UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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Decision Rationale
Total Maximum Daily Loads
For Nutrients and Sediment
Anderson Creek Watershed
Clearfield County, Pennsylvania

Signed

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I. Introduction

This document will set forth the U.S. Environmental Protection Agency's (EPA) rationale for approving Total Maximum Daily Loads (TMDLs) for nutrients and sediment for the Anderson Creek Watershed in Clearfield County, Pennsylvania. The TMDL document was submitted by the Pennsylvania Department of Environmental Protection (PADEP) for final Agency review and was received by EPA on November 3, 2004. This report includes TMDLs for nutrients (phosphorus) and sediment, in addition to three metals (aluminum, iron, and manganese) and pH. Note that this approval and rationale only addresses the non-mining related impairments, nutrients and sediment, and that the mining TMDLs were addressed in a separate decision rationale document (approval date of April 2005). The TMDL report addresses segments first listed on Pennsylvania's 2002 and 2004 Section 303(d) lists of impaired waters. EPA's rationale is based on the TMDL document and supporting information contained in appendices to the document. EPA's review determined that the TMDLs meet the following eight regulatory requirements pursuant to 40 CFR §130.

1. The TMDLs are designed to implement the applicable water quality standards.
2. The TMDLs include a total allowable load as well as individual wasteload allocations (WLAs) and load allocations (LAs).
3. The TMDLs consider the impacts of background pollutant contributions.
4. The TMDLs consider critical environmental conditions.
5. The TMDLs consider seasonal environmental variations.
6. The TMDLs include a margin of safety (MOS).
7. There is reasonable assurance that the TMDLs can be met.
8. The TMDLs have been subject to public participation.

II. Summary

The Anderson Creek Watershed, approximately 78 square miles in area, is located in Clearfield County, Pennsylvania. The watershed lies within the Appalachian Plateau Province and is characterized by rolling hills and narrow valleys. Anderson Creek flows from its headwaters in Pine Township in a southward arc to its confluence with the West Branch of the Susquehanna River in Curwensville. Major tributaries of Anderson Creek include Kratzer Run and Little Anderson Creek. Smaller tributaries include Whitney Run, Burns Run, Bear Run, Irvin Branch, Panther Run, Montgomery Run, Coupler Run, Dressler Run, Blanchard Run, Stony Run, Tanners Run, Bilger Run, Hughey Run, Fenton Run and Rock Run. Land use in the watershed is primarily forested areas (83.9%) followed by agriculture (11.7%), mainly croplands and hay fields, and minimal developed lands (1.3%). Surface coal and clay mines have impacted 2.6% of the watershed. Additionally, most of the soils in the watershed are formed from acidic bedrock. The soils are therefore strongly acidic without much buffering capacity.

Aside from impacts from acid mine drainage (AMD), nutrients and siltation have been identified as pollutants causing aquatic life use impairments in the Anderson Creek Watershed. For TMDL development purposes, PADEP looked at the watershed as being comprised of two subbasins, each affected by a different type of pollutant. Subbasin 1 represents the portion of the watershed affected by siltation and is comprised of Little Anderson Creek and Rock Run, whereas Subbasin 2 is affected by nutrients and is comprised of Kratzer Run and Bilger Run. There are no permitted wastewater discharges in either of the two subbasins. Based on assessment data and visual observations, abandoned mine and agricultural lands are ths sources of the siltation in Subbasin 1. Some areas are sparsely vegetated where acid conditions exist, contributing to significant sediment runoff. There are also portions of the watershed where livestock have unlimited access to the stream, and no riparian buffer exists. For Subbasin 2, the assessment data show the source of nutrients to be on-site wastewater, although there is a significant amount of disturbed and agricultural lands present as well.

Table 1 presents the 2002 and 2004 Section 303(d) listing information for the water-quality limited segments listed with the Anderson Creek Watershed. Note that Table 1 of the TMDL Report differs from the table below due to factors related to the timing of this TMDL approval. During the time between EPA's receipt of PADEP's final TMDL submittal and EPA's approval of the mining related TMDLs for the Anderson Creek Watershed, EPA received Pennsylvania's 2004 Integrated Report. It contained changes listed for segments addressed within the Anderson Creek Watershed TMDL additional to those described in Attachment B of the TMDL Report. Table 1 below incorporates the most recent listing information to date.

TABLE 1. 2002 AND 2004 303(D) NON-AMD LISTINGS FOR ANDERSON CREEK WATERSHED ADDRESSED IN THIS APPROVAL

State Water Plan (SWP) Subbasin 08-B: Upper West Branch Susquehanna River Basin							
Year	***Miles***	***Segment ID***	***DEP Stream Code***	***Stream Name***	***Data Source***	***Source***	***EPA 305(b) Cause Code***
2002	1.08	990506-0950-JLR	26660	Bilger Run	SSWAP	On-site wastewater	Nutrients
2004	1.1	990506-0951-JLR	26660	Bilger Run	SSWAP	On-site wastewater	Nutrients
2002	11.5	990506-0950-JLR	26659	Kratzer Run	SSWAP	On-site wastewater	Nutrients
2004	5.1	990506-0950-JLR	26659	Kratzer Run	SSWAP	On-site wastewater	Nutrients
2004	6.4	990506-0951-JLR	26659	Kratzer Run	SSWAP	On-site wastewater	Nutrients
2004	1.1	990506-0952-JLR	26665	Kratzer Run, UNT	SSWAP	On-site wastewater	Nutrients

2004	1.0	990506-0952-JLR	26670	Kratzer Run, UNT	SSWAP	On-site wastewater	Nutrients
2004	1.3	990506-0952-JLR	26671	Kratzer Run, UNT	SSWAP	On-site wastewater	Nutrients
2004	0.6	990506-0952-JLR	26672	Kratzer Run, UNT	SSWAP	On-site wastewater	Nutrients
2002	15.5	990505-0855-JLR	26687	Little Anderson Creek	SSWAP	Grazing-Related Agriculture	Siltation
2004	5.9	990505-0855-JLR	26687	Little Anderson Creek	SSWAP	Grazing-Related Agriculture	Siltation
2004	6.6	990505-0856-JLR	26687	Little Anderson Creek	SSWAP	Grazing-Related Agriculture	Siltation
2004	0.6	990505-0857-JLR	26688	Little Anderson Creek, UNT	SSWAP	Grazing-Related Agriculture	Siltation
2004	0.4	990505-0857-JLR	26691	Little Anderson Creek, UNT	SSWAP	Grazing-Related Agriculture	Siltation
2004	0.7	990505-0857-JLR	26692	Little Anderson Creek, UNT	SSWAP	Grazing-Related Agriculture	Siltation
2004	0.7	990505-0857-JLR	26693	Little Anderson Creek, UNT	SSWAP	Grazing-Related Agriculture	Siltation
2004	1.2	990505-0857-JLR	26694	Little Anderson Creek, UNT	SSWAP	Grazing-Related Agriculture	Siltation
2004	1.2	990505-0857-JLR	26695	Little Anderson Creek, UNT	SSWAP	Grazing-Related Agriculture	Siltation
2002	3.67	990505-0855-JLR	26689	Rock Run	SSWAP	Grazing-Related Agriculture	Siltation
2004	3.7	990505-0856-JLR	26689	Rock Run	SSWAP	Grazing-Related Agriculture	Siltation
2004	0.57	990505-0857-JLR	26690	Rock Run, UNT	SSWAP	Grazing-Related	Siltation

						Agriculture	

Statewide Surface Water Assessment Program = SSWAP
See Attachment B, Excerpts Justifying Changes Between the 1996, 1998 and Draft 2000 Section 303(d) Lists.
The use designations for the stream segments in this TMDL can be found in PA Title 25 Chapter 93.

Section 303(d) of the Clean Water Act (CWA) and its implementing regulations require a TMDL be developed for those waterbodies identified as impaired by the state where technology-based and other controls will not provide for attainment of water quality standards. These TMDLs were developed to address the impairments caused by excess nutrients and sediments in waters of the Anderson Creek Watershed.

According to Federal regulations at 40 CFR §130.2(g), LAs are best estimates of the nonpoint or background loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Table 2 summarizes the elements of the TMDLs for nutrients (phosphorus) and sediment developed by PADEP. These TMDLs are separated by subbasin to address each impairment. Subbasin 1 address siltation impaired segments, and Subbasin 2 addresses the nutrient impaired segments. Despite the fact that EPA believes that annual loads are an appropriate measure for these TMDLs, we are breaking the annual TMDL loads into daily loads.

TABLE 2. 2002 AND 2004 303(D) NON-AMD LISTINGS FOR ANDERSON CREEK WATERSHED ADDRESSED IN THIS APPROVAL

Subbasin	*Pollutant*	*LA*	*WLA**	*MOS*	*TMDL*		*Existing Load*	*Overall % Reduction*
		lbs/yr	lbs/yr	lbs/yr	lbs/yr	lbs/day	lbs/yr	
Subbasin 1	Sediment	618,016.06	0	68,668.4	686,684.51	1881.3	1,588,248.60	57%
Subbasin 2	Phosphorus	1,408.27	0	156.47	1,564.74	4.3	2,212.10	29%

* No point sources are present within the watershed

A TMDL is a written plan and analysis established to ensure that a waterbody will attain and maintain water quality standards. A TMDL is a scientifically-based strategy which considers current and foreseeable conditions, the best available data, and accounts for uncertainty with the inclusion of a MOS value. Conditions, available data, and the understanding of the natural processes can change more than anticipated by the MOS. If this occurs, the option is always available to refine the TMDL for resubmittal to EPA for approval.

III. Discussion of Regulatory Conditions

EPA finds that Pennsylvania has provided sufficient information to meet all of the eight basic requirements for establishing nutrient (phosphorus) and sediment TMDLs for waters within the Anderson Creek Watershed. EPA therefore approves the TMDLs and information contained in the appendices of the TMDL document. EPA's rationale for approval is set forth according to the regulatory requirements listed below.

1. The TMDLs are designed to implement the applicable water quality standards.

Water Quality Standards consist of three components: designated and existing uses, narrative and/or numerical water quality criteria necessary to support those uses, and an antidegradation statement. The designated use of Anderson Creek and its tributaries from their source to the DuBois Reservoir High Quality-Cold Water Fishes (HQ-CWF). Below the DuBois Reservoir, Anderson Creek and its tributaries are designated as Cold Water Fishes (CWF), with the exception of Bear Run, which is classified as a HQ-CWF from its source to the Pike Township Municipal Authority Dam. Pennsylvania does not currently have specific numeric water quality criteria for nutrients (nitrogen or phosphorus) or sediments. Therefore, Pennsylvania utilized its narrative water quality criteria, which states that "water may not contain substances attributable to point or nonpoint source waste discharges in concentrations or amounts sufficient to be inimical or harmful to the water uses to be protected or to human, animal, plant, or aquatic life"[1], to establish endpoints for phosphorus and sediment such that the designated uses of the Anderson Creek Watershed are attained and maintained.

[1] Pennsylvania Code, Title 25., Environmental Protection, Chapter 93. Water Quality Standards, Section 93.6(a).

In order to numerically express these endpoint consistent with the general water quality criteria, PADEP uses a Reference Watershed Approach in combination with the Arc View Generated Watershed Loading Function (AVGWLF)[2] watershed loading model. The reference watershed is representative of the conditions required for the impaired watershed to meet its designated uses. This representative condition is analyzed to determine an appropriate level of nutrient and sediment loading to the waterbody. The Reference Watershed Approach consists of comparing the biologically-impaired watershed with a reference watershed that is meeting its designated uses for aquatic life to determine an appropriate level of nutrient and sediment loading to the waterbody. This approach is based on comparing the impaired watershed to one with similar designated uses, geology, landuses, physiographic province, land area, soils, and meteorological patterns. The AVGWLF model provides a powerful and accurate means of estimating the dissolved and total nutrient loadings to a stream from the watershed with added Geographic Information Systems capabilities. The model provides monthly streamflow, soil erosion, and sediment yield values and includes both surface runoff and groundwater sources, as well as nutrient loads from point sources and onsite wastewater disposal (septic) systems[3]. Calibration of this model is not required. However, it has been applied and validated to an 85,000 hectare watershed in upstate New York. The rationale of this method is that achieving nutrient and sediment loadings in the impaired watershed similar to those loadings of the reference watershed will ensure that the impaired watershed will attain and maintain its designated uses and general water quality criteria.

The Curry Creek Watershed was used as the reference watershed for comparison with the Anderson Creek watershed to develop the phosphorus and sediment TMDLs. The Curry Creek Watershed is located just west of Anderson Creek and, based on the most recent sampling conducted by PADEP, was found to be attaining its designated CWF uses. Table 3 below compares these watersheds. EPA finds the use of the Curry Creek Watershed as reference watershed to be reasonable for these TMDLs.

TABLE 3. COMPARISON BETWEEN CURRY CREEK AND ANDERSON CREEK WATERSHEDS

Attribute	***Watershed***		
	Subbasin 1	***Subbasin 2***	***Reference***
Physiographic Province	Appalachian Plateau (100%)	Appalachian Plateau (100%)	Appalachian Plateau (100%)
Area (square miles)	21	15	14
Landuse Distribution	Forested (74%) Agriculture (17%) Disturbed (9%)	Forested (73%) Agriculture (21%) Disturbed (4%) Development (2%)	Forested (90%) Agriculture (6%) Disturbed (4%)
Geology	Sandstone - Interbedded Sedimentary (100%)	Sandstone - Interbedded Sedimentary (100%)	Sandstone - Interbedded Sedimentary (100%)
Soils	Udorthents-Ernest-Gilpin Hazleton-DeKalb-Buchanan Gilpin-Ernest-Cavode Hazleton-Cookport-Ernest	Udorthents-Ernest-Gilpin Hazleton-DeKalb-Buchanan Gilpin-Ernest-Cavode	Udorthents-Ernest-Gilpin Hazleton-DeKalb-Buchanan Gilpin-Ernest-Cavode
Dominant Hydro Soil Group	C	C	C

[2] Arcview Generalized Watershed Loading Function model, the Environmental Resources Research Institute of Pennsylvania State University's Arcview based version of the GWLF model developed by Cornell.

[3] Haith, D.A., R. Mandel and R.S. Wu, Generalized Watershed Loading Functions, Version 2.0, Cornell University, Dec. 15, 1992.

K Factor	0.25-0.30	0.25-0.30	0.25-0.30
20-Year Average Rainfall (in)	43.4	43.4	42.1
20-Year Average Runoff (in)	3.2	3.0	2.5

Although both the impaired and reference watersheds are similar in terms of physical characteristics, locations, size, and precipitation, there are differences in the existing landuse practices between each watershed. The Anderson Creek Watershed has a significant presence of abandoned mine lands and lack of vegetation in some areas due to acidic soil conditions. There is a general lack of strip cropping and contour plowing, as well as riparian buffers despite the presence of grazing cattle. Conversely, the Curry Creek Watershed was found to have forest buffers along the streams. Attachment H of the TMDL Report identifies the adjustments made to specific AVGWLF model parameters to account for existing landuse practices in each of these watersheds.

Using the continuous simulation AVGWLF model, the Susquehanna River Basin Commission modeled the nutrient and sediment loads originating from nonpoint sources in the reference watershed for PADEP. As previously mentioned, AVGWLF has the ability to estimate dissolved and total monthly nutrient loads to streams from watersheds including surface runoff, groundwater sources, point sources, septic systems, monthly streamflow, soil erosion, and sediment yield values. In order to make these estimates, AVGWLF requires daily precipitation and temperature data, runoff sources and transport and chemical parameters. The AVGWLF model is a combined distributed/lumped parameter watershed model. In terms of surface loading, this means that the model allows the user to distribute multiple landuse/cover scenarios in the watershed. However, the loads originating from the watershed are lumped, and spatial routing of nutrient and sediment loads is not available. In terms of subsurface loading, the load contributions from subsurface areas are not distinct and are considered lumped using a water balance approach. The AVGWLF model relies on the Soil Conservation Service Curve Number (SCS-CN) to estimate surface runoff and the Universal Soil Loss Equation (USLE) to estimate erosion and sediment yield. Monthly estimates of nutrient and sediment loadings, applicable to each watershed, are generated by using watershed-specific local daily weather inputs and USLE factors[4]. The following average existing load values for phosphorus and sediment, illustrated in Table 4, were determined for the Curry Creek Watershed and the Anderson Creek Watershed using watershed-specific data.[5]

TABLE 4. EXISTING PHOSPHORUS AND SEDIMENT LOADING VALUES FOR THE IMPAIRED AND REFERENCE WATERSHEDS

Watershed	*Area (Acres)*	*Mean Annual Load (lbs/yr)*	*Unit Area Loading Rate (lbs/acre/yr)*
Anderson Creek, Subbasin 1 - Sediment	6626.31	1,588,248.60	239.69

[4] Local daily weather inputs include temperature and precipitation. The USLE factors are KLSCP; K=changes in soil loss erosion, LS=length slope factor, C=vegetation cover factor, P=conservation practices factor.

[5] Local daily weather inputs include temperature and precipitation. The USLE factors are KLSCP; K=changes in soil loss erosion, LS=length slope factor, C=vegetation cover factor, P=conservation practices factor.

Anderson Creek, Subbasin 2 - Phosphorus	9779.61	2212.10	0.23
Curry Creek	8920.60	Sediment: 924,442.80 Phosphorus: 1430.43	Sediment: 103.63 Phosphorus: 0.16

Although nutrients (phosphorus and nitrogen) are listed as the causes of impairment and are subsequently modeled, only a TMDL for phosphorus is being established to help restore the designated uses of the Anderson Creek Watershed. This is due to PADEP's finding that phosphorus is the limiting nutrient in the watershed. A common N:P ratio is 10:1, and an increase in this ratio indicates a limitation of phosphorus[6]. The ratio for Subbasin 2 was determined to be 18:1, indicating that it is phosphorus-limited. Phosphorus is often the major nutrient in shortest supply and is frequently a prime determinant of the total biomass[7]. It is also the most effectively controlled using existing engineering technology and landuse management. EPA finds this to be a reasonable determination.

The final step in the process is to determine the appropriate pollutant loading for the watershed. For the Anderson Creek Watershed, the values generated for sediment and phosphorus loadings were based on those found in the Curry Creek Watershed. In the process of determining the total phosphorus and sediment loadings in the reference watershed, a unit area loading coefficient for the parameter of concern was calculated. Those area loading coefficients were then applied to the Anderson Creek Watershed subbasins to determine the allowable (TMDL) sediment and phosphorus loadings. EPA finds this application reasonable to implement the applicable water quality standards.

Table 5 illustrates the sediment and phosphorus TMDL calculations. The target TMDL values for sediment and phosphorus are determined by multiplying the unit area loading value of the reference watershed by the total area in acreage of the impaired watershed.

TABLE 5. TMDL CALCULATIONS FOR ANDERSON CREEK

Parameter	***Unit area loading rate in Curry Creek Watershed (lbs/acre/yr)***	***Area (acres)***	***TMDL Value (lbs/yr)***
Subbasin 1 - Sediment	103.63	6626.31	686,684.51
Subbasin 2 - Phosphorus	0.16	9779.61	1564.74

EPA finds that the TMDL submitted by PADEP has been appropriately designed to determine the acceptable level of nutrient and sediment loading to Anderson Creek, while ensuring that the applicable water quality standards are attained and maintained.

2. The TMDLs include a total allowable load as well as individual WLAs and LAs.

[6] Horne, A.J. and C.R. Goldman. 1994. Limnology (2nd Edition). McGraw-Hill Inc., New York, New York.

[7] U.S. EPA. 1980. Modeling Phosphorus Loading and Lake Response under Uncertainty: A Manual and Compilation of Export Coefficients. EPA 440/5-80-011.

Tables 2 and 5 indicate the total allowable loads for phosphorus and sediment as determined using the Reference Watershed Approach and the AVGWLF model.

Pennsylvania indicates that there are no non-mining point sources facilities that currently operate within the watershed. Should any facility apply for National Pollutant Discharge Elimination System (NPDES) coverage, the TMDL and allocations should be revisited prior to permit issuance, as EPA interprets the absence of an individual WLA to mean zero discharge.

Federal regulations at 40 CFR 122.44(d)(1)(vii)(B) require that NPDES permit effluent limits to be consistent with the assumptions and requirements of the approved WLA.

The phosphorus and sediment TMDLs include LAs for nonpoint sources. According to Federal regulations, 40 CFR §130.2(g), LAs are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. The AVGWLF process enables the LA to be distributed to sources based on landuse type.

As discussed earlier, LAs for phosphorus and sediment were determined by multiplying the unit area loading rate for each parameter of the Curry Creek Watershed by the total area in the Anderson Creek Watershed. The determination of how LAs are distributed is at the discretion of PADEP. To determine the distribution of the sediment and/or phosphorus LAs between contributing land based sources, PADEP uses a method called the Equal Marginal Percent Reduction (EMPR)[8]. This method equitably assigns the greater reduction requirements to the largest contributing source. The EMPR method assigns equal percent reductions to all baseline loads after adjusting any landuse loads that individually exceed the total LA. This process is established on a site-specific basis and considers several factors regarding ability to affect the pollutant loading processes. The EMPR method is described in Attachment K of the TMDL Report. According to PADEP's analysis, disturbed/abandoned mine land is the major source of sediment loading within Subbasin 1, and cropland is the major source of phosphorus loading within Subbasin 2. Table 6 shows the LAs and reductions of sediment and phosphorus for the various landuses within the Anderson Creek Watershed. Existing sediment loads to this watershed were determined by PADEP utilizing a simple landuse area/loading coefficient methods where the loadings were computed based on landuse type and watershed loading values taken from the AVGWLF model.

TABLE 6. SEDIMENT AND PHOSPHORUS LAS FOR THE ANDERSON CREEK WATERSHED

	Subbasin 1 - Sediment			***Subbasin 2 - Phosphorus***		
Pollutant Source/ Landuse	***Existing Load (lbs/yr)***	***Allocated Load (lbs/yr)***	***Percent Reduction***	***Existing Load (lbs/yr)***	***Allocated Load (lbs/yr)***	***Percent Reduction***
Hay/Pasture	17,200.00	13,265.71	23	103.50	32.22	69
Cropland	157,600.00	121,550.89	23	558.10	83.76	85

[8] Pennsylvania Department of Environmental Protection. June 1986. Implementation Guidance for the Water Quality Analysis Model 6.3. Document 391-2000-007.

Developed	600.00	462.76	23	22.60	8.60	62
Disturbed/Abandoned Mine Land	1,386,249.60	456,136.71	67	320.80	76.58	76
Coniferous Forest	1800.00	1800.00	0	3.30	3.30	0
Mixed Forest	3800.00	3800.00	0	6.30	6.30	0
Deciduous Forest	21,000.00	21,000.00	0	57.80	57.80	0
Groundwater	N/A	N/A	0	1139.70	1139.70	0

EPA finds that PADEP appropriately applied the EMPR method for phosphorus and sediment in the Anderson Creek watershed TMDLs. According to Federal regulations at 40 CFR §130.2(g), LAs are best estimates of the nonpoint or background loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. While it is not necessary to specifically approve an allocation method, EPA believes that the EMPR method used by PADEP is acceptable because it supports three main objectives: (1) to assure compliance with the applicable water quality standard; (2) to minimize the overall cost of compliance, and; (3) to provide maximum equity among competing pollutant sources.

3. The TMDLs consider the impacts of background pollutant contributions.

Pennsylvania has included natural background as a component of the LAs, as required by 40 CFR §130.2(g). There are two separate considerations of background pollutants within the context of these TMDLs. First, there is the inherent assumption of the Reference Watershed Approach that, because of the similarities between the reference and impaired watersheds, the background pollutant contributions will be similar. Therefore, the background pollutant contributions will be considered when determining the loads for the impaired watershed which are consistent with the loads from the reference watershed. Secondly, the AVGWLF model implicitly considers background pollutant contributions through the soil and groundwater component of the model process.

4. The TMDLs consider critical environmental conditions

EPA regulations at 40 CFR §130.7(c)(1) require TMDLs to take into account critical conditions for streamflow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of Anderson Creek is protected during times when it is most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards.[9] In specifying critical conditions in the waterbody, an attempt is made to use a reasonable "worst case" scenario condition. Critical conditions are

[9] EPA Memorandum regarding EPA Actions to Support High Quality TMDLS from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Water Management Division Directors, August 9, 1999.

the combination of environmental factors (*e.g*., flow, temperature) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. For example, stream analysis often uses a low flow (7Q10) design condition as critical because the ability of the waterbody to assimilate pollutants without exhibiting adverse impacts is at a minimum.

Within the context of the Reference Watershed Approach, the assumption is that the reference watershed is achieving its designated use even during critical environmental conditions. Thus, achieving sediment and/or phosphorus loadings in the impaired watershed consistent with that of the reference watershed will effectively consider critical conditions. To account for different flow conditions, the AVGWLF model uses daily average temperature, daily time step and total precipitation values for each year simulated. PADEP modeled each watershed to develop the existing loading values for each watershed. The length of the model time period will also effectively consider critical environmental conditions. EPA finds that Pennsylvania adequately considered critical conditions in the TMDL analysis of the Anderson Creek Watershed.

5. The TMDLs consider seasonal environmental variations.

Seasonal variations involve changes in streamflow as a result of hydrologic and climatological patterns. In the continental United States, seasonally high flow normally occurs during the colder period of winter and in early spring from snowmelt and spring rain, while seasonally low flow typically occurs during the warmer summer and early fall drought periods[10]. The AVGWLF watershed modeling analysis was run for a sufficient time period and appropriately considers seasonal environmental variations. As discussed in Section 4 above, the 20-year simulation period of the model appropriately considers seasonal variations in precipitation and temperature conditions. The model considers seasonal changes requiring specifications of the growing season, hours of daylight for each month, the months in which manure is applied to the land and by using daily time steps for weather data and water balance calculations. EPA finds that both the AVGWLF model and the assumptions of the Reference Watershed Approach effectively consider seasonal environmental variations.

6. The TMDLs include an MOS.

The MOS requirement is intended to add a level of safety to the modeling process to account for any uncertainty. A MOS may be implicit, built into the modeling process, or explicit, taken as a percentage of the WLA, LA, or TMDL. PADEP reserved 10% of the TMDL value for both phosphorus and sediments as the MOS to account for uncertainty in the data and computational methodology used in the analysis. Table 2 indicates the actual value of the MOS for each TMDL. EPA finds this explicit MOS acceptable.

7. There is reasonable assurance that the proposed TMDLs can be met.

[10] U.S. EPA. 1997. Technical Guidance Manual for Developing Total Maximum Daily Loads, Book 2, Part 1, Section 2.3.3. EPA 823-B-97-002.

EPA requires that there is reasonable assurance that TMDLs can be implemented. Regarding the Anderson Creek TMDL for sediment and phosphorus, there exist several programs that can be utilized to help implement the TMDL. With regard to LAs for nonpoint sources, numerous state programs, such as CWA Section 319 and Pennsylvania's Growing Greener programs, are available.

In the sediment and phosphorus, Recommendations for Implementation Section, the TMDL Report highlights various means to treat pollutant sources. As described in the report, reaching the reduction goals established by these TMDLs will only occur through changes in current land use practices and reclamation of abandoned-mine lands, including the incorporation of best management practices (BMPs). BMPs that would be helpful in lowering the amount of sediment and nutrients reaching Anderson Creek include streambank fencing and riparian buffer strips, among many others. In the AMD Recommendations Section, PADEP outlines each of the mines in detail and its priority in remediation efforts. This section illustrates that there are multiple interests in reclaiming these abandoned mines and also explains the general BMPs needed for each particular mine to reach the assigned TMDL allocations.

EPA agrees with PADEP that the reduction goals specified in this TMDL help to set the stage for local citizens to design and implement watershed restoration plans, correct current use impairments.

8. The TMDLs have been subject to public participation.

PADEP published a notice of availability for the anderson Creek Watershed TMDLs for public review and comment in the Pennsylvania Bulletin on December 14, 2002 and in The Progress on January 6, 2003. A public meeting with watershed residents was held on January 9, 2003 at the Anderson Creek Watershed Organization's meeting, in the Pike Township Municipal Building, to discuss the proposed TMDL.

Although not specifically stated in the TMDL Report, PADEP routinely posts the approved TMDL Report on their web site: www.dep.state.pa.us./watermanagement_apps/tmdl.