**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION I**
**5 POST OFFICE SQUARE, SUITE 100**
**BOSTON, MASSACHUSETTS 02109-3912**

April 15, 2015

Martin Suuberg, Commissioner
Department of Environmental Protection
One Winter Street
Boston, MA 02108

Re: Approval of the Final Nitrogen TMDL for Lewis Bay and Halls Creek

Dear Commissioner Suuberg:

Thank you for your Department's submittal of the TMDL analysis for Lewis Bay and Halls Creek on March 9, 2015. We appreciate your efforts and involvement with our office to finalize this TMDL. The U.S. Environmental Protection Agency (EPA) has reviewed the document entitled "Lewis Bay System and Halls Creek Total Maximum Daily Loads for Total Nitrogen", Control #314, March 2015 and it is my pleasure to approve the 10 (6 Total Nitrogen and 4 Pollution Prevention) 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 are very pleased with the quality of your TMDL submittal from the Division of Watershed Management, and commend your efforts to address nutrient-related impacts to the Cape Cod Watershed, including waterbodies that were identified as impaired by nutrients but not yet placed on the State's impaired waters list. Early intervention will help restore water quality and help prevent further degradation of these waterbody segments. My staff and I look forward to continued cooperation with the Massachusetts DEP in exercising our shared responsibility of implementing the requirements under Section 303(d) of the CWA. If you have any questions regarding this approval, please contact Ralph Abele at (617) 918-1629 or have your staff contact Andrea Traviglia at (617) 918-1993.

Sincerely,

/s/

Ken Moraff, Director
Office of Ecosystem Protection

Enclosure

cc:
Rebecca Weidman, MassDEP
Kimberly Groff, MassDEP
Christine Duerring, MassDEP
Ralph Abele, EPA
Andrea Traviglia, EPA

# EPA NEW ENGLAND'S TMDL REVIEW

**DATE:** April 15, 2015

**TMDL:** Final Lewis Bay System and Halls Creek TMDLs for Total Nitrogen

**STATUS:** Final

**IMPAIRMENT/POLLUTANT**: 10 TMDLs – 6 Total Nitrogen TMDLs and 4 Pollution Prevention TMDLs (See Attachment 1)

**BACKGROUND:** EPA Region 1 received the *Final Lewis Bay System and Halls Creek TMDLs for Total Nitrogen* (Control Number: CN 314) on March 9, 2015 with a transmittal letter dated March 3, 2015. In addition to the Final Nitrogen TMDL itself, the submittal included, either directly or in reference, the following documents:

- Public Meeting Information and Response to Comments, Appendix E
- Massachusetts Surface Water Quality Standards (WQS)
- Moraff, Ken (US EPA Region 1). Letter to: Gary Moran (MassDEP). February 19, 2015
- Moran, Gary (MassDEP). Letter to: Ken Moraff (US EPA Region 1). April 3, 2015
- Massachusetts Estuaries Project, Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Lewis Bay Embayment System, Barnstable, Massachusetts. http://www.oceanscience.net/estuaries/Lewis_Bay.htm
- Massachusetts Year 2012 Integrated List of Waters, Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 303(d) and 305(b) of the Clean Water Act (CN 400.1), March 2013. http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf
- Massachusetts Estuaries Project Embayment Restoration and Guidance for Implementation Strategies, MassDEP 2003. http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/mepmain.pdf

The following review explains how the TMDL submission meets the statutory and regulatory requirements of TMDLs in accordance with § 303(d) of the Clean Water Act and EPA's implementing regulations in 40 CFR Part 130.

**REVIEWERS:** Andrea Traviglia (617-918-1993) e-mail: traviglia.andrea@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.*

## 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.*

### A. Description of Waterbody, Priority Ranking, and Background Information

The Lewis Bay System is a complex estuary located within the towns of Barnstable and Yarmouth with its southern shore bordered by Nantucket sound. The TMDL document presents a good overview of the estuary systems and the companion Massachusetts Estuaries Project final report (December 2008) presents a complete description of the Lewis Bay System and Halls Creek watersheds. The TMDL document identifies six water body segments needing a TMDL for Nitrogen: Lewis Bay, Hyannis Inner Harbor, Mill Creek, Mill Pond Creek, Inner Harbor Creek, and Uncle Roberts Cove and 4 segments that need pollution prevention TMDLs (Snow's Creek, Stewart's Creek, Chase Brook, and Halls Creek) (i.e., segments which are not impaired for total nitrogen but for which TMDLs were prepared since the embayments are linked). Lewis Bay, Hyannis Inner Harbor and Mill Creek are listed as impaired for nutrients on the Massachusetts' 2012 Clean Water Act (CWA) §303(d) list and were previously determined to be impaired by nutrients by MassDEP. Mill Pond Creek, Inner Harbor Creek and Uncle Roberts Cove were determined to be impaired during the development of this TMDL and were not listed on the Massachusetts' 2012 §303(d) List.

MassDEP has determined that all nutrient impaired segments in the Commonwealth are a high priority. See the Massachusetts 2012 Integrated List of Waters at:
http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

### B. Pollutant of Concern

In the Lewis Bay System and Halls Creek, the pollutant of concern is the nutrient nitrogen. Impairments include nutrients, loss of eelgrass beds, low dissolved oxygen levels, elevated chlorophyll a levels, and decreased quality of benthic fauna habitat.

### C. Pollutant Sources

The TMDL document identifies excess total nitrogen originating primarily from septic systems serving individual residences as the cause of the impairments. In addition, discharge from wastewater treatment facilities, nutrient rich bottom sediments, fertilizer and runoff account for some of the impairments.

***Assessment:*** EPA Region 1 concludes that the TMDL document meets the requirements for describing the TMDL waterbody segments, pollutants of concern, identifying and characterizing sources of impairment, and priority ranking.

## 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.*

The TMDL document identifies several provisions of the Commonwealth's water quality standards that are relevant to the cultural eutrophication in these waters, including numeric criteria for dissolved oxygen and narrative criteria for nutrients, aesthetics, excess plant biomass, and nuisance vegetation. As stated on page 8 of the TMDL document and in EPA guidance, individual estuarine and coastal marine waters tend to have unique characteristics and therefore, site-specific analyses of the individual water body are typically required. For example, the loading of nitrogen that a specific water body can handle without becoming impaired varies. Factors that influence the effect of nitrogen include: flow velocity, tidal hydraulics, dissolved oxygen, and sediment adsorption and desorption of nitrogen.

The Massachusetts Estuaries Project analytical method is the Linked Watershed-Embayment Management Model (Linked Model) and is discussed on pages 8 - 16 of the TMDL document. It links watershed inputs with embayment circulation and nitrogen characteristics, and:

- requires site-specific measurements within each watershed and embayment;
- uses realistic "best-estimates" of nitrogen loads from each specific type of land-use;
- spatially distributes the watershed nitrogen loading to the embayment;
- accounts for nitrogen attenuation during transport to the embayment;
- includes a 2D or 3D embayment circulation model depending on embayment structure;
- accounts for basin structure, tidal variations, and dispersion within the embayment;
- includes nitrogen regenerated within the embayment;
- is validated by both independent hydrodynamic, nitrogen concentration, and ecological data; and
- is calibrated and validated with field data prior to generation of "what if" scenarios.

Sentinel locations were identified in the embayment system as locations at which restoration will necessarily result in high quality habitat throughout the system and attainment of water quality standards (page 10 - 12 of the TMDL document). These sentinel locations are located in each of the embayment systems: Lewis Bay and Halls Creek. Halls Creek continues to function as a healthy salt

marsh-dominated system that is assimilating its current N loadings.

Attaining the modeled nitrogen target at the sentinel location through implementation of the TMDL will lead to restoration of eelgrass and infaunal habitats in each of the sub-embayments. The target threshold nitrogen concentrations which have been determined to be protective for each embayment system are 0.38 mg/L for Lewis Bay and 1.0 mg/L in the Halls Creek System (Table 2, page 12 of the TMDL document). This concentration, which represents the average water column concentration of nitrogen, will restore or maintain SA waters or high habitat quality in these embayments.

***Assessment:*** The use of the Linked Model, the description of the process in the TMDL document, and the companion Technical Report to this TMDL document adequately demonstrate the basis for deriving the target nitrogen loads and demonstrating that the targets will achieve water quality standards. EPA Region 1 concludes that MassDEP has properly presented its numeric water quality standards and has made a reasonable and appropriate interpretation of its narrative water quality criteria for the designated uses of the Lewis Bay and Halls Creek embayment systems.

## 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.*

As stated in the TMDL document, the Linked Model is a robust and fairly complicated model that determines an embayment's nitrogen sensitivity, nitrogen threshold watershed loading levels and response to changes in the loading rate. A key feature of the approach involves the selection of sentinel sub-embayments that have the poorest water quality in the embayment system. If these degraded areas come into compliance with the TMDL, other areas will also achieve water quality standards for nitrogen in the system. This approach captures the critical targets needed to address the impaired segments.

Percent reductions of existing nitrogen loads necessary to meet the target threshold watershed loads range from 83% in Inner Harbor Creek to 0% in Uncle Robert's Cove. These loads represent one scenario using the Linked Model that could achieve the target threshold N concentration at the sentinel station. The TMDL for each sub-embayment is therefore the sum of the calculated target threshold watershed load, atmospheric deposition load, and benthic flux load from sediment sources. TMDLs

range from 0.33 kg/day in Inner Harbor Creek to 47 kg/day in Lewis Bay (pages 15-16, and page 21 of the TMDL document). See Tables 4 and 5 below taken from pages 16 and 21 of MassDEP's TMDL document.

**TABLE 4. Present Watershed Nitrogen Loading Rates, Calculated Loading Rates that are Necessary to Achieve Target Threshold Nitrogen Concentrations, and the Percent Reductions of the Existing Loads Necessary to Achieve the Target Threshold Loadings**

| Embayment | Present Total Watershed Load [1] (kg/day) | Target Threshold Watershed Load[2] (kg/day) | Percent Watershed Load Reductions Needed to Achieve Threshold Loads |
|---|---|---|---|
| Hyannis Inner Harbor | 12.15 | 7.12 | 42% |
| Snow's Creek | 15.12 | 15.12 | 0 |
| Lewis Bay | 30.86 | 9.66 | 69% |
| Stewart's Creek | 38.99 | 38.99 | 0 |
| Uncle Robert's Cove | 0.54 | 0.54 | 0 |
| Mill Creek | 15.96 | 4.32 | 73% |
| Chase Brook | 3.35 | 3.35 | 0 |
| Mill Pond Creek | 15.04 | 14.68 | 2% |
| Inner Harbor Creek | 1.91 | 0.33 | 83% |
| Halls Creek System | 23.14 | 23.14 | 0 |

[1] Composed of fertilizer, runoff from impervious surfaces, septic systems and atmospheric deposition to natural surfaces.
[2] Target threshold watershed load is the load from the watershed needed to meet the embayment target threshold N concentration identified in Table 2 above. Includes natural background.

**TABLE 5. The Total Maximum Daily Loads (TMDLs) for the Lewis Bay System and Halls Creek**

| Sub-embayment | Target Threshold Watershed Load [1] (kg/day) | Atmospheric Deposition (kg/day) | Sediment Load (kg/day) | TMDL [2] (kg/day) |
|---|---|---|---|---|
| Hyannis Inner Harbor | 7.12 | 0.63 | 9.78 | 17.53 |
| Snow's Creek | 15.12 | Not Measured | 0 | 15.12 |
| Lewis Bay | 9.66 | 13.51 | 23.92 | 47.09 |
| Stewart's Creek | 38.99 | 0.24 | 0 | 39.23 |

| | | | | |
|---|---|---|---|---|
| Uncle Robert's Cove | 0.54 | 0.76 | 10.99 | 12.29 |
| Mill Creek | 4.32 | 0.63 | 0 | 4.95 |
| Chase Brook | 3.35 | Not Measured | Not Measured | 3.35 |
| Mill Pond Creek | 14.68 | Not Measured | Not Measured | 14.68 |
| Inner Harbor Creek | 0.33 | Not Measured | Not Measured | 0.33 |
| Halls Creek System | 23.14 | 0.63 | 6.65 | 30.42 |

[1] Target threshold watershed load is the load from the watershed needed to meet the embayment target threshold nitrogen concentration identified in Table 2.
[2] Sum of target threshold watershed load, atmospheric deposition, and sediment load.

***Assessment:*** The TMDL document explains and EPA concurs with the approach for applying the Linked Model to specific embayments for the purpose of developing target nitrogen loading rates and in identifying sources of needed nitrogen load reduction. EPA believes that this approach is reasonable because the factors influencing and controlling nutrient impairment were well justified, as demonstrated by the foregoing and the TMDL's administrative record.

## 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.*

Using the Linked Model, MassDEP has identified the portion of the loading capacity allocated to existing and future non-point sources necessary to meet water quality standards. These non-point sources are primarily on-site subsurface wastewater disposal systems (i.e., septic systems). Additional nitrogen sources include: natural background, storm water runoff (including nitrogen from fertilizers), a waste water treatment facility groundwater discharge, atmospheric deposition, and nutrient-rich sediments. The percent contribution of locally controllable sources of nitrogen to the Lewis Bay System is approximately 63% from septic systems, 34% from WWTF, and 15% from fertilizers and runoff.

MassDEP describes and sets forth the load allocations for cultural and natural background sources (see pages 18 - 19 of the TMDL document).

***Assessment:*** EPA concludes that the TMDL document sufficiently addresses the calculation of the load allocations, as demonstrated by the foregoing and by the TMDL's administrative record.

## 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.*

The Commonwealth assigned to the WLA those point sources (1) that "discharge" pollutants to waters of the United States within the meaning of the Act *and* (2) that are subject to the NPDES permitting program; it allocated sources that did not meet these two criteria to the LA. Thus, for example, the pollutant loads from MS4s that discharge nitrogen and are subject to the NPDES permit program were included in the WLA, while the remaining sources of nitrogen (*e.g.*, septic systems and WWTFs) that are initially released to ground and enter the receiving waters only after traveling through soils and groundwater, were included in the LA portion of the load.

This approach is reasonable and is consistent with the Act and implementing regulations. By illustration, EPA interprets 40 CFR § 130.2(h) to require that allocations for NPDES-regulated discharges of storm water be included in the waste load component of the TMDL. On Cape Cod the vast majority of storm water percolates into the ground and aquifer and proceeds into the embayment systems through groundwater migration. Although the vast majority of storm water percolates into the ground, there are a few storm water pipes that discharge directly to water bodies that are subject to the requirements of the Phase II Storm Water NPDES Program. The loadings allocated to such storm water discharges must be treated as a waste load allocation. Since the majority of the nitrogen loading comes from septic systems, fertilizer, and storm water that infiltrates into the groundwater, the allocation of nitrogen for any storm water pipes that discharge directly to any of the embayments is insignificant as compared to the overall groundwater load.

Based on land use, the Linked Model accounts for loading of storm water, but does not explicitly breakout storm water into a load and waste load allocation. Nonetheless, based on the fact that there are few storm water discharge pipes within NPDES Phase II communities that discharge directly to embayments or waters that are connected to the embayments, a small relatively insignificant total waste load allocation was calculated for these sources. This is based on the percent of impervious surface within 200 feet of the shoreline that may discharge storm water via pipes directly to the water body. For the purposes of waste load allocation, it was assumed that all impervious surfaces within 200 feet of the shoreline discharge directly to the water body whether or not they actually do so. Although the loading contribution from the point source discharges is insignificant compared to the non-point sources, the point source discharges are subject to the Phase II Storm Water NPDES Program and their collective load is to be treated as a WLA. In the absence of site-specific information on direct discharge sources, EPA believes the approach set out in the TMDL for the WLAs is

reasonable. The specific WLAs are set forth in Appendix C and on pages 17 and 18 of the TMDL document.

***Assessment:*** EPA concludes that the TMDL document sufficiently addresses the calculation of the waste load allocations, as demonstrated by the foregoing and by the TMDL's administrative record.[1]

## 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.*

MassDEP employs an implicit MOS in these TMDLs, described in the TMDL document on pages 19-21. There are several factors that contribute to the margin of safety inherent in the approach used to develop this TMDL including:

1) **Use of conservative data in the Linked Model as follows**:
    - Nitrogen concentrations in the watershed that were used in the model were higher and more conservative than those actually measured in the streams;
    - Agreement between the modeled and observed values has been approximately
    - 95%;
    - Attenuation factors used were lower and more conservative than those that were actually measured;
    - Water column nitrogen validation dataset is conservative. High or low measurements are marked as outliers;
    - Reductions in benthic regeneration of nitrogen are most likely underestimates; and

2) **Conservative sentinel station/target threshold nitrogen concentrations.** Sites were chosen that had stable eelgrass or benthic (infaunal) communities. Selection of sites that were starting to show impairment would have resulted in higher nitrogen concentrations; and

[1] The categorization of the pollutant sources on Cape Cod (*i.e.*, whether a particular source, or category of sources, is required as a matter of law to be placed within the WLA or LA) has been the subject of recent litigation. On August 24, 2010, CLF filed a complaint in the United States District Court for the District of Massachusetts, captioned *Conservation Law Foundation et al. v. United States Environmental Protection Agency, et al*., Action No. 1:10-cv-11455, challenging EPA's approval of thirteen (13) Total Maximum Daily Load determinations submitted to EPA by the Commonwealth of Massachusetts under section 303(d), 33 U.S.C. § 1313(d), of the Clean Water Act, 33 U.S.C. §§ 1251-1387, as arbitrary and capricious, an abuse of discretion, and in violation of the Administrative Procedure Act, 5 U.S.C. § 706(2). EPA's positions on categorization, margin of safety, seasonal variation and other matters raised in the litigation, including climate change, have been described in the Agency's filings in that case; have been specifically considered and relied upon by EPA for the purpose of these TMDL approvals; and accordingly, have been incorporated into the TMDL's administrative record. Additionally, EPA has considered MassDEP's correspondence of April 3, 2015 regarding these issues, and EPA's analysis thereof has also been included in the administrative record.

3) **Conservative approach.** Target loads were based on averaged nitrogen concentrations on the outgoing tide. This is the worst case scenario because this is when the nitrogen concentrations are highest. Nitrogen concentrations will be lower on the flood tides, due to dilution from the incoming tide.

***Assessment:*** EPA concludes that the approach used in developing the TMDL provides for an adequate implicit MOS, as demonstrated by the foregoing and by the TMDL's administrative record.

## 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 TMDLs for the water body segments identified in the document are based on achieving the nitrogen loads during the most critical time period, i.e., the summer growing season. Since the other seasons are less sensitive to nitrogen loading, the TMDLs are protective of all seasons throughout the year. Seasonal variation is addressed on page 21 of the TMDL document.

***Assessment:*** Since the other seasons are less sensitive to nitrogen loading, EPA concludes that the TMDL is protective of all seasons throughout the year.

## 8. Monitoring Plan

*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 nitrogen TMDL report for Lewis Bay and Halls Creek is not a phased TMDL, therefore a monitoring plan is not required in order to assure that data is available for updating the TMDL in the near future. However, the document does includes a description of a monitoring plan designed to measure attainment of water quality standards (page 23-24 TMDL report). MassDEP recommends that in order to assess the progress in obtaining the TMDLs' water quality goals, two forms of monitoring are undertaken by the Towns: track implementation progress as approved in the Town Comprehensive Wastewater Management Planning (CWMP) and monitor ambient water quality conditions at the sentinel stations. MassDEP presents suggested guidelines for water quality, benthic habitat, and eelgrass bed monitoring.

***Assessment:*** EPA concludes that the anticipated monitoring by and in cooperation with MassDEP is sufficient to evaluate the adequacy of the TMDL and attainment of water quality standards, although is 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 for the total nitrogen TMDL for the Lewis Bay Embayment System is described on pages 22 - 23 of the TMDL document. EPA concludes that the approach taken by MassDEP is reasonable because of the resources available to the towns to address nitrogen such as the CWMP, additional linked model runs at nominal expense, assessment of cost-effective options for reducing loadings from individual on-site subsurface wastewater disposal systems, land use planning and controls, water conservation, and stormwater control and treatment. MassDEP advised the town to incorporate the nitrogen loading reduction strategies outlined in the Massachusetts Estuaries Implementation Guidance report http://www.mass.gov/dep/water/resources/restore.htm into the implementation plan.

***Assessment:*** MassDEP has addressed the implementation plan. Although EPA is not approving the implementation plan, EPA has concluded that it outlines a reasonable approach to implementation, as demonstrated by the foregoing and by the TMDL's administrative record.

## 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."*

The TMDL targets for point sources in this TMDL are not less stringent based on any assumed nonpoint source reductions, so documentation of reasonable assurance in the TMDL is not a requirement. However, MassDEP addresses the concept of reasonable assurance insofar as it relates to overall TMDL implementation on page 24 of the Final TMDL. In addition, Barnstable and Yarmouth have demonstrated their commitment to implement this TMDL through the comprehensive wastewater planning that they initiated well before the generation of this TMDL. The towns expects to use the information in this TMDL to generate support from their citizens to take the necessary steps to remedy existing problems related to nitrogen loading from septic systems, storm water, and runoff (including fertilizers), and to prevent any future degradation of these valuable resources. Enforcement of local, state, and federal programs for pollution control contribute to the level of reasonable assurance. There are also financial incentives to encourage the town to follow through with its plans and prevent further degradation to water quality.

***Assessment:*** Because MassDEP did not increase WLAs based on expected LA reductions, reasonable assurance is not required. However, EPA acknowledges MassDEP's reasonable assurance discussion for the record.

## 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*.

The public participation process for the Lewis Bay TMDL is described on page 25 of the TMDL document. MassDEP publically announced the draft TMDL on August 10, 2010 and copies were distributed to key stakeholders. Two public meetings were held on September 15, 2010 from 4 to 6 PM at the Barnstable Town Hall and on September 23, 2010 from 5 to 6 PM at the Yarmouth Town Hall to present the Draft Nitrogen TMDL and to collect public comments. The public comment period was extended until October 22, 2010. The attendance list, public comments, and the MassDEP responses are included in Appendix E of the TMDL document. MassDEP fully addressed all comments received during public comment in Appendix E of the TMDL report.

***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 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 March 9, 2015, MassDEP submitted the Final Lewis Bay System and Halls Creek TMDL For Total Nitrogen (Report #96-TMDL-18 Control #314) and associated documents for EPA approval. The documents contained all of the elements necessary to approve the TMDL

**Attachment 1**: Lewis Bay System and Halls Creek Nitrogen Impaired Segments

| **Embayment System and Sub-embayment** | **Segment ID** | **Impairment / TMDL Status** | **TMDL (kg/day)** (See Table 5 on Page 21 of TMDL Document) |
|---|---|---|---|
| **Lewis Bay System** | | | |
| Hyannis Inner Harbor | MA96-82_2010 | Determined to be impaired for nutrients during the development of this TMDL. | 17.53 |
| Snow's Creek | MA96-81_2008 | Not impaired for total nitrogen, but TMDL needed since embayments are linked. (Pollution Prevention TMDL) | 15.12 |
| Lewis Bay | MA96-36_2008 | Determined to be impaired for nutrients during the development of this TMDL. | 47.09 |
| Stewart's Creek | MA96-94_2012 | Not impaired for total nitrogen, but TMDL needed since embayments are linked. (Pollution Prevention TMDL) | 39.23 |
| Uncle Robert's Cove | Part of MA96-36_2008 | Determined to be impaired for nutrients during the development of this TMDL. | 12.29 |
| Mill Creek | MA96-80_2010 | Determined to be impaired for nutrients during the development of this TMDL. | 4.95 |
| Chase Brook | | Not impaired for total nitrogen, but TMDL needed since embayments are linked. (Pollution Prevention TMDL) | 3.35 |
| Mill Pond Creek | | Determined to be impaired for nutrients during the development of this TMDL. | 14.68 |
| Inner Harbor Creek | | Determined to be impaired for nutrients during the development of this TMDL. | 0.33 |
| **Lewis Bay System Total** | | | **154.57** |
| **Halls Creek System** | MA96-93_2012 | Not impaired for total nitrogen, but TMDL needed since embayments are linked. (Pollution Prevention TMDL) | 30.42 |

| **Data for entry in EPA's National TMDL Tracking System** | | | | | | | |
|---|---|---|---|---|---|---|---|
| TMDL Name | **Final Lewis Bay System and Halls Creek TMDLs for Total Nitrogen** | | | | | | |
| Number of TMDLs* | 6 | | | | | | |
| Type of TMDLs* | Total Nitrogen | | | | | | |
| Number of listed causes (from 303(d) list) | 2 | | | | | | |
| Lead State | Massachusetts (MA) | | | | | | |
| **Individual TMDLs listed below** | | | | | | | |
| TMDL Segment name | TMDL Segment ID # | TMDL Pollutant ID# & name | TMDL Impairment Cause(s) | Pollutant endpoint (Class: geometric mean;10% or SSM$^{+}$) | Unlisted? | NPDES Point Source & ID# | Listed for anything else? |
| Hyannis Inner Harbor | MA96-82_2010 | 772 (Total Nitrogen) | | 0.38 mg/L Total Nitrogen | Yes | MAR041090, MAR041176 | Fecal Coliform |
| Lewis Bay | MA96-36_2008 | 772 (Total Nitrogen) | Estuarine Bioassessments | 0.38 mg/L Total Nitrogen | NO | MAR041090, MAR041176 | -Pathogens |
| Uncle Robert's Cove | MA96-36_2008-A | 772 (Total Nitrogen) | Estuarine Bioassessments | 0.38 mg/L Total Nitrogen | NO | MAR041090, MAR041176 | -Pathogens |
| Mill Creek | MA96-80_2010 | 772 (Total Nitrogen) | | 0.38 mg/L Total Nitrogen | Yes | MAR041090, MAR041176 | -Fecal coliform |
| Mill Pond Creek | UN-N2015-21 | 772 (Total Nitrogen) | | 0.38 mg/L Total Nitrogen | Yes | MAR041090, MAR041176 | No |
| Inner Harbor Creek | UN-N2015-22 | 772 (Total Nitrogen) | | 0.38 mg/L Total Nitrogen | Yes | MAR041090, MAR041176 | No |
| **303(d)3 Pollution Prevention TMDLs** | | | | | | | |
| Snow's Creek | MA96-81_2008 | 772 (Total Nitrogen) | | 0.38 mg/L Total Nitrogen | Yes | MAR041090, MAR041176 | No |
| Stewart's Creek | MA96-94_2012 | 772 (Total Nitrogen) | | 0.38 mg/L Total Nitrogen | Yes | MAR041090, MAR041176 | No |
| Chase Brook | UN-N2015-23 | 772 (Total Nitrogen) | | 0.38 mg/L Total Nitrogen | Yes | MAR041090, MAR041176 | No |
| Halls Creek System | MA96-93_2012 | 772 (Total Nitrogen) | | 1.0 mg/L | Yes | MAR041090, MAR041176 | No |
| TMDL Type | Nonpoint Sources & MS4 point source | | | | | | |

| | |
|---|---|
| Establishment Date (approval)* | Apr 15, 2015 |
| EPA Developed | No |
| Towns affected* | Barnstable & Yarmouth, MA |

[+]Class = Water Body Classification: 10% = no more than 10% of the samples shall exceed statistic; SSM = Single Sample Maximum