UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

January 29, 2001

Robert Hoyt
Assistant Secretary
Maryland Department of the Environment
2500 Broening Highway
Baltimore, Maryland 21224

Dear Mr. Hoyt:

The Environmental Protection Agency (EPA) Region III, has reviewed the report "Total Maximum Daily Loads (TMDLs) of Nitrogen and Phosphorus for the Wicomico Creek, Wicomico County, Maryland" which was submitted by the Maryland Department of Environment (MDE) for final agency review on December 14, 2000. Pursuant to 40 CFR Section 130.7(d), EPA is approving the Wicomico Creek TMDLs.

The definition of Load Allocation (LA) at 40 CFR Section 130.2(g) states, in part, that "Load allocations 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." Further, a wasteload allocation (WLA), according to 40 CFR Section 130.2(h), is "The portion of a receiving water's loading capacity that is allocated to one of its existing or future points sources of pollution." In addition, a TMDL is defined at 40 CFR Section 130.2(i) as "The sum of the individual WLAs for point sources and LAs for nonpoint sources and natural background."

The supporting documentation provided with the TMDL report, specifically, the Technical Memorandum provides one allocation scenario for nonpoint source allocation. EPA relied upon this information in reviewing and approving the TMDL submittal and in preparing EPA's Decision Rationale. EPA expects for future TMDLs that the Technical Memorandum will be included in any public notice of the TMDLs.

EPA has determined that the TMDL and technical report are consistent with the regulation and requirements of 40 CFR Section 130 (see enclosed Decision Rationale). Pursuant to 40 CFR Sections 130.6 and 130.7(d)(2), the TMDLs and the supporting documentation, including the Technical Memorandum, should be incorporated into Maryland's current water quality management plan.

If you have any questions or concerns, please contact me at (215) 814-1111 or contact Thomas Henry at (215) 814-5752.

Sincerely,

/s/

Rebecca W. Hanmer, Director
Water Protection Division

Enclosure

Decision Rationale

Total Maximum Daily Load of Nitrogen and Phosphorus for Wicomico Creek, Wicomico and Somerset Counties, Maryland

I. Introduction

This document sets forth the U.S. Environmental Protection Agency (EPA) rationale for approving the Total Maximum Daily Loads (TMDLs) of Nitrogen and Phosphorus for Wicomico Creek as submitted by the Maryland Department of the Environment (MDE) on December 14, 2000. EPA's rationale is based on the TMDLs, the TMDL Technical Memorandum, and other information provided in the submittal document to determine if the TMDLs meets the following eight regulatory conditions pursuant to 40 CFR §130:

1) The TMDLs are designed to implement applicable water quality standards.
2) The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.
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.
7) The TMDLs have been subject to public participation.
8) There is reasonable assurance that the TMDLs can be met.

The Technical Memorandum, *Significant Nutrient Nonpoint Sources in the Wicomico Creek Watershed*, submitted by the Maryland Department of the Environment (MDE), specifically allocates nitrogen and phosphorus to each of 4 separate land use/source categories (direct atmospheric deposition of nitrogen or phosphorus to the water surface is obviously not considered a "land use" source). Each land use or source is allocated some percentage of the total allowed nutrient load originating from nonpoint sources. Current nonpoint source load estimates were based on the Chesapeake Bay Model Phase IV Year 2000 loading coefficients which considers natural background, loads from septic tanks, as well as baseflow contributions. Likewise, the load allocations to each land use also consider natural background, septic tanks and baseflow. Each land use load allocation represents yearly allowable loads of nitrogen and phosphorus. There are no significant point sources to which allocations can be made. Table 1 summarizes the TMDLs for Wicomico Creek as determined by MDE. There are no point sources, therefore the wasteload allocation (WLA) is zero.

Table 1, Summary of Phosphorus and Nitrogen TMDLs[1]

Flow Regime (Period)	Parameter	TMDL	WLA[2]	LA[3]	MOS[4]
Low-flow (May 1 - Oct. 31)	Nitrogen (lbs/month)	1,017	0	969	48
	Phosphorus (lbs/month)	38	0	36	2
Average-flow (Nov. 1 - April 30)	Nitrogen (lbs/year)	104,584	0	101,538	3,046
	Phosphorus (lbs/year)	6,008	0	5,833	175

[1] The load allocations for low-flow represent flows developed using a U.S. Geological Survey regression analysis and 1998 base-flow field data from Wicomico Creek
[2] WLA = Waste Load Allocation
[3] LA = Load Allocation
[4] MOS = Margin of Safety

II. Summary

Wicomico Creek, which is located within Somerset and Wicomico Counties, Maryland, is about 7 miles (11.2 km) long and originates at the impoundment spillage of Allen Pond. The creek drains to the Wicomico River and ultimately to the Chesapeake Bay. Wicomico Creek is tidal throughout its navigable reach, from the confluence with the Wicomico River approximately 7 miles upstream to the impoundment spillage of Allen Pond. The pond serves as the head of tide of the creek. The Wicomico Creek watershed covers about 19,961 acres (31.2 sq. miles). Land uses in the watershed include forest and other herbaceous cover (12,495 acres or 62.6 percent); mixed-use agriculture (5,840 acres or 29.3 percent); water (413 acres or 2.1 percent); and urban areas (1,214 acres or 6.1 percent)[1]. The designated uses of Wicomico Creek, as defined in the Code of Maryland Regulations, are Use I water body (Water Contact Recreation and Protection of Aquatic Life) for all free-flowing tributaries.

In response to the requirements of Section 303(d) of the Clean Water Act (CWA), MDE listed Wicomico Creek on the 1996 303(d) list of impaired waterbodies. The creek is listed as impaired by nutrients based on evidence of eutrophication, including excessive algal blooms and low dissolved oxygen (DO) concentrations. A eutrophic system typically contains an undesirable abundance of plant growth, particularly phytoplankton (photosynthetic microscopic organisms considered algae), periphyton or attached benthic algae, and macrophytes (large vascular rooted aquatic plants)[2]. Excessive plant growth due to eutrophication interferes with the designated uses[3] of Wicomico Creek by (1) disrupting the aesthetics of the river and (2) harming inhabited aquatic communities.

MDE listed nutrients (nitrogen and phosphorus) from nonpoint and natural sources as the cause

[1] This information is based on 1997 Maryland Office of Planning land/land cover data and 1997 Farm Service Agency data.

[2] Protocol for Developing Nutrient TMDLs. First Edition. November 1999. EPA 841-B-99-007.

[3] The designated uses of Wicomico Creek is Use I water body (Water Contact Recreation and Protection of Aquatic Life) for all free-flowing tributaries. See Code of Maryland Regulations 26.08.02.07.

of the eutrophication and subsequent impairments. Section 303(d) of the CWA and its implementing regulations that require TMDLs to be developed for waterbodies identified as impaired where technology-based and other controls cannot attain water quality standards. The TMDLs for Wicomico Creek were determined using the Water Quality Analysis Simulation Program (WASP) model, version 5.1. Maximum loads for total nitrogen and total phosphorus entering Wicomico Creek were established for both low flow and average annual flow conditions. As part of the TMDL analysis, the model was used to investigate seasonal variations and to establish margins of safety that are environmentally conservative. These levels of nitrogen and phosphorus were established to help control eutrophication and subsequent algal blooms. Eutrophication is measured through a surrogate indicator (known as chlorophyll-a); this test will indicate if the water quality criterion for DO is attained.

MDE developed the TMDLs to address the current excessive, nutrient enrichment in Wicomico Creek. The methodology used to develop the TMDLs is designed to satisfy the water quality standards and designated uses of Wicomico Creek for nutrients only. Designated use impairments due to suspended sediments are not addressed by these TMDLs.

To address impairments of Wicomico Creek as indicated on the 303(d) list, MDE believes it is necessary to control excessive nutrient input to the system. Nitrogen and phosphorus influence not only DO concentrations in a waterbody but also biomass (typically characterized as algae or phytoplankton and measured as chlorophyll-a for modeling purposes). Figure 1 (taken from EPA 823-B-97-002, page 2-14) illustrates the interrelationship of major kinetic processes for BOD, DO, and nutrient analysis.

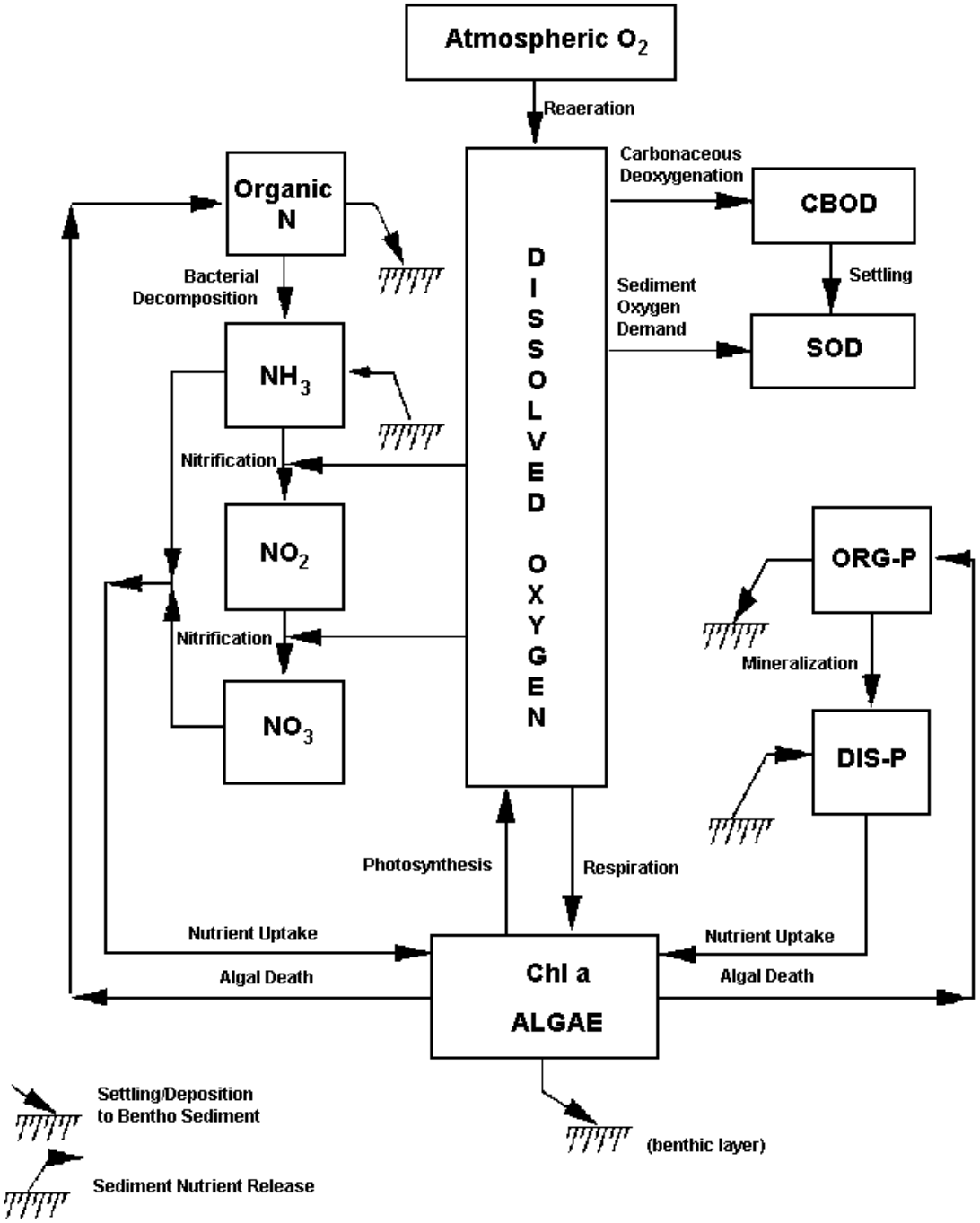

Figure 1

Nutrient enrichment and subsequent algal growth are a concern in rivers and streams because of their effect on DO concentrations. Photosynthesis of growing plants provides a net addition of DO to the waterway during the daylight hours; however, nighttime respiration in eutrophied systems may lower DO levels drastically, affecting the survival of sensitive fish and invertebrate species. In addition, if environmental conditions cause a die-off of either microscopic or macroscopic plants, the decay of biomass can severely depress DO levels. Therefore, excessive plant growth, due to excessive nutrient inputs, can affect a stream's ability to meet both average

daily and instantaneous DO standards[4].

MDE has applied the WASP5[5] to evaluate the link between nutrient loadings, algal growth, and DO. This evaluation is based on representing current conditions within the Wicomico Creek system and determining the necessary reductions in nutrient loadings from various sources to achieve and maintain water quality standards. WASP5 is a general-purpose modeling system for assessing the fate and transport of conventional and toxic pollutants in surface waterbodies[6]. The model can be applied in one, two, or three dimensions and includes two submodels (EUTRO5 and TOXI5) used to investigate water quality/eutrophication and toxics impairments. EUTRO5 can simulate the transport and transformation of eight state variables, including DO, carbonaceous biochemical oxygen demand (CBOD), phytoplankton carbon and chlorophyll-a, ammonia (NH_3), nitrate (NO_3), organic nitrogen (ON), organic phosphorus (OP), and orthophosphate (OPO). WASP5 has been previously applied in a number of regulatory and water quality management applications and is an appropriate linkage evaluation tool for Wicomico Creek. Based on this analysis, MDE has determined that the levels of nutrient input to Wicomico Creek specified by the TMDLs will ensure that water quality standards are achieved, algal blooms are controlled, and DO water quality criterion is maintained.

III. Discussion of Regulatory Conditions

EPA finds that Maryland has provided sufficient information to meet all of the eight basic requirements for establishing nitrogen and phosphorus TMDLs for Wicomico Creek. EPA therefore approves the TMDLs, the TMDL Technical Memorandum, and supporting documentation for nitrogen and phosphorus in Wicomico Creek. EPA approval is outlined according to the regulatory requirements listed below.

1) The TMDL is designed to implement the applicable water quality standards.

MDE has indicated that algal blooms due to excessive nutrient input have caused violations of the water quality standards and designated uses applicable to the Wicomico Creek. As previously mentioned, the Wicomico Creek is designated as Use I. The DO water quality criterion to support this use indicates that DO concentrations may not be less than 5 mg/L at any time. While Maryland does not have numeric water quality criteria for nitrogen and phosphorus, Maryland interprets it's General Water Quality Criteria to provide numerical objectives for nitrogen and phosphorus which will support the DO water quality criterion as well as a surrogate indicator (chlorophyll-a)[7] to determine acceptable algae levels in the

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[4] Technical guidance Manual for Developing Total Maximum Daily Loads, Book 2: Streams and Rivers, Part 1: Biochemical Oxygen Demand/Dissolved Oxygen and Nutrients/Eutrophication. Section 4.2.1.2. March 1997. EPA 823-B-097-002.

[5] Ambrose, R.B., T.A. Wool, and J.L. Martin. 1993. The water quality simulation program, WASP5 version 5.10. Part A: Model documentation. U.S. EPA, ORD, ERL, Athens, GA.

[6] Compendium of Tools for Watershed Assessment and TMDL Development. May 1997. EPA 841-B-97-006.

[7] Chlorophyll-a is typically used as a measure of algal biomass in natural waters because most algae have chlorophyll as the primary pigment for carbon fixation (EPA 823-B-97-002).

Wicomico Creek. Chlorophyll-a is desirable as an indicator because algae are either the direct (e.g. nuisance algal blooms) or indirect (e.g. high/low DO and pH and high turbidity) cause of most problems related to excessive nutrient enrichment[8]. The WASP5 model used by Maryland will help to determine those nutrient levels and compliance with the DO criterion and chlorophyll-a levels.

The presence of aquatic plants in a waterbody can have a profound effect on the DO resources and the variability of the DO throughout a day or from day to day[9]. This is due to the photosynthetic and respiration processes of aquatic plants which can cause large diurnal variations in DO that are harmful to fish. Photosynthesis is the process by which plants utilize solar energy to convert simple inorganic nutrients into more complex organic molecules[10]. Due to the need for solar energy, photosynthesis only occurs during daylight hours and is represented by the following simplified equation (proceeds from left to right):

$$\underset{(Carbon\ Dioxide)}{6CO_2} + \underset{(Water)}{6H_2O} \leftrightarrow \underset{(Sugar)}{C_6H_{12}O_6} + \underset{(Oxygen)}{6O_2}$$

In this reaction, photosynthesis is the conversion of carbon dioxide and water into sugar and oxygen such that there is a net gain of DO in the waterbody. Conversely, respiration and decomposition operate the process in reverse and convert sugar and oxygen into carbon dioxide and water resulting in a net loss of DO in the waterbody. Respiration and decomposition occur at all times and are not dependent on solar energy. Waterbodies exhibiting typical diurnal variations of DO experience the daily maximum in mid-afternoon during which photosynthesis is the dominant mechanism and the daily minimum in the predawn hours during which respiration and decomposition have the greatest effect on DO and photosynthesis is not occurring. In order to ensure that the DO concentration of 5 mg/L is met at all times, MDE calculates both the daily average DO concentrations and the minimum diurnal DO concentrations as a result of photosynthesis and respiration of phytoplankton using the WASP5 model.

In addition to the negative effects on DO, an overabundance of aquatic plant growth adversely impacts the aesthetic and recreational uses of a waterbody by decreasing water clarity and forming unsightly floating algae blooms which also hinder navigation. MDE utilizes chlorophyll-a, a surrogate indicator for algal biomass[11], to evaluate the link between nutrient loadings and aquatic plant levels necessary to support the designated uses of Wicomico Creek. Using their General Water Quality Criteria, MDE establishes a numeric chlorophyll-a goal of 50 µg/L. This level is based on the goals/strategies recommended by

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[8] Supra, footnote 3

[9] Principles of Surface Water Quality Modeling and Control. Robert V. Thomann., and J.A. Mueller. 1987. Page 283.

[10] Surface Water-Quality Modeling. Steven C. Chapra. 1997. Page 347.

[11] Biomass is defined as the amount, or weight, of a species, or group of biological organisms, within a specific volume or area of an ecosystem (EPA 823-B-97-002).

the Algal Bloom Expert Panel to prevent the occurrence of algal blooms similar to those experienced in the Potomac Estuary in 1983[12]. Specifically, the panel believed that nuisance conditions from algal blooms occurred when chlorophyll-a concentrations exceeded 100 µg/l. Similar to the nutrient-DO evaluation, MDE uses the WASP5 model to determine acceptable levels of loadings of nutrients to achieve a chlorophyll-a concentration of 50 µg/l.

EPA finds that the TMDLs for phosphorus and nitrogen will ensure that the designated use and water quality criteria for the Wicomico Creek are met and maintained.

2) *The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.*

Total Allowable Loads

Maryland has identified the summer months as the critical season for excessive algal growth in the Wicomico Creek. During the summer, flow levels in the creek channel are reduced. The slow moving, warmer water has less dilution potential and is more susceptible to eutrophication, subsequent algal blooms, and resulting low DO concentrations. To control the algal growth and its impacts on water quality, particularly DO levels, Maryland has established individual TMDLs for nitrogen and phosphorus that are applicable from May 1 through October 31. Expressing TMDLs as monthly loads is consistent with federal regulations stating that TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure [40 CFR 130.2(i)].

EPA regulations (40 CFR 130.2(i)), define TMDL as the sum of individual WLA for point sources and LA for nonpoint sources and natural background. TMDLs for nitrogen and phosphorus for Wicomico Creek are consistent with Section 130.2(i) because the total loads provided by Maryland equal the sum of the individual WLAs for point sources and the land-based LAs for nonpoint sources as set forth below and in the Technical Memorandum provided with the TMDLs. Pursuant to 40 CFR 130.6 and 130.7(d)(2), the TMDLs, Technical Memorandum, and supporting documentation should be incorporated into Maryland's current water quality management plan. See Table 1 for a summary of the allowable loads.

Waste Load Allocations

No significant point sources have been identified. Therefore, waste loads were not allocated. EPA notes that the TMDLs state that there are concentrated feeding operations of beef cattle and poultry which are contributing significantly the nonpoint source loads. These operations may need to considered for permitting as animal feed operation (AFOs) and therefore would be considered as point sources.

[12] Thomann, R.V., N.J. Jaworski, S.W. Nixon, H.W. Paerl, and J. Taft. March 14, 1985. Algal Bloom Expert Panel. The 1983 Algal Bloom in the Potomac Estuary. Prepared for the Potomac Strategy State/EPA Management Committee.

Load Allocations

Maryland provided adequate land use and loading data in the TMDL report, but did not distribute the total load allocation to specific land use categories in the TMDL report. Maryland included a gross load allocation for the low-flow and average-flow TMDLs (see Table 1).

According to federal regulations at 40 CFR 130.2(g), load allocations 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. Wherever possible natural and nonpoint source loads should be distinguished. Baseline average annual nonpoint source loads, from which reductions are computed, are based on year 2000 EPA Chesapeake Bay Program Phase IV loading coefficients (Year 2000 scenario) watershed model loading rates as applied to 1997 land use acreages. The watershed contains no permitted point sources. Therefore, allowable loads have been allocated to nonpoint sources incorporating an appropriate margin of safety.

The Technical Memorandum provides a breakdown of the LAs for average annual flow. The TMDLs are based on nitrogen and phosphorus loading from the four land uses/sources within the watershed. Specific LAs are presented in Tables 2 and 3 for average flow.

Table 2 - Summary of Load Allocations for Nitrogen (average flow)

Land Use Category	Percent Land Use	Watershed Area (acres)	Percent Nonpoint Source Current Load	Nonpoint Source Current Load (lbs/yr)	Percent Nonpoint Source TMDL Load	Nonpoint Source TMDL Load (lbs/yr)	Percent Reduction Needed (%)
Mixed Agriculture	29.3	5,840	57.1	74,999	50.6	51,378	31
Forest and Other Herbaceous Cover	62.6	12,495	25.8	33,873	33.4	33,873	0
Urban	6.1	1,214	14.3	18,778	12.3	12,498	33
Atmospheric Deposition[1]	2.1	413	2.9	3,789	3.7	3,789	0
Total	100.1	19,962	100	131,439	100	101,538	23

[1] The atmospheric deposition load is attributable to deposition to surface water only. Atmospheric deposition to land surfaces is included in the loads attributed to mixed agriculture, forest and other herbaceous cover, and urban land uses.

Table 3 - Summary of Load Allocations for Phosphorus (average flow)

Land Use Category	Percent Land Use	Watershed Area (acres)	Percent Nonpoint Source Current Load	Nonpoint Source Current Load (lbs/yr)	Percent Nonpoint Source TMDL Load	Nonpoint Source TMDL Load (lbs/yr)	Percent Reduction Needed (%)
Mixed Agriculture	29.3	5,840	79.9	6,558	76.9	4,484	32

Forest and Other Herbaceous Cover	62.6	12,495	9.0	741	12.7	741	0
Urban	6.1	1,214	8.2	672	6.4	372	45
Atmospheric Deposition[1]	2.1	413	2.9	236	4.0	236	0
Total	100.1	19,962	100	8,207	100	5,833	29

[1] The atmospheric deposition load is attributable to deposition to surface water only. Atmospheric deposition to land surfaces is included in the loads attributed to mixed agriculture, forest and other herbaceous cover, and urban land uses.

A breakdown by land use cannot be determined for nonpoint source loads during low flow. These nonpoint source loads which were based on observed concentrations account for "natural" and human-induced components. Table 4 presents the gross LA for low flow.

Table - Summary of low-flow LAs for Nitrogen, Phosphorus, and BOD

Parameter	"Existing"[1] Nonpoint Source Load (lbs/month)	LA (lbs/month)	Reduction needed (%)
Nitrogen	1,017	969	5
Phosphorus	47	36	23

[1] Based on1998 observed field data. Reflects what is considered as current conditions.

Allocations Scenarios

EPA acknowledges that the total loads presented for nitrogen and phosphorus for specific land uses is just one allocation scenario. As the established TMDLs are implemented or more detailed information becomes available, Maryland may find other combinations of land use allocations that are more feasible or cost-effective.

3) The TMDL considers the impacts of background pollutant contributions.

For the low-flow TMDL analysis, Maryland used 1998 field data that would adequately consider pollutant contributions from baseflow. Baseflow is considered to be most influential during low-flow periods, as well as other nonpoint source contributions, such as atmospheric deposition and loads from septic systems.

For the high-flow TMDL analysis, Chesapeake Bay Model Phase IV loading coefficients (Year 2000 scenario) were used; this approach effectively considers natural background, loads from septic tanks, as well as baseflow contributions.

4) The TMDLs consider critical environmental conditions.

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

Critical conditions are important because they describe factors that can combine to result in a violation of water quality standards. As such, critical conditions will help identify actions needed to meet water quality standards.[13] Critical conditions represent the combination of environmental factors (such as flow, temperature, and other parameters) that results in attaining and maintaining the water quality criterion with an acceptably low frequency of occurrence. In specifying critical conditions in the water body, an attempt is made to use a reasonable "worst-case" scenario condition. For example, stream analysis often uses a low-flow (7Q10) design condition as critical because at low flow the water body is least able to assimilate pollutants without exhibiting adverse impacts.

Based on 1998 field data and current knowledge regarding eutrophication, Maryland identified the months of July, August, and September as the critical period for Wicomico Creek. Specific conditions that describe this critical period include reduced stream flows (low-flow), higher concentrations of nutrients, and warmer water temperatures. These conditions combine to create favorable conditions for algal growth and wider fluctuations in DO concentrations. These conditions in turn result in violations of the designated uses and water quality criteria in Wicomico Creek. Furthermore, data from the creek indicated that chlorophyll-a levels were of concern and DO concentrations do not meet water quality criteria. The low-flow TMDL analysis using the WASP5 model adequately considers these critical conditions.

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. Seasonal low flow typically occurs during the warmer summer and early fall drought periods[14]. The WASP5 model and TMDL analysis will effectively consider seasonal environmental variations.

6) The TMDLs include a margin of safety.

This requirement is intended to add a level of safety to the modeling process to account for any uncertainty. Margins of safety may be implicit and be built into the modeling process, or they may be explicit and taken as a percentage of the WLA, LA, or TMDL.

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[13] 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.

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

In terms of the low-flow TMDL analysis for both nitrogen and phosphorus, MDE states that it explicitly allocates 5 percent of the LA value and reserves this for the margin of safety. For the high-flow TMDL analysis, MDE explicitly allocates 3 percent of the LA value and reserves this for the margin of safety.

MDE uses certain conservative assumptions which are implicitly included in the modeling process. The low-flow analysis sets a goal of 50 µg/L for chlorophyll-a, which MDE believes is conservative given the generally acceptable range of chlorophyll-a values for waters meeting their water quality standards of 50 to 100 µg/L. The high-flow analysis assumes conditions of summer water temperatures and summer solar radiation levels; however, these conditions are not likely to occur during typical high flow because high flow regimes occur during winter and spring months of the year. As a result, the high flow analysis may overestimate chlorophyll-a concentrations, providing an even greater margin of safety.

7) The TMDLs have been subject to public participation.

TMDLs for nitrogen and phosphorus in Wicomico Creek were open for public comment from October 27, 2000 to November 27, 2000. A total of 1 set of written comments were received by MDE. The comments and the MDE response document were provided with the TMDL report.

EPA submitted a copy of these TMDLs to the United States Fish and Wildlife Service (USFWS) on October 31, 2000 and to the United States National Marine Fisheries Service (USNMFS) on November 16, 2000. The EPA did not receive a response from the USFWS or USNMFS on the proposed TMDLs.

8) There is a reasonable assurance that the TMDL can be met.

EPA requires that there be a reasonable assurance that the TMDL can be implemented. Nonpoint source controls to achieve LAs can be implemented through a number of existing programs, including EPA's Clean Water Action Plan and Maryland's Water Quality Improvement Act of 1998, and the State's Chesapeake Bay Agreement's Tributaries Strategies for Nutrient Reduction.

MDE believes that agricultural ditching, direct loading from animals, and deposition of nutrient-laden sediment from high-flow events are potential nonpoint sources that negatively impact water quality during critical low-flow periods. MDE believes that nonpoint source control mechanisms are necessary to improve water quality during low-flow periods. MDE states that controlling these nonpoint sources will ensure that water quality standards during low-flow periods will be achieved.

In addition, there will be follow-up monitoring within five years as part of Maryland's Watershed Cycling Strategy. This follow-up monitoring will allow Maryland and EPA to determine whether these TMDLs have been implemented successfully.

IV. Additional Information

The following table presents the TMDLs in pounds per day.

Flow Regime (Period)	Parameter	TMDL	WLA[1]	LA2[2]	MOS[3]
Low-flow (May 1 - Oct. 31)	Nitrogen (lbs/day)[4]	33	0	31.8	1.6
	Phosphorus (lbs/day)[4]	1	0	1.2	0.1
Average-flow (Nov. 1 - April 30)	Nitrogen (lbs/day)	287	0	278.2	8.3
	Phosphorus (lbs/day)	197	0	191.2	5.7

[1] WLA = Waste Load Allocation
[2] LA = Load Allocation
[3] MOS = Margin of Safety
[4] 30.5 days per month was used to convert lbs/month to lbs/day