

August 28, 2009

Laurie Burt, Commissioner
Department of Environmental Protection
1 Winter Street Boston, MA 02108

Re: Approval of the Pathogen TMDL for Cape Cod Watershed

Dear Commissioner Burt:

Thank you for submitting the Final Pathogen TMDL for the Cape Cod Watershed on August 25, 2009. We appreciate your extensive efforts and involvement with our office to finalize this TMDL. We believe this TMDL combined with the other pathogen watershed TMDLs in various stages of development within the Commonwealth will be a catalyst in the restoration of this and other watersheds.

The U.S. Environmental Protection Agency (EPA) has reviewed the document entitled "Final Pathogen TMDL for the Cape Cod Watershed, August 2009 (Control Number 252.0) and it is my pleasure to approve the 49 TMDLs. EPA has determined, as set forth in the enclosed review document, that these TMDLs meet the requirements of Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 Code of Federal Regulations (CFR) Part 130.

We commend your efforts again to develop "pollution prevention" TMDLs on water body segments not currently impaired. This approach can encourage the maintenance and protection of existing water quality and help prevent further degradation of water bodies that are downstream or linked to other water body segments. Although EPA does not approve pollution prevention TMDLs, EPA acknowledges the establishment of these TMDLs consistent with developing information as set forth in CWA Section 303(d)(3).

Once again, please pass on to your staff in the Division of Watershed Management our appreciation for their excellent work in developing these TMDLs.

Sincerely,

/s/

Ken Moraff, Acting Director
Office of Ecosystem Protection

Enclosure

cc:
Glenn Haas, MassDEP
Rick Dunn, MassDEP
Steve Silva, EPA
Beth Edwards, EPA

EPA NEW ENGLAND'S TMDL REVIEW

DATE: August 28, 2009

TMDL: Cape Cod Watershed Pathogen TMDL

STATUS: Final

IMPAIRMENT/POLLUTANT: Pathogen TMDL for 49 Water Body Segments (See Attachment)

BACKGROUND: Final Pathogen TMDL for the Cape Cod Watershed, August 2009, (Control Number: CN 252.0). The documents submitted by MassDEP as part of the record for this TMDL include:

- Final Pathogen TMDL for the Cape Cod Watershed, August 2009, (Control Number: CN 252.0);
- Public Meeting Information and Response to Comments, Appendix A;
- Massachusetts Surface Water Quality Standards;
- Mitigation Measures to Address Pathogen Pollution in Surface Waters: A TMDL Implementation Guidance Manual for Massachusetts;

REVIEWER: Beth Edwards, telephone number 617.918.1840, e-mail address: edwards.beth@epa.gov

REVIEW ELEMENTS OF TMDLs

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. § 130 describe the statutory and regulatory requirements for approvable TMDLs. The following information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation

Introduction

The Cape Cod Watershed Pathogen TMDL is designed to support reduction of waterborne disease-causing organisms, known as pathogens, to reduce public health risk. Waterborne pathogens enter surface waters from a variety of sources including sewage, the feces of warm-blooded wildlife such as barn-yard animals, pets, geese, gulls, illicit discharges of boat wastes and agricultural applications of manure. These pathogens can pose a risk to human health due to gastrointestinal illness through exposure via ingestion and contact with recreational waters, ingestion of drinking water, and consumption of filter-feeding shellfish.

The Cape Cod Watershed to which this TMDL applies includes 49 water bodies that are impaired for pathogens (see Attachment). The approach outlined in this pathogen watershed TMDL includes two types of daily TMDL targets: 1) the establishment of concentration-based targets (expressed as the number of indicator bacteria organisms (pathogens) per 100 ml) based

on the Water Quality Standards (WQS) for each discharge source by category (e.g., storm water, CSO, etc.) and 2) maximum loads (expressed as the number of indicator bacteria organisms (pathogens) per day) for each stream and embayment segment. The maximum loads are also expressed through daily loadings for each stream segment for high, medium and low stream flow conditions while the embayment segments are expressed as daily loads based on the amount of storm water flow from impervious and pervious areas contributing to the watershed.

The TMDL includes: a) monitoring data related to water quality impairments in each segment (i.e., the TMDL report provides specific data describing the range of pathogen concentrations in each water body), b) a prioritization of discharge outfall sources, river segments and embayment segments based on the concentration of pathogens present, c) a supplementary TMDL Implementation Guidance Manual that suggests ways in which the TMDL can be implemented, and d) the development of “pollution prevention” TMDLs by MassDEP (see Section 13).

The TMDL document provides monitoring data with links to additional data sources and descriptions of sources and prioritizes water body segments that will help agencies/local governments make appropriate decisions to implement this TMDL. For example, for each water body segment, there is a description of the segment and links to additional segment descriptions and additional data sources, a summary of all of the pathogen data, identification of potential sources and recommendations to address the sources. In addition, MassDEP’s decision to define small water body segments, designed to correspond to major potential sources of pollution and land use, further facilitates the identification and prioritization of sources of impairment.

MassDEP provides TMDL targets as concentrations (Table 7-1), and daily mass load TMDL targets (Figure 7-1 and Table 7-2), but believes that concentration based targets are most useful for guiding implementation. Load allocations based on concentration are advantageous for several reasons. In particular, a concentration limit is more readily understandable to the public, and will allow interested citizens and/or watershed groups to more easily determine whether any particular source is exceeding its allocation. This is particularly true for storm water sources because the link between pathogen discharges and rainfall creates a complex relationship between loadings and flow conditions.

Finally, while not required as part of the TMDL approval process, MassDEP, in the document, “Mitigation Measures to Address Pathogen Pollution in Surface Waters: A TMDL Implementation Guidance Manual for Massachusetts” (TMDL Implementation Guidance Manual) which accompanies the TMDL, presents a broad array of implementation tools to address pathogen control. As discussed more fully below, Massachusetts has a variety of regulatory requirements to mitigate pathogens within the Commonwealth.

1. Description of Waterbody, Pollutant of Concern, Pollutant Sources and Priority Ranking

The TMDL analytical document must identify the waterbody as it appears on the State/Tribe's 303(d) list, the pollutant of concern and the priority ranking of the waterbody. The TMDL submittal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and location of the sources. Where it is possible to separate natural background from nonpoint sources, a description of the natural background must be provided, including the magnitude and location of the source(s). Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources; (3) present and future growth trends, if taken into consideration in preparing the TMDL; and, (4) explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments, or chlorophyll a and phosphorus loadings for excess algae.

The TMDL document describes the Cape Cod Watershed and specifically the water body segments identified as not attaining designated uses (primarily contact recreation and shellfishing) due to exceeding Massachusetts' WQS for pathogens. The document identifies a total of 49 impaired segments (Attachment) included on Massachusetts' 2006 Integrated 303(d) list for pathogens.

The TMDL document identifies the non-point and point sources of pathogens that are present and contribute to exceedances of Massachusetts' WQS. As set forth in Sections 4 and 5, the TMDL document articulates both general categories and specific sources of pathogen contributions from the range of possible pathogen source categories. Specific sources identified include storm water run-off, leaking sewer pipes, failing septic systems, wildlife including birds, recreational activities, illicit boat discharges, sanitary sewer overflows and wastewater treatment plants. In addition, MassDEP prioritizes the segments and sources of pathogen impairment in need of mitigation measures (see Sections 5 and 6 of the TMDL document). On a broader scale, MassDEP has determined that all pathogen impaired segments in the Commonwealth are a high priority (see Massachusetts Integrated List of Waters at: <http://www.mass.gov/dep/water/priorities/priorities.htm>). Approximately 24% of the Commonwealth's assessed waters are impaired for pathogens.

Sources of data collected and highlighted by MassDEP in the TMDL suggest that much information is available to assist the public in understanding the sources of pathogen contamination in the Cape Cod Watershed. First, ambient data collected during both dry and wet weather conditions provide an insight into the overall magnitude of sources contributing to the impairment in the Cape Cod Watershed. Second, MassDEP summarizes and provides links to extensive data sets that indicate the nature of the impairment and ranges of pathogens present within each water body segment. As stated above, MassDEP prioritized water body segments based on the concentration of pathogens present, use of the water body and discharge sources (see Sections 5 and 6 of the TMDL document). Moreover, since MassDEP divides the water bodies within the watershed into small, manageable segments, the link of the sources of pathogens to the impairment within each water body segment is more apparent because of the association of land use and the types of sources of pathogens. The assessments and monitoring

that occurs in these spatially-refined water body segments allows for a higher degree of association with the sources of pollution and their ultimate remediation.

Assessment:

EPA concurs with MassDEP's determination to address pathogen impaired waters in the Cape Cod Watershed as a high priority given the growing use of the area for recreation and shellfishing. EPA concludes that the Cape Cod Watershed TMDL document adequately characterizes the nature of the pathogen impairments and causes by summarizing ambient pathogen and storm water outfall data including new data provided during the comment period. MassDEP has relied on the best available information including extensive ambient monitoring during both dry and wet weather conditions and information from other studies and references to characterize the source categories. EPA believes that MassDEP has consequently, appropriately documented the extent of the impairments due to pathogen contamination, as well as the types of sources that are likely to be present that are in need of abatement (see Sections 5 and 6 of the TMDL).

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribe water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard is attained) must be identified. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, usually site specific, must be developed from a narrative criterion and a description of the process used to derive the target must be included in the submittal.

There are Class A, B, SA and SB segments of the Cape Cod Watershed included in this TMDL. The Massachusetts Surface Water Quality Standards include water quality criteria for fecal coliform, E. coli, total coliform and enterococci as indicator organisms of potential harmful pathogens for fresh water and fecal coliform and enterococci for marine waters. The TMDL document presents the applicable Massachusetts WQS in Section 3.0 of the document.

Section 4.0 of the TMDL document describes each of the 49 impaired water segments of the Cape Cod Watershed -- including the water body's designated use, applicable WQS, summary of data, sources of pathogens when available and other characteristics. This section also indicates the water quality classification (A, B, SA or SB) for each segment. The water quality criteria applicable to the A, B, SA and SB segments of the Cape Cod watershed are included in the TMDL document in Tables ES-1 and 7-1.

The EPA approved numeric water quality criteria for each segment are the targets upon which both the daily concentration and load TMDL targets of the TMDL are based.

Assessment:

EPA concludes that MassDEP has properly described and interpreted the applicable water quality standards to set the TMDL targets as indicated in Section 4.0 of the TMDL document. Section 4.0 describes each water body segment -- including the water body's designated use, applicable WQS, summary of data, sources of pathogens when available and other characteristics such as which segments and sources of pathogens are priorities. MassDEP is directly applying the numeric criteria in its WQS to derive the TMDL targets.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

As described in EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards (40 C.F.R. § 130.2(f)). The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. § 130.2(i)). The TMDL submittal must identify the waterbody's loading capacity for the applicable pollutant and describe the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In most instances, this method will be a water quality model. Supporting documentation for the TMDL analysis must also be contained in the submittal, including the basis for assumptions, strengths and weaknesses in the analytical process, results from water quality modeling, etc. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation.

In many circumstances, a critical condition must be described and related to physical conditions in the waterbody as part of the analysis of loading capacity (40 C.F.R. § 130.7(c)(1)). The critical condition can be thought of as the "worst case" scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. 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.

For this TMDL, MassDEP developed two types of daily TMDL targets. First, MassDEP set daily concentration TMDL (WLA/LA) targets for each one of the discharge sources by category (i.e., NPDES discharges, storm water, CSO, etc). MassDEP recommends that the concentration targets be used as the primary guide for implementation. Second, maximum daily loads were developed as a function of watershed size and run-off volume. For streams, since no USGS gages are located in this area, the maximum loads were calculated as a function of the long-term average run-off observed at USGS gages in New England (which accounts for infiltration and evapotranspiration), the watershed size and water quality standard criteria for e-coli and enterococcus applicable to each segment. For embayments, maximum daily loads were calculated as a function of the observed long-term precipitation on Cape Cod, the estimated average run-off associated within 200 feet from each embayment or the entire contributing watershed area for each segment and the most stringent water quality criteria based on segment classification (see Section 7 of the TMDL document for a more detailed description).

1) MassDEP chose to express the loading capacities in terms of concentrations (Table 7-1) set equal to or less than the WQS for several reasons. First, as stated in the TMDL, "MassDEP believes that expressing a loading capacity for bacteria in terms of concentrations set equal to the Commonwealth's adopted criteria provides the clearest and most understandable expression of

water quality goals to the public and to groups that conduct water quality monitoring.” In addition, specific water body segment data are provided that indicate the range in magnitude of the pathogen concentrations for each impaired segment. Based on the data available, MassDEP prioritized the water body segments in need of remediation (See Section 5 and 6 of the TMDL document; specifically Table 6-1, Priority Segments). In the Cape Cod watershed, storm water run-off, illicit connections, leaking sewer pipes, sanitary sewer overflows in sewer areas and failing septic systems are a significant cause of pathogen criteria water quality impairment.

2) In the TMDL, MassDEP also described the approach for estimating daily bacteria loads in rivers. This description was included in the TMDL even though there are currently no river segments on the integrated list for pathogens in the Cape Cod Watershed. As of the date of this document very few river segments have been assessed on Cape Cod. A description of the approach for developing loads for rivers was included for future possible reference in the event that a river segment(s) is listed as impaired for bacteria.

As stated above, MassDEP believes the concentration targets are most useful for evaluating whether a particular source is exceeding its allocation because it does not require complex simultaneous flow measurement. The mass loadings for each waterbody segment provide information on the degree of relative assimilative capacity available in each waterbody and identify the loads necessary to meet quality standards

Assessment:

There is nothing in EPA’s regulations that forbids expression of a TMDL in terms of multiple TMDL targets. TMDLs can be expressed in various ways, including in terms of toxicity, which is a characteristic of one or more pollutants, or by some “other appropriate measure.” 40 C.F.R. § 130.2(i). The target loading capacities expressed in the TMDL document are set at levels which assure WQS will be met (criteria at point of discharge and loading based on meeting ambient water quality criteria). The concentration loading capacity is based on the concentration criteria for each water body. If all sources of pathogens are below the water quality criteria then it follows that the receiving water will meet the WQS for bacteria.

Both formats (concentration and load) express targets designed to attain the designated use of each waterbody segment based on a straight forward derivation of TMDL targets from the water quality criteria adopted by the Commonwealth. Both formats will achieve water quality criteria for both dry and wet weather and for all storm events whenever they occur (e.g. on any given day), whenever the bacteria criteria are in effect. These approaches have been used by states for TMDL development and approved by EPA in the past.

The daily maximum loads were calculated by multiplying the concentration criterion by stream flow or storm water run-off to calculate a daily mass loading. The loading capacity expressed in this way is mathematically derived to assure that the sum of the loads to the receiving water from either the stream flow and/or storm water will result in a concentration at the water quality standard.

In sum, the above loading capacity targets are directly linked to the Commonwealth's WQS' pathogen criteria to achieve the designated use of the water bodies covered by this TMDL.

4. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background (40 C.F.R. § 130.2(g)). Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. § 130.2(g)). Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.

If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero load allocation, the LA must be expressed as zero. If the TMDL recommends a zero LA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero LA implies an allocation only to point sources will result in attainment of the applicable water quality standard, and all nonpoint and background sources will be removed.

The TMDL sets the target load allocations for non-NPDES regulated point sources, non-point sources and background equal to either the applicable water quality standard of the receiving water or to zero if the origin of the source is prohibited (e.g., failing septic systems) (Table7-1). The difference between the LAs and WLAs (discussed in the next Section) is the source of the discharge and whether it is regulated under the NPDES program.

The storm water load allocation for each stream segment throughout the Cape Cod watershed is zero since the runoff from pervious areas is negligible due to the highly pervious soils on Cape Cod. However, as discussed in the next section on wasteload allocations, storm water mass (colonies/day) allocations were developed for embayments and are included in the wasteload allocation.

Assessment:

As discussed in Section 3, MassDEP used the applicable numeric water quality criteria directly related to the use impairment which the TMDL is designed to address. As discussed in Section 6 under margin of safety, MassDEP set conservative targets based on meeting criteria at the point of source discharge. The aggregate mass load allocation for storm water is derived from the applicable criteria, flow, and land cover data and is included in the wasteload allocation. As discussed in Section 5, EPA concludes that load allocations are adequately specified in the TMDL at levels necessary to attain and maintain WQS.

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources (40 C.F.R. § 130.2(h)). If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero. If the TMDL recommends a zero WLA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero WLA implies an allocation only to nonpoint sources and background will result in attainment of the applicable water quality standard, and all point sources will be removed.

In preparing the wasteload allocations, it is not necessary that each individual point source be assigned a portion of the allocation of pollutant loading capacity. When the source is a minor discharger of the pollutant of concern or if the source is contained within an aggregated general permit, an aggregated WLA can be assigned to the group of facilities. But it is necessary to allocate the loading capacity among individual point sources as necessary to meet the water quality standard.

The TMDL submittal should also discuss whether a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. In such cases, the State/Tribe will need to demonstrate reasonable assurance that the nonpoint source reductions will occur within a reasonable time.

Point source discharges subject to the NPDES permit program must be addressed by the wasteload allocation component of a TMDL, as required by 40 C.F.R. § 130.2(h). MassDEP has established WLA targets for concentration (colonies/100ml) by discharge source category (Table 7-1). Discharges involving process wastewater, non-contact cooling water, and other non-storm water discharges are assigned individual concentration and mass waste load allocations pursuant to 40 C.F.R. § 130.2(h). The WLAs for non-storm water sources (e.g., wastewater treatment plants) are established as a concentration equal to the water quality criteria for each source by discharge category (see Table 7-1).

Storm water discharges are less amenable to individual wasteload allocations. In recognition of this fact, EPA's November 22, 2002 guidance entitled "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs," provides that it is reasonable to express allocations for NPDES-regulated storm water discharges from multiple point sources as a single categorical or aggregate wasteload allocation when data and information are insufficient to assign each source or outfall individual WLAs. In the case of this pathogen TMDL, MassDEP did establish concentration (colonies/100ml) TMDL targets on a discharge by discharge basis, but daily loads (colonies/day) were established on an aggregate basis by segment because of insufficient flow data on each storm water source outfall.

The TMDL sets the target load allocations for storm water sources equal to the applicable water quality criteria of the receiving water (Table 7-1). The difference between the WLAs and LA (discussed in the previous Section) is the source of the discharge and whether it is regulated under the NPDES program.

In addition to the concentration targets, the TMDL includes maximum daily loads for streams (pollution prevention TMDLs) as a function of stream flow and the applicable WQS (Figure 7-1), and a WLA for each embayment segment based on an approximation of the runoff from a buffer zone.

USGS hydrology data for Cape Cod were employed to develop this estimate of daily bacteria load. Walter and Whealan (2005) report precipitation results covering a time period from 1941-1995 at the Hatchville weather station in Falmouth, MA. These data indicate that an annual average of 45 inches/year typically falls on Cape Cod varying from a low of about 25 inches to a high of 73 inches. Rates of natural surface runoff on Cape Cod are generally very low to zero, because of the medium-to-coarse sandy soils. Precipitation in sandy soils in Cape Cod has essentially two fates: (1) ground-water recharge, or (2) evapotranspiration. Walter and Whealan

(2005) report an annual average ground water recharge rate of 27 inches/year for Cape Cod and Desimone (2003) estimates that approximately 24 inches of precipitation on Cape Cod is lost to evapotranspiration.

As a result it was assumed that no runoff occurs from the pervious areas and therefore no load allocation was provided. A buffer area of 200 feet was chosen as a reasonable estimate of the area which is likely to contribute storm water discharges directly to each embayment. Within this 200 ft area it is assumed that all 45 inches per year of precipitation runs directly off any impervious area within this buffer zone and runoff is negligible from pervious surfaces (e.g., 0 inches/yr) because of the medium-to-coarse sandy soils on the Cape. A conservative assumption was made that all runoff from impervious surfaces is collected and piped directly to the embayment through storm drain infrastructure. Hence, the allowable total number of bacteria per day is the water quality standard times the estimated daily runoff associated with impervious areas within the 200 foot buffer zone once conversions for the various units are applied. (See Section 7.3.2 of the TMDL document).

MassDEP believes the concentration targets are most useful for guiding implementation because the concentration targets are independent of storm water flow volume.

Assessment:

MassDEP established concentration-based WLAs by applying the numeric criteria directly to each discharge. MassDEP has established WLA/LA targets for concentration (colonies/100ml) by discharge source category (Table 7-1), applicable to each individual source (wastewater treatment plants, CSO, storm water, etc). Individual mass loading targets were also established for all regulated continuous sources (i.e. non-storm water related) as the product of each discharger's daily flow and the concentration target.

EPA concludes that the wasteload allocations are adequately specified in the TMDL at levels necessary to attain and maintain WQS.

6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)). EPA guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

The TMDL provides for an implicit margin of safety. The TMDL sets the target loading capacity, load allocations, and wasteload allocations equal to either the applicable water quality standard of the receiving water, or zero if the sources are prohibited. Therefore, there is a high level of confidence that the TMDL is established at levels that are consistent with the WQS. In addition, in establishing the concentration WLAs and LAs, the approach used by MassDEP does not rely on in-stream processes such as bacteria die-off and settling which are known to reduce

in-stream bacteria concentrations. The loading targets are mathematically calculated based on the concentration water quality criteria to assure the numeric bacteria criteria are met for continuous dischargers as well as instream (as described above) and share the same direct connection to WQS and implicit margin of safety.

Assessment:

EPA concludes that the approach used in developing the TMDL provides for an adequate implicit MOS. There is not a lack of knowledge concerning the relationship between allocations and water quality in this case, where the TMDL applies the criteria as allocations for each source. Setting the concentration TMDL targets at the water quality criteria with no allowance for in-stream bacteria die-off and settling provides an implicit margin of safety. The daily load TMDL expressions are derived from the same water quality criteria and concentration TMDL targets multiplied by the appropriate flow factor to obtain a mass TMDL expression with the same implicit MOS.

7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The method chosen for including seasonal variations in the TMDL must be described (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)).

The TMDL applies throughout the year when seasonal pathogen WQS apply. The WQS criteria may be applied on a seasonal basis at the discretion of the MassDEP (see 314 CMR 4.05(3)(a)4 and 4.05(3)(b)4.)

Assessment:

The pathogen TMDL applies over the entire season that the pathogen criteria apply. There is no reason to apply different targets on a seasonal basis because the measures implemented to meet the TMDL targets will reduce pathogen concentrations to water quality criteria levels for all seasons for which the WQS apply. Therefore, the TMDL adequately accounts for all seasons. EPA concludes that the TMDL documents have adequately addressed seasonal variability.

8. Monitoring Plan for TMDLs

EPA's 1991 document, Guidance for Water Quality-Based Decisions: The TMDL Process (EPA 440/4-91-001), and EPA's 2006 guidance, Clarification Regarding "Phased" Total Maximum Daily Loads, recommend a monitoring plan when a TMDL is developed using the phased approach. The guidance indicates that a State may use the phased approach for situations where TMDLs need to be developed despite significant data uncertainty and where the State expects that the loading capacity and allocation scheme will be revised in the near future. EPA's guidance provides that a TMDL developed under the phased approach should include, in addition to the other TMDL elements, a monitoring plan that describes the additional data to be collected and a scheduled timeframe for revision of the TMDL.

The pathogen TMDL for the Cape Cod Watershed is not a phased TMDL, but the document includes a description of a monitoring plan designed to measure attainment of WQS.

The TMDL and companion TMDL Implementation Guidance Manual document describe post-TMDL monitoring activities including various community efforts and MassDEP's commitment for monitoring every five years. The monitoring plan is designed to identify and eliminate specific sources and track improvements in water quality. In addition, the TMDL document recommends additional monitoring that should be conducted.

Assessment:

EPA concludes that the anticipated monitoring by and in cooperation with MassDEP is sufficient to evaluate the adequacy of progress toward attainment of WQS, although not a required element of EPA's TMDL approval process.

9. Implementation Plans

On August 8, 1997, Bob Perciasepe (EPA Assistant Administrator for the Office of Water) issued a memorandum, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)," that directs Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired solely or primarily by nonpoint sources. To this end, the memorandum asks that Regions assist States/Tribes in developing implementation plans that include reasonable assurances that the nonpoint source load allocations established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. The memorandum also includes a discussion of renewed focus on the public participation process and recognition of other relevant watershed management processes used in the TMDL process. Although implementation plans are not approved by EPA, they help establish the basis for EPA's approval of TMDLs.

The implementation plan set out in the Cape Cod Watershed Pathogen TMDL document and the identification of priority water body segments along with the TMDL Implementation Guidance Manual, set forth an approach to addressing the pathogen impaired water body segments. Table 6-1 sets out the priority water body segments in need of remediation. In addition, the TMDL Implementation Guidance Manual sets forth the priority for addressing pathogen impairments based on land use and the types of pathogen sources. Moreover, the TMDL segments are small so that outfall pipe elevated bacteria data, and ambient stream data can be related back to potential sources and implementation needs.

MassDEP and EPA have historically required wastewater treatment plants to meet criteria based concentration effluent limits at the point of discharge and will continue to do so, consistent with the TMDL. Phase I and II storm water communities are or will be required to implement aggressive illicit discharge detection and elimination programs. Watershed stakeholders are providing valuable assistance in defining hot spots and sources of pathogen contamination as well as with the implementation of mitigation or preventative measures.

Through Phase II NPDES regulations, EPA has the authority to 1) require general and/or individual permits for many types of storm water discharges and 2) enforce storm water permits to assure adequate progress in storm water pollution abatement is being made. In addition, EPA has the authority to require non-regulated point source storm water discharges to obtain NPDES permits if it determines that such storm water discharge causes or contributes to a water quality violation, or is a significant contributor of pollutants, or where controls are needed based on a

waste load in an EPA approved TMDL. MassDEP has similar authority under the Commonwealth's law.

Although the TMDL targets are expressed in a variety of numeric terms, EPA anticipates that NPDES permits for regulated storm water discharges will contain Best Management Practice (BMP) based requirements rather than numeric effluent limits. This approach is consistent with EPA's November 22, 2002 guidance entitled "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs." The guidance states "WQBELs [water quality based effluent limits] for NPDES-regulated storm water discharges that implement WLAs in TMDLs may be expressed in the form of best management practices (BMPs) under specified circumstances. See 33 U.S.C. 1342(p)(3)(B)(iii); 40 C.F.R. 122.44(k)(2)&(3)." This memorandum goes on to state:

...because storm water discharges are due to storm events that are highly variable in frequency and duration and are not easily characterized, only in rare cases will it be feasible or appropriate to establish numeric limits for municipal and small construction storm water discharges. The variability in the system and minimal data generally available make it difficult to determine with precision or certainty actual or projected loadings for individual dischargers or groups of dischargers. Therefore, EPA believes that in these situations, permit limits typically can be expressed as BMPs, and that numeric limits will be used only in rare instances. ... [i]n light of 33 U.S.C. §1342(p)(3)(B)(iii), EPA recommends that for NPDES-regulated municipal and small construction storm water discharges effluent limits should be expressed as best management practices (BMPs) or other similar requirements, rather than as numeric effluent limits. See *Interim Permitting Approach for Water Quality-Based Effluent Limitations in Storm Water Permits*, 61 FR 43761 (Aug. 26, 1996). The Interim Permitting Approach Policy recognizes the need for an iterative approach to control pollutants in storm water discharges. Specifically, the policy anticipates that a suite of BMPs will be used in the initial rounds of permits and that these BMPs will be tailored in subsequent rounds.

Assessment:

MassDEP has included an outline of implementation plans, priorities and authorities, although not a required element of the TMDL approval. EPA is taking no action on the implementation plan.

10. Reasonable Assurances

EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources. In a water impaired by both point and nonpoint sources, where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur, reasonable assurance that the nonpoint source reductions will happen must be explained in order for the TMDL to be approvable. This information is necessary for EPA to determine that the load and wasteload allocations will achieve water quality standards.

In a water impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable. However, for such nonpoint source-only waters, States/Tribes are strongly encouraged to provide reasonable assurances regarding achievement of load allocations in the implementation plans described in section 9, above. As described in the August 8, 1997 Perciasepe memorandum, such reasonable assurances should be included in State/Tribe implementation plans and “may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs.”

Although no regulated point source was given a less stringent allocation based on the assumption that non-point source load reduction would occur, MassDEP provides reasonable assurance that both point and non-point allocations will be achieved. The TMDL will be implemented through enforcement of regulations, availability of financial incentives and local, state and federal programs for pollution control. Combined sewer overflows and wastewater treatment facilities are regulated under existing NPDES and Commonwealth permits. Communities subject to storm water NPDES permit Phase II coverage will address discharges from municipally-owned storm water drainage systems. Enforcement of regulations controlling non-point discharges include local implementation of the Commonwealth’s Wetlands Protection Act, the Rivers Protection Act, Title 5 regulations for septic systems and other local regulations. Financial incentives include federal and state funds available under Sections 319 and 104(b) programs of the CWA as well as the State Revolving Loan Program. Other potential funds and assistance are available through Massachusetts’ Department of Agriculture’s Enhancement Program and the United States Department of Agriculture’s Natural Resources Conservation Services. Additional financial incentives include income tax credits for Title 5 upgrades and low interest loans for Title 5 septic system upgrades available through municipalities participating in this portion of the state revolving loan fund program.

As stated above, MassDEP has in place a number of state regulatory and financial programs that will help to assure implementation of the TMDL will be achieved. These programs are more fully discussed in Sections 8 and 10 of the TMDL document.

Finally, it should be noted that MassDEP has had some experience implementing pathogen TMDLs. A previous TMDL was developed and approved by EPA for the Neponset River Watershed. The implementation recommendations outlined in that TMDL were similar to the Cape Cod TMDL. Since the time of approval, MassDEP has worked closely with a local watershed group (Neponset River Watershed Association) to develop a 319 project to implement the recommendations of the TMDL. The total project cost was approximately \$472,000 of which \$283,000 was provided through federal 319 funds and the additional 40% provided by the watershed association and two local communities. Although the project is not yet completed, the towns and watershed association have worked closely together to identify and install several new structural BMPs (enhanced wetland treatment, bioretention cells and vegetated buffers) to reduce storm water and bacterial inputs into Pine Tree Brook which was impaired due to pathogens.

In the spring of 2005, BMPs were installed along Pine Tree Brook. These BMPs effectively eliminated the discharges of four outfalls to Pine Tree Brook. By removing known sources of pathogens, water quality improvements are expected to occur. Additional BMPs are being evaluated for future implementation at this time. In addition, extensive public education on pet waste management has occurred in the form of fliers inserted into bills, canvassing neighborhoods and posting signs. Areas where people walked their pets were cleaned up to

encourage individuals to look after their pets. The Neponset River Association has reported significant behavioral changes in the area resulting in a substantial reduction in pet waste.

In summary, MassDEP's existing programs set out a wide variety of tools communities can use to address pathogens, based on land use and the commonality of pathogen sources (e.g., combined sewer overflows (CSOs), failing septic systems, storm water and illicit connections, pet waste, etc.) Since there are only a few categories of sources of pathogens, the necessary remedial actions to address these sources are well established.

Since pathogen impairment in many communities has a significant economic impact, for example due to shellfish and beach closures, watershed stakeholders are often eager to implement measures to mitigate pathogen impairments. The TMDL provides a mechanism and incentive for community administrators to among other things seek funding, educate the public and prioritize remedial action. Moreover, for sources beyond the scope of federal and state jurisdiction (e.g., storm water not subject to Phase II NPDES regulation), this TMDL and the companion document, "*Mitigation Measures to Address Pathogen Pollution in Surface Water: A TMDL Implementation Guidance Manual for Massachusetts*," provide communities with information and tools for mitigating pathogen sources.

Assessment:

Although not required because MassDEP did not increase WLAs based on expected LA reductions, MassDEP has provided reasonable assurance that WQS will be met.

11. Public Participation

EPA policy is that there must be full and meaningful public participation in the TMDL development process. Each State/Tribe must, therefore, provide for public participation consistent with its own continuing planning process and public participation requirements (40 C.F.R. § 130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval must describe the State/Tribe's public participation process, including a summary of significant comments and the State/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. § 130.7(d)(2)).

Inadequate public participation could be a basis for disapproving a TMDL; however, where EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.

MassDEP publically announced the draft TMDL on July 23, 2005 and copies were distributed to key stakeholders. MassDEP also posted the draft TMDL on its website for public review on the same date. A public informational meeting was held on August 1, 2005, to review the findings of the draft TMDL report and to solicit public comment. The public comment period was extended until August 26, 2005 when the public comment period closed. MassDEP has involved the public during the development of the TMDL and has provided ample opportunity for the public to comment. Finally, MassDEP has provided a comprehensive record of the comments received and provided clear responses to those comments.

Assessment:

EPA concludes that MassDEP has done a sufficient job of involving the public in the development of the TMDL, provided adequate opportunities for the public to comment and has fully addressed the comments received as set forth in the response to comment section of the TMDL document.

12. Submittal Letter

A submittal letter should be included with the TMDL analytical document, and should specify whether the TMDL is being submitted for a technical review or is a final submittal. Each final TMDL submitted to EPA must be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final submittal, should contain such information as the name and location of the waterbody, the pollutant(s) of concern, and the priority ranking of the waterbody.

Assessment:

On August 25, 2009, MassDEP submitted the Final Pathogen TMDL for the Cape Cod Watershed (Control Number: CN 252.0) and associated documents for EPA approval. The documents contained all of the elements necessary to approve the TMDL.

13. "Pollution Prevention" TMDL for the Cape Cod Watershed

MassDEP recommends that the information contained in this TMDL guide management activities for all other waters throughout the watershed to help maintain and protect existing water quality. For these non-impaired waters, Massachusetts is proposing "pollution prevention" TMDLs consistent with CWA § 303(d)(3).

Pollution prevention TMDLs on water body segments can encourage the maintenance and protection of existing water quality and help prevent further degradation to water bodies. Although EPA does not approve pollution prevention TMDLs, EPA acknowledges the establishment of these TMDLs consistent with developing information as set forth in CWA Section 303(d)(3). Therefore, EPA's approval of the TMDL submitted by MassDEP applies only to the 49 water body segments set out in the Attachment that are currently listed for pathogens (bacteria) on the 2006 CWA § 303(d) list of impaired waters.

In terms of how these pollution prevention TMDLs would be implemented, MassDEP proposes that the analyses conducted for the pathogen impaired segments in this TMDL would apply to the non-impaired segments, since the sources and their characteristics are equivalent. Thus, the waste load and/or load allocation for each source and designated use would be the same as specified in the TMDL document. Therefore, the pollution prevention TMDL would have identical concentration waste load and load allocations based on the sources present and the designated uses of the water body segments.

Finally, MassDEP is also recommending that the Cape Cod Watershed TMDL may, in appropriate circumstances, apply to other Cape Cod watershed segments that are listed for

pathogen impairment in subsequent Massachusetts CWA § 303(d) Integrated List of Waters. EPA agrees that for such segments, the approaches set forth in this TMDL may apply if, after listing the waters for pathogen impairment and taking into account all relevant comments submitted on the CWA § 303(d) list, MassDEP determines with EPA approval of the CWA § 303(d) list that this TMDL should apply to future pathogen impaired segments.

Attachment
TMDL Addressing 49 Pathogen Impaired Water Body Segments
Cape Cod Watershed

Segment ID Segment Name	Applicable Water Quality Standard (CFU/100 ml)	200 ft Buffer Area (Acres)	WLA		TMDL
			Impervious Buffer Area		(WLA + LA ¹)
			Percent of Impervious Area within 200 ft buffer (%)	Daily Load (CFU/day)	Daily Load CFU/day
MA96-01 Barnstable Harbor	14	158.96	3	2.94E+07	2.94E+07
MA96-02 Bumps River	14	25.61	8.2	1.3E+07	1.3E+07
MA96-04 Centerville River	14	45.84	8.5	2.4E+07	2.4E+07
MA96-05 Hyannis Harbor	14	73.73	19.6	8.91E+07	8.91E+07
MA96-06 Maraspin Creek	14	17.76	6.9	7.56E+06	7.56E+06
MA96-08 Shoestring Bay	14	50.72	12.2	3.82E+07	3.82E+07
MA96-09 Quivett Creek	14	17.76	1.8	1.97E+06	1.97E+06
MA96-11 Stage Harbor	14	68.31	7.9	3.33E+07	3.33E+07
MA96-12 Bass River	14	73.21	13	5.87E+07	5.87E+07
MA96-13 Sesuit Creek	14	23.93	5.8	8.56E+06	8.56E+06
MA96-14 Swan Pond river	14	20.07	11.6	1.44E+07	1.44E+07
MA96-15 Boat Meadow River	14	20.07	1.5	1.86E+06	1.86E+06
MA96-16 Rock Harbor Creek	14	15.03	7.4	6.86E+06	6.86E+06
MA96-17 Falmouth Inner Harbor	88	22.09	26.4	2.26E+08	2.26E+08
MA96-18 Great Harbor	14	50.72	18.2	5.69E+07	5.69E+07
MA96-19 Little Harbor	14	25.61	23.7	3.74E+07	3.74E+07
MA96-20 Quashnet river	14	25.61	6.4	1.01E+07	1.01E+07

Segment ID Segment Name	Applicable Water Quality Standard (CFU/100 ml)	200 ft Buffer Area (Acres)	WLA		TMDL
			Impervious Buffer Area		(WLA + LA ¹)
			Percent of Impervious Area within 200 ft buffer (%)	Daily Load (CFU/day)	Daily Load CFU/day
MA96-21 Waquoit Bay	14	104.54	6.5	4.19E+07	4.19E+07
MA96-22 Herring river	14	25.61	6	9.48E+06	9.48E+06
MA96-23 Saquatucket Harbor	14	15.03	12.3	1.14E+07	1.14E+07
MA96-24 Mashpee River	14	28.66	5.6	9.90E+06	9.90E+06
MA96-26 Little Namskaket Creek	14	11.47	4.6	3.26E+06	3.26E+06
MA96-27 Namskaket Creek	14	15.03	1.6	1.48E+06	1.48E+06
MA96-29 Provincetown Harbor	14	181.04	22.7	2.53E+08	2.53E+08
MA96-30 Scorton Creek	14	25.61	3.1	4.90E+06	4.90E+06
MA96-31 Pamet River	14	35.03	5.2	1.12E+07	1.12E+07
MA96-32 Duck Creek	14	36.16	16.9	3.77E+07	3.77E+07
MA96-33 Herring River	14	56.54	4.5	1.57E+07	1.57E+07
MA96-34 Wellfleet Harbor	14	253.37	9.3	1.45E+08	1.45E+08
MA96-35 Chase Garden Creek	14	37.25	3.6	8.27E+06	8.27E+06
MA96-36 Lewis Bay	14	118.15	11.8	8.60E+07	8.60E+07
MA96-37 Mill Creek	14	22.09	2.6	3.54E+06	3.54E+06
MA96-38 Parkers River	14	20.07	19.1	2.36E+07	2.36E+07
MA96-39 Popponesset Creek	14	20.07	17.4	2.15E+07	2.15E+07
MA96-41 Mill Creek	14	17.76	5.6	6.14E+06	6.14E+06
MA96-42 Taylors Pond	14	15.03	13.7	1.27E+07	1.27E+07
MA96-43 Harding Beach Pond	14	25.61	8.1	1.28E+07	1.28E+07

Segment ID Segment Name	Applicable Water Quality Standard (CFU/100 ml)	200 ft Buffer Area (Acres)	WLA		TMDL
			Impervious Buffer Area		(WLA + LA ¹)
			Percent of Impervious Area within 200 ft buffer (%)	Daily Load (CFU/day)	Daily Load CFU/day
MA96-44 Bucks Creek	14	15.03	11.6	1.08E+07	1.08E+07
MA96-45 Oyster Pond	14	42.25	10.7	2.79E+07	2.79E+07
MA96-46 Oyster Pond River	14	35.03	7.8	1.69E+07	1.69E+07
MA96-50 Ryders Cove	14	38.31	15.5	3.66E+07	3.66E+07
MA96-53 Perch Pond	14	17.76	21.4	2.34E+07	2.34E+07
MA96-54 Great Pond	14	57.22	23.6	8.33E+07	8.33E+07
MA96-55 Green Pond	14	42.25	15.3	3.99E+07	3.99E+07
MA96-57 Bournes Pond	14	44.97	12.6	3.50E+07	3.50E+07
MA96-58 Hamblin Pond	14	40.33	7.4	1.84E+07	1.84E+07
MA96-61 Little River	14	17.76	16.3	1.79E+07	1.79E+07
MA96-62 Oyster Pond	14	30.05	12.2	2.26E+07	2.26E+07
MA96-68 Town Cove	14	79.73	8	3.93E+07	3.93E+07

1 = Load Allocation (LA) equals zero since runoff from the pervious area is assumed to be negligible.