



The Problem

The Massachusetts Estuaries Project (MEP) Technical Report (available at www.oceanscience.net/estuaries/) indicates that the Waquoit Bay system exceeds its critical nitrogen threshold, resulting in impaired water quality.

A total maximum daily load (TMDL) for nitrogen was established for the Quashnet River, Great River, Jehu Pond, and Hamblin Pond portions of the system by the MassDEP and US EPA in 2006. A TMDL for nitrogen has not been established for the remainder of the Waquoit Bay system.

- **MEP TECHNICAL REPORT STATUS:** Final
- **TMDL STATUS:** In Progress. Nitrogen TMDL established for Quashnet River, Great River, Jehu Pond and Hamblin Pond.
- **TOTAL WASTEWATER FLOW:** 333 MGY (million gal per year)
 - Treated WW Flow: 29 MGY
 - Septic Flow: 304 MGY
- **UNATTENUATED TOTAL NITROGEN LOAD (MEP):** 48,319 kg/Y (kilograms per year)
- **ATTENUATED TOTAL NITROGEN LOAD (MEP):** 40,233 kg/Y

- **SOURCES OF CONTROLLABLE NITROGEN (MEP):**
 - 75% Septic Systems
 - 12% Lawn Fertilizer
 - 13% Stormwater From Impervious Surfaces

CONTRIBUTING TOWNS

- **FALMOUTH**
- **MASHPEE**
- **SANDWICH**
- **DISCUSSION:** A portion of the land area in Mashpee and Sandwich is not in the control of the towns as it is part of Joint Base Cape Cod (JBCC), which is served by a wastewater treatment facility and discharged outside of the watershed.

THE MEP RESTORATION SCENARIO

- **WATERSHED TOTAL NITROGEN REDUCTION TARGET:** 53%
- **WATERSHED SEPTIC REDUCTION TARGET:** 76% (The scenario represents the aggregated sub-embayment percent removal targets from the MEP technical report)

The Waquoit Bay estuary and embayment system is a large marine embayment with shoreline located in the Towns of Mashpee and Falmouth. The system is comprised of the main Waquoit Bay basin and subembayments consisting of Eel Pond, the Childs River, the Great River, Quashnet River, Jehu Pond, Hamblin Pond, and Sage Lot Pond. The Bay supports a variety of recreational uses including boating, swimming, shell fishing and fin fishing.

WAQUOIT BAY ESTUARY

- **EMBAYMENT AREA:** 1,632 acres
- **EMBAYMENT VOLUME:** 380 million cubic feet
- **2012 INTEGRATED LIST STATUS:**
 - Quashnet River: Category 4a for fecal coliform, nitrogen, dissolved oxygen; and Category 5 for estuarine bioassessments and dissolved oxygen
 - Hamblin Pond: Category 4a for fecal coliform, nitrogen, dissolved oxygen; and Category 5 for mercury in fish tissue and dissolved oxygen
 - Jehu Pond: Category 4a for estuarine bioassessments and nitrogen
 - Great River: Category 4a for estuarine bioassessments and nitrogen

- Waquoit Bay System: Category 5 for estuarine bioassessments and dissolved oxygen
- Category Descriptions: Category 4a: TMDL is completed; Category 5: Waters requiring a TMDL
- www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

- Commercial Park
- Southport Retirement Community

WAQUOIT BAY WATERSHED

- **ACRES:** 15,021
- **PARCELS:** 7,171
- **% DEVELOPED RESIDENTIAL PARCELS:** 80%
- **PARCEL DENSITY:** 2.1 acres per parcel (approx.)
- **WASTEWATER TREATMENT FACILITIES:** 3
 - Mashpee High School

Freshwater Sources

PONDS

- **IDENTIFIED SURFACE WATERS:** 38
- **NUMBER OF NAMED FRESHWATER PONDS:** 16
- **PONDS WITH PRELIMINARY TROPHIC CHARACTERIZATION:** 4
(Listed In Appendix 4C, Ponds With Water Quality Data)

LOCAL PROGRESS

MASHPEE

The Town of Mashpee contributes 42% of the attenuated wastewater nitrogen load to the Waquoit Bay watershed. The town has been engaged in wastewater planning since 2001. The draft Needs Assessment and Technologies Screening Reports completed in 2007 address nitrogen loading to the eastern portion of Waquoit Bay and document the significant level of effort that had gone into addressing coastal water quality over the previous six years.

The Alternatives Assessment completed in 2008 evaluates 4 options that consider an array of wastewater management scenarios involving the use of, and potential expansion of, existing wastewater treatment facilities, new sewerage and use of denitrifying on-site septic systems.

In 2013, the town filed its Final Needs Assessment which considers 8 computer simulations run by the Massachusetts Estuaries Project (MEP) to evaluate total maximum daily load (TMDL) compliance. The final report includes adjustments to previous scenarios and incorporates decentralized wastewater treatment and non-traditional nitrogen-reduction approaches, such as aquaculture and stormwater best management practices (BMPs). Scenarios were applied to the eastern portion of the Waquoit Bay system only (i.e. Quashnet River, Jehu Pond, Hamblin Pond, and Sage Lot Pond) pending completion of the MEP technical report for the western portions of systems.

FALMOUTH

The Town of Falmouth contributes 54% of the attenuated wastewater nitrogen load to the Waquoit Bay watershed.

The town received approval of its Comprehensive Wastewater Management Plan (CWMP) in 2014. The plan proposes a combination of traditional and non-traditional approaches to reduce nitrogen loading to coastal waters. The plan proposes to defer sewerage in the Waquoit Bay watershed pending piloting results of non-traditional alternatives evaluated under the CWMP.

SANDWICH

The Town of Sandwich contributes 4% of the attenuated wastewater nitrogen load to the Waquoit Bay watershed. Much of the nitrogen load from Sandwich is attenuated naturally by Ashumet, Johns and Snake Ponds. Sandwich is at the early stages of wastewater planning.

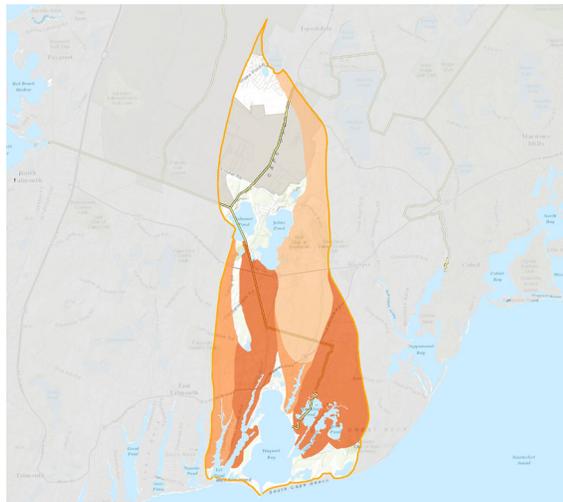
Local efforts in these towns are described in Chapter 6.

WAQUOIT BAY

- **2012 INTEGRATED LIST STATUS:** Ashumet Pond listed as Category 5: Watershed requiring a TMDL

STREAMS

- **SIGNIFICANT FRESHWATER STREAM OUTLETS:** 4
 - Childs River:
 - Average Flow: 10,372 cubic meters per day (m3/d)
 - Average Nitrate Concentrations: 0.21 milligrams per liter (mg/L)
 - Quashnet River:
 - Average Flow: 41,529 m3/d
 - Average Nitrate Concentrations: 0.20 mg/L
- **DISCUSSION:** Characterization of fresh water streams like these is a regular part of the MEP technical reports. These concentrations are higher than areas of the aquifer with less than 0.05 mg/L background concentrations that are evident in public supply wells located in pristine areas. This provides evidence of the impact of non-point source nitrogen pollution from residential areas on the aquifer and receiving coastal waters.



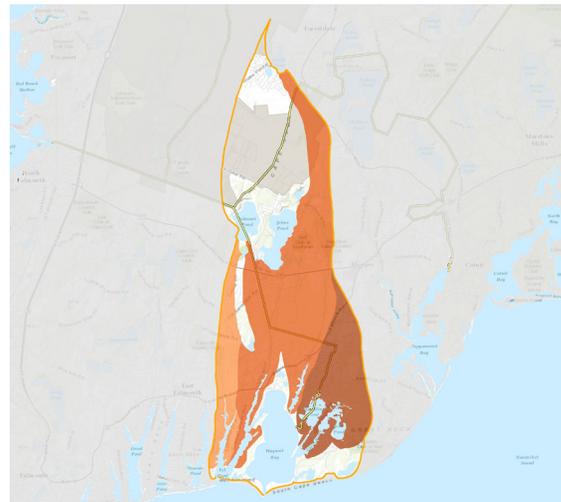
WATERSHEDS: UPPER CAPE

DRINKING WATER SOURCES

- **WATER DISTRICTS:** 2
 - Mashpee Water District
 - Falmouth Water District
- **GRAVEL PACKED WELLS:** 7
 - 4 have nitrate concentrations between 0 and 0.5 mg/L
 - 2 have nitrate concentrations between 0.5 and 1 mg/L
 - 1 have nitrate concentrations between 1 and 2.5 mg/L
- **SMALL VOLUME WELLS:** 0

Degree of Impairment and Areas of Need

For the purposes of the §208 Plan Update areas of need are primarily defined by the amount of nitrogen reduction required as defined by the TMDL and/or MEP technical report. As noted above, the aggregated watershed removal rates are 53% and 76% for total nitrogen load and septic nitrogen loads, respectively. More specifically, the targeted amount of nitrogen

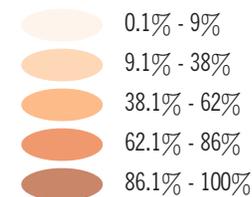


reduction required by subwatershed is shown in Figure 4-1 WB Subwatersheds with Total Nitrogen Removal Targets and Figure 4-2 WB Subwatersheds with Septic Nitrogen Removal Targets.

The nitrogen load from the watershed exceeds the threshold or TMDL for Waquoit Bay resulting in impaired water quality. The ecological health of a water body is determined from water quality, extent of eelgrass, assortment of benthic fauna, and dissolved oxygen and ranges from 1-severe degradation, 2-significantly impaired, 3-moderately impaired, 4- healthy habitat conditions.

MEP ECOLOGICAL CHARACTERISTICS AND WATER QUALITY

- **OVERALL ECOLOGIC CONDITION:** Healthy to Severely Degraded
- **EASTERN SUB-EMBAYMENTS**
- **QUASHNET RIVER-UPPER:** Severely Degraded



Subwatersheds with Total Nitrogen Removal Targets

Figure 4-1 WB

Subwatersheds with Septic Nitrogen Removal Targets

Figure 4-2 WB

WATERSHEDS: UPPER CAPE

WAQUOIT BAY

- **QUASHNET RIVER-LOWER:** Significantly Impaired to Severely Degraded
- **HAMBLIN POND:** Moderately Impaired
- **LITTLE RIVER:** Healthy to Moderately Impaired
- **JEHU POND:** Significantly Impaired
- **GREAT RIVER:** Moderately Impaired
- **WESTERN SUB-EMBAYMENTS**
- **WAQUOIT BAY-NORTH:** Significantly Impaired
- **WAQUOIT BAY-SOUTH:** Significantly Impaired to Severely Degraded
- **EEL POND-WEST:** Significantly Impaired
- **EEL POND-EAST:** Significantly Impaired
- **SAGE LOT POND:** Moderately Impaired
- **SENTINEL STATIONS:**
 - Waquoit Bay:
 - Total Nitrogen Concentration Threshold: 0.38 mg/L
 - Total Nitrogen Concentration Existing: 0.40 mg/L
 - Childs River:
 - Total Nitrogen Concentration Threshold: 0.38 mg/L
 - Total Nitrogen Concentration Existing: 0.65 mg/L
 - Eel River:
 - Total Nitrogen Concentration Threshold: 0.49 mg/L
 - Total Nitrogen Concentration Existing: 0.67 mg/L
(As reported at the MEP sentinel water-quality monitoring stations)