



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

3/30/2011

Richard Eskin, Ph.D., Director
Technical and Regulatory Service Administration
Maryland Department of the Environment
1800 Washington Blvd., Suite 540
Baltimore, Maryland 21230-1718

Dear Dr. Eskin:

The U.S. Environmental Protection Agency (EPA) is pleased to approve the *Total Maximum Daily Loads (TMDLs) of Fecal Coliform for the Restricted Shellfish Harvesting Area in Monie Bay in Somerset County, Maryland*. The TMDL report was submitted by the Maryland Department of the Environment's letter dated September 30, 2010, and received by EPA for review and approval on October 12, 2010. The TMDL was established and submitted in accordance with Section 303(d)(1)(c) and (2) of the Clean Water Act to address impairments of water quality as identified in Maryland's Section 303(d) List.

In accordance with Federal regulations at 40 CFR §130.7, a TMDL must comply with the following requirements: (1) be designed to attain and maintain the applicable water quality standards; (2) include a total allowable loading and as appropriate, wasteload allocations for point sources and load allocations for nonpoint sources; (3) consider the impacts of background pollutant contributions; (4) take critical stream conditions into account (the conditions when water quality is most likely to be violated); (5) consider seasonal variations; (6) include a margin of safety (which accounts for uncertainties in the relationship between pollutant loads and instream water quality); and (7) be subject to public participation. In addition, the TMDL considered reasonable assurance that the TMDL allocations assigned to the nonpoint sources can be reasonably met. The enclosure to this letter describes how the bacteria TMDL for Monie Bay satisfies each of these requirements.

As you know, all new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL wasteload allocation pursuant to 40 CFR §122.44 (d)(1)(vii)(B). Please submit all such permits to EPA for review as per EPA's letter dated October 1, 1998.

If you have any questions or comments concerning this letter, please do not hesitate to contact María García, Maryland TMDL coordinator, at 215-814-3199.

Sincerely,

Jon M. Capacasa, Director
Water Protection Division

Enclosure

cc: Lee Curry, MDE-TARSA
Melissa Chatham, MDE-TARSA



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Decision Rationale
Total Maximum Daily Loads of
Fecal Coliform for the Restricted Shellfish
Harvesting Area in Monie Bay
Somerset County, Maryland

/S/

Jon M. Capacasa, Director
Water Protection Division

Date: 3/30/11

Decision Rationale
Total Maximum Daily Loads of Fecal Coliform for the
Restricted Shellfish Harvesting Area in Monie Bay
Somerset County, Maryland

I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (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. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a Margin of Safety (MOS), that may be discharged to a water quality limited waterbody.

This document sets forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the TMDL for fecal coliform in the Restricted Shellfish Harvesting Area in Monie Bay. The TMDL was established to address impairments of water quality, caused by fecal coliform, as identified in Maryland's 1996 Section 303(d) List for water quality-limited segments. The Maryland Department of the Environment (MDE) submitted the report, *Total Maximum Daily Loads of Fecal Coliform for the Restricted Shellfish Harvesting Area in Monie Bay in Somerset County, Maryland*, dated July 2010, to EPA for final review on October 12, 2010. The TMDL in this report addresses the fecal coliform impairment in the Monie Bay watershed as identified on Maryland's Section 303(d) List. The basin identification for the Monie Bay watershed is MD-02130302.

EPA's rationale is based on the TMDL Report and information contained in the computer files provided to EPA by MDE. EPA's review determined that the TMDL meets the following seven regulatory requirements pursuant to 40 CFR Part 130.

1. The TMDL is designed to implement applicable water quality standards.
2. The TMDL includes a total allowable load as well as individual wasteload allocations (WLAs) and load allocations (LAs).
3. The TMDL considers the impacts of background pollutant contributions.
4. The TMDL considers critical environmental conditions.
5. The TMDL considers seasonal environmental variations.
6. The TMDL includes a MOS.
7. The TMDL has been subject to public participation.

In addition, the TMDL considered reasonable assurance that the TMDL allocations assigned to nonpoint sources can be reasonably met.

II. Summary

The TMDL specifically allocates the allowable fecal coliform loadings to the restricted shellfish harvesting area in Monie Bay. There are currently no permitted point source facilities included in the WLA component of the TMDL. Therefore, the entire load allocation was assigned to the nonpoint sources of fecal coliform in the Monie Bay watershed. The fact that the TMDL does not assign WLAs to any other source in the watershed should not be construed as a determination by either EPA or MDE that there are no additional sources in the watershed that are subject to the National Pollutant Discharge Elimination System (NPDES) program. In

addition, the fact that EPA is approving this TMDL does not mean that EPA has determined whether some of the sources discussed in the TMDL, under appropriate conditions, might be subject to the NPDES program.

The total permitted fecal coliform load in the Monie Bay watershed is 7.547×10^{12} counts per day. The TMDL was expressed as a median TMDL and a 90th percentile TMDL, which is consistent with the format of Maryland’s bacteriological criteria which assigns numeric threshold criteria for fecal coliform based on the median and 90th percentile. Since the 90th percentile is more stringent in the case of this TMDL, the load allocations for the fecal coliform impairment in the Monie Bay watershed were based on the 90th percentile criterion, as indicated in Table 1.

Table 1. Fecal Coliform 90th Percentile TMDL Summary (counts per day)

Area	TMDL	=	LA	+	WLA	+	MOS
Restricted Shellfish Harvesting Area in Monie Bay	7.547×10^{12}	=	7.547×10^{12}	+	N/A	+	Implicit

The TMDL is a written plan and analysis established to ensure that a waterbody will attain and maintain water quality standards. The TMDL is a scientifically based strategy that considers current and foreseeable conditions, the best available data, and accounts for uncertainty with the inclusion of a MOS value. The option is always available to refine the TMDL for resubmittal to EPA for approval if environmental conditions, new data, or the understanding of the natural processes change more than what was anticipated by the MOS.

III. Background

Monie Bay is located on Maryland’s Eastern Shore in Somerset County, Maryland. The restricted shellfish harvesting area extends from the mouth of the Monie River to the confluence of Monie Bay and Tangier Sound, which is a part of the Chesapeake Bay. The restricted shellfish harvesting area has an area of 3,165 acres and a drainage area of 19,858 acres. Land use data in the Monie Bay watershed shows that the area is primarily rural, with 40.1 percent of the area being forest, 27 percent wetland and 15 percent cropland.

Wicomico River Mesohaline (WICMH) is the Chesapeake Bay segment within which Monie Bay is located. Wicomico River Mesohaline has been identified on Maryland’s 2008 Section 303(d) List as impaired by nutrients (1996), sediments (1996) and fecal coliform (2006). For the fecal coliform listing, the restricted shellfish harvesting area in Monie Bay is specified. A TMDL for nutrients and sediments was established in 2010. This TMDL addresses the fecal coliform impairment in the restricted shellfish harvesting area in Monie Bay only.

The Surface Water Designation Use for the Monie Bay watershed is Use II *Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting*. Maryland’s water quality standards provide bacteriological criteria for Use II waters which state that a public hazard will be presumed if the most probable number (MPN) of fecal coliform exceeds a median concentration of 14 MPN per 100 milliliters or if the 90th percentile concentration exceeds 49 MPN per 100 milliliters for a three tube decimal dilution test. The restricted shellfish harvesting area of Monie Bay was placed on Maryland’s Section 303(d) List because the shellfish harvesting areas within Monie Bay violate Maryland’s protective bacteriological criteria for Use II waters.

CWA Section 303(d) and its implementing regulations require that TMDLs be developed

for waterbodies identified as impaired by the State where technology based and other required controls do not provide for the attainment of water quality standards. In the impaired segments of the Monie Bay watershed, a TMDL was developed through modeling based on data collected throughout the watershed. The purpose for developing the TMDL is to reduce fecal coliform loadings under existing conditions so that water quality standards can be met. Refer to Table 1 above for a summary of allowable loads.

The computational framework utilized for this TMDL was the steady-state single-segment tidal prism model. The methodology used assumes that freshwater input, tidal range, and the first order decay of fecal coliform are all constant. Through the use of the tidal prism model, watershed loads were computed based on tidal flushing, freshwater discharge, and observed fecal coliform concentrations. Table 2 presents the current (baseline) loads of fecal coliform in the restricted shellfish harvesting area in Monie Bay. These loads were calculated based on routine monitoring data collected in the watershed from June 2004 to June 2009. Appendix A of the TMDL Report presents the Tidal Prism Model Calculations for Monie Bay.

Table 2. Summary of Baseline Loads

Waterbody	Fecal Coliform Baseline Loads (counts/day)	
	Median Analysis Scenario	90 th Percentile Analysis Scenario
Restricted Shellfish Harvesting Area in Monie Bay	3.889 x 10 ¹²	1.753 x 10 ¹³

The allowable load for the restricted shellfish harvesting area in Monie Bay was computed through the use of the steady-state single-segment tidal prism model (Appendix A). The allowable load was calculated using the water quality criteria of a median of 14 MPN/100 ml and a 90th percentile of 49 MPN/100 ml. The median and 90th percentile TMDLs are presented in Table 3.

Table 3. Summary of TMDL Loading Caps

Waterbody	Fecal Coliform TMDL (counts/day)	
	Median Analysis	90 th Percentile Analysis
Restricted Shellfish Harvesting Area in Monie Bay	2.196 x 10 ¹²	7.547 x 10 ¹²

The goal of the TMDL allocation is to determine the maximum allowable loads for each known source in the watershed that will ensure the attainment of the water quality standard. The allocations proposed in this TMDL were developed based on the criterion requiring the largest percent reductions, in this case the 90th percentile criterion. The TMDL will therefore require a reduction of approximately 57 percent to attain the 90th percentile water quality criteria.

MDE will achieve the water quality goals of the TMDL by focusing first on the sources of fecal coliform that have the greatest impact on water quality. In order to identify the sources of fecal coliform in the Monie Bay watershed, MDE conducted a Bacterial Source Tracking (BST) analysis. BST is based on the premise that the antibiotic resistance of bacteria isolated from different hosts can be discerned based upon differences in the selective pressure of microbial populations found in the gastrointestinal tract of its host. Twelve months of sampling was conducted in the watershed, from November 2008 to October 2009, to compile data for the BST analysis. The Antibiotic Resistance Analysis (ARA) was the BST approach selected to compare the water quality samples collected to a library of known-source isolates and resistance

patterns. A statistical analysis can then predict the likely host source of the water samples. Table 4 presents the results of the BST analysis for the Monie Bay watershed.

Table 4. Source Distribution Based on Bacterial Source Tracking

Human	Livestock	Pets	Wildlife
28.69%	25.50%	17.26%	28.55%

IV. Discussion of Regulatory Conditions

EPA finds that MDE has provided sufficient information to meet all seven of the basic requirements for establishing a fecal coliform TMDL for the restricted shellfish harvesting area in Monie Bay. EPA, therefore, approves the fecal coliform TMDL for Monie Bay. This approval is outlined below according to the seven regulatory requirements.

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

TMDLs are established to achieve and maintain water quality standards. In the state of Maryland, water quality standards consist of two components: designated and existing uses; and the narrative and/or numerical water quality criteria necessary to support those uses. The fecal coliform impairment addressed in this analysis was determined with reference to Maryland's Classification of Use II Waters for Shellfish Harvesting (Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting).

The water quality criteria for shellfish waters are established under the National Shellfish Sanitation Program (NSSP), a cooperative program that involves states, industry, academic and federal agencies, with oversight by the U.S. Food and Drug Administration (FDA). The NSSP uses fecal coliform as an indicator organism to assess shellfish harvesting waters. When the water quality standard for fecal coliform in shellfish waters is exceeded, waters are closed to shellfish harvesting to protect human health due to the potential risk from consuming raw molluscan shellfish from contaminated waters. The following water quality criteria were established by NSSP to protect Use II Waters for Shellfish Harvesting.

- Approved classification means that the median fecal coliform MPN of at least 30 water sample results taken over a 3-year period to incorporate inter-annual variability does not exceed 14 per 100 milliliters.
- In areas affected by point source discharges, not more than 10 percent of the samples exceed an MPN of 43 per 100 milliliters for a five tube decimal test or 49 MPN per 100 milliliters for a three tube decimal dilution test.
- In other areas, the 90th percentile of water sample results does not exceed an MPN of 43 per 100 milliliters for a five tube decimal dilution test or 49 MPN per 100 milliliters for a three tube decimal dilution test (COMAR 2006)¹.

The water quality impairment in the restricted shellfish harvesting area of Monie Bay was assessed as not meeting the median and 90th percentile criterion at three of the four monitoring

¹ COMAR (Code of Maryland Regulations). 2006. 26.08.02.03-3C(2). <http://www.dsd.state.md.us/comar/26/26.08.02.03-3.htm> (Accessed August, 2006)

stations in Monie Bay. For the water quality assessment, MDE used routine monitoring data collected over a five-year period between July 2004 and June 2009. Two of the stations in the watershed exceeded both the median and the 90th percentile criteria. One of the stations exceeded only the 90th percentile criterion. Table 5 presents the water quality exceedances in the Monie Bay watershed. The goal of this TMDL is to reduce the high fecal coliform concentrations in Monie Bay to levels that meet the criteria associated with the shellfish harvesting designated use.

Table 5. Monie Bay Fecal Coliform Water Quality Monitoring Data

Area	Station	Median		90 th Percentile	
		Monitoring Data	Criterion	Monitoring Data	Criterion
		MPN/100 ml		MPN/100 ml	MPN/100 ml
Restricted Shellfish Harvesting Area in Monie Bay	18-01-010	43	14	240	49
	18-01-013	5	14	43	49
	18-01-019	9	14	59	49
	18-01-108A	43	14	228	49

This TMDL establishes a maximum allowable load for the Monie Bay watershed to ensure attainment of the water quality standard. The allowable loads for the restricted shellfish harvesting area in Monie Bay were computed using both the median concentration water quality criterion of 14 MPN/100 ml and the 90th percentile criterion concentration of 49 MPN/100 ml for a three-tube decimal dilution. Since the 90th percentile is more stringent in the case of this TMDL, the load allocations for the fecal coliform impairment in the Monie Bay watershed were based on the 90th percentile criterion. Table 1 presents the allowable fecal coliform loads allocated to the restricted shellfish harvesting area in Monie Bay. The TMDLs are presented as counts/day of fecal coliform. Appendix A of the TMDL Report presents the methods used to compute the load allocations for the fecal coliform TMDL.

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

Total Allowable Load

EPA regulations at 40 CFR §130.2(i) state *that the total allowable load shall be the sum of individual WLAs for point sources, LAs for nonpoint sources, and natural background concentrations.* The TMDL for fecal coliform in the restricted shellfish harvesting area in Monie Bay is consistent with 40 CFR §130.2(i) because the total loads provided by MDE equal the sum of the individual WLAs for point sources and the land based LAs for nonpoint sources. Pursuant to 40 CFR §130.6 and §130.7(d)(2), this TMDL and the supporting documentation should be incorporated into Maryland’s current water quality management plan. The daily fecal coliform TMDL is presented in Table 1.

Load Allocations

According to Federal regulations at 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. Wherever possible, natural and nonpoint source loadings should be distinguished.

Since there are no permitted point sources of fecal coliform in the Monie Bay watershed,

the entire load allocation was assigned to nonpoint sources. Table 1 presents the load allocation assigned to the nonpoint sources of fecal coliform in the watershed. In order to better identify the specific nonpoint sources of fecal coliform in Monie Bay, MDE conducted BST in the area from November 2008 to October 2009. Based on the BST results, the major sources of fecal coliform in the Monie Bay watershed were humans, wildlife, livestock and pets. Table 4 presents the source distribution of fecal coliform based on the BST results. BST may be used as a tool by MDE during initial implementation efforts.

Wasteload Allocations

There are no permitted municipal or industrial point source facilities with permits regulating the discharge of bacteria in the Monie Bay watershed, based on MDE point source permitting information.

Federal regulations at 40 CFR §122.44(d)(1)(vii)(B) require that, for an NPDES permit for an individual point source, the effluent limitations must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the State and approved by EPA.

There is no express or implied statutory requirement that effluent limitations in NPDES permits necessarily be expressed in daily terms. The CWA definition of “effluent limitation” is quite broad (effluent limitation is “any restriction ... on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources...”). See CWA 502(11). Unlike the CWA’s definition of TMDL, the CWA definition of “effluent limitation” does not contain a “daily” temporal restriction. NPDES permit regulations do not require that effluent limits in permits be expressed as maximum daily limits or even as numeric limitations in all circumstances, and such discretion exists regardless of the time increment chosen to express the TMDL. For further guidance, refer to Benjamin H. Grumbles memo (November 15, 2006) titled *Establishing TMDL Daily Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. v. EPA, et al., No. 05-5015 (April 25, 2006) and implications for NPDES Permits.*

EPA has authority to object to the issuance of an NPDES permit that is inconsistent with WLAs established for that point source. It is expected that MDE will require periodic monitoring of the point source(s) for bacteria, through the NPDES permit process, in order to monitor and determine compliance with the TMDL’s WLAs. Based on the foregoing, EPA has determined that the TMDLs are consistent with the regulations and requirements of 40 CFR Part 130.

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

The TMDL considers the impact of background pollutants by considering the fecal coliform load from natural background sources such as wildlife.

4) The TMDLs consider critical environmental conditions.

EPA regulations at 40 CFR §130.7(c)(1) require TMDLs to account for critical conditions for stream flow, loading, and water quality parameters. The intent of the regulations is to ensure that (1) the TMDLs are protective of human health, and (2) the water quality of the

waterbodies is protected during the times when they are 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 standards². Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable worst-case scenario condition.

In the Monie Bay watershed, the critical condition requirement is implicitly included in the 90th percentile value of the TMDL. A comparison of the median value and the 90th percentile value against the water quality criteria determined that the 90th percentile value represented the higher percent reduction, or more critical condition. If the median values dictate the higher reduction, it suggests, on average, water sample counts are high with limited variation around the mean. If the 90th percentile criterion requires a higher reduction, this suggests an occurrence of high fecal coliform due to the variation of hydrological conditions.

5) The TMDLs consider seasonal environmental variations.

In the Monie Bay fecal coliform TMDL for the restricted shellfish harvesting area, seasonality is implicitly included in the TMDL analysis. The MDE Shellfish Monitoring Program uses a systematic random sampling design that was developed to cover inter-annual variability. The monitoring design and the statistical analysis used to evaluate water quality attainment therefore includes the effect of seasonality. By examining the seasonal variability of fecal coliform, the highest fecal coliform concentration often occurs during the few months of the year that correspond to the critical condition. If loads under the critical condition can be controlled, water quality attainment can be achieved.

6) The TMDLs include a Margin of Safety.

The requirement for a MOS is intended to add a level of conservatism to the modeling process in order to account for uncertainty. Based on EPA guidance, the MOS can be achieved through two approaches. One approach is to reserve a portion of the loading capacity as a separate term, and the other approach is to incorporate the MOS as part of the design conditions.

MDE has adopted an implicit MOS for this TMDL. A decay rate of 0.7 per day was used as a conservative estimate in the TMDL calculation. The decay rate is one of the most sensitive parameters in the model. For a given system, the higher the decay rate, the higher the assimilative capacity. Further literature review supports this assumption as a conservative estimate of the decay rate (MDE 2004)³. The value of the decay rate varies from 0.7 to 3.0 per day in salt water. Therefore, the MOS is implicitly included in the TMDL calculation.

7) The TMDLs have been subject to public participation.

MDE provided an opportunity for public review and comment on the fecal coliform TMDL for the restricted shellfish harvesting area in Monie Bay. The public review and

² 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 Management Division Directors, August 9, 1999.

³ Maryland Department of the Environment. 2004. *Technical Memorandum: Literature Survey of Bacteria Decay Rates*. Baltimore, MD: Maryland Department of the Environment.

comment period was open from August 18, 2010 through September 16, 2010. MDE received no written comments.

A letter was sent to the U.S. Fish and Wildlife Service pursuant to Section 7(c) of the Endangered Species Act, requesting the Service's concurrence with EPA's findings that approval of this TMDL does not adversely affect any listed endangered and threatened species, and their critical habitats.

V. Discussion of Reasonable Assurance

In general, MDE intends for the required reductions to be implemented in an iterative process that first addresses those sources with the greatest impact on water quality, with consideration given to ease of implementation and cost. The iterative approach will help to ensure that the most cost-effective best management practices (BMPs) are implemented first. The source contributions estimated from the BST analysis (Table 4) may be used as a tool to target and prioritize initial implementation efforts. The success of BMP implementation will be evaluated and tracked through follow-up stream monitoring.

It is expected that the BMPs applied to the controllable sources of fecal coliform may also result in the reduction of some wildlife sources. If wildlife sources can not be controlled, managing the overpopulation of wildlife in the watershed may serve as a viable option towards attaining water quality standards in Monie Bay; however, it is not the intended goal of this TMDL.

The following funding sources can be drawn upon by MDE to implement the BMPs in the Monie Bay watershed: MDE's Linked Deposit Program, Bay Restoration Fund, State Water Quality Revolving Loan Fund, Stormwater Pollution Cost Share Program, and the Environmental Quality and Incentives Program. Details on these programs and additional funding sources can be found at <http://www.dnr.state.md.us/bay/services/summaries.html>.

MDE will continue to monitor shellfish waters and classify shellfish harvesting areas as restricted, approved, or conditionally approved in accordance with the Shellfish Certification Program. The removal of shellfish harvesting restrictions may serve as a tracking tool when measuring water quality improvements in the Monie Bay watershed.