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

Dr. Richard A. Eskin, Director
Technical & Regulatory Services Administration
Maryland Department of the Environment
1800 Washington Boulevard, Suite 540
Baltimore, MD 21230-1718

MAR 14 2007

TARSA/TMDL RECORD COPY

Dear Dr. Eskin:

We are in receipt of your letter dated October 30, 2006, requesting the U.S. Environmental Protection Agency's (EPA) approval of a revised bacteria TMDL for the Non-tidal Cabin John Creek Basin in Montgomery County, Maryland. The original bacteria TMDL for the Cabin John Creek Basin was approved by EPA on September 11, 2006. The revision proposed for EPA approval includes modified language for the storm water section of the report, specifically as it concerns the MS4 (Municipal Separate Storm Sewer System) areas.

EPA has reviewed the modified language and believes that the language is consistent with EPA policies and procedures as they relate to the allocation considerations for MS4 areas. Therefore, EPA approves the revised bacteria TMDL for the Cabin John Creek Basin as submitted.

If you have any questions, please call Mr. Thomas Henry, Program Manager, at (215) 814-5752.

Sincerely,

Jon Capacasa, Director
Water Protection Division

cc: Nauth Panday, MDE-TARSA
Melissa Chatham, MDE-TARSA

MAR 1[illegible] 2007

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029
9/11/2006

Dr. Richard Eskin, Director
Technical and Regulatory Services Administration
Maryland Department of the Environment
1800 Washington Boulevard, Suite 540
Baltimore, Maryland 21230-1718

Dear Mr. Eskin:

The Environmental Protection Agency (EPA) Region III is pleased to approve the *Total Maximum Daily Load of Fecal Coliform for the Non-Tidal Cabin John Creek Basin in Montgomery County, Maryland*. The TMDL Report was submitted to EPA for review and approval on January 31, 2006. The TMDL was developed and submitted in accordance with Sections 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 of impaired waters. Maryland identified the non-tidal Cabin John Creek as impaired by fecal coliform.

In accordance with Federal regulations at 40 CFR § 130.7, a TMDL must comply with the following requirements: (1) designed to attain and maintain the applicable water quality standards, (2) include a total allowable loading and as appropriate, wasteload allocations (WLAs) 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), (7) consider reasonable assurance that the TMDL can be met, and (8) be subject to public participation. The enclosure to this letter describes how the TMDL for the fecal colirom impairment for the Cabin John Creek satisfies each of these requirements.

As you know, all new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL WLA 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 don't hesitate to contact Mr. Thomas Henry at 215-814-5752 or Mary Beck at 215-814-3429.

Sincerely,

Signed

Jon M. Capacasa, Director
Water Protection Division

Enclosure

Nauth Panday, MDE-TARSA
Melissa Chatham, MDE-TARSA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029
3/14/2007

Dr. Richard A. Eskin, Director
Technical & Regulatory Services Administration
Maryland Department of the Environment
1800 Washington Boulevard, Suite 540
Baltimore, MD 21230-1718

Dear Dr. Eskin:

We are in receipt of your letter dated October 30, 2006, requesting the U.S. Environmental Protection Agency's (EPA) approval of a revised bacteria TMDL for the Non-tidal Cabin John Creek Basin in Montgomery County, Maryland. The original bacteria TMDL for the Cabin John Creek Basin was approved by EPA on September 11, 2006. The revision proposed for EPA approval includes modified language for the storm water section of the report, specifically as it concerns the MS4 (Municipal Separate Storm Sewer System) areas.

EPA has reviewed the modified language and believes that the language is consistent with EPA policies and procedures as they relate to the allocation considerations for MS4 areas. Therefore, EPA approves the revised bacteria TMDL for the Cabin John Creek Basin as submitted.

If you have any questions, please call Mr. Thomas Henry, Program Manager, at (215) 814-5752.

Sincerely,

Signed

Jon Capacasa, Director
Water Protection Division

cc: Nauth Panday, MDE-TARSA
Melissa Chatham, MDE-TARSA

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

Decision Rationale
Total Maximum Daily Loads
Cabin John Creek Watershed
For Fecal Coliform Affected Non-Tidal Segments
Montgomery County, Maryland

Signed

Jon M. Capacasa, Director
Water Protection Division

Date : *9/11/2006*

Decision Rationale

Total Maximum Daily Fecal Bacteria
for the Non-tidal Cabin John Creek Basin
in Montgomery County, Maryland

I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those water bodies 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, that may be discharged to a water quality-limited water body.

This document sets forth the United States Environmental Protection Agency's (EPA) rationale for approving the TMDLs for fecal bacteria in the Cabin John Creek watershed. The TMDL was established to address impairments of water quality, caused by bacteria as identified in Maryland's 2002 Section 303(d) list. The Maryland Department of the Environment (MDE), submitted the *Total Maximum Daily Loads of Fecal Bacteria for the Non-tidal Cabin John Creek Basin in Montgomery County, Maryland*, dated November 2005 (TMDL Report), to EPA for final review on January 31, 2006. Cabin John Creek watershed (02-14-02-07) was first identified on Maryland's 1996 Section 303(d) list for nutrients and sediments with fecal bacteria and impacts to biological communities added on the 2002 Section 303(d) list. The TMDLs described in this document were developed to address fecal bacteria water quality impairments. The suspended sediment, nutrient, and impacts to the biological communities impairments will be addressed separately by MDE in a separate TMDL document at a future date.

EPA's rationale is based on the TMDL Report and information contained in the computer files provided. EPA's review determined that the TMDLs meet the following eight regulatory requirements pursuant to 40 CFR Part 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. There is reasonable assurance that the TMDLs can be met.
8. The TMDLs have been subject to public participation.

The only NPDES permitted sources within the watershed are the municipal separate stormwater systems (MS4s). They are: Montgomery County (MD0068349) and Prince George's County (MD0068284). Maryland provided adequate land use and instream bacteria data in the TMDL report and allocated the TMDL loads to specific sources. The TMDL shown in Table 1 requires approximately 52.3 percent reduction from existing or baseline conditions.

Table 1- Fecal Bacteria TMDLs Summary

Parameter	Units	Baseline	TMDL	WLA-PS	WLA-MS4[2]	LA[3]	MOS[4]
Fecal Coliform *E. coli*	Billion MPN[1]/day	369.9	176.4	0.0	108.2	68.2	5 % explicit

[1] MPN = Most Probable Number
[2] WLA-PS = Waste Load Allocation for non MS4 systems (municipal or industrial)
[3] WLA-MS4 = Waste Load Allocation for MS4 systems
[4] LA = Load Allocation
[5] MOS = Margin of Safety

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 which considers current and foreseeable conditions, the best available data, and accounts for uncertainty with the inclusion of a "margin of safety" value. Conditions, available data and the understanding of the natural processes can change more than anticipated by the margin of safety. The option is always available to refine the TMDL for re-submittal to EPA for approval.

Background

Cabin John Creek's headwaters originate in the City of Rockville. The creek flows south about 10 miles, passing under Interstate 270, through Cabin John Regional Park, under the Capital Beltway (I-495), and the historic Cabin John Bridge to its confluence with the Potomac River near the towns of Cabin John and Glen Echo. The major tributaries of the Creek are Bogley Branch, Booze Creek, Buck Branch, Congressional Branch, Ken Branch, Old Farm Branch, Snakeden Branch and Thomas Branch (also called Beltway Branch). The Cabin John Creek and all its tributaries are non-tidal. (Friends of Cabin John Creek Watershed: www.cabinjohn.org)

Cabin John Creek watershed has an area of approximately 16,424 acres (25.7 sq. miles). Figure 2.2.1 of the TMDL Report shows the location of Cabin John Creek. Figures 2.1.2 and 2.1.3 of the TMDL Report show the stream system and soils in the watershed and the land uses in the watershed, respectively. Land uses consist of open water (30 acres or 0.2 %), residential (11,987 acres or 73.0 %), commercial (2,178 acres or 13.2 %), forest (2,129 acres or 13.0 %) and pasture (100 acres or 0.6 %).[1] Population density is shown in Figure 2.1.4 of the TMDL Report.

In response to the requirements of Section 303(d) of the CWA, MDE listed Cabin John Creek on the 1996 Section 303(d) list of impaired waterbodies as being impaired by nutrients and sediments. Bacteria and impacts to biological communities impairments were added in 2002. These TMDLs address only the bacteria impairment and the nutrients, sediment, and impacts to biological communities will be addressed at a future date.

[1] This information is based on the 2002 Maryland Department of Planning land cover data.

In 1986, EPA published "Ambient Water Quality Criteria for Bacteria - 1986[2]" whereby three indicator organisms were assessed to determine their correlation with swimming-associated illnesses. Fecal coliform, *E. coli* and enterococci were the indicators used in the analysis. Fecal coliform are a subgroup of total coliform bacteria and *E. coli* are a subgroup of fecal coliform. Most *E. coli* are harmless and are found in great quantities in the intestines of people and warm-blooded animals; however, certain pathogenic strains may cause illness. Enterococci are a subgroup of bacteria in the fecal streptococcus group. Fecal coliform, *E. coli* and enterococci, can all be classified as fecal bacteria. The results of the EPA study demonstrated that fecal coliform showed less correlation to swimming-associated gastroenteritis than either *E. coli* or enterococci.

The non-tidal Cabin John Creek watershed was listed on the Maryland 2002 Section 303(d) list of impaired waters using fecal coliform as the indicator organism. The State of Maryland used the 1986 EPA guidance as the basis of a 2004 water quality standards change from an indicator organism of fecal coliform to *E.coli/*enterococci to fulfill requirements of the Beaches Act of 2000. *E. coli* is the indicator organism used in the Cabin John Creek fecal bacteria TMDL analysis.

The original listing was based on monitoring at the Maryland Department of Natural Resources (DNR) monitoring station CJB0005 located at the mouth of the watershed from January 1997 to April 1998. The TMDL is based on 26 *E. coli* samples were taken between November 2002 and October 2003, 13 bacteria source tracking (BST) samples were taken at station CJB0005 from November 2002 through October 2003.

[2]EPA440/5-84-002, January 1986

II. **Computational Procedure**

General

In addition to the TMDL Report provided during the public notice period, MDE provided EPA with computer files in Microsoft Excel® for review. MDE's procedure uses a variation of the load-duration method which is also used by several states and by EPA. MDE uses stream flow data from United States Geological Survey (USGS) gages and sampling data to determine the bacteria load reductions necessary to meet water quality standards. MDE then uses bacteria source tracking (BST) results to allocate the TMDL loads to various sources, *i.e.*, domestic animals, human sources, livestock, and wildlife.

The load-duration method uses sampling data combined with a long-term stream flow record, frequently from a USGS gaging station, to provide insight into the flow condition under which exceedances of the water quality standard occur. Exceedances that occur under low-flow condition are generally attributed to loads delivered directly to the stream such as straight pipes, sanitary sewer overflows, livestock with access to the stream, and wildlife. Exceedances that occur under high-flow conditions are typically attributed to loads that are delivered to the stream in stormwater runoff. A flow-duration curve is shown in Figure 1 below. The flow duration interval shown across the bottom is the percent of time that a given flow is exceeded. For example, flows at the gaging station exceed 1,500 cubic feet per second (cfs)10 percent of the time.[3]

Figure 1- Example Flow-Duration Curve

[3] *TMDL Development From the "Bottom Up" – Part III: Duration Curves and Wet-Weather Assessment*,2003, Bruce Cleland.

The flow-duration curve is converted to a load-duration curve by multiplying the flow by the bacteria count and the appropriate unit conversion factor (100 ml to cubic feet). An example load-duration curve is shown in Figure 2.

Figure 2 - Example Load-Duration Curve

Frequently the target load shown in Figure 2 is based on the single-sample maximum value from the state's water quality standards. The required load reduction at all flows is equal to the difference between the target load and a line parallel to the target load line which passes through the highest sample value.

Cabin John Creek Computational Method

In order for EPA to conduct a thorough review of MDE's method, MDE provided EPA with Microsoft Excel® files and, therefore, the following description of MDE's computational method refers to information not necessarily contained in the TMDL Report.

There are no USGS gaging stations located within the Cabin John Creek watershed, therefore, MDE used a common method to estimate flow in the stream by using the flow record of a nearby similar watershed, adjusting for the difference in drainage area. MDE used the USGS gage 01650500 located in the Anacostia River watershed on the Northwest Branch near Colesville, MD, with a drainage are of 21.1 square miles, less than the 25.7-square mile Cabin John Creek drainage area. A comparison of the watersheds land use and soil types are shown in Appendix B, Tables B-1 and B-2, respectively. In addition, the gage flow data is incomplete for Station 01650500 for October 1988 through November 1997. The missing flows were estimated using USGS gaging station 0165100, also located on the Northwest Branch near Hyattsville, MD, with a drainage area of 49.4 square miles.

MDE then used a hydrograph separation program, the USGS HYSEP, to analyze the daily flow record to separate surface water flow to Cabin John Creek from interflow[4] and groundwater to the stream. MDE determined that flows below the 30 percent daily flow interval represent surface water flow and are likely to have higher bacteria loads than interflow or groundwater, as shown in Figure B-2, Appendix B of the TMDL Report. Figure B-3 is a plot of the bacteria sampling data vs. the daily flow duration percentile. (The date of the sample determines the flow percentile and is shown in TMDL Report, Appendix A, Table A-1.) The resulting existing geometric means for high flow and low flow are shown in Figure B-3 and in Table 2.3.3 as shown below. Note that all geometric means in the table exceed the 126 MPN/100ml criterion for *E. Coli*.

Table 2 - Existing/Baseline Conditions (TMDL Report, Table 2.3.3)

The seasonal period uses only data from May 1 through September 30, a critical period for the recreational use.

Using the average flow for the high flow and low flow regimes, the baseline bacteria load of 369.9 billion MPN/100ml/day was estimated by the procedure shown in TMDL Report, and

[4]Interflow is that portion of infiltrated rainfall that discharges to a waterbody prior to reaching the groundwater table.

shown in Table 4.3.1. It should be noted that the baseline or existing load shown in the table is incorrect as the F_1 (unit conversion factor) was neglected.

In order to analyze the flow record for periods that might produce higher overall geometric means, each day of the flow record was assigned to either the high flow or low flow regime. MDE used a rolling one-year period to find a year with the most high-flow days and a year with the most low-flow days, and examined each year's swimming season to find the one with the most high-flow days and most low-flow days as shown below.

Table 3 - Critical Time Periods (TMDL Report, Table 4.4.1)

Table 4 - Existing/Baseline Geometric Means for Critical Time Periods[5]

Condition	Dates	Hydrologic Condition	Geometric Mean MPN/100ml
Annual	May 1995-April 1996	Average	210
	May 1996-April 1997	Wet	240
	Nov 2001- Oct 2002	Dry	186
Seasonal	May 2003-Sept 2003	Wet	259
	May 2002-Sept 2002	Dry	240

Again, all geometric means exceed the 126 MPN/100ml criterion.

Bacteria source tracking (BST) was used to identify the relative contribution of bacteria to the instream water samples. TMDL Report, Appendix C, is the Salisbury University, Department of Biological Sciences and Environmental Health Services, BST report, *Identifying Sources of Fecal Pollution in the Cabin John Creek Watershed, Maryland. Enterococci* isolates were obtained from known sources, which included human, dog, cow, goat, horse, pig, sheep, chicken, deer, rabbit, fox, and goose. For purposes of the TMDL, the sources were separated into domestic animals, human, livestock, and wildlife. A fifth classification of "unknown" results from the analysis when the source could not be identified. The source percentage for each sample is shown in Table C-8, Percentage of Sources per Station per Date. The TMDL Report, Section 2.4, Bacteria Source Tracking, explains MDE's procedure to obtain Table 2.4.1, Distribution of Fecal Bacteria Source Loads in the Cabin John Creek Watershed, shown below as Table 5.

Table 5, Distribution of Fecal Bacteria by Sources for Existing/Baseline Sources
(TMDL Report, Table 2.4.1)

[5]Included in the MDE spreadsheet file.

The target reduction for each condition is the reduction necessary in the geometric mean from Table 4 to meet the criterion. A five percent MOS was used so that the geometric mean was reduced to 95 percent of 126 MPN/100ml or 119.5 MPN/100ml. In determining the final reduction scenario, two additional factors were considered: risk and practicability.

Bacteria from human sources are presumed to present a larger risk to humans than bacteria from other sources and bacteria from wildlife presents the lowest risk to humans. Section 4.7, Scenario Descriptions, page 30 identified the assumed risk factors. In addition, some bacteria sources are more easily control. Table 4.7.2, Maximum Practicable Reduction Targets, shown below, identifies the practicable reductions and the rationale for selecting them.

Table 6, Maximum Practicable Reduction Targets (TMDL Report, Table 4.7.2)

The required reduction was determined by analyzing each of the above critical time periods individually, together with the results of the BST analysis, to minimize the final risk. Each critical period's reductions are shown below in Table 7. The reductions shown for each critical period will meet the TMDL. However, adding the source risk factor described in the TMDL Report, Section 4.7, to each critical analysis, discloses that source reductions for the annual wet scenario presents the lowest overall risk to humans.

Table 7, Required Reduction for Each Critical Period (TMDL Report, Table 4.4.2)

The MS4 permit issued to Montgomery County covers the whole county. The WLA-MS4 and LA loads given here for only for the Cabin John Creek watershed portion of the county. Although the entire Cabin John watershed is regulated by the MS4 permit, the physical extent of the MS4 system is unknown and, in the future, it may be determined that loads currently considered part of the WLA-MS4 are actually part of the LA. MDE has allocated loads to the LA based on land use, *i.e.,* land uses not expected to lie within the actual MS4 service area.

With no wastewater treatment plants (WWTPs) present in the Cabin John Creek basin, the human allocation is assigned entirely to LA. Where the entire watershed is covered by a MS4 permit(s), the domestic pet allocation is assigned to the MS4 WLA. Livestock is not covered by MS4 permits and will therefore, be part of the LA when it is not included as part of a CAFO. Wildlife is split between MS4 and LA. This wildlife ratio is estimated based on the amount of urban pervious land (*e.g.*, residential) compared to other pervious land (*e.g.*, pasture, forest).

III. Discussion of Regulatory Conditions

EPA finds that Maryland has provided sufficient information to meet all of the eight basic requirements for establishing bacteria TMDLs for Cabin John Creek. EPA therefore approves the TMDLs for Cabin John Creek. EPA's approval is outlined according to the regulatory requirements listed below.

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

The Maryland water quality standards Surface Water Use Designation for this watershed area is Use I-P – Water Contact Recreation, and Protection of Aquatic Life and Public Water Supply (COMAR 26.08.02.08O).

The standards for bacteria used for Use I Waters—Water Contact Recreation and Protection of Nontidal Warmwater Aquatic Life are contained in COMAR 26.08.02.03-3. For waters not designated natural bathing areas the applicable criteria from Table 1, COMAR 26.08.02.03-3.A.(1)(a) is as follows:

Table 8 - Water Quality Criteria

Indicator	Steady State Geometric Mean Indicator Density
Freshwater	
E. Coli	126 MPN[1]/100ml
Enterococci	33 MPN./100ml
Marine Water	
Enterococci	35 MPN/100ml

[1]MPN - Most Probable Number

The standards do not specify either a minimum number of samples required for the geometric mean or time frame such as the commonly used 30-day period. However, the *2006 List of Impaired Surface Waters [303(d) List] and Integrated Assessment of Water Quality In Maryland*, dated April 2006, Section B.3.2.1.3.1, Recreational Waters, contains MDE's interpretation of how bacteria data will be used for assessing waters for general recreational use. A steady state geometric mean will be calculated with available data where there are at least five representative sampling events. The data shall be from samples collected during steady state conditions and during the beach season (Memorial Day through Labor Day) to be representative of the critical condition. Furthermore, according to Section B.3.2.1.3.2, Beaches, "(t)he single sample maximum criteria applies only to beaches and is to be used for closure decisions based on short-term exceedances of the geometric mean portion of the standard."

EPA finds that the TMDLs for bacteria will ensure that the designated use and water quality criteria for Cabin John Creek are met and maintained.

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

The TMDL is expressed as MPN per day as is based on meeting the instream long-term geometric mean of *e coli* bacteria. EPA's regulations at 40 CFR § 130.2(i), also define "total maximum daily load (TMDL)" as the "sum of individual wasteload allocations for point sources and load allocations for nonpoint sources and natural background." As the total loads provided by Maryland equal the sum of the individual wasteload allocations for point sources and the land-based load allocations for nonpoint sources set forth below, the TMDL for bacteria for Cabin John Creek are consistent with § 130.2(i). Pursuant to 40 CFR §§ 130.6 and 130.7(d)(2), these TMDLs and supporting documentation, should be incorporated into Maryland's current water quality management plan.

The waste load allocation is assigned to the MS4 system. Approximately 98 percent of the watershed is covered by that system. MDE apportioned the load to the MS4 system according to its source. All of the domestic load and none of the human or livestock loads were assigned to the WLA-MS4 load. The wildlife loads were apportioned between the WLA and LA based on the ratio of impervious area in the sewered and unsewered area.

Table 9- Fecal Bacteria TMDL Summary

Parameter	Units	Baseline	TMDL	WLA- PS[2]	WLA-MS4[3]	LA[4]	MOS[5]
Fecal Coliform *E. coli*	Billion MPN[1]/day	369.9	176.4	0.0	108.2	68.2	explicit 5 %

[1] MPN = Most Probable Number
[2] WLA-PS = Waste Load Allocation for non MS4 systems (municipal or industrial)
[3] WLA-MS4 = Waste Load Allocation for MS4 systems
[4] LA = Load Allocation
[5] MOS = Margin of Safety

EPA realizes that the bacteria allocation shown in Table 9 is one allocation scenario designed to meet instream water quality standards. As implementation of the established TMDLs proceed or more detailed information becomes available, Maryland may find other combinations of dividing the TMDL loads between WLA-MS4 and LA allocations are feasible and/or cost effective. Any subsequent changes, however, must ensure that the instream water quality standards are met.

Based on the foregoing, EPA has determined that the Cabin John Creek TMDLs for bacteria are consistent with the regulations and requirements of 40 CFR Section 130.

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

The entire Cabin John Creek watershed is included in this TMDL so there are no upstream loads to be considered. The monitoring data used in developing the TMDL is from instream sampling which integrates the effects of all loads.

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 stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that Cabin John Creek water quality is protected at all times. MDE's water quality standards do not specify a time period for which the geometric mean is calculated. For the designated recreational use, the critical period for exposure is the summer months during the swimming season. To identify critical periods resulting from flow and rainfall conditions, MDE developed a procedure to examine the 15-year flow record for critical high- and low-flow periods of one year and for seasonal (May 1 to September 30) conditions. however, MDE's 2006 Section 303(d) listing methodology identifies the swimming period as Memorial day to Labor Day, the difference in dates does not affect the results of this TMDL The corresponding critical period dates are shown in the TMDL Report Table 4.4.1.

5. The TMDLs consider seasonal environmental variations.

Seasonal variation involve changes in stream flow 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 snow melt and spring rain, while low flow typically occurs during warmer summer and early fall drought periods[6]. MDE's statistical method analyzed flows in Cabin John Creek by dividing them into high- and low-flow regimes and calculated geometric mean bacteria concentrations for each regime in order to evaluate seasonal differences.

6. The TMDLs include a margin of safety.

A margin of safety (MOS) is required as part of a TMDL in recognition of many uncertainties in the understanding and simulation of water quality in natural systems. For example, knowledge is incomplete regarding the exact nature and magnitude of pollutant loads from various sources and the specific impacts of those pollutants on the chemical and biological quality of complex, natural water bodies. The MOS is intended to account for such uncertainties in a manner that is conservative from the standpoint of environmental protection.

Based on EPA guidance, the MOS can be achieved through two approaches (EPA, April 1991). One approach is to reserve a portion of the loading capacity as a separate term in the TMDL. The second approach is to incorporate the MOS as conservative assumptions used in the TMDL analysis.

MDE chose an explicit five percent MOS, *i.e.*, in determining the required reduction the allowable geometric mean was 95 percent of the criterion, or a geometric mean equal to 119.5 MPN/100ml.

[6]Technical Guidance Manual for Developing Total Maximum Daily Loads, Book 2, Part 1, Section 2.33, (EPA 823-B-97-002, 1997)

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

EPA requires that there be a reasonable assurance that the TMDLs can be implemented. According to 40 CFR § 122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available wasteload allocation for the discharge which is prepared by the state and approved by EPA. Therefore, any wasteload allocations will be implemented through the NPDES permit process. The permitted point sources within Cabin John are municipal separate stormwater systems (MS4s).

For these TMDLs, Maryland has several well-established programs that will be drawn upon: the NPDES permit limits will be based on the TMDL loadings, MDE's Managing for Results work plan, and the State's Chesapeake Bay Agreement's Tributary Strategies. Also, Maryland has adopted procedures to assure that future evaluations are conducted for all TMDLs that are established.

Although 98 percent of Cabin John Creek's watershed is covered by the MS4 permit, the loads are generated by stormwater runoff with the final scenario based on reductions that meet the maximum practicable reduction (MPR) targets. These MPR targets were defined based on a literature review of BMPs effectiveness and assuming a zero reduction for wildlife sources. The uncertainty of BMPs effectiveness for bacteria, reported within this literature, is quite large. As an example, pet waste education programs have varying results based on stakeholder's involvement. Additionally, the extent of wildlife reduction associated with various BMPs methods (*e.g.,* structural, non-structural, etc) is uncertain. Therefore, MDE intends for the required reductions to be implemented in an iterative process that first addresses those sources with the largest impact on water quality, with consideration given to ease of implementation and cost. The iterative implementation of BMPs in the watershed has several benefits: tracking of water quality improvements following BMP implementation through follow-up stream monitoring; providing a mechanism for developing public support through periodic updates on BMP implementation; and helping to ensure that the most cost-effective practices are implemented first.

The largest required source load reduction is human. MDE's Managing for Results work plan strategies to reduce the human component from sanitary sewer overflows as described in Section 5.0, Assurance of Implementation. In addition, the State of Maryland is party to a suit against the Washington Suburban Sanitary Commission (WSSC) to remedy recurrent SSOs from the WSSC system.

Finally, Maryland has recently adopted a five-year watershed cycling strategy to manage its waters. Pursuant to this strategy, the State is divided into five regions and management activities will cycle through those regions over a five-year period. The cycle begins with intensive monitoring, followed by computer modeling, TMDL development, implementation activities, and follow-up evaluation. This follow-up monitoring will allow Maryland and EPA to determine whether these TMDLs have been implemented successfully.

8. The TMDLs have been subject to public participation.

MDE conducted two public reviews of the TMDL for bacteria loadings in Cabin John Creek. The first pubic comment period was August 12, 2005 to September 12, 2005. A second public comment period was held November 22, 2005 to December 21, 2005, because of several comments received by MDE during the first comment period. Three sets of written comments were received by MDE from the first comment period, including EPA's on September 12, 2005, and two sets from the second public comment period. These were provided along with MDE's response document with the TMDL report. MDE provided responses to EPA on January 31, 2006, with the final submittal.