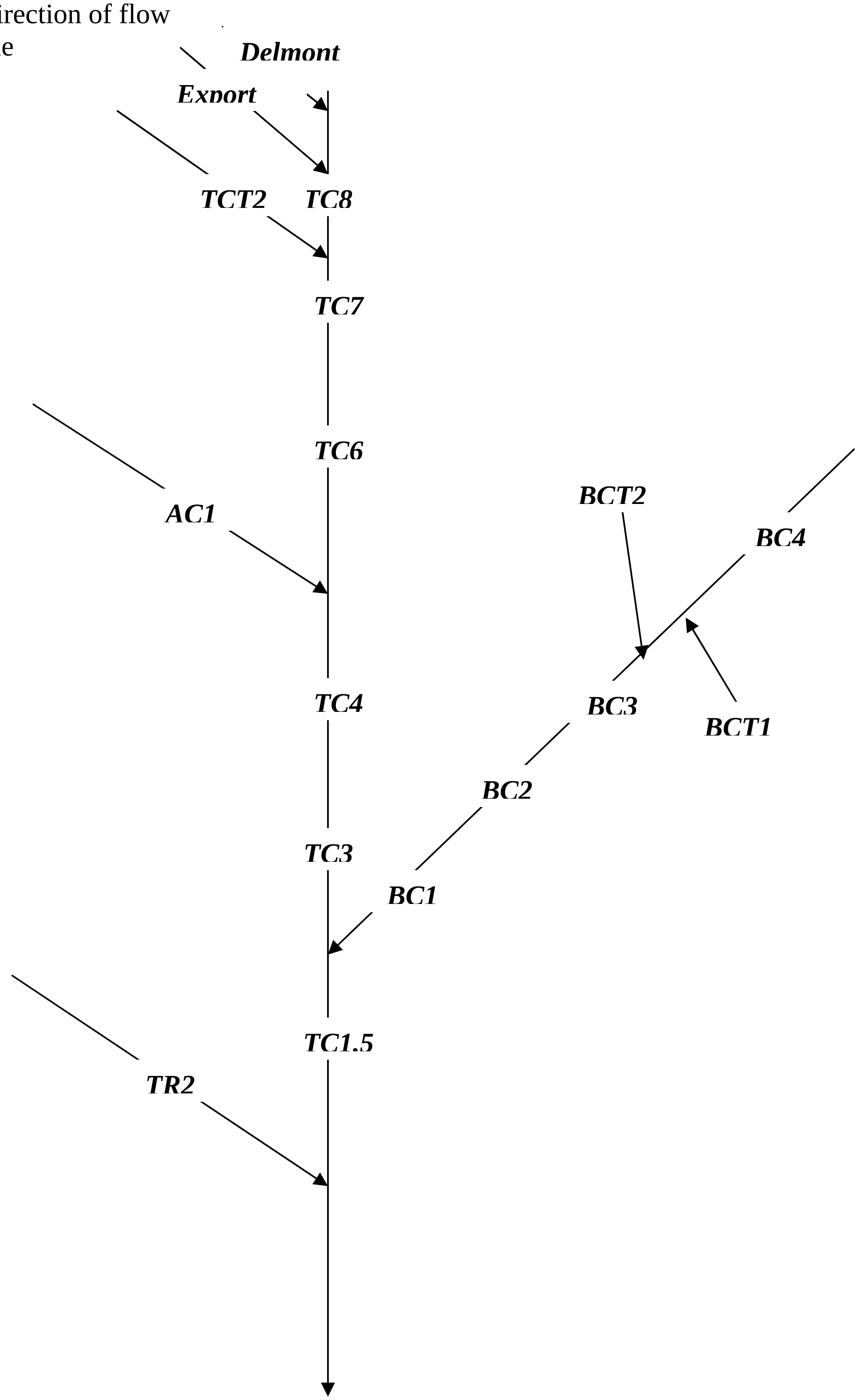
Turtle Creek

The TMDL for Turtle Creek consists of load allocations to six sampling sites on Turtle Creek (TC8, TC7, TC6, TC4, TC3, and TC1.5), one site on an unnamed tributary to Turtle Creek locally called Italy Run (TCT2), one site on Abers Creek (AC1), four sites on Brush Creek (BC1-4), two sites on unnamed tributaries to Brush Creek (BCT1, BCT2), and one site on Thompson Run (TR2). Sample data sets were collected in 2007 and 2008. All sample points are shown on the maps included in Attachment A as well as on the loading schematic presented on the following page.

Turtle Creek is listed on the 1996 PA Section 303(d) list for metals from AMD as being the cause of the degradation to this stream. Although this TMDL will focus primarily on metal loading to the Turtle Creek Watershed, acid loading analysis will be performed. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range (between 6 & 9) 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.

An allowable long-term average in-stream concentration was determined at each sample point for metals 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 log normally 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. Following is an explanation of the TMDL for each allocation point.

Turtle Creek Sampling Station Diagram
Arrows represent direction of flow
Diagram not to scale



A waste load allocation for future mining was included for the segment of Turtle Creek upstream of TC8 allowing for two operations with two active pits (1500' x 300') to be permitted in the future on this segment.

Table C1. Waste Load Allocations for future mining operations			
Parameter	Monthly Avg. Allowable Conc. (mg/L)	Average Flow (MGD)	Allowable Load (lbs/day)
Future Operation 1			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.26
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.26

TMDL calculations – Delmont – Delmont Deep Mine Discharge

The TMDL for sampling point Delmont consists of a load allocation to the discharge. The load allocation for the discharge was computed using water-quality sample data collected at point Delmont. The average flow, measured at the sampling point Delmont (1.1549 MGD), is used for these computations.

Sample data at point Delmont shows pH ranging between 3.4 and 5.3; pH will be addressed. Table C2 shows the measured and allowable concentrations and loads at Delmont. Table C3 shows the load reductions necessary to meet water quality standards at Delmont.

Table C2		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.67	6.44	0.27	2.64
	Iron	27.08	260.81	0.54	5.22
	Acidity	180.00	1733.71	12.60	121.36
	Alkalinity	17.00	163.74		

Table C3. Allocations Delmont			
Delmont	Al (Lbs/day)	Fe (Lbs/day)	Acidity (Lbs/day)
Existing Load @ Delmont	6.44	260.81	1733.71
Allowable Load @ Delmont	2.64	5.22	121.36
Load Reduction @ Delmont	3.80	255.59	1612.35
% Reduction required @ Delmont	59%	98%	93%

TMDL calculations – Export – Export Deep Mine Discharge

The TMDL for sampling point Export consists of a load allocation to the discharge. The load allocation for the discharge was computed using water-quality sample data collected at point Export. The average flow, measured at the sampling point Export (1.0975 MGD), is used for these computations.

Sample data at point Export shows pH ranging between 2.8 and 3.2; pH will be addressed. Table C4 shows the measured and allowable concentrations and loads at Export. Table C5 shows the load reductions necessary to meet water quality standards at Export.

Table C4		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	10.32	94.45	0.21	1.89
	Iron	2.06	18.88	0.72	6.61
	Acidity	205.00	1876.40	0.00	0.00
	Alkalinity	0.00	0.00		

Table C5. Allocations Export			
Export	Al (Lbs/day)	Fe (Lbs/day)	Acidity (Lbs/day)
Existing Load @ Export	94.45	18.88	1876.40
Allowable Load @ Export	1.89	6.61	0.00
Load Reduction @ Export	92.56	12.27	1876.40
% Reduction required @ Export	98%	65%	100%

TMDL calculations – TC8 – Turtle Creek at intersection of Old Lincoln Highway and Italy Road in Export

The TMDL for sampling point TC8 consists of a load allocation to all of the area upstream of this point shown in Attachment A. The load allocation for this segment of Turtle Creek was computed using water-quality sample data collected at point TC8. The average flow, measured at the sampling point TC8 (6.3125 MGD), is used for these computations.

Sample data at point TC8 shows pH ranging between 3.75 and 5.03; pH will be addressed. Table C6 shows the measured and allowable concentrations and loads at TC8. Table C7 shows the load reductions necessary to meet water quality standards at TC8.

Table C6		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	8.08	425.32	0.40	21.27
	Iron	8.24	433.71	1.40	73.73
	Acidity	61.15	3219.32	3.67	193.16
	Alkalinity	7.05	371.16		

The measured and allowable loading for point TC8 for aluminum, iron, and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points Delmont/Export shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points TC8 and Delmont/Export to determine a total load tracked for the segment of stream between Delmont/Export and TC8. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at TC8.

Table C7. Allocations TC8			
TC8	Al (Lbs/day)	Fe (Lbs/day)	Acidity (Lbs/day)
Existing Load at TC8	425.32	433.71	3219.32
Difference in measured loads between the loads that enter and existing TC8	324.43	154.02	-390.79
Additional load tracked from above samples	4.53	11.83	121.36
Total load tracked between Delmont/Export and TC8	328.96	165.85	108.01
Allowable Load at TC8	21.27	73.73	193.16
Load Reduction at TC8	307.69	92.12	0
% Reduction required at TC8	94%	56%	0%

TMDL calculations- TCT2 – Italy Run upstream of confluence with Turtle Creek

The TMDL for sampling point PCTR1 consists of a load allocation to all of the area upstream of this point shown in Attachment A. The load allocation for Italy Run was computed using water-quality sample data collected at point TCT2. The average flow, measured at the sampling point TCT2 (0.2610 MGD), is used for these computations.

Sample data at point TCT2 shows pH ranging between 2.50 and 3.21; pH will be addressed. Table C8 shows the measured and allowable concentrations and loads at TCT2. Table C9 shows the load reductions necessary to meet water quality standards at TCT2.

Table C8		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	24.34	52.98	0.24	0.53
	Iron	8.71	18.97	0.52	1.14
	Acidity	238.93	520.07	0.0	0.0
	Alkalinity	0.0	0.0		

Table C9. Allocations TCT2			
TCT2	Al (Lbs/day)	Fe (Lbs/day)	Acidity (Lbs/day)
Existing Load @ TCT2	52.98	18.97	520.07
Allowable Load @ TCT2	0.53	1.14	0.0
Load Reduction @ TCT2	52.45	17.83	520.07
% Reduction required @ TCT2	99%	94%	100%

TMDL calculations- TC7 – Turtle Creek downstream of Trafford Road bridge in Murrysville

The TMDL for sample point TC7 consists of a load allocation to all of the area between points TC8 and TC7 shown in Attachment A. The load allocation for this segment of Turtle Creek was computed using water-quality sample data collected at point TC7. The average flow, measured at the sampling point TC7 (8.6954 MGD), is used for these computations.

Sample data at point TC7 shows that this segment has a pH ranging between 5.12 and 7.72; pH will be addressed. Table C10 shows the measured and allowable concentrations and loads at TC11. Table C7 shows the load reductions necessary to meet water quality standards at TC7.

Table C10		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	2.75	199.77	0.14	9.99
	Iron	1.80	130.21	0.25	18.23
	Acidity	13.70	993.52	3.56	258.32
	Alkalinity	25.80	1871.01		

The measured and allowable loading for point TC7 for aluminum, iron, and acidity was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points TC8/TCT2 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points TC7 and TC8/TCT2 to determine a total load tracked for the segment of stream between TC8/TCT2 and TC7. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at TC7.

Table C11. Allocations TC7			
TC7	Al (Lbs/day)	Fe (Lbs/day)	Acidity (Lbs/day)
Existing Load at TC7	199.77	130.21	993.52
Difference in measured loads between the loads that enter and existing TC7	-278.53	-322.47	-2745.87
Additional load tracked from above samples	21.80	74.87	193.16
Total load tracked between TC8/TCT2 and TC7	9.16	20.96	50.22
Allowable Load at TC7	9.99	18.23	258.32
Load Reduction at TC7	0	2.73	0
% Reduction required at TC7	0%	13%	0%

A waste load allocation for future mining was included for the segment of Turtle Creek between TC7 and TC6 allowing for one operation with two active pits (1500' x 300') to be permitted in the future on this segment.

Table C12. Waste Load Allocations for future mining operations			
Parameter	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	2.26

TMDL calculations- TC6 – Turtle Creek upstream of Abers Creek

The TMDL for sampling point TC6 consists of a load allocation to all of the area between points TC7 and TC6 shown in Attachment A. The load allocation for this segment of Turtle Creek was computed using water-quality sample data collected at point TC6. The average flow, measured at the sampling point TC6 (14.0019 MGD), is used for these computations.

Sample data at point TC6 shows pH ranging between 6.97 and 7.96; pH will not be addressed because water quality standards are being met. Table C13 shows the measured and allowable concentrations and loads at TC6. Table C14 shows the percent reduction for aluminum, iron, manganese, and acidity needed at TC6.

Table C13		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	1.23	143.05	0.10	11.44
	Iron	0.93	108.05	0.21	24.85
	Acidity	-23.20	-2709.20	-23.20	-2709.20
	Alkalinity	39.05	4560.09		

The measured and allowable loading for point TC6 for aluminum and iron was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points TC7 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points TC6 and TC7 to determine a total load tracked for the segment of stream between TC7 and TC6. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at TC6.

Table C14. Allocations TC6		
TC6	Al (Lbs/day)	Fe (Lbs/day)
Existing Load at TC6	143.05	108.05
Difference in measured loads between the loads that enter and existing TC6	-56.72	-22.16
Additional load tracked from above samples	9.99	18.23
Total load tracked between TC7 and TC6	7.09	15.13
Allowable Load at TC6	11.44	24.85
Load Reduction at TC6	0	0
% Reduction required at TC6	0%	0%

TMDL calculations- AC1 – Abers Creek at mouth

The TMDL for sampling point AC1 consists of a load allocation to all of the area upstream of this point shown in Attachment A. The load allocation for this segment of Abers Creek was computed using water-quality sample data collected at point AC1. The average flow, measured at the sampling point AC1 (4.99 MGD), is used for these computations.

Sample data at point AC1 shows pH ranging between 7.75 and 8.87; pH will not be addressed as water quality standards are being met. Table C15 shows the measured and allowable concentrations and loads at AC1.

Table C15		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.25	10.42	0.25	10.42
	Iron	0.24	10.01	0.24	10.01
	Acidity	-90.25	-3762.67	-90.25	-3762.67
	Alkalinity	106.20	4427.66		

TMDL calculations- TC4- Turtle Creek downstream of Saunders Station Road bridge

The TMDL for sampling point TC4 consists of a load allocation to all of the area between points TC6 and TC4 shown in Attachment A. The load allocation for the segment of Turtle Creek was computed using water-quality sample data collected at point TC4. The average flow, measured at the sampling point TC4 (23.2213 MGD), is used for these computations.

Sample data at point TC4 shows pH ranging between 7.65 and 8.40; pH will not be addressed because water quality standards are being met. Table C16 shows the measured and allowable concentrations and loads at TC4. Table C17 shows the load reductions necessary to meet water quality standards at TC4.

Table C16		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.77	149.27	0.12	22.39
	Iron	0.59	114.21	0.27	51.40
	Acidity	-32.93	-6376.45	-32.93	-6376.45
	Alkalinity	54.03	10462.80		

The measured and allowable loading for point TC4 for aluminum and iron was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points TC6/AC1 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points TC6/AC1 and TC4 to determine a total load tracked for the segment of stream between TC4 and TC6/AC1. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at TC4.

Table C17. Allocations TC4		
TC4	Al (lbs/day)	Fe (lbs/day)
Existing Load @ TC4	149.27	114.24
Difference in measured loads between the loads that enter and existing TC4	-4.20	-3.85
Additional load tracked from above samples	21.86	34.86
Total load tracked between TC6/AC1 and TC4	21.20	33.47
Allowable Load at TC4	22.39	51.40
Load Reduction at TC4	0	0
% Reduction required at TC4	0%	0%

A waste load allocation for future mining was included for the segment of Turtle Creek between TC4 and TC3 allowing for two operations with two active pits (1500' x 300') to be permitted in the future on this segment.

Table C18. Waste Load Allocations for future mining operations			
Parameter	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	2.26
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.26

TMDL calculations- TC3- Turtle Creek upstream of confluence with Brush Creek in Trafford

The TMDL for sample point TC3 consists of a load allocation to all of the area between TC4 and TC3 shown in Attachment A. The load allocation for this segment of Turtle Creek was computed using water-quality sample data collected at point TC3. The average flow, measured at the sampling point TC3 (23.9601 MGD), is used for these computations.

Sample data at point TC3 shows that this segment has a pH ranging between 7.98 and 9.03; no reductions in acidity area necessary. Table C19 shows the measured and allowable concentrations and loads at TC3. Table C20 shows the load reductions necessary to meet water quality standards.

Table C19		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.68	135.08	0.03	6.75
	Iron	0.50	100.31	0.09	17.05
	Acidity	-43.00	-8592.57	-43.00	-8592.57
	Alkalinity	62.05	12399.28		

The measured and allowable loading for point TC3 for aluminum and iron was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points TC3 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points TC4 and TC3 to determine a total load tracked for the segment of stream between TC3 and TC4. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at TC3.

Table C20. Allocations TC3		
TC3	Al (Lbs/day)	Fe (Lbs/day)
Existing Load at TC3	135.08	100.31
Difference in measured loads between the loads that enter and existing TC3	-14.19	-13.90
Additional load tracked from above samples	22.39	51.40
Total load tracked between TC4 and TC3	20.15	45.23
Allowable Load at TC3	6.75	17.05
Load Reduction at TC3	13.40	28.18
% Reduction required at TC3	67%	63%

TMDL calculations - BC4 – Brush Creek at PA Turnpike overpass in Shafton

The TMDL for sampling point BC4 consists of a load allocation to all of the area upstream of this point shown in Attachment A. The load allocation for this segment of Brush Creek was computed using water-quality sample data collected at point BC4. The average flow, measured at the sampling point BC4 (15.8625 MGD), is used for these computations.

Sample data at point BC4 shows pH ranging between 7.83 and 8.30; pH will not be addressed because water quality standards are being met. Table C21 shows the measured and allowable concentrations and loads at BC4. No reductions are necessary as water quality standards are being met.

Table C21		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.25	33.07	0.25	33.07
	Iron	0.22	28.81	0.22	28.81
	Acidity	-73.20	-9683.87	-73.20	-9683.87
	Alkalinity	125.28	16573.04		

TMDL calculations - BCT2 – Coal Run at railroad tunnel

The TMDL for sampling point BCT2 consists of a load allocation to all of the area upstream of this point shown in Attachment A. The load allocation for Coal Run was computed using water-quality sample data collected at point BCT2. The average flow, measured at the sampling point BCT2 (1.7052 MGD), is used for these computations.

Sample data at point BCT2 shows pH ranging between 6.36 and 6.98; pH will not be addressed because water quality standards are being met. Table C22 shows the measured and allowable concentrations and loads at BCT2. Table C23 shows the load reductions necessary to meet water quality standards at BCT2.

Table C22		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.31	4.46	0.31	4.46
	Iron	7.95	113.05	0.32	4.52
	Acidity	-47.40	-674.09	-47.40	-674.09
	Alkalinity	91.25	1297.70		

Table C23. Allocations BCT2	
BCT2	Fe (Lbs/day)
Existing Load @ BCT2	113.05
Allowable Load @ BCT2	4.52
Load Reduction @ BCT2	108.53
% Reduction required @ BCT2	96%

TMDL calculations- BCT1- Unnamed tributary to Brush Creek "Tinker Run" at Alfieri Metals in Irwin

The TMDL for sample point BCT1 consists of a load allocation to all of the area upstream of this point shown in Attachment A. The load allocation for the unnamed tributary to Brush Creek (Tinker Run) was computed using water-quality sample data collected at point BCT1. The average flow, measured at the sampling point BCT1 (2.8098 MGD), is used for these computations.

Sample data at point BCT1 shows that this segment has a pH ranging between 6.16 and 6.45; pH will not be addressed as water quality standards are being met. Table C24 shows the measured and allowable concentrations and loads at BCT1. Table C25 shows the load reductions necessary to meet water quality standards at BCT1.

Table C24		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.25	5.86	0.25	5.86
	Iron	50.22	1176.82	1.00	23.54
	Acidity	-17.00	-398.37	-17.00	-398.37
	Alkalinity	15.54	364.15		

Table C25. Allocations BCT1	
BCT1	Fe (Lbs/day)
Existing Load @ BCT1	1176.82
Allowable Load @ BCT1	23.54
Load Reduction @ BCT1	1153.28
% Reduction required @ BCT1	98%

TMDL calculations – BC3 – Brush Creek downstream of Irwin

The TMDL for sample point BC3 consists of a load allocation to all of the area between points BC4 and BC3 shown in Attachment A. The load allocation for this segment of Brush Creek was computed using water-quality sample data collected at point BC3. The average flow, measured at the sampling point BC3 (27.1844 MGD), is used for these computations.

Sample data at point BC3 shows that this segment has a pH ranging between 6.68 and 7.00; pH will not be addressed because water quality standards are being met. Table C26 shows the measured and allowable concentrations and loads at BC3. Table C27 shows the load reductions necessary to meet water quality standards at BC3.

Table C26		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.25	56.68	0.25	56.68
	Iron	20.26	4592.40	0.61	137.77
	Acidity	-45.78	-10378.01	-45.78	-10378.01
	Alkalinity	93.68	21237.80		

The measured and allowable loading for point BC3 for iron was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points BC4/BCT2/BCT1 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points BC4/BCT2/BCT1 and BC3 to determine a total load tracked for the segment of stream between BC3 and BC4/BCT2/BCT1. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at BC3.

Table C27. Allocations BC3	
BC3	Fe (lbs/day)
Existing Load @ BC3	4592.40
Difference in measured loads between the loads that enter and existing BC3	3273.72
Additional load tracked from above samples	56.87
Total load tracked between BC4/BCT1/BCT2 and BC3	3330.59
Allowable Load at BC3	137.77
Load Reduction at BC3	3192.82
% Reduction required at BC3	96%

A waste load allocation for future mining was included for the segment of Brush Creek between BC3 and BC2 allowing for two operations with two active pits (1500’ x 300’) to be permitted in the future on this segment.

Table C28. Waste Load Allocations for future mining operations			
Parameter	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	2.26
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.26

<u>TMDL calculations- BC2 – Brush Creek at SR4019 near Ardarda in Acerman Natural Area</u>

The TMDL for sample point BC2 consists of a load allocation to all of the area between points BC3 and BC2 shown in Attachment A. The load allocation for this segment of Brush Creek was computed using water-quality sample data collected at point BC2. The average flow, measured at the sampling point BC2 (28.0420 MGD), is used for these computations.

Sample data at point BC2 shows that this segment has a pH ranging between 6.81 and 7.25; pH will not be addressed because water quality standards are being met. Table C29 shows the measured and allowable concentrations and loads at BC2. Table C30 shows the load reductions necessary to meet water quality standards at BC2.

Table C29		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.45	105.42	0.02	5.27
	Iron	6.51	1522.85	1.11	258.88
	Acidity	-38.88	-9091.71	-38.88	-9091.71
	Alkalinity	92.53	21638.87		

The measured and allowable loading for point BC2 for aluminum and iron was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points BC3 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points BC3 and BC2 to determine a total load tracked for the segment of stream between BC2 and BC3. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at BC2.

Table C30. Allocations BC2		
BC2	Al (Lbs/day)	Fe (Lbs/day)
Existing Load at BC2	105.42	1522.85
Difference in measured loads between the loads that enter and existing BC2	48.74	-3069.55
Additional load tracked from above samples	56.68	137.77
Total load tracked between BC3 and BC2	105.42	45.46
Allowable Load at BC2	5.27	258.88
Load Reduction at BC2	100.15	0
% Reduction required at BC2	95%	0%

TMDL calculations- BC1 – Brush Creek at Irwin Street Bridge upstream of Trafford

The TMDL for sample point BC1 consists of a load allocation to all of the area between points BC2 and BC1 shown in Attachment A. The load allocation for this segment of Brush Creek was computed using water-quality sample data collected at point BC1. The average flow, measured at the sampling point BC1 (31.0681 MGD), is used for these computations.

Sample data at point BC1 shows that this segment has a pH ranging between 7.27 and 7.87; pH will not be addressed because water quality standards are being met. Table C31 shows the measured and allowable concentrations and loads at BC1. Table C32 shows the load reductions necessary to meet water quality standards at BC1.

Table C31		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.40	104.74	0.02	5.24
	Iron	3.24	840.03	0.55	142.80
	Acidity	-68.50	-17748.91	-68.50	-17748.91
	Alkalinity	91.10	23604.76		

The measured and allowable loading for point BC1 for aluminum and iron was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points BC2 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points BC2 and BC1 to determine a total load tracked for the segment of stream between BC1 and BC2. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at BC1.

Table C32. Allocations BC1		
BC1	Al (Lbs/day)	Fe (Lbs/day)
Existing Load at BC1	104.74	840.03
Difference in measured loads between the loads that enter and existing BC1	-0.68	-682.82
Additional load tracked from above samples	5.27	258.88
Total load tracked between BC2 and BC1	5.22	142.38
Allowable Load at BC1	5.24	142.80
Load Reduction at BC1	0	0
% Reduction required at BC1	0%	0%

A waste load allocation for future mining was included for the segment of Turtle Creek between TC3 and TC1.5 allowing for two operations with two active pits (1500' x 300') to be permitted in the future on this segment.

Table C33. Waste Load Allocations for future mining operations			
Parameter	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	2.26
Future Operation 2			
Al	0.75	0.090	0.56
Fe	3.0	0.090	2.26

TMDL calculations- TC1.5 – Turtle Creek near gauging station in Wilmerding

The TMDL for sample point TC1.5 consists of a load allocation to all of the area between points TC3 and TC1.5 shown in Attachment A. The load allocation for this segment of Turtle Creek was computed using water-quality sample data collected at point TC1.5. The average flow, measured at the sampling point TC1.5 (57.60 MGD), is used for these computations.

Sample data at point TC1.5 shows that this segment has a pH ranging between 8.18 and 9.81; no reductions in acidity are necessary. Table C34 shows the measured and allowable concentrations and loads at TC1.5. Table C35 shows the load reductions necessary to meet water quality standards at TC1.5.

Table C34		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.72	343.94	0.25	120.38
	Iron	1.81	870.53	0.54	261.16
	Acidity	-55.70	-26755.95	-55.70	-26755.95
	Alkalinity	81.85	39317.31		

The measured and allowable loading for point TC1.5 for aluminum and iron was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources. The additional load from points TC3/BC1 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points BC1/TC3 and TC1.5 to determine a total load tracked for the segment of stream between TC1.5 and BC1/TC3. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at TC1.5.

Table C35. Allocations TC1.5		
TC1.5	Al (Lbs/day)	Fe (Lbs/day)
Existing Load at TC1.5	343.94	870.53
Difference in measured loads between the loads that enter and existing TC1.5	104.12	-69.81
Additional load tracked from above samples	11.99	159.85
Total load tracked between TC3/BC1 and TC1.5	116.11	147.06
Allowable Load at TC1.5	120.38	261.16
Load Reduction at TC1.5	0	0
% Reduction required at TC1.5	0%	0%

TMDL calculations- TR2 – Thompson Run in Turtle Creek

The TMDL for sample point TR2 consists of a load allocation to all of the area upstream of this point shown in Attachment A. The load allocation for Thompson Run was computed using water-quality sample data collected at point TR2. The average flow, measured at the sampling point TR2 (8.34 MGD), is used for these computations.

Sample data at point TR2 shows that this segment has a pH ranging between 7.50 and 8.62; pH will not be addressed as water quality standards are being met. Table C36 shows the measured and allowable concentrations and loads at TR2. Table C37 shows the load reductions necessary to meet water quality standards at TR2.

Table C36		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	2.03	141.22	0.10	7.06
	Iron	0.49	34.36	0.35	24.39
	Acidity	-22.70	-1578.77	-22.70	-1578.77
	Alkalinity	51.30	3567.89		

Table C37. Allocations TR2		
TR2	Al (Lbs/day)	Fe (Lbs/day)
Existing Load @ TR2	141.22	34.36
Allowable Load @ TR2	7.06	24.39
Load Reduction @ TR2	134.16	9.97
% Reduction required @ TR2	95%	29%

<u>TMDL calculations- TC1 – Turtle Creek at mouth</u>

The TMDL for sample point TC1 consists of a load allocation to all of the area between TC1.5/TR2 and this point shown in Attachment A. The load allocation for this segment of Turtle Creek was computed using the flow-adjusted concentration method (Attachment D) using data from the two upstream contributing stations, TR2 and TC1.5, and the remaining watershed area (flows derived using the unit area approach; concentration was assumed to be equal to that of TR2). The average flow, the sum of the average flows at sampling points TR2 and TC1.5 (68.11 MGD), is used for these computations.

Water from both contributing upstream stations has pH ranging between 7.1 and 9.6; pH will not be addressed as water quality standards are being met. Table C38 shows the measured and allowable concentrations and loads at TC1. Table C39 shows the load reductions necessary to meet water quality standards at TC1.

Table C38		Measured		Allowable	
		Concentration	Load	Concentration	Load
		mg/L	lbs/day	mg/L	lbs/day
	Aluminum	0.92	522.17	0.18	104.43
	Iron	1.61	914.14	0.55	310.81
	Acidity	-50.62	-28756.82	-50.26	-28756.82
	Alkalinity	77.15	43828.81		

The measured and allowable loading for point TC1 for aluminum and iron was computed using water-quality sample data collected at the point. This was based on the sample data for the point and did not account for any loads already specified from upstream sources.

The additional load from points TC1.5/TR2 shows the total load that was permitted from upstream sources. This value was added to the difference in existing loads between points TR2/TC1.5 and TC1 to determine a total load tracked for the segment of stream between TC1 and TR2/TC1.5. This load will be compared to the allowable load to determine if further reductions are needed to meet the calculated TMDL at TC1.

Table C39. Allocations TC1		
TC1	Al (Lbs/day)	Fe (Lbs/day)
Existing Load at TC1	522.17	914.14
Difference in measured loads between the loads that enter and existing TC1	37.01	9.25
Additional load tracked from above samples	127.44	285.55
Total load tracked between TC1.5/TR2 and TC1	164.45	294.80
Allowable Load at TC1	104.43	310.81
Load Reduction at TC1	60.02	0
% Reduction required at TC1	37%	0%

Margin of Safety

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

- An additional MOS is provided because that the calculations were done with a daily Fe average instead of the 30-day average.

Seasonal Variation

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

Critical Conditions

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

Attachment D

Flow Adjusted Concentration Method (taken from Final Mahanoy Creek TMDL)

Continental Mine Waste Load Allocation

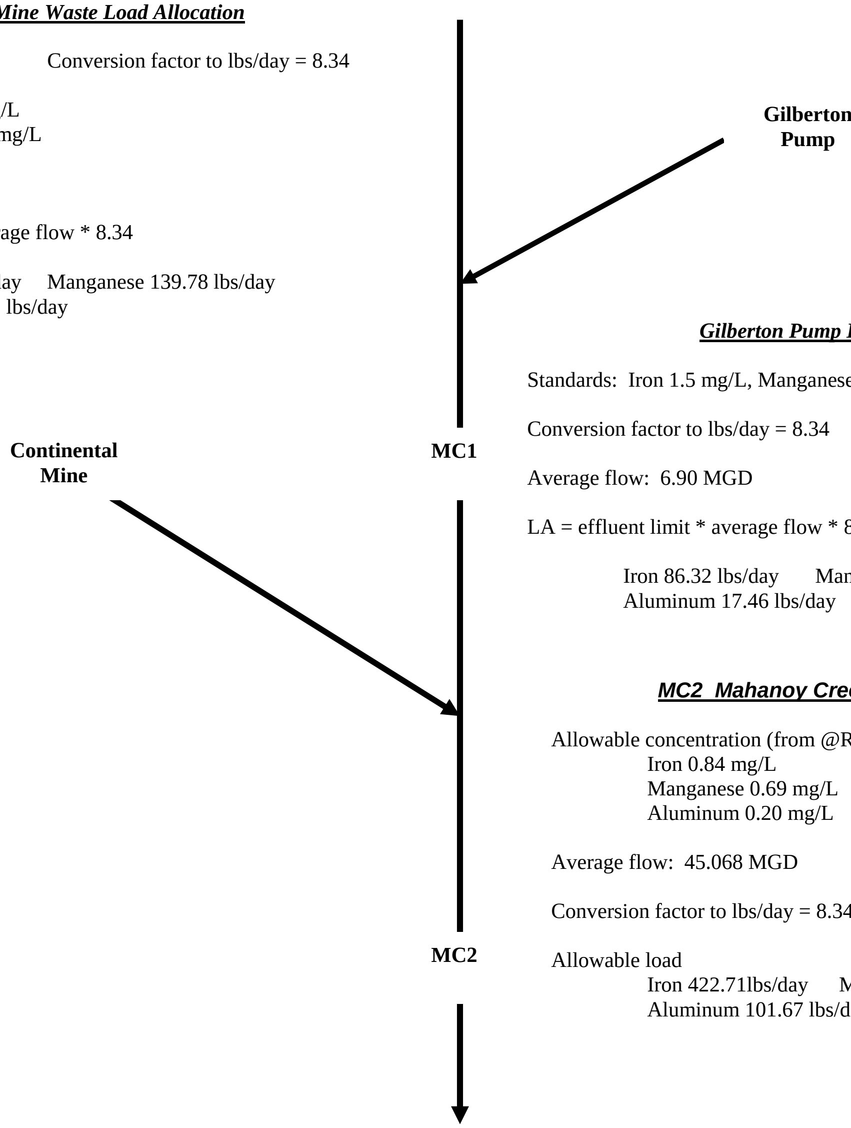
Effluent limits: Conversion factor to lbs/day = 8.34

Iron 3 mg/L
Manganese 2 mg/L
Aluminum 0.75 mg/L

Average flow: 8.38 MGD

WLA = effluent limit * average flow * 8.34

Iron 209.67 lbs/day Manganese 139.78 lbs/day
Aluminum 52.42 lbs/day



Gilberton Pump Load Allocation

Standards: Iron 1.5 mg/L, Manganese 1 mg/L, Aluminum 0.303 mg/L

Conversion factor to lbs/day = 8.34

Average flow: 6.90 MGD

LA = effluent limit * average flow * 8.34

Iron 86.32 lbs/day Manganese 57.55 lbs/day
Aluminum 17.46 lbs/day

MC2 Mahanoy Creek near Gordon

Allowable concentration (from @Risk)
Iron 0.84 mg/L
Manganese 0.69 mg/L
Aluminum 0.20 mg/L

Average flow: 45.068 MGD

Conversion factor to lbs/day = 8.34

Allowable load
Iron 422.71lbs/day Manganese 348.13 lbs/day
Aluminum 101.67 lbs/day

Flow adjusted mass balance method

Total Flow: 8.38 MGD (Continental Mine flow) + 45.068 MGD (instream flow measured at MC2) + 6.90 (Gilberton Pump flow) = 60.348 MGD

Flow ratio to total:
Continental Mine 8.38/60.348 = 0.14 MC2 45.068/60.348 = 0.75 Gilberton Pump 6.90/60.348 = 0.11

Flow adjusted iron concentration at MC2 (2/14/1991) = (flow ratio Continental * iron concentration Continental) + (flow ratio MC2 * iron concentration MC2) + (flow ratio Gilberton * iron concentration Gilberton) = (0.14 * 3) + (0.75 * 15.6) + (0.11 * 30) = 0.42 + 11.70 + 3.30 = 15.42 mg/L

Flow adjusted total allowable iron load @ MC2 = allowable iron concentration from @Risk simulation using average flow adjusted iron concentration @ MC2 * total flow @ MC2 * 8.34
= 0.84 * 60.348 * 8.34 = 422.77 lbs/day iron

TMDL = waste load allocation + load allocation + margin of safety (implicit in model)

LA @ MC2 = TMDL – WLA
= 422.77 – 209.67 = 213.10 lbs/day

TMDL = 422.77 lbs/day iron WLA = 209.67 lbs/day iron* LA = 213.10 lbs/day iron

Attachment E

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

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

<u>Migration to National Hydrography Data (NHD)</u>

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 F

Water Quality Data Used In TMDL Calculations

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
TC8	7/26/2008	1373.02	1.98	4.44	69.2	8.4	843	8	6.02	8.46	1.66
TC8	10/1/2007	1985.26	2.86	3.75	82	0	942	1.5	8.89	7.92	1.87
TC8	3/25/2008	11096.39	15.98	4.85	52.8	9.8	791	30	9.72	8.184	1.452
TC8	7/16/2008	3074.67	4.43	5.03	40.6	10	840	24	7.685	8.389	1.629
	Average	*4382.34*	*6.31*	*4.52*	*61.15*	*7.05*	*854.00*	*15.88*	*8.08*	*8.24*	*1.65*
	StDev	*4531.02*	*6.52*	*0.57*	*18.18*	*4.75*	*63.32*	*13.34*	*1.61*	*0.24*	*0.17*

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
TC7	7/26/2007	2535.45	3.65	7.59	-8.4	50.4	568	1.5	0.25	0.15	0.472
TC7	10/1/2007	2280.84	3.28	5.12	44.8	8.4	801	1.5	2.78	0.84	1.76
TC7	3/26/2008	*15851.26*	*22.84*	6.67	10	12	*	20	7.03	5.08	1.178
TC7	7/16/2008	3481.67	5.01	7.72	-16.6	32.4	776	2.5	0.959	1.112	0.957
	Average	*6037.31*	*8.70*	*6.78*	*7.45*	*25.80*	*715.00*	*6.38*	*2.75*	*1.80*	*1.09*
	StDev	*6563.00*	*9.46*	*1.20*	*27.27*	*19.51*	*127.92*	*9.10*	*3.04*	*2.23*	*0.53*

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
TCT2	10/1/2007	50	0.072	3.21	210.6	0	1265	1.5	28.3	2.99	5.14
TCT2	3/25/2008	*387.5*	*0.56*	2.84	266.2	0	1264	5	29.064	12.445	4.21
Italy Run	4/27/2008	116	0.167156	3.1	240	0	1257		20	7.3	5.2
Italy Run	5/29/2008	171	0.246411	2.5			1270		20	12.12	5.1
	Average	*181.13*	*0.26*	*2.91*	*238.93*	*0.00*	*1264.00*	*3.25*	*24.34*	*8.71*	*4.91*
	StDev	*146.21*	*0.21*	*0.32*	*27.82*	*0.00*	*5.35*	*2.47*	*5.02*	*4.48*	*0.47*

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
TC6	7/26/2007	2908.71	4.19	7.9	-22.6	58.8	581	1.5	0.25	0.15	0.194

TC6	10/2/2007	2838.4	4.09	6.97	-0.2	23.8	811	1.5	0.25	0.15	0.799
TC6	3/26/2008	26710.32	38.49	7.74	-32.8	23.2	470	1.5	4.15	2.95	0.752
TC6	7/17/2008	6410.78	9.24	7.96	-37.2	50.4	749	2.5	0.25	0.451	0.395
	Average	9717.05	14.00	7.64	-23.20	39.05	652.75	1.75	1.23	0.93	0.54
	StDev	11450.94	16.50	0.46	16.51	18.28	155.83	0.50	1.95	1.36	0.29

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
AC1	7/26/2007	1280.11	1.84	8.77	-74.8	101.2	809	1.5	0.25	0.15	0.025
AC1	10/2/2007	1082.53	1.56	7.75	-94	115.8	816	1.5	0.25	0.15	0.025
AC1	3/26/2008	9435.12	13.60	8.7	-76	82.8	650	1.5	0.25	0.15	0.083
AC1	7/15/2008	2084.22	3.00	8.87	-116.2	125	858	2.5	0.25	0.51	0.025
	Average	3470.50	5.00	8.52	-90.25	106.20	783.25	1.75	0.25	0.24	0.04
	StDev	3999.94	5.77	0.52	19.40	18.42	91.43	0.50	0.00	0.18	0.03

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
TC4	7/26/2007	6511.05	9.38	8.31	-34	64.2	749	1.5	0.25	0.15	0.072
TC4	10/2/2007	4949.06	7.13	7.35	-24.8	47.6	842	1.5	0.25	0.15	0.212
TC4	3/26/2008	45472.12	65.53	7.92	-21.7	40.3	563	8	2.333	1.599	0.448
TC4	7/16/2008	7535.95	10.85	8.56	-51.2	64	852	2.5	0.25	0.46	0.107
	Average	16117.05	23.22	8.04	-32.93	54.03	751.50	3.38	0.77	0.59	0.21
	StDev	19598.93	28.24	0.53	13.26	12.01	133.95	3.12	1.04	0.69	0.17

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
TC3	7/27/2007	2887.13	4.16	8.64	-50.4	71.8	802	1.5	0.25	0.15	0.025
TC3	10/2/2007	5604.87	8.07	7.98	-41.2	62.2	818	1.5	0.25	0.15	0.025
TC3	3/26/2008	49410.15	71.20	8.33	-18.6	40.4	550	8	1.954	1.558	0.4
TC3	7/16/2008	8618.90	12.41	9.03	-61.8	73.8	806	2.5	0.25	0.15	0.025
	Average	16630.26	23.96	8.50	-43.00	62.05	744.00	3.38	0.68	0.50	0.12
	StDev	21978.29	31.67	0.45	18.32	15.30	129.51	3.12	0.85	0.70	0.19

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
BC4	7/27/2007	3578.66	5.15	8.2	-84.4	119.1	951	3.5	0.25	0.15	0.025
BC4	10/1/2007	3239.75	4.67	7.83	-80.4	113.8	844	1.5	0.25	0.15	0.025
BC4	3/24/2008	30035.59	43.25	7.88	2.8	116.4	695	8	0.25	0.15	0.104
BC4	7/15/2008	7208.88	10.38	8.3	-130.8	151.8	829	2.5	0.25	0.421	0.025
	Average	*11015.72*	*15.86*	*8.05*	*-73.20*	*125.28*	*829.75*	*3.88*	*0.25*	*0.22*	*0.04*
	StDev	*12806.55*	*18.44*	*0.23*	*55.59*	*17.82*	*104.98*	*2.87*	*0.00*	*0.14*	*0.04*

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
BCT1	10/4/2007	*474.76*	*0.68*	6.16	26.2	102.4	1592	8	0.25	57.1	1.83
BCT1	3/24/2008	*4334.57*	*6.25*	6.26	-48.6	133.2	1475	44	0.25	41.272	1.271
BCT1	7/17/2008	*1040.35*	*1.50*	6.45	-28.6	121.4	1571	24	0.25	52.285	1.624
	Average	*1949.89*	*2.81*	*6.29*	*-17.00*	*119.00*	*1546.00*	*25.33*	*0.25*	*50.22*	*1.58*
	StDev	*2084.46*	*3.00*	*0.15*	*38.73*	*15.54*	*62.38*	*18.04*	*0.00*	*8.11*	*0.28*

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
BCT2	7/27/2007	*205.08*	*0.30*	6.98	-24.4	60.2	1220	10	0.25	1.26	0.512
BCT2	10/4/2007	636.1	0.92	6.36	-14.6	105.4	1150	1.5	0.25	14.5	0.71
BCT2	3/24/2008	3479.19	5.01	6.43	-73.6	105.2	1066	16	0.504	4.888	0.642
BCT2	7/15/2008	*413.11*	*0.60*	6.62	-77	94.2	1126	14	0.25	11.148	0.624
	Average	*1183.37*	*1.71*	*6.60*	*-47.40*	*91.25*	*1140.50*	*10.38*	*0.31*	*7.95*	*0.62*
	StDev	*1540.63*	*2.22*	*0.28*	*32.49*	*21.35*	*63.69*	*6.42*	*0.13*	*5.98*	*0.08*

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
BC3	7/27/2007	12022.10	17.31	6.68	3.8	77.2	1298	44	0.25	23.6	1.01
BC3	10/1/2007	9133.30	13.15	7	-1	82.6	1286	22	0.25	28.4	1.13
BC3	3/25/2008	*38416.10*	*55.36*	6.78	-98.8	109.6	918	12	0.25	9.367	0.389
BC3	7/15/2008	15919.93	22.92	6.96	-87.1	105.3	1215	37	0.25	19.657	0.791

	Average	*18872.86*	*27.18*	*6.86*	*-45.78*	*93.68*	*1179.25*	*28.75*	*0.25*	*20.26*	*0.83*
	StDev	*13322.29*	*19.20*	*0.15*	*54.72*	*16.15*	*177.98*	*14.45*	*0.00*	*8.09*	*0.33*

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
BC2	7/27/2007	*5255.79*	*7.57*	6.89	13.2	74.8	1165	16	0.644	4.89	0.813
BC2	10/1/2007	11023.42	15.87	6.81	13.1	81.3	1189	5.5	0.25	5.99	0.928
BC2	3/25/2008	*44111.38*	*63.56*	7.03	-91.6	112.4	937	12	0.659	6.708	0.403
BC2	7/15/2008	17469.57	25.16	7.25	-90.2	101.6	1136	24	0.25	8.458	0.733
	Average	*19465.04*	*28.04*	*7.00*	*-38.88*	*92.53*	*1106.75*	*14.38*	*0.45*	*6.51*	*0.72*
	StDev	*17171.56*	*24.75*	*0.19*	*60.08*	*17.49*	*115.22*	*7.74*	*0.23*	*1.50*	*0.23*

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
BC1	7/27/2007	*5728.22*	*8.25*	7.54	-41	72	1183	6	0.25	1.94	0.522
BC1	10/2/2007	12466.58	17.95	7.27	-46.2	79.6	1172	1.5	0.25	1.64	0.549
BC1	3/25/2008	*48076.45*	*69.28*	7.29	-97.2	110.4	863	1.5	0.867	7.286	0.586
BC1	7/15/2008	19992.22	28.79	7.87	-89.6	102.4	1097	2.5	0.25	2.102	0.469
	Average	*21565.87*	*31.07*	*7.49*	*-68.50*	*91.10*	*1078.75*	*2.88*	*0.40*	*3.24*	*0.53*
	StDev	*18609.28*	*26.82*	*0.28*	*29.00*	*18.23*	*148.82*	*2.14*	*0.31*	*2.70*	*0.05*

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
TC1.5	7/27/2007	*12970.36*	*18.69*	8.66	-40.4	77.4	1066	4	0.25	0.801	0.17
TC1.5	10/3/2007	*11923.25*	*17.18*	8.18	-48.8	78	1079	1.5	0.818	2.13	0.403
TC1.5	3/26/2008	*108859.14*	*156.87*	8.28	-60.6	84.4	695	6	1.201	2.931	0.409
TC1.5	7/16/2008	*26127.60*	*37.65*	9.81	-73	87.6	1031	2.5	0.595	1.387	0.096
	Average	*39970.09*	*57.60*	*8.73*	*-55.70*	*81.85*	*967.75*	*3.50*	*0.72*	*1.81*	*0.27*
	StDev	*46378.61*	*66.83*	*0.75*	*14.20*	*4.97*	*182.96*	*1.96*	*0.40*	*0.92*	*0.16*

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)

TR2	7/27/2007	*1732.29*	*2.50*	8.06	-22	58.2	1323	1.5	0.569	0.15	0.025
TR2	10/3/2007	*1738.15*	*2.50*	7.74	-19.2	60.2	1428	6	0.516	1.01	0.236
TR2	3/26/2008	*15869.28*	*22.87*	7.5	1.2	24.2	1215	28	6.398	0.666	0.516
TR2	7/16/2008	*3808.83*	*5.49*	8.62	-50.8	62.6	1490	2.5	0.639	0.15	0.091
	Average	*5787.14*	*8.34*	*7.98*	*-22.70*	*51.30*	*1364.00*	*9.50*	*2.03*	*0.49*	*0.22*
	StDev	*6792.14*	*9.79*	*0.48*	*21.40*	*18.16*	*120.90*	*12.48*	*2.91*	*0.42*	*0.22*

Site Name	Date	Flow (gpm)	Flow (MGD)	pH (Field)	Acidity (mg/L)	Alkalinity (mg/L)	Conductivity (uS)	TSS (mg/L)	Al (mg/L)	Fe (mg/L)	Mn (mg/L)
TC1	7/27/2007	*15193.13*	*21.89*	8.57	-37.71	74.59	1103.60	3.63	0.30	0.71	0.15
TC1	10/3/2007	*14112.29*	*20.34*	8.11	-44.21	75.24	1133.14	2.20	0.77	1.96	0.38
TC1	3/26/2008	*128845.02*	*185.67*	8.16	-51.01	75.06	775.66	9.41	2.01	2.58	0.43
TC1	7/16/2008	*30924.47*	*44.56*	9.63	-69.56	83.72	1102.20	2.50	0.60	1.20	0.10
	Average	*47268.73*	*68.11*	*8.62*	*-50.62*	*77.15*	*1028.65*	*4.44*	*0.92*	*1.61*	*0.26*
	StDev	*54924.25*	*79.15*	*0.70*	*13.74*	*4.39*	*169.26*	*3.37*	*0.75*	*0.83*	*0.16*

Underlined values are included at half the detection limit.
All concentrations are given in units of milligrams per liter.

Attachment G

TMDLs and NPDES Permitting Coordination

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

Load Tracking Mechanisms

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

Options for Permittees in TMDL Watersheds

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

Options identified

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

Other possible options

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

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

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

Attachment H
Comment and Response

Comments Received from the Franklin Township Municipal Sanitary Authority (FTMSA)

FTMSA

Franklin Township Municipal Sanitary Authority
3001 Meadowbrook Road
Murrysville, PA 15668-1627

James S. Hamilton, Chairman
David R Perry, Vice-Chairman
Robert Klingensmith, Secretary
William S. Kagarise, Jr., Treasurer
Allan J. Sarver, Asst. Sec.-Treas.

James C. Brucker, Manager
Phones: (724) 327-1950
(724) 468-4847
Plant: (724) 327-6117
FAX: (724) 327-8557
Web Site: www.ftmsa.org

December 17, 2008

Ms. Jennifer Orr
PA Department of Environmental Protection
Bureau of Watershed Management
Rachael Carson State Office Building
PO Box 8555
Harrisburg, PA 17105-8555

RE: DRAFT TURTLE CREEK WATERSHED
TMDL REPORT DATED 10-24-08

Dear Ms. Orr:

Please find attached the Authority's comments as to the above TMDL report for Turtle Creek. If you have any questions, please call.

Very truly yours,

James C. Brucker
Manager

JCB/kas

Enc.

C: Turtle Creek Watershed Assciaton

Hatch Mott MacDonald

Gateway View Plaza, 1600 W. Carson St.
Pittsburgh, PA 15219-1031
T 412.497.2900 www.hatchmott.com

December 16, 2008

Mr. James Brucker, Manager
Franklin Township Municipal Sanitary Authority
3001 Meadowbrook Road
Murrysville, PA 15668

Re: Turtle Creek Watershed TMDL Report Evaluation

Dear Mr. Brucker:

This letter responds to your request to comment on the draft Turtle Creek Watershed TMDL report dated October 24, 2008 that was prepared by the Pennsylvania Department of Environmental Protection (PaDEP)[1]. You specifically requested that Hatch Mott MacDonald review the new TMDL limits, especially the pH and alkalinity requirements near the FTMSA treatment plant and comment on the potential effect on the plant's NPDES permit.

Overview

The basic definition of a Total Maximum Daily Load (TMDL) is the maximum amount of pollution that a waterbody can assimilate without violating state water quality standards. A TMDL reflects a stream's total capacity to accept metals and pH, and maintain levels below water quality criteria, 99% of the time. TMDLs consist of Load Allocations (LA), which are made to non-point sources of pollution; Wasteload Allocations (WLA), which are made to permitted point source discharges plus a Margin of Safety (MOS). TMDLs set allowable loading rates for metals, sediment and acidity at specified points in the watershed.

Setting TMDLs has been required for years, and was mandated by Section 303(d) of the Clean Water Act, passed in 1972. The draft report was prepared to address impairments noted on the 1996 Pennsylvania Section 303(d) list of impaired waters. One stream segment in the Turtle Creek Watershed has been identified as impaired on the 1996 PA 303(d) list due to high concentrations of metals. The listed segment is Turtle Creek, Stream Code 37204, with 16.5 miles degraded. The impairments resulted from abandoned coal mines that discharge acid mine drainage into surface waters within the watershed. The basis of information in the report is field data collected through 2007.

The PaDEP will submit the draft report to the U.S. Environmental Protection Agency (USEPA) for approval. The public comment period on the draft report is open until December 25, 2008.

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[1] Draft Turtle Creek Watershed TMDL, Allegheny and Westmoreland Counties, For Mine Drainage Affected Segments, Pennsylvania Department of Environmental Protection, Oct. 24, 2008.

Hatch Mott MacDonald

TMDL Methodology

Impaired streams are listed on the PA Section 303(d) list with the source and cause. Turtle Creek is listed as an impaired waterway due to metals from acid mine drainage. As such, a TMDL must be developed for the stream segment and each pollutant. In addition to pH, the TMDL addresses three primary metals associated with abandoned mine drainage, namely Iron, Manganese and Aluminum.

A two-step approach is used for the TMDL analysis of acid mine drainage impaired stream segments. The first step uses a statistical method for determining the allowable in-stream concentrations at the point of interest necessary to meet water quality standards. Once the allowable concentration and load for each pollutant is determined, the second step is to conduct 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 TMDL was developed using a method referred to as Monte Carlo Simulation to determine long-term average concentrations that each stream segment could accept and still meet water quality criteria 99% of the time.

For TMDLs applicable to pH, acidity is compared to alkalinity. Each sample point used in the analysis of pH must have measurement for total alkalinity and hot acidity. Statistical procedures are applied, using the average value for total alkalinity at that point as the target to specify a reduction in the acid concentration. By maintaining a net alkaline stream, the pH value will be in the range between 6.0 s.u. to 8.0 s.u. This method negates the need to specifically monitor the pH value, which for streams affected by low pH from acid mine drainage may not be a true reflection of acidity.

Where net alkalinity is positive (greater than or equal to zero), the pH range is most commonly 6.0 to 8.0 s.u., which is within the USEPA's acceptable range of 6.0 to 9.0 s.u., and PA water quality criteria in Chapter 93.

TMDL Sample Data

Review of the TMDL report indicates the FTMSA treatment plant is located closest to Sampling Point TC-4-Turtle Creek Downstream of Saunders Station Road Bridge. The sample point upstream of the FTMSA treatment plant is TC-6-Turtle Creek upstream of Abers Creek. The sample point downstream of the FTMSA treatment plant is TC-3-Turtle Creek upstream of confluence with Brush Creek in Trafford. Sample data for acidity, alkalinity, pH, Aluminum and Iron at these locations are as follows. The TMDL for Sample Point TC-4 consists of a load allocation to all of the area between points TC-6 and TC-4. The TMDL for sample point TC-3 consists of a load allocation to all of the area between TC4 and TC3.

RepRe

Hatch Mott MacDonald

The NPDES permit does not currently include monitoring requirements or effluent limits for Iron and Aluminum therefore there were no available data to compare to the TMDL sample data. As such it is difficult to predict the impact of the treatment plant discharge on the metals concentrations in Turtle Creek. The potential effect of the TMDL development for Iron, Manganese and Aluminum on the FTMSA treatment plant's NPDES permit is uncertain.

It is possible that the NPDES permit may be revised in the future to include monitoring and reporting requirements for these parameters. The cause, however, of the Turtle Creek impairment was determined to be acid mine drainage from coal mines therefore, the responsibility for reducing discharges of these metals would likely be attributed to these sources. Sample data indicates a 0% reduction in Aluminum and Iron loading is required at the sample point closest to the FTMSA treatment plant therefore the plant discharge does not appear to be significantly impacting these metals concentrations in Turtle Creek.

In summary, review of the new TMDL limits indicates a TMDL will not be developed for pH in the impaired section of Turtle Creek because water quality standards for this parameter are already being met. Since a TMDL will not be developed for pH, the treatment plant NPDES permit would likely not be revised for this parameter. The effect of the TMDL development for Aluminum and Iron on the NPDES permit remains uncertain, although the sample data in the report suggests that the source of the metals is attributable to acid mine drainage and not the treatment plant discharge.

If you have any questions regarding this matter, please contact me.

Very truly yours,

Hatch Mott MacDonald

Linda French

Linda French
Project Scientist
T412.497.2912 F412.497.2901
Linda.French@hatchmott.com

LF/iw

cc: Stephen Polen, P.E. - HMM

Response:

The Department thanks FTMSA for its review of the Turtle Creek Watershed TMDL.