



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

May 20, 2016

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

Re: Approval of the Final Allen, Wychmere and Saquatucket Harbor Embayment Systems TMDLs for Total Nitrogen

Dear Commissioner Suuberg:

Thank you for your Department's submittal of the TMDL analysis for Allen, Wychmere and Saquatucket Harbors on February 26, 2016. 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 "Final Allen, Wychmere and Saquatucket Harbor Embayment Systems TMDLs for Total Nitrogen", Control #312.1, February 2016 and it is my pleasure to approve the 3 Total Nitrogen 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 Harwich harbors. MassDEP's efforts will help restore water quality and 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
Barbara Kickham, MassDEP
Ralph Abele, EPA
Andrea Traviglia, EPA

EPA NEW ENGLAND'S TMDL REVIEW

DATE: May 20, 2016

TMDL: Final Allen, Wychmere and Saquatucket Harbor Embayment Systems TMDLs for Total Nitrogen

STATUS: Final

IMPAIRMENT/POLLUTANT: 6 TMDLs – 3 Total Nitrogen TMDLs and 3 Pollution Prevention TMDLs (See Attachment 1)

BACKGROUND: EPA Region 1 received the *Final Allen, Wychmere and Saquatucket Harbor Embayment Systems TMDLs for Total Nitrogen* (Control Number: CN 312.1) on March 1, 2016 with a transmittal letter dated February 26, 2016. 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 D
- 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 Allen, Wychmere and Saquatucket Harbor Embayment Systems, Harwich, Massachusetts.
<http://www.mass.gov/eea/docs/dep/water/resources/mep/cape/mep-allen-lc.pdf>
- 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

Data for entry in EPA's National TMDL Tracking System							
TMDL Name		Final Allen, Wychmere and Saquatucket Harbor TMDLs for Total Nitrogen					
Number of TMDLs*		3					
Type of TMDLs*		Total Nitrogen					
Number of listed causes (from 303(d) list)		0					
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?
Allen Harbor	UN-N2016-28	772 (Total Nitrogen)	Total Nitrogen	0.5 mg/L Total Nitrogen	Yes	-	No
Wychmere Harbor	UN-N2016-29	772 (Total Nitrogen)	Total Nitrogen	0.5 mg/L Total Nitrogen	Yes	-	No
Saquatucket Harbor	MA96-23-2012	772 (Total Nitrogen)	Total Nitrogen	0.5 mg/L Total Nitrogen	Yes	-	E.Coli (TMDL)
303(d)3 Pollution Prevention TMDLs							
Allen Pond Stream	UN-N2016-30	772 (Total Nitrogen)	Total Nitrogen	0.5 mg/L Total Nitrogen	Yes		
Cold Spring Brook	UN-N2016-31	772 (Total Nitrogen)	Total Nitrogen	0.5 mg/L Total Nitrogen	Yes		
East Saquatucket Stream	UN-N2016-32	772 (Total Nitrogen)	Total Nitrogen	0.5 mg/L Total Nitrogen	Yes		
TMDL Type		Nonpoint Sources					
Establishment Date (approval)*		May 20, 2016					
EPA Developed		No					
Towns affected*		Harwich					

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 Allen, Wychmere and Saquatucket Harbor embayment systems are small estuaries located in the town of Harwich on Cape Cod. The three harbors are also referred to as the Harwich harbors. The estuaries are bounded by barrier beaches and each has a single inlet for tidal exchange with Nantucket Sound. The inlets are fixed by jetties that require dredging maintenance to maintain maximum flows. Allen Harbor has a small tributary basin near the inlet and a salt marsh at the head; Wychmere and Saquatucket Harbors are comprised of single basins. The harbors are each less than 20 acres of open water, between 2-3 meters deep, and largely vertically well-mixed.

The TMDL document presents a good overview of the estuary systems and the companion Massachusetts Estuaries Project final report (May 2010) presents a complete description of the Allen, Wychmere and Saquatucket Harbor estuarine systems. The TMDL document identifies three water body segments impaired and needing a TMDL for nitrogen: Allen Harbor, Wychmere Harbor and Saquatucket Harbor. These water body segments were determined to be impaired by nutrients during the development of this TMDL. Three additional water body segments are not impaired for nitrogen at this time but have pollution prevention TMDLs since the water bodies are linked to the impaired harbors. These pollution prevention TMDLs are for Allen Pond Stream, Cold Spring Brook and East Saquatucket Stream.

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 Allen, Wychmere and Saquatucket Embayment Systems, the pollutant of concern is the nutrient nitrogen. Impairments include excess nutrients, low dissolved oxygen levels, elevated chlorophyll a levels, periodic algae blooms and decreased diversity and quantity of benthic fauna habitat.

C. Pollutant Sources

The TMDL document identifies that most of the controllable N affecting the Harwich harbors originates from on-site subsurface wastewater disposal systems (septic systems). Additional controllable sources include a wastewater treatment facility, runoff from impervious surfaces, fertilizers and farms. Other sources, not locally controllable, include atmospheric nitrogen deposition to the estuaries and natural surfaces (pages 18-19 of the TMDL document).

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 water quality classifications of the saltwater portions of for Allen, Wychmere and Saquatucket Harbors are SA and the freshwater portions are classified as B. 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 (pages 11-12). As stated on page 12 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), discussed on pages 12-19 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.

A sentinel location was identified in each of the Allen, Wychmere and Saquatucket Harbor embayment systems as a location at which restoration will necessarily result in high quality habitat throughout the system and attainment of water quality standards (page 16 of the TMDL document). For the Harwich harbors systems, high habitat quality was based primarily on the nutrient and oxygen levels, and benthic community indicators. Temporal trends in eelgrass distribution was not used as an indicator because historic eelgrass habitat could not be documented. As explained in the MEP Report, all of the available information on eelgrass relative to these three heavily altered harbor systems indicates that these embayments have not supported eelgrass over the past half century and likely have not supported eelgrass for over a century (Section VII.3 of the MEP Report). The most appropriate locations for the sentinel stations are long-term water quality monitoring stations: Allen Harbor (HAR-4), Wychmere Harbor (HAR-3) and Saquatucket Harbor (HAR-2). A secondary “check” station (HAR-5) is located in Allen Creek to account for the potential influence of tidal restriction. (Figure 7, pages 16-17 of the TMDL document).

Attaining the modeled nitrogen target at the sentinel location through implementation of the TMDL will lead to restoration of benthic habitat for infaunal animals throughout each of the three harbors as nitrogen enrichment will be reduced to the overall embayment system. The target threshold nitrogen concentration which has been determined to be protective for the all three harbors and the system as a whole is 0.50 mg/L (Table 4, pages 16-18 of the TMDL document).

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 Allen, Wychmere and Saquatucket Harbor 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 locations 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.

The percent reduction of existing nitrogen loads necessary to meet the target threshold watershed loads ranges between 40.72% in Cold Spring Brook and 82.93% in Wychmere Harbor (Table 6 below from page 20 of the TMDL document). As described in the TMDL document, these loads represent one scenario using the Linked Model that could achieve the target threshold N concentration at the sentinel station. This scenario relied heavily on reductions in septic watershed nitrogen loads to the embayments. Alternative scenarios to meet the target threshold N concentration may also be evaluated as part of the MEP process, at the town’s request.

TABLE 6. 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 (from the TMDL document)

Harbor System	Present Total Watershed Load ¹ (kg/day)	Target Threshold Watershed Load ² (kg/day)	Watershed Load Reductions Needed to Achieve Target Loads	
			Kg N/day	% change
Allen Harbor	4.764	1.392	3.372	-70.78%
Wychmere Harbor	3.866	0.66	3.206	-82.93%
Saquatucket Harbor	2.795	0.756	2.039	-72.95%
Allen Pond Stream	1.838	1.055	0.783	-42.60%
Cold Spring Brook	10.501	6.225	4.276	-40.72%
East Saquatucket Stream	3.948	2.296	1.652	-41.84%

¹ Composed of fertilizer, runoff from impervious surfaces, septic systems, agriculture, landfill and atmospheric deposition to natural surfaces.

² Target threshold watershed load is the N load from the watershed (including natural background) needed to meet the target threshold N concentration of 0.50 mg/L for each of the embayments.

The TMDL for each embayment considers all sources of N, and is therefore the sum of the calculated target threshold watershed load, atmospheric deposition load, and benthic flux load from sediment sources (Table 7 below from page 27 of the TMDL document). The TMDLs for the waters of the Harwich harbors range from 1.055 kg N/day for Allen Pond Stream to 11.557 kg N/day for Saquatucket Harbor.

TABLE 7. The Total Maximum Daily Loads (TMDLs) for Allen, Wychmere and Saquatucket Harbor Embayment Systems, Represented as the Sum of the Calculated Target Threshold Loads, Atmospheric Deposition and Sediment Load (from the TMDL document)

Harbor System	Target Threshold Watershed Load ¹ (kg N/day)	Atmospheric Deposition (kg N/day)	Nitrogen Load from Sediments ² (kg N/day)	TMDL ³ (kg N/day)
Allen Harbor	1.392	0.227	8.216	9.835
Wychmere Harbor	0.66	0.195	6.03	6.885
Saquatucket Harbor	0.756	0.151	10.67	11.557
Allen Pond Stream	1.055	--	--	1.055
Cold Spring Brook	6.225	--	--	6.225
East Saquatucket Stream	2.296	--	--	2.296

¹ Target threshold watershed load (including natural background) is the load from the watershed needed to meet the embayment target threshold nitrogen concentration identified in Table 4 of the TMDL document.

² Projected sediment N loadings obtained by reducing the present loading rates (Table 5 of the TMDL document) proportional to proposed watershed load reductions and factoring in the existing and projected future concentrations of PON from Table ES-2 of the MEP Technical Report.

³ Sum of target threshold watershed load, sediment load and atmospheric deposition 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 from impervious surfaces, fertilizers from lawns, golf courses and cranberry bogs, farm animals, groundwater discharge of wastewater treatment plant effluent, and atmospheric deposition. The percent contribution of locally controllable sources of nitrogen to the Allen Harbor system is approximately 86% from septic systems, 7% from impervious surfaces and 7% from fertilizers. For Wychmere Harbor system the percent contribution is 83% septic systems, 9% fertilizers, 6% impervious surfaces and 2% wastewater treatment facility. The percent contribution for Saquatucket Harbor system is 79% septic systems, 13% fertilizers, 7% impervious surfaces and 1% farms. Natural background loading is included in the estimates but is not presented separately. The percent contribution due to atmospheric deposition is not considered locally controllable.

MassDEP describes and sets forth the load allocations for cultural and natural background sources (see pages 22-23 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 (existing and future); 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 stormwater be included in the waste load component of the TMDL. On Cape Cod and the Islands the vast majority of stormwater percolates into the ground and aquifer and proceeds into the embayment systems through groundwater migration. Although the vast majority of stormwater

percolates into the ground, there are a few stormwater pipes that discharge directly to water bodies that are subject to the requirements of the Phase II Stormwater NPDES Program. The loadings allocated to such stormwater discharges must be treated as a waste load allocation. Since the majority of the nitrogen loading comes from septic systems, fertilizer, and stormwater that infiltrates into the groundwater, the allocation of nitrogen for any stormwater 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 stormwater, but does not explicitly breakout stormwater into a load and waste load allocation. Nonetheless, based on the fact that generally there are few stormwater discharge pipes within NPDES Phase II communities on the Cape and Islands 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 in Harwich. This is based on the percent of impervious surface within 200 feet of the shoreline that may discharge stormwater 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 Stormwater 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 page 22 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.

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.

MassDEP employs an implicit MOS in these TMDLs, described in the TMDL document on pages 23-26. 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.** The target nitrogen concentration was chosen based on sites that had stable benthic (infaunal) communities. Selection of sites that were starting to show impairment would have resulted in higher nitrogen concentrations; and
- 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 26 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 for Allen, Wychmere and Saquatucket Harbors 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 include a description of a monitoring plan designed to measure attainment of water quality standards (pages 31-32). MassDEP recommends that in order to assess the progress in obtaining the TMDLs' water quality goals, two forms of monitoring are undertaken by the Town of Harwich: track implementation progress as approved in the town Comprehensive Wastewater Management Plan (CWMP) and monitor ambient water quality and habitat conditions in the estuaries, including but not limited to, at the sentinel stations. MassDEP presents suggested guidelines for water quality, benthic habitat, and eelgrass bed monitoring, if applicable, in the future.

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 Harwich harbors system is described on pages 27-31 of the TMDL document. EPA concludes that the approach taken by MassDEP is reasonable because of the resources available to the town 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. The Town of Harwich is covered by the Phase II MS4 stormwater permit and therefore compliance with the permit will contribute to reducing the nitrogen load to the watersheds of Allen, Wychmere and Saquatucket Harbors. The town has completed mapping of their storm drain system and outfalls and they continue to update the stormwater drainage systems to Phase II standards. The town also has an active public outreach and participation program for pollution prevention. MassDEP advised the town to incorporate the nitrogen loading reduction strategies outlined in the Massachusetts Estuaries Implementation Guidance report <http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/mepmain.pdf> 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 pages 32-33 of the Final TMDL. In addition, Harwich has demonstrated their commitment to implement this TMDL through the comprehensive wastewater planning that they initiated well before the generation of this TMDL. The town 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 towns 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 Allen, Wychmere and Saquatucket Harbor embayment systems TMDL is described on page 33 of the TMDL document. MassDEP publically announced the draft TMDL in August 2015 and copies were distributed to key stakeholders. A public meeting was held in the Selectmen’s meeting room in the Harwich Town Hall on August 26, 2015 for all interested parties. The public comment period extended until close of business on September 30,

2015. No written comments were received during the public comment period. The attendance list, public comments from the meeting, and the MassDEP responses are included in Appendix D of the TMDL document. MassDEP fully addressed all comments received during public comment in Appendix D of the TMDL document.

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 February 26, 2016, MassDEP submitted the Final Allen, Wychmere and Saquatucket Harbor Embayment Systems TMDL for Total Nitrogen (Control #312.1) and associated documents for EPA approval. The documents contained all of the elements necessary to approve the TMDL

Attachment 1:

Allen, Wychmere and Saquatucket Harbor Embayment Systems: 3 Total Nitrogen TMDLs and 3 Pollution Prevention TMDLs (taken from Table B-1 of the TMDL)

Embayment/Sub-embayment	Segment ID/Description	Description	TMDL (kg N/day)
Allen Harbor	--/South of Rt 28, Harwich to confluence with Nantucket Sound, Harwich. West of Wychmere Harbor.	Determined to be impaired for nutrients during the development of this TMDL.	9.835
Allen Pond Stream	--/Unnamed stream that flows into Allen Harbor from the northeast under Kildee Road.	Not impaired for total nitrogen, but TMDL needed since embayments are linked. (Pollution Prevention TMDL)	1.055
Wychmere Harbor	--/South of Rt 28, Harwich to confluence with Nantucket Sound, Harwich. West of Saquatucket Harbor.	Determined to be impaired for nutrients during the development of this TMDL.	6.885
Saquatucket Harbor	MA96-23-2012/ South of Rt 28, Harwich to confluence with Nantucket Sound, Harwich	Determined to be impaired for nutrients during the development of this TMDL.	11.557
Cold Spring Brook	--/Stream flows from the north into the northwest side of Saquatucket Harbor.	Not impaired for total nitrogen, but TMDL needed since embayments are linked. (Pollution Prevention TMDL)	6.225
East Saquatucket Stream	--/ Stream flows from the north into the northeast side of Saquatucket Harbor.	Not impaired for total nitrogen, but TMDL needed since embayments are linked. (Pollution Prevention TMDL)	2.296