



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

September 29, 2023

Bonnie Heiple, Commissioner
Department of Environmental Protection
One Winter Street
Boston, MA 02108

Re: Approval of the Wellfleet Harbor Embayment System TMDLs for Total Nitrogen

Dear Commissioner Heiple:

Thank you for the Massachusetts Department of Environmental Protection's (MassDEP) submittal of the TMDL analyses for the Wellfleet Harbor system on August 31, 2022. We appreciate your efforts and involvement with our office to finalize these TMDLs. The U.S. Environmental Protection Agency (EPA) has reviewed the document entitled "Final Wellfleet Harbor Embayment System Town of Wellfleet, Massachusetts Total Maximum Daily Load for Total Nitrogen" (CN – 447.1) and it is my pleasure to approve the Total Nitrogen TMDLs. EPA has determined, as set forth in the enclosed review document, that this TMDL document meets the requirements of Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 Code of Federal Regulations Part 130.

MassDEP's efforts will help restore water quality and prevent further degradation of this, and adjacent, waterbody segments. My staff and I look forward to continued cooperation with MassDEP 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 Jackie Leclair at (617) 918-1549 or have your staff contact Ivy Mlsna of her staff at (617) 918-1311.

Sincerely,

/s

Kenneth Moraff, Director
Water Division

Enclosure

cc:

Richard Carey, MassDEP
Matthew Reardon, MassDEP
Jackie Leclair, EPA
Ivy Mlsna, EPA



Department of Environmental Protection

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August 31, 2023

Jacqueline LeClair
U.S. EPA/Office of Ecosystem Protection
5 Post Office Square, Suite 100
Boston, MA 02109-3912

RE: Final Wellfleet Harbor Embayment System TMDL for Total Nitrogen

Dear Ms. LeClair:

The Massachusetts Department of Environmental Protection through its Watershed Planning Program is pleased to submit for EPA review and approval the enclosed report:

Final Wellfleet Harbor Embayment System, Town of Wellfleet, Massachusetts, Total Maximum Daily Load for Total Nitrogen.

Wellfleet Harbor (MA96-34) is in Category 5, impaired for Nutrient/Eutrophication Biological Indicators and Total Nitrogen. Herring River (MA96-33) is in Category 5, impaired for Aluminum, Estuarine Bioassessments, Fish Passage Barrier, Flow Regime Alterations, and Low pH. Duck Creek (MA96-32) is in Category 5, impaired for Benthic Macroinvertebrates, Dissolved Oxygen, Total Nitrogen, and Nutrient/Eutrophication Biological Indicators. Loagy Bay (MA96-125) is in Category 5, impaired for Chlorophyll *a* and Dissolved Oxygen. Duck Creek and Herring River have approved TMDLs for Fecal Coliform. The impairments addressed in the Wellfleet Harbor Embayment System TMDL report are presented in Table 1.

Table 1 – Impairments addressed in TMDL report.

Waterbody Name	Segment ID	Impairment	TMDL Type	TMDL (kg/day)
Wellfleet Harbor	MA96-34	Total Nitrogen, Nutrient/Eutrophication, and Biological Indicators	Restoration	217.16
Herring River	MA96-33	Estuarine Bioassessments	Protection ¹	48.64
Duck Creek	MA96-32	Total Nitrogen, Benthic Macroinvertebrates, Dissolved Oxygen, Nutrient/Eutrophication, and Biological Indicators	Restoration	70.6

Waterbody Name	Segment ID	Impairment	TMDL Type	TMDL (kg/day)
Blackfish Creek	MA96-123		Protection ²	0.37
Fresh Brook	MA96-126		Protection ²	3.81
Hatches Creek	MA96-124		Protection ²	5.80
Loagy Bay	MA96-125	Chlorophyll <i>a</i> and Dissolved Oxygen	Restoration	10.83
Wellfleet Harbor (total system)				357.17

¹Protective TMDL assigned based on hydraulic connection to Wellfleet Harbor. TMDL or Alternative Plan for Herring River restoration to be developed separately.

²Not impaired for nutrients, but TMDL needed since embayments are hydrologically linked. (Also referred to as a Pollution Prevention TMDL.)

This TMDL report is submitted as final for these waterbodies pursuant to Section 303(d) of the Clean Water Act and in accordance with the provisions of the EPA/State Performance Partnership Agreement.

MassDEP publicly announced the availability of the draft TMDLs in September 2022 and copies were distributed to key stakeholders. The draft TMDL report was posted on the Department's web site for public review at the same time. In addition, a public meeting was held at the Wellfleet Adult Community Center on September 28, 2022, and the public comment period extended until close of business on October 28, 2022. Notice of the public meeting and comment period were published in local newspapers and in the Massachusetts Environmental Monitor. Responses to comments received during the public comment period are included in the TMDL report.

This document now constitutes a final submittal by MassDEP for formal approval by your office. I would like to thank you and other EPA staff for your continued support and assistance during the development of this TMDL report. Please feel free to contact me (Richard.Carey@mass.gov; 508-767-2894) or Matthew Reardon (Matthew.Reardon@mass.gov; 857-248-8349) if you have any additional questions.

Sincerely,

Richard O. Carey, Ph.D.
 Director, Watershed Planning Program
 Massachusetts Department of Environmental Protection

Enclosures

cc: w/o enclosure

Ivy Mlsna, EPA Region 1
 Millie Garcia-Serrano, Regional Director, MassDEP SERO
 Drew Osei, Environmental Engineer, MassDEP SERO
 Matthew Reardon, TMDL Section Chief, MassDEP WPP

EPA NEW ENGLAND'S TOTAL MAXIMUM DAILY LOAD (TMDL) REVIEW

DATE: September 29, 2023

TMDL: Wellfleet Harbor TMDL for Total Nitrogen

STATUS: Final

IMPAIRMENT/POLLUTANT: Three (3) Restoration Total Nitrogen TMDLs and four (4) Protection Total Nitrogen TMDLs (See Attachment 1)

BACKGROUND: EPA Region 1 received the *Final Wellfleet Harbor Total Maximum Daily Load for Total Nitrogen* (Control Number: CN 447.1) from the Massachusetts Department of Environmental Protection (MassDEP) with a transmittal letter dated August 31, 2023. 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, page 40 and Appendix E
- Applicable Massachusetts Surface Water Quality Standards (WQS), Appendix A
- Massachusetts Estuaries Project, Linked Watershed-Embayment Approach to Determine Critical Nitrogen Loading Threshold for the Wellfleet Harbor Embayment System, Town of Wellfleet, Massachusetts, March 2017.
<https://www.mass.gov/doc/wellfleet-harbor-embayment-system-wellfleet-ma-2017/download>
- Final Massachusetts Integrated List of Waters for the Clean Water Act 2022 Reporting Cycle (CN 568.1), May 2023.
<https://www.mass.gov/doc/final-massachusetts-integrated-list-of-waters-for-the-clean-water-act-2022-reporting-cycle/download>
- Massachusetts Estuaries Project Embayment Restoration and Guidance for Implementation Strategies, MassDEP 2003
<https://www.mass.gov/doc/embayment-restoration-and-guidance-for-implementation-strategies/download>

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: Ivy Mlsna (617-918-1311) e-mail: mlsna.ivy@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 Wellfleet Harbor embayment system is located within the Town of Wellfleet on Cape Cod in Massachusetts. The system has a western shore bounded by a narrow barrier beach (the Gut extending southward past Great Island and ending at Jeremy Point) separating the Harbor from Cape Cod Bay, with which it exchanges tidal waters. The Wellfleet Harbor Estuary is one of the largest embayments on Cape Cod and is comprised of large open water areas (namely Wellfleet Harbor) as well as small tributary sub-embayments such as the mouth of Herring River at The Gut, Duck Creek, The Cove, Drummers Cove and Loagy Bay. The watershed contributing nitrogen to the waters of the Wellfleet Harbor Estuary is contained primarily within the Town of Wellfleet except for smaller watershed areas within Truro and Eastham.

The Wellfleet Harbor Embayment System is impaired due to excess nutrients, low dissolved oxygen concentrations, elevated chlorophyll *a* levels, and benthic fauna habitat degradation.¹ The

¹ Small patches of eelgrass were recorded at the mouth of the Herring River in 1995 and 2001, during eelgrass surveys completed by MassDEP. Eelgrass declined by more than 50% between 1995 and 2001 and no eelgrass was mapped in the area in any of the following surveys completed in 2006/7, 2010, and 2015. The restoration target for the Herring River (MA96-33) is for eelgrass habitat, to be addressed separately through an Advance Restoration Plan.

nature of enclosed embayments in populous regions brings two opposing elements to bear: 1) as protected marine shoreline they are popular regions for boating, recreation, and land development and 2) as enclosed waterbodies, they may not be readily flushed of the pollutants that they receive due to the proximity and density of development near and along their shores. The Wellfleet Harbor system is at risk of further eutrophication from high nutrient loads in the groundwater and runoff from the watershed.

While Wellfleet Harbor presently has a relatively low nitrogen load from its watershed, due to its moderately sized watershed and proportionally large undeveloped areas, it is still showing signs of impairment by nitrogen enrichment in the upper most reaches of the system (tributary basins) and is clearly eutrophic (e.g., Duck Creek). The Herring River (MA96-33) has been listed as impaired upstream from the dike at Chequessett Neck (the upper 0.071 mi² area) because of flow alterations (changes in tidal amplitude and flushing) and fish-passage barrier (non-pollutants), as well as for pollutants including low pH, associated metals toxicity due to the lowering of the water table in the marsh sediments (aluminum), estuarine bioassessments, and fecal coliform. Due to the presence of the Chequessett Neck Dike, the river is primarily fresh water, instead of marine water as it would be in its natural state. Prior to construction of the dikes (Chequessett Neck, Pole Dike, and Mill Creek Dike), the Herring River was a complex system that included an estuary in the lower reaches, a salt marsh, and brackish-to-fresh water marshes. Historically, the Herring River was bordered by nearly 1,100 acres of saltwater marsh. Herring River (MA96-33) and Duck Creek (MA96-32) both have an approved TMDL for fecal coliform, CN 252.0, EPA TMDL #36772.

The Wellfleet Harbor Embayment System TMDL for Total Nitrogen was developed by the Massachusetts Department of Environmental Protection (MassDEP) with data collected, compiled, and analyzed by the University of Massachusetts Dartmouth's School of Marine Science and Technology (SMAST), U.S. Geological Survey, Applied Coastal Research and Engineering, Inc., Cape Cod Commission, Town of Wellfleet, Town of Truro, and Cape Cod National Seashore, as part of the Massachusetts Estuaries Project (MEP). To restore and protect this estuarine system, nitrogen loadings, and subsequently the concentrations of nitrogen in the water, must be reduced to levels below the threshold that causes the observed environmental impacts. This concentration will be referred to as the target threshold nitrogen concentration. The goal of the TMDL is to reach this target threshold nitrogen concentration, as it has been determined for each impaired waterbody segment. The MEP has determined that a nitrogen concentration of 0.53 mg/L for this estuarine system at the sentinel station in upper Wellfleet Harbor (WH-5) will restore benthic habitat for infauna animals in the main harbor².

MassDEP has determined that all nutrient impaired segments in the Commonwealth are a high priority. See the Massachusetts 2022 Integrated List of Waters at:

<https://www.mass.gov/lists/integrated-lists-of-waters-related-reports>

² The Herring River Restoration Project will result in major improvements in tidal exchange and flushing. Additional data analysis and modeling is needed to demonstrate that the Herring River Restoration Project will effectively serve as an Advance Restoration Plan for the mouth of the Herring River for the restoration of eelgrass habitat. This requires that the waterbody remain in Category 5 (Waters Requiring a TMDL) in the Integrated List of Waters until SWQS are met or until a traditional TMDL is completed.

B. Pollutant of Concern

In the Wellfleet Harbor Embayment System, the pollutant of concern is the nutrient nitrogen. Additional relevant impairment parameters include low dissolved oxygen, elevated chlorophyll a, and degradation of benthic infauna habitat.

C. Pollutant Sources

The primary ecological threat to Wellfleet Harbor is degradation resulting from nutrient enrichment. Most of the nitrogen load (82%) is from septic systems, with other controllable nitrogen contributions coming from runoff of impervious surfaces and fertilizers. Other sources that are not locally controllable include atmospheric deposition to the surface of the estuary and natural surfaces. Nitrogen from these sources enters the groundwater and eventually enters the estuary system.

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 Use Class for Wellfleet Harbor is SA (314 CMR 4.06, Table 4). Water quality standards of particular interest to the issues of cultural eutrophication are dissolved oxygen, nutrients, aesthetics, excess plant biomass and nuisance vegetation. The Massachusetts Water Quality Standards (314 CMR 4.00) contain descriptions of coastal and marine classes and numeric criteria for dissolved oxygen but have only narrative standards that relate to the other variables, as described in Appendix A of the TMDL document. As stated on page 16 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.

The Massachusetts Estuaries Project analytical method is the Linked Watershed-Embayment Management Model (Linked Model), discussed on pages 16-24 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.

The Linked Model has been previously applied to watershed nitrogen management in numerous embayments throughout Southeastern Massachusetts. In these applications it became clear that the model can be calibrated and validated and has use as a management tool for evaluating watershed nitrogen management options. The Linked Model provides a quantitative approach for determining an embayment's: (1) nitrogen sensitivity; (2) nitrogen threshold loading levels (TMDL); and (3) response to changes in loading rate. Determination of the critical nitrogen threshold for maintaining high quality habitat within Wellfleet Harbor is based primarily on the nutrient, dissolved oxygen, and chlorophyll data and benthic community indicators. The nitrogen threshold for Wellfleet Harbor is based upon the goal of restoration of benthic habitat for infauna animals.

MassDEP selected a sentinel station within the embayment system where restoration activities leading to attainment of SWQS in this most-degraded area would indicate attainment throughout the entire system. This sentinel station in the upper main basin of the Wellfleet Harbor Embayment System will continue to be monitored to determine whether the biological endpoints and nitrogen levels are restored. It was determined that meeting a nitrogen threshold concentration of 0.53 mg/L for tidally averaged total nitrogen (TN) at the sentinel station would restore and support benthic infaunal habitat throughout the system.

In numerous estuaries evaluated by the MEP, it was determined that 0.500 mg/L TN is the upper limit to sustain unimpaired benthic animal habitat (e.g., Eel Pond [Waquoit Bay], Parkers River, upper Bass River, upper Great Pond, Rands Harbor and Fiddlers Cove). Present TN concentrations within the upper reaches of the open water subbasins of Wellfleet Harbor Estuary are >0.55 mg/L TN, consistent with moderately impaired benthic animal habitat. Based upon comparisons to other systems and given the TN concentrations in the non-wetland influenced basins, the periodic oxygen depletions, and the phytoplankton blooms, it appears that a water column nitrogen threshold for the main basin of 0.53 mg/L TN, with 0.50 mg/L TN for the eastern sub-basins, is required for restoration in this system. This slightly higher threshold is due in part to the well-mixed, oxygenated nature of the main basin (resulting from its shallow depth and large fetch for wind driven mixing). In addition, this lagoon does not support high rates of organic deposition, evidenced by the observed generally sandy sediments with oxidized surfaces. The semi-enclosed sub-basins on the eastern shore are less well-mixed and allow more organic deposition, such that a level of 0.50 mg/L TN would be more conducive to high quality benthic habitat.

Should the target concentration be met at the sentinel station without benthic community restoration in Wellfleet Harbor (main), other management activities would have to be identified

and considered to reach the goals outlined in this TMDL (page 39 of the TMDL document). MassDEP's commitment to monitor the receiving water response is, in EPA's view, a reasonable measure designed to manage the inherent uncertainty around selecting a target against a backdrop of considerable scientific and technical uncertainty. While there is sufficient basis in the administrative record at the time of approval to conclude that the selected target will be protective, EPA will coordinate with the MassDEP to review any additional monitoring data or other information that may become available concerning benthic macroinvertebrate populations in the receiving waters, consistent with MassDEP's commitment to evaluate the adequacy of the target. EPA may determine at some point in the future whether a revision of this TMDL may be necessary to achieve water quality that fully supports the aquatic life designated use. These revisions may require additional monitoring, modeling, and revised nitrogen targets at the sentinel station.

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 targets and has made a reasonable and appropriate interpretation of its narrative water quality criteria for the designated uses of the Wellfleet Harbor System. In addition, MassDEP's adaptive management approach to the TMDL allows for revision if the target concentration is reached but habitat indicators are not met.

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 reductions of existing nitrogen loads necessary to meet the target threshold watershed loads range from 0% to 69% with an overall required reduction of 31.4% for the Wellfleet Harbor system as a whole (TMDL Table 6 below, page 24 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. An alternative scenario to meet the target threshold N concentration can also be evaluated as part of the MEP process, at the town’s request.

TMDL 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

System Component	Present Attenuated Watershed Load¹ (kg/day)	Target Threshold Watershed Load² (kg/day)	Watershed Reductions Needed to Achieve Target Threshold Loads
Herring River/The Gut	27.72	27.13	-2.1%
Duck Creek	5.40	1.80	-66.7%
The Cove	9.82	3.04	-69.0%
Drummer/Blackfish	7.36	3.59	-51.2%
Hatches Creek	9.46	9.46	0%
Wellfleet Harbor	17.53	8.64	-50.7%
Loagy Bay	2.45	1.19	-51.2%
System Total	79.74	54.85	-31.4%

¹ Composed of wastewater from septic systems, fertilizer, landfill, wastewater treatment facilities, agriculture, runoff from impervious surfaces, atmospheric deposition to freshwater waterbodies and

natural surfaces. This load does not include direct atmospheric deposition onto estuarine surfaces or benthic regeneration.

² Target Threshold Watershed Load is the load from the watershed needed to meet the embayment target threshold N concentration of 0.53 mg/L identified in Table 4 above.

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, page 26 of the TMDL document). The TMDLs for the Falmouth Inner Harbor system range from 0.76 kg N/day to 3.68 kg N/day. The TMDL for the system as a whole is 7.18 kg N/day.

TMDL Table 7: The Nitrogen Total Maximum Daily Load for the Wellfleet Harbor System

Sub-component	Target Threshold Watershed Load¹ (kg N/day)	Atmospheric Deposition (kg N/day)	Sediment Flux Net² (kg N/day)	TMDL³ (kg N/day)
Herring River/The Gut	27.13	2.81	18.70	48.64
Duck Creek	1.80	-	17.88	19.68
The Cove	3.04	2.22	133.46	138.72
Drummer/Blackfish	3.59	1.66	6.47	11.72
Hatches Creek	9.46	0.15	0	9.61
Wellfleet Harbor	8.64	64.72	44.61	117.97
Loagy Bay	1.19	0.99	8.65	10.83
System Total	54.85	72.55	221.93	357.17

¹ Target threshold watershed load is the load from the watershed needed to meet the embayment target threshold nitrogen concentration identified in Table 4.

² Projected future flux (present rates reduced approximately proportional to watershed load reductions). (Negative fluxes set to zero.)

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 nonpoint sources necessary to meet water quality standards. LAs identify the portion of loading capacity allocated to existing and future nonpoint sources. In the case of the Wellfleet Harbor system, the controllable nonpoint source loadings are primarily from on-site subsurface wastewater disposal systems. Additional nitrogen sources include stormwater runoff (except from impervious cover within 200 feet of the waterbody which is defined below as part of the waste load), fertilizers and atmospheric deposition. Nitrogen loads from the wastewater treatment facility, farm animals, and a landfill contribute $\leq 1\%$ each

Wellfleet received a waiver in 2016 from the requirements of the EPA Phase II Stormwater Program. Stormwater that is subject to the EPA Phase II Program is considered a part of the waste load allocation (WLA), rather than the LA. As presented in Chapter IV, V, and VI, of the MEP Technical Report, on Cape Cod the vast majority of stormwater percolates into the aquifer and enters the embayment system through groundwater, thus defining the stormwater in pervious areas to be a component of the nonpoint source load allocation. As discussed below, even though there are measurable directly connected impervious areas in these systems, the N load from stormwater was determined to be insignificant when compared to the overall controllable N load. Accordingly, this TMDL accounts for stormwater loadings and groundwater loadings in one aggregate LA as a nonpoint source, thus combining the assessments of wastewater and stormwater for the purpose of developing control strategies.

MassDEP addresses LAs for natural background sources (see page 25 of the TMDL document).

Assessment: EPA concludes that the TMDL document sufficiently addresses the calculation of the LAs, 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.

MassDEP 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. This approach is reasonable and is consistent with the Act and implementing regulations. 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. In the Wellfleet Harbor Embayment System there are no NPDES regulated point source discharges in the watershed. EPA interprets 40 CFR 130.2(h) to require that allocations for NPDES-regulated discharges of stormwater also be included in the waste load component of the TMDL. Although a portion of the town of Wellfleet is designated as an urbanized area by EPA, the town requested and received a waiver from the current requirements of Massachusetts Stormwater MS4 permit (EPA 2016). This waiver does not constitute a complete exemption from the stormwater program. EPA will periodically review the information in the waiver request and determine if conditions have changed enough to warrant revisiting whether a waiver is appropriate.

In MS4 communities where an estimate of the nitrogen loadings from regulated stormwater sources was needed, MassDEP considered that most stormwater runoff on Cape Cod and the Islands is not discharged directly into surface waters, but, rather, percolates into the ground. The geology on Cape Cod and the Islands consists primarily of glacial outwash sands and gravels, and water moves rapidly through this type of soil profile. A systematic survey of stormwater conveyances on Cape Cod and the Islands was never undertaken prior to the MEP study used in the development of this TMDL. Nevertheless, most catch basins on Cape Cod and the Islands are known to MassDEP to have been designed as leaching catch basins considering the permeable sediments. Therefore, MassDEP recognized that most stormwater that enters a catch basin will percolate into the local

groundwater table rather than directly discharge to a surface waterbody. However, MassDEP also considered that some stormwater may be discharged directly to surface waters through outfalls. In the absence of specific data or other information to accurately quantify stormwater discharged directly to surface waters, MassDEP assumed that all impervious surfaces within 200 feet of the shoreline, as calculated from MassGIS data layers, would discharge directly to surface waters, whether or not they in fact did so. MassDEP selected this approach because it was unlikely that any stormwater collected farther than 200 feet from the shoreline would be directly discharged into surface waters. Although the 200-foot approach provided a gross estimate, MassDEP considered it a reasonable and conservative approach given the lack of pertinent data and information about stormwater collection systems on Cape Cod. MassDEP has calculated the potential WLA for this 200-foot buffer zone previously in a number of TN TMDLs for embayments on Cape Cod. The calculated waste load allocation due to runoff from impervious surfaces within 200 feet of the estuary system is 0.59 kg/day, 0.71 % of the total unattenuated watershed load (refer to Appendix C for details). This conservative load is obviously negligible when compared to other sources.

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 25-26 of the TMDL document.

Assessment: EPA concludes that the TMDL document sufficiently addresses the calculation of the WLAs, as demonstrated by the foregoing and by the TMDL's administrative record.³

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 this TMDL, described in the TMDL document on pages

³ 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.

28-31. 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 are conservative because the model assumes 100% of the groundwater discharge load enters the embayment, and stream flow entering the embayment was directly measured to determine attenuation;
 - Agreement between the modeled and observed values has been approximately 95%;
 - Water column nitrogen validation dataset is conservative with high or low measurements marked as outliers;
 - Reductions in benthic regeneration of nitrogen are most likely underestimates based on a reduced deposition of PON, due to lower primary production rates under the reduced N loading in these systems; and

- 2) **Conservative sentinel station/target threshold nitrogen concentrations.** The target nitrogen concentration was chosen based on sites that had stable eelgrass or benthic animal (infaunal) communities, and not those just starting to show impairment, which would have slightly higher N concentration. Meeting the target threshold N concentrations at the sentinel stations will result in reductions of N concentrations in the rest of the system; and

- 3) **Conservative approach.** The target loads were based on tidally averaged N concentrations on the outgoing tide, which is the worst case condition because that is when the N concentrations are the highest. The N concentrations will be lower on the flood tides and therefore this approach is conservative.

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 31 of the TMDL document.

Assessment: Since the other seasons are less sensitive to nitrogen loading, EPA concludes that the TMDL is protective during 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 TMDL document presents two forms of monitoring that would be useful to determine progress towards achieving compliance with the TMDL (pages 38-39 of the TMDL document). MassDEP's position is that TMDL implementation will be conducted through an iterative process where adjustments may be needed in the future. The two forms of monitoring include: 1) tracking implementation progress as approved by MassDEP in Wellfleet's Comprehensive Wastewater Management Plan (CWMP), and 2) monitoring water quality and habitat conditions in the estuaries, including but not limited to, the sentinel station identified in the MEP Technical Report. Relative to water quality MassDEP believes that an ambient monitoring program much reduced from the data collection activities needed to properly assess conditions and to populate the model will be sufficient to determine actual compliance with water quality standards. Although more specific details need to be developed on a case-by-case basis, MassDEP believes that about half the current effort (using the same data collection procedures) would be sufficient to monitor compliance over time and to observe trends in water quality changes. In addition, the benthic habitat and infaunal communities would require periodic monitoring on a frequency of about every 3-5 years.

Assessment: EPA concludes that the anticipated ambient water quality monitoring program approved in the CWMP by 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 Wellfleet Harbor Embayment System is described on pages 33-38 of the TMDL document. MassDEP has provided the following implementation plan recommendations:

- **Herring River Restoration Project:** Following years of hydrologic and ecologic research, the Herring River Restoration Project has completed state and federal permitting. The Herring River Restoration Committee and the National Park Service prepared the Environmental Impact Statement/Environmental Impact Report and received the Record of Decision approval September 2016 through National Environmental Policy Act (NEPA) reviews and the Massachusetts Environmental Policy Act (MEPA) certificate was issued in July 2016. Phase I was approved by the Cape Cod Commission on June 15, 2020 (Cape Cod Times, 2020). Phase I includes removal of the Chequessett Dike Dam and replacement with a bridge and a control structure to allow managed increases in tidal flow. The Herring River Restoration Project also includes raising low-lying roads so that there is safe passage under all tidal conditions. Upper Pole Road will be raised, and a larger culvert will be installed with an attached tide gate to manage water levels locally, separate from the main system. Similarly, a dike at Mill Creek will be constructed to manage water levels locally, separate from the main system.

This project is proposed as a long-term, phased increase in tidal flow to avoid unexpected or irreversible changes to the river or Wellfleet Harbor (Friends of Herring River, 2020). In August 2020, the Massachusetts Division of Ecological Restoration awarded the Herring River Restoration Project \$500,000 which will allow project proponents to leverage an additional \$1 million of federal funding (MassDER, 2020). Two grants totaling nearly \$50 million were awarded in 2022 to support the Herring River Estuary Restoration project in Wellfleet, one of the largest tidal estuary restoration projects in the North Atlantic coastal region. The funds are made up of \$27,200,000 in funding from the U.S. Department of Agriculture Natural Resource Conservation Service, and about \$22,670,000 from the Massachusetts Division of Ecological Restoration. In 2023, the U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA) awarded the Town of Wellfleet \$14,690,000 to support implementation of the Herring River Restoration Project.

- **Septic system** loading from private residences is a significant contributor to the controllable N load, therefore as part of the Comprehensive Wastewater Management Plan (CWMP) the town should assess the most cost-effective options for achieving the target N watershed loads, including but not limited to, sewerage and treatment for N control of sewage and septage at either centralized or de-centralized locations and denitrifying systems for all private residences. An approximately 47.4% reduction in attenuated septic loads from present conditions is required in the septic load to the system to achieve the threshold requirements.
- **Stormwater runoff:** EPA granted the town of Wellfleet a waiver from the Massachusetts Stormwater MS4 permit requirements (because it is in a jurisdiction with a population under 1,000 within the urbanized area as defined by the 2010 Census) and at this time is not required to obtain permit coverage for stormwater discharges from their small MS4 (EPA

2016). The NPDES permitting authority is required to periodically review any waivers granted to MS4 operators to determine whether any information required for granting the waiver has changed and EPA may require the town of Wellfleet to seek permit coverage in the future. NPDES permits issued in Massachusetts do not establish numeric effluent limitations for stormwater discharges, rather, they establish narrative requirements, including best management practices, to meet the following six minimum control measures and to meet State Water Quality Standards.

1. Public education and outreach particularly on the proper disposal of pet waste,
2. Public participation/involvement,
3. Illicit discharge detection and elimination,
4. Construction site runoff control,
5. Post construction runoff control, and
6. Pollution prevention/good housekeeping.

Communities applying for Phase II permit coverage, communities must identify the best management practices they will use to comply with each of these six minimum control measures and the measurable goals they have set for each measure.

- **Climate change** should be addressed through TMDL implementation with an adaptive management approach in mind. Adjustments can be made as environmental conditions, pollutant sources, or other factors change over time. The Massachusetts Office of Coastal Zone Management has developed a StormSmart Coasts Program (2008) to help coastal communities address impacts and effects of erosion, storm surge, and flooding, which are increasing due to climate change.

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, as well as reductions in stormwater runoff and/or fertilizer use within the watershed through the establishment of local by-laws and/or the implementation of stormwater Best Management Practices. MassDEP's MEP Implementation Guidance report <http://www.mass.gov/dep/water/resources/coastalr.htm#guidance> provides N loading reduction strategies that are available to Falmouth that could be incorporated into the implementation plans.

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.”

MassDEP explains that a combination of regulatory and non-regulatory program support in Massachusetts will provide reasonable assurances that both point and nonpoint allocations will be achieved, including regulatory enforcement, technical assistance, availability of financial incentives, and state and federal programs for pollution control. MassDEP addresses the concept of reasonable assurance insofar as it relates to overall TMDL implementation on pages 36-37 of the TMDL document. The towns expect 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 on-site subsurface wastewater disposal systems, stormwater 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: MassDEP has described a number of programs that provide 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.

The public participation process for the Wellfleet Harbor TMDL is described on page 40 of the TMDL document. MassDEP publicly announced the draft TMDL and copies were distributed to key stakeholders. A public meeting to present the results of and answer questions about this

TMDL was held on September 28, 2022, in the Adult Community Center in Wellfleet. Comments received at the public meeting and received in writing within the 30-day comment period were considered by MassDEP. The attendance list, public comments from the meeting, written comments received by MassDEP, and the MassDEP responses are included in Appendix E of the TMDL document. MassDEP fully addressed all comments received in Appendix E 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 comments 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 31, 2022, MassDEP submitted the Final Wellfleet Harbor Embayment System TMDL For Total Nitrogen (Control #447.1) and associated documents for EPA approval. The documents contained all of the elements necessary to approve the TMDL.

Attachment 1: Wellfleet Harbor Embayment System Total Nitrogen TMDL (Appendix D of TMDL document)

Waterbody Name	Segment ID	Impairment	TMDL Type	TMDL (kg/day)	Notes
Wellfleet Harbor	MA96-34	Total Nitrogen, Nutrient/Eutrophication Biological Indicators	Restoration	217.16	Includes portions identified by MEP as Drummer Cove and The Cove
Herring River	MA96-33	Estuarine Bioassessments, pH (low)	Protection ¹	48.64	
Duck Creek	MA96-32	Total Nitrogen, Benthic Macroinvertebrates, Dissolved Oxygen, Nutrient/Eutrophication Biological Indicators	Restoration	70.6	Includes portions identified MEP as The Cove
Blackfish Creek	MA96-123		Protection ²	0.37	
Fresh Brook	MA96-126		Protection ²	3.81	The MEP consolidated this waterbody with Hatches Creek in the model. Fresh Brook represents approximately 39.6% of the present watershed loading identified as Hatches Creek in the MEP model. The TMDL load for this waterbody has been prorated to represent the relative present watershed load (ie 39.6% of 9.61 kg/day)
Hatches Creek	MA96-124		Protection ²	5.80	The MEP consolidated this waterbody with Fresh Brook in the model. Fresh Brook represents approximately 60.4% of the present watershed loading identified as Hatches Creek in the MEP model. The TMDL load for this waterbody has been prorated to represent the relative present watershed load for Hatches Creek as a separate entity (ie 60.4% of 9.61 kg/day)
Loagy Bay	MA96-125	Chlorophyll <i>a</i> , Dissolved Oxygen	Restoration	10.83	
Wellfleet Harbor (total system)				357.17	

¹Protective TMDL assigned based on hydraulic connection to Wellfleet Harbor. TMDL or Alternative Plan, for Herring River restoration to be developed separately.

² Not impaired for nutrients, but TMDL needed since embayments are hydrologically linked. (Also referred to as a Pollution Prevention TMDL.)

Data for entry in EPA's National TMDL Tracking System									
TMDL Name *			Wellfleet Harbor Embayment System Total Nitrogen TMDL						
Number of TMDLs*			3 Restoration TMDLs, 4 Protection Plans						
Type of TMDLs*			Nutrients (Total Nitrogen)						
Number of listed causes/parameters (from 303(d) list)									
Lead State			Massachusetts (MA)						
TMDL Status			Final						
Individual TMDLs listed below									
Action ID#	Segment name	Segment ID #	TMDL, Protection Plan, OR Alternative**	Pollutant name	Impairment PARAMETERS/Cause name	Pollutant endpoint	Unlisted?	MA DEP Point Source & ID#	Listed for anything else?
R1_MA_2024_01P	Herring River/The Gut	MA96-33	PP	Total Nitrogen	Estuarine Bioassessments, pH (low)	48.64 kg TN/day	N		Aluminum (5), fecal coliform (4A), fish passage barrier (4C), flow regime modification (4C)
R1_MA_2024_01P	Hatches Creek	MA96-124	PP	Total Nitrogen		5.80 kg TN/day	Y		
R1_MA_2024_01	Duck Creek	MA96-32	TMDL	Total Nitrogen	Total Nitrogen, Benthic Macroinvertebrates, Dissolved Oxygen, Nutrient/Eutrophication Biological Indicators	70.6 kg TN/day	N		Fecal coliform (4A)
R1_MA_2024_01P	Drummer/Black fish Creek	MA96-123	PP	Total Nitrogen		0.37 kg TN/day	Y		
R1_MA_2024_01P	Fresh Brook	MA96-126	PP	Total Nitrogen		3.81 kg TN/day	Y		
R1_MA_2024_01	Wellfleet Harbor	MA96-34	TMDL	Total Nitrogen	Total Nitrogen, Nutrient/Eutrophication Biological Indicators	217.16 kg TN/day	N		
R1_MA_2024_01	Loagy Bay	MA96-125	TMDL	Total Nitrogen	Chlorophyll <i>a</i> , Dissolved Oxygen	10.83 kg TN/day	N		
TMDL Type			Point and nonpoint sources						

Establishment Date (approval)*	September 29, 2023
Completion (final submission) Date	August 31, 2023
Public Notice Date	September 28, 2022
EPA Developed	No
Towns affected* (in alphabetical order)	Eastham, Truro, Wellfleet

**Abbreviations: TMDL = TMDL; Protection Plan = PP; Alternative Restoration Approach = Alt