

- Watershed Nitrogen Management Plan

# Town of Mashpee, Popponesset Bay, & Waquoit Bay East Watersheds

## *Needs Assessment Report*



**Final Report**  
**April 2007**

WATERSHED NITROGEN MANAGEMENT PLAN  
NEEDS ASSESSMENT REPORT

TOWN OF MASHPEE, POPPONESSET BAY,  
& WAQUOIT BAY EAST WATERSHEDS

Prepared for  
MASHPEE SEWER COMMISSION

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## **EXECUTIVE SUMMARY**

### **WATERSHED NITROGEN MANAGEMENT PLAN NEEDS ASSESSMENT REPORT TOWN OF MASHPEE SEWER COMMISSION**

#### **BACKGROUND**

The Town of Mashpee's (Town) Watershed Nitrogen Management Plan (WNMP) project was initiated in 1999 to address the Town's need for reducing nitrogen impacts to its coastal embayments and to evaluate all options for restoring those embayments. The project was put on hold as it awaited the results of the Massachusetts Estuaries Project (MEP). The MEP's reports on Popponesset Bay and the Waquoit Bay East (specifically the Quashnet River, Hamblin Pond, and Jehu Pond) watershed systems were released in late 2004 and early 2005, respectively. The findings as developed in those reports are summarized in this report and will be used in the development of the nitrogen management needs and recommended plan for the Project Planning Area (PPA).

The Town of Mashpee, which makes up the majority of the land area of the PPA, is located on the southern side of Cape Cod, bordered by the towns of Falmouth, Sandwich, and Barnstable. The PPA includes the following areas:

- The entire town of Mashpee
- The Popponesset Bay watershed that extends into the towns of Barnstable and Sandwich, as defined by the MEP
- The Waquoit Bay East watershed that extends into the towns of Falmouth and Sandwich, as defined by the MEP

This Report has been developed to identify the wastewater, storm water, and other nitrogen related problems in the PPA, including the Town of Mashpee and those portions of the adjacent towns located within the Popponesset Bay and Waquoit Bay East watersheds.

The purpose of the WNMP Project is to provide an environmentally and economically sound plan for nitrogen reduction, wastewater treatment, and effluent recharge in the PPA. The WNMP will be based on the MEP findings of the associated Total Maximum Daily Loads (TMDLs) for the two watersheds. It will identify other wastewater needs in the PPA, and it will ultimately propose alternatives and a recommended plan to address the effects of the wastewater loads and other nitrogen loadings.

This Needs Assessment Report is the first phase of this long and comprehensive project. It is designed to develop the understanding of existing and future conditions in the PPA that will be used throughout the entire WNMP project, and to complement the work of the MEP.

## **FINDINGS AND CONCLUSIONS**

Information on existing wastewater facilities (septic systems and small treatment plants), physical features, land use, and regulatory issues affecting wastewater facilities is discussed in this Report. Existing conditions and problems related to environmental resources, nitrogen loadings, and on-site septic systems are evaluated and summarized. In addition, future conditions of the PPA relating to population, growth, and the potential effects of that growth on any proposed wastewater collection, treatment, and disposal facilities are identified in the Report.

## **WASTEWATER FLOWS AND NITROGEN LOADINGS**

Wastewater flows and nitrogen loadings were developed based on information compiled as part of the MEP and updated based on revised build-out information developed by the Mashpee Town Planner for the Mashpee portions of the PPA and available build-out information gathered from the MEP analysis and other Town sources for those areas outside of Mashpee.



After each parcel was assigned an appropriate wastewater generation estimate, the parcels were grouped according to land use. The following Table summarizes the existing and future average annual wastewater flows, developed as described above.

#### EXISTING AND FUTURE AVERAGE ANNUAL WASTEWATER FLOWS<sup>(1)</sup>

<b>Land Use</b>	<b>Existing Flow (gpd)<sup>(2)</sup></b>	<b>Future Flow (gpd)<sup>(2)</sup></b>
Multiuse	2,900	4,100
Residential	1,400,000	2,400,000
Commercial	93,000	200,000
Industrial	14,000	72,000
Institutional	15,000	67,000
<b>Total</b>	<b>1,600,000</b>	<b>2,700,000</b>
(1) Flows for the entire PPA.		
(2) All numbers rounded to 2 significant figures.		

The nitrogen concentrations and recharge rates were based on those used by the MEP for their analysis and were applied as part of this Report to obtain estimates of nitrogen loads (in kg/year) from each respective source. These nitrogen estimates were added to wastewater nitrogen to determine total nitrogen loads for each planning zone. To illustrate the predominance of wastewater nitrogen, the percent of total nitrogen load that comes from wastewater was calculated. The following Table details the wastewater and non-wastewater nitrogen loads and the percentage of the nitrogen load that comes from wastewater. The analysis performed for this Report included the entire PPA, which includes portions of Towns outside of Mashpee.

# SUMMARY OF TOTAL NITROGEN LOADS PER TOWN<sup>(1)</sup>

Town	Wastewater Nitrogen Load (kg/yr)		Non-Wastewater Nitrogen Load (kg/yr)		Total Nitrogen Load (kg/yr)		% Wastewater Nitrogen Load <sup>(2)</sup>	
	Existing	Future	Existing	Future	Existing	Future	Existing	Future
Mashpee								
Waquoit Bay East	14,000	29,000	5,600	5,900	20,000	35,000	70%	83%
Popponesset Bay	28,000	41,000	7,700	8,100	36,000	50,000	78%	82%
Other	9,000	16,000	1,800	1,900	11,000	18,000	82%	89%
Total	51,000	87,000	15,000	16,000	66,000	100,000	77%	87%
Falmouth								
Waquoit Bay East	3,200	5,800	800	1,000	4,100	6,800	78%	85%
Sandwich								
Waquoit Bay East	4,500	5,400	1,200	1,300	5,700	6,700	79%	81%
Popponesset Bay	12,000	14,000	2,300	2,500	14,000	16,000	86%	88%
Barnstable								
Popponesset Bay	5,700	8,500	1,200	1,300	7,000	9,800	81%	87%
<p>(1) The nitrogen loads presented in this table do not assume any natural attenuation. Wastewater nitrogen loads are based on septic system nitrogen concentrations of 35 mg/L. All numbers are rounded to two significant figures.</p> <p>(2) Percent of total nitrogen load that comes from wastewater sources.</p> <p>(3) Nitrogen loads were calculated as discussed in Chapter 7.</p>								

As shown in the table above, the predominant source of nitrogen is wastewater effluent. The percentage of nitrogen that comes from future wastewater ranges from 80% to 90%. These percentages are similar to the percentages obtained in MEP's analysis.

The calculations performed as part of the WNMP were compared with the calculations performed for the MEP. The following table summarizes the daily nitrogen loads by subwatershed.

## DAILY NITROGEN LOADS BY SUBWATERSHED

Subwatershed	MEP Results <sup>(1)</sup>		WNMP Results <sup>(2,3)</sup>		Adjusted WNMP <sup>(3,4)</sup> Results	
	Existing Load (kg/day)	Build-out Load (kg/day)	Existing Load (kg/day)	Build-out Load (kg/day)	Existing Load (kg/day)	Build-out Load (kg/day)
Popponesset Bay System						
Popponesset Bay	1.82	1.98	2.3	2.9	1.8	2.2
Popponesset Creek	4.94	5.35	6.3	9.1	4.9	7.1
Pinquickset Cove	0.76	0.98	1.1	1.6	0.9	1.3
Ockway Bay	3.15	4.25	4.1	7.4	3.3	5.7
Mashpee River <sup>(5,6)</sup>	27.67	54.2	75	110	59	87
Shoestring Bay <sup>(7)</sup>	30.77	39.55	38	55	30	43
Waquoit Bay System						
Hamblin Pond <sup>(8)</sup>	9.26	14.23	16	27	13	21
Jehu Pond <sup>(9)</sup>	8.35	10.23	10	15	7.7	12
Quashnet River <sup>(5,10)</sup>	25.95	50.74	41	73	33	57

Notes:

- (1) Total Nitrogen loads (all sources) from MEP reports (Table VI-4 of MEP's *Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Popponesset Bay, Mashpee and Barnstable, Massachusetts*, September 2004 and Table VI-5 of MEP's *Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Quashnet River, Hamblin Pond, and Jehu Pond in the Waquoit Bay System of the Towns of Mashpee and Falmouth, MA*, January 2005). Natural attenuation is considered for septic loads, meaning that these calculations assumed a wastewater nitrogen concentration of 26.25 mg/L.
- (2) Total Nitrogen loads (all sources) from WNMP analysis. Nitrogen reduction in the septic system is not considered for septic loads, meaning that these calculations assumed a wastewater nitrogen concentration of 35 mg/L. WNMP analysis did not split parcels in the same manner that the MEP analysis did. WNMP analysis did not subtract public water supply withdrawals from the total nitrogen loads.
- (3) All WNMP figures are rounded to two significant figures.
- (4) The WNMP figures were adjusted *for comparison purposes only* by reducing the wastewater nitrogen load by 25% (from 35 mg/L to 26.25 mg/L) and leaving all other loads the same.
- (5) This subwatershed includes freshwater subwatersheds. MEP values include attenuation as groundwater flows through the freshwater system. WNMP calculations are higher because they did not include any attenuation resulting from flow through the freshwater system, which likely accounts for the large discrepancy in nitrogen loads.
- (6) Includes surface water loads from Mashpee River.
- (7) Includes surface water loads from Santuit River and Quaker Run River.
- (8) Includes subembayments of Red Brook, Upper Hamblin Pond, and Hamblin Pond.
- (9) Includes subembayments of Little River, Upper Great River, Lower Great River, and Jehu Pond.
- (10) Includes subembayments of Moonakis River, Upper Quashnet River, and Lower Quashnet River.

The predominant reasons for the differences in nitrogen loads are the assumption of a nitrogen reduction in the septic system and natural attenuation through freshwater systems. Natural attenuation is important to consider when evaluating the health of water resources. However, natural attenuation is not considered for wastewater facility planning purposes. Natural attenuation would only be considered for on-site system treatment; when considering treatment at a facility requiring a Groundwater Discharge Permit, any facilities designed to treat wastewater nitrogen would need to account for all of the wastewater nitrogen that could be generated.

## **PRIORITY AREA GROUPINGS**

Based on the criteria developed as part of this Report, the PPA was divided into three Priority classifications. The Priority Areas were grouped into categories of Primary, Secondary, and Tertiary Areas.

Primary Areas are those areas that are located within MEP watersheds requiring high nitrogen removal, areas with high nitrogen loading rates, areas with predominantly year round residents, and planning zone specific criteria identified by the Town of Mashpee Planning Department (such as phosphorus issues in Santuit Pond and the quality and condition of the Mashpee River).

Secondary Areas include those Priority Areas with some of the same concerns as the Primary Areas. However, the secondary areas typically have lower nitrogen loading rates and more seasonal homes. For these reasons, it is recommended these areas be addressed in a later implementation stage of the ultimate recommended plan to address existing nitrogen loading needs.

Tertiary Areas will need to address nitrogen loading issues in the future, but due to the predominantly seasonal residences and the location within the MEP watersheds (typically far upstream in the watershed or completely outside of watershed lines), it is not anticipated that immediate attention is warranted.

The following list summarizes the Priority Area groups:

Primary Areas

- M-1 “Johns Pond”
- M-2 “Mashpee Central”
- M-3 “Shoestring Bay”

Secondary Areas

- M-4 “Santuit Pond”
- M-5 “Mashpee River”
  - M-6 “Jehu Pond”
- M-7 “Popponesset Creek”
- S-4 “Sandwich Quashnet”
  - F-1 “Red Brook”

Tertiary Areas

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>○ M-8 “Mashpee-Wakeby Pond”<ul style="list-style-type: none"><li>○ M-9 “MMR”</li><li>○ M-10 “Mashpee East”</li><li>○ M-11 “Quashnet River”</li><li>○ M-12 “Mashpee South”</li><li>○ M-13 “New Seabury”</li><li>○ S-1 “Sandwich West”<ul style="list-style-type: none"><li>○ S-2 “J Well”</li></ul></li></ul></li></ul> | <ul style="list-style-type: none"><li>○ S-3 “Snake Pond”</li><li>○ S-5 “Sandwich Popponesset”</li><li>○ B-1 “Barnstable Fresh Water”<ul style="list-style-type: none"><li>○ B-2 “Shoestring Bay”</li><li>○ B-3 “Pinquisset Cove”</li><li>○ B-4 “Popponesset Bay”</li></ul></li><li>○ F-2 “Falmouth Quashnet”</li><li>○ F-3 “Falmouth North”</li></ul> |
|--|---|

The following table summarizes the main criteria considered when determining priority areas.



**PRIORITY AREA CRITERIA SUMMARY**

<b>Priority Area Name</b>	<b>MEP Removal Rate</b>	<b>Nitrogen Loading Rates</b>	<b>Year Round</b>	<b>Other Town Considerations</b>	<b>Zone II</b>
<b>Primary Priority Areas</b>					
M-1 – Johns Pond	✓	✓	✓		
M-2 – Mashpee Central	✓	✓	✓		
M-3 – Shoestring Bay	✓	✓	✓		✓
<b>Secondary Priority Areas</b>					
M-4 – Santuit Pond		✓	✓	✓	✓
M-5 – Mashpee River			✓	✓	✓
M-6 – Jehu Pond	✓	✓			
M-7 – Popponesset Creek	✓	✓			
S-4 – Sandwich Quashnet		✓	✓		✓
F-1 – Red Brook	✓	✓			
<b>Tertiary Priority Areas</b>					
M-8 – Mashpee-Wakeby Pond			✓		
M-9 – MMR			✓		
M-10 – Mashpee East			✓		✓
M-11 – Quashnet River			✓		✓
M-12 – Mashpee South			✓		✓
M-13 – New Seabury		✓			✓
B-1 – Barnstable Fresh Water			✓		✓
B-2 – Shoestring Bay (Barnstable)	✓		✓		✓
B-3 – Pinquickset Cove					
B-4 – Popponesset Bay	✓				
S-1 – Sandwich West			✓		✓
S-2 – J Well			✓		✓
S-3 – Snake Pond			✓		✓
S-5 – Sandwich Popponesset			✓		✓
F-2 – Falmouth Quashnet	✓				
F-3 – Falmouth North			✓		✓
Note: Prioritization is based on build-out conditions.					

## **PILOT PROJECT**

In addition to the efforts of the WNMP, Mashpee is working with MADEP on the development of case studies in three estuaries. The goal of this “Pilot Project” is to investigate the use of inter-municipal agreements with respect to watershed based permitting and establishing fair share nitrogen management. This project has brought together the Towns of Mashpee, Sandwich, and Barnstable to examine the best methods to achieve TMDL targets for the Popponesset Bay watershed.

This is an important piece of the nitrogen management planning process for the full development of the WNMP and its implementation in the future.

## **NEXT STEPS TO IDENTIFY SOLUTIONS FOR NITROGEN MANAGEMENT NEEDS**

The next phases of the WNMP process are the screening of technologies and screening of alternatives. As the technologies and alternatives are evaluated and accepted or eliminated, a detailed evaluation can be made and the WNMP can be fully developed. Any remaining issues are then resolved before the final step of environmental and public review.

The Town of Falmouth is currently moving forward with wastewater planning in the Eastern portion of the town, which includes areas that are within the PPA. These efforts can be coordinated with the WNMP, but the Town of Falmouth may wish to use different prioritization criteria for their planning purposes. Additionally, MEP work for the western portion of the Waquoit Bay watershed is still incomplete. The results of this work may have an impact on the findings and recommendations that were outlined in the reports for the Waquoit Bay East watershed. This future work by both the Town and MEP should be taken into consideration as the WNMP process moves forward.

## GLOSSARY OF COMMON ACRONYMS

ACEC	Area of Critical Environmental Concern
ACRE	Applied Coastal Research and Engineering, Inc.
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
BOH	Board of Health
CAC	Citizens Advisory Committee
CCC	Cape Cod Commission
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
CPR	Coastal Pollutant Remediation
CWA	Clean Water Act
CZM	Massachusetts Office of Coastal Zone Management
DEIR	Draft Environmental Impact Report
DRI	Development of Regional Impact
DU	Buildout Dwelling Unit
EIR	Environmental Impact Report
ENF	Environmental Notification Form
EOEA	Executive Office of Environmental Affairs
FAST	Fixed Activated Sludge Treatment
FEIR	Final Environmental Impact Report
FEMA	Federal Emergency Management Agency
ft <sup>2</sup>	Square Feet
gpd	gallons per day
gpm	gallons per minute
GWDP	Groundwater Discharge Permit
HP	Horsepower
I/A	Innovative/Alternative
I/I	Infiltration and Inflow
kg/day	kilograms per day
kg/yr	kilograms per year
LCP	Local Comprehensive Plan
MADEP	Massachusetts Department of Environmental Protection
MBR	Membrane Bioreactor
MCL	Maximum Contaminant Level
MEP	Massachusetts Estuaries Project
MEPA	Massachusetts Environmental Policy Act
mgd	million gallons per day
mg/L	milligrams per liter
MHC	Massachusetts Historical Commission
MMR	Massachusetts Military Reservation

## **GLOSSARY OF COMMON ACRONYMS**

**(continued)**

MSL	Mean Sea Level
NEPA	National Environmental Policy Act
NOI	Notice of Intent
NPC	Notice of Project Change
NPDES	National Pollutant Discharge Elimination System
NPS	Coastal Non-Point Source
N/L	Nitrogen per Liter
OSID	Open Space Incentive Development
POTW	Publicly Owned Treatment Works
PPA	Project Planning Area
ppm	parts per million
PSTF	Privately Owned Sewage Treatment Facilities
PZ	Planning Zone
RBC	Rotating Biological Contactor
RFR	Request for Responses
RPP	Regional Policy Plan
SBR	Sequencing Batch Reactor
SDWA	Safe Drinking Water Act
SHA	Sanborn, Head & Associates
SMAST	School for Marine Science and Technology
SRF	State Revolving Fund
TAC	Technical Advisory Committee
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TSS	Total Suspended Solids
USGS	United States Geological Survey
USEPA	United States Environmental Protection Agency
UV	Ultraviolet
VOC	Volatile Organic Compound
WBNERR	Waquoit Bay National Estuarine Research Reserve
WIC	Wastewater Implementation Committee
WNMP	Watershed Nitrogen Management Plan
WPA	Wetlands Protection Act
WQS	Water Quality Standards
W&S	Weston and Sampson, Inc.
WWTF	Wastewater Treatment Facility

**MASHPEE SEWER COMMISSION  
NEEDS ASSESSMENT REPORT  
WATERSHED NITROGEN MANAGEMENT PLAN**

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- B Excerpts of Response to Comments, Final Environmental Impact Report – New Seabury Development Project, March 2001



## **Chapter 1**

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### **Introduction**

# CHAPTER 1

## INTRODUCTION

### 1.1 PROJECT IDENTIFICATION AND PURPOSE

The Town of Mashpee's (Town) Watershed Nitrogen Management Plan (WNMP) project was initiated in 1999 to address the Town's need for reducing nitrogen impacts to its coastal embayments and to evaluate all options for restoring those embayments. The project was put on hold as it awaited the results of the Massachusetts Estuaries Project (MEP). The MEP's reports on Popponesset Bay and the Waquoit Bay East (specifically the Quashnet River, Hamblin Pond, and Jehu Pond) watershed systems were released in late 2004 and early 2005, respectively. The findings as developed in those reports are summarized in this report and will be used in the development of the nitrogen management needs and recommended plan for the Project Planning Area (PPA).

The Town of Mashpee, which makes up the majority of the land area of the PPA, is located on the southern side of Cape Cod, bordered by the towns of Falmouth, Sandwich, and Barnstable, as shown in Figure 1-1. This figure also illustrates the PPA which includes the following areas:

- The entire town of Mashpee
- The Popponesset Bay watershed that extends into the towns of Barnstable and Sandwich, as defined by the MEP
- The Waquoit Bay East watershed that extends into the towns of Falmouth and Sandwich, as defined by the MEP

This planning area is designed to identify the wastewater, stormwater, and other nitrogen related problems in the Town of Mashpee and the portions of the adjacent towns located within the Popponesset Bay and Waquoit Bay East watersheds.

The purpose of the WNMP Project is to provide an environmentally and economically sound plan for nitrogen reduction, wastewater treatment, and effluent recharge in the PPA. The WNMP will be based on the MEP findings of the associated Total Maximum Daily Loads (TMDLs) for the two watersheds. It will identify other wastewater needs in the PPA, and it will ultimately propose alternatives and a recommended plan to address the effects of the wastewater loads and other nitrogen loadings.

This Needs Assessment Report is the first phase of this long and comprehensive project. It is designed to develop the understanding of existing and future conditions in the PPA that will be used throughout the entire WNMP project, and to complement the work of the MEP.

## **1.2 PROJECT BACKGROUND AND ISSUES**

Mashpee is the fastest-growing town on Cape Cod (according to US Census data). During the 1980s, its population was the fastest growing in New England, increasing by 113%. At the same time, it is located almost entirely within the watersheds of two shallow, nitrogen-sensitive embayments – Popponesset Bay and Waquoit Bay East. The estuarine systems of both bays have shown significant signs of degradation, which has been documented to be attributable to excessive inputs of nitrogen.

The main source of nitrogen is the sub-surface disposal of domestic wastewater through septic systems or cesspool systems and the migration of the nitrogen in the wastewater to the estuary via groundwater. The MEP reports have documented these impacts and the quantity of nitrogen that needs to be removed (in one potential scenario) to meet proposed nitrogen TMDLs for these two estuary systems. The other main sources of wastewater nitrogen are the eight (8) small wastewater treatment facilities (WWTFs) in Mashpee and one WWTF in Sandwich, also located within the PPA (one additional WWTF will be discussed in Chapter 6 because of its potential use as part of the WNMP).

Other sources of nitrogen include the precipitation that falls on natural areas, roofs, and paved roads or parking areas; the application of fertilizers to vegetation; and the presence of domestic







and wild animals. Reduction in these other types of nitrogen loadings is also a goal of the community and of the WNMP project, but the source of nitrogen that appears most amenable to reduction using available technology is domestic wastewater.

The Towns of Mashpee and Sandwich currently have no municipal sewer system; the municipal sewers in Falmouth and Barnstable do not extend into the PPA. Since 1988, Mashpee has had a Sewer Commission with full authority, given funding, to implement such a system for the town. In the late 1990s, the Board of Selectmen also created a “Watershed Management Committee,” now defunct, in response to resident concerns about coastal water quality, particularly in the Mashpee River estuary. The Committee engaged in an active debate about nitrogen loading issues, suggested certain regulatory changes, secured Town Meeting approval of funding for consultant studies of ecological conditions in the Popponesset Bay estuary, and presented a public education program on the issue entitled “Mashpee’s Watershed Year 1997-98”. In addition, in May of 1998 Town Meeting adopted a Local Comprehensive Plan (as directed by the Cape Cod Commission’s Regional Policy Plan) that included a section on “Water & Wastewater Facilities” (with the Wastewater portion drafted by the Planning Department and Sewer Commission and approved by the Planning Board). The Water and Wastewater Facilities section included a concept plan illustrating possible approaches to wastewater treatment improvements. However, there is no wastewater sewer district governing the entire PPA as a whole.

The WNMP is a more formal next step, intended to recommend a cost-effective and “politically” feasible means to address the nitrogen loading problem. This WNMP is likely to include municipal wastewater treatment facilities along with other facilities and management structures to accomplish the goals of the plan.

Mashpee’s WNMP process started in 1999 with the approval of project funding by Town Meeting, subject to receipt of a State Revolving Fund (SRF) loan, which was received in 2001. The Sewer Commission contracted with the Center for Marine Science and Technology (CMaST) at the University of Massachusetts Dartmouth to provide the nitrogen modeling and targets for the Town’s coastal embayments and with Stearns & Wheler to develop facilities plans to meet those targets. (CMaST is now known as SMAST – the School for Marine Science and



Technology.) However, in 2001, SMAST teamed with a group consisting of the Massachusetts Department of Environmental Protection (MADEP), the US Environmental Protection Agency (USEPA), the Executive Office of Environmental Affairs (EOEA), and the Cape Cod Commission (CCC) to form the MEP. The MEP was developed to evaluate and quantify nutrient impacts to 89 estuaries in Southeastern Massachusetts. The creation of the MEP has prompted an even greater awareness of wastewater impacts (namely from nitrogen) to Mashpee's estuaries and natural resources.

As stated above, the MEP is a combined effort to address impacts to 89 southeastern Massachusetts estuaries. Additional information on this effort can be viewed at [www.state.ma.US/dep/smerp/smerp.htm](http://www.state.ma.US/dep/smerp/smerp.htm). The main components of this effort include:

1. Watershed delineation by United States Geological Survey (USGS) staff.
2. Multi-year water quality monitoring by the Town of Mashpee, the Cotuit Waders, and other volunteers working with SMAST.
3. Nitrogen loading assessment for the watershed by the CCC Water Resources staff. Existing and build-out projections of land use (by parcel) were provided by the Mashpee Planning Department. Water use data was obtained from each respective Water District or Department.
4. Tidal flushing evaluations and hydrodynamic model development by Applied Coastal Research and Engineering, Inc. (ACRE).
5. Specialized coastal surveys, monitoring, and analysis by SMAST staff and development of water quality models.
6. Nitrogen concentration thresholds and loading limits development by SMAST, MADEP, and ACRE staffs.

## 7. Technical guidance information development.

With the creation of the MEP and its work to evaluate Popponesset Bay and the Waquoit Bay East system, the WNMP planning process was put on hold until the MEP efforts were completed. Nitrogen limits for the Popponesset Bay estuary were determined by the MEP in September 2004; nitrogen limits for the Waquoit Bay East estuary (Quashnet River, Hamblin Pond, and Jehu Pond) were determined by the MEP in January 2005. The nitrogen limits led to the development of TMDLs for these embayments; the TMDLs were issued in April 2006 (Final) and October 2005 (Final Draft), respectively. The needs assessment process was resumed after release of this information. The WNMP will build upon this information developed by the MEP and MADEP.

The following other regional projects on Cape Cod are proceeding concurrently with the development of the Town's WNMP. Useful information developed as part of these efforts will be incorporated into the findings of the WNMP. Efforts are being made by the Town of Mashpee to coordinate the WNMP with these ongoing efforts.

**A. Barnstable County Regional Efforts.** Barnstable County has initiated several regional efforts that are ongoing or recently completed, as briefly discussed below:

1. Formation and coordination of the Cape Cod Water Protection Collaborative (Collaborative), which meets monthly to discuss wastewater initiatives and coordinate information between towns. Selectman John Cahalane is the Town representative to this group and has participated regularly. The Collaborative is the result of the efforts by the Barnstable County Blue Ribbon Panel, formed to review the Cape Cod Business Round Table's proposal for county-wide wastewater management authority efforts, as well as other county efforts.

2. Establishment of a Technical Advisory Committee (TAC) to the Collaborative, made up of wastewater and planning professionals appointed by the County Commissioners to advise the Collaborative. The TAC replaced the County's Wastewater Implementation Committee (WIC), which had provided County-wide coordination of wastewater initiatives prior

to the establishment of the Collaborative. Mashpee Sewer Commissioner and Town Planner F. Thomas Fudala serves on the TAC.

3. Distribution and administration of County appropriations through the WIC to develop scientific, engineering, and management information to support nitrogen and wastewater management studies. These efforts included the following related projects:

- A report entitled “*Enhancing Wastewater Management on Cape Cod: Planning, Administrative, and Legal Tools*” (“Tools Report” July 2004), to investigate planning, administrative, and legal tools for improving wastewater management on the Cape, including a case study on issues involved in integrating private wastewater treatment facilities into a municipal wastewater management system in Mashpee.
- A project, performed by Stearns & Wheler, to evaluate the use of computer models (SewerCAD) to evaluate potential sewer systems, which used the Popponesset Bay watershed as a Case Study (Sewer Modeling and Preliminary Design Evaluations, Guidance Document and Case Study Report, November, 2005).
- County and federally-funded project by the USGS to utilize a USGS regional groundwater particle tracking model and staff expertise to evaluate potential well and effluent recharge sites in several Cape towns, including a series of alternative wastewater recharge scenarios in Mashpee.

**B. Popponesset Bay Pilot Project.** In addition to these County initiatives, a USEPA Water Quality Cooperative Agreements Watershed Permitting Grant funded an ongoing MADEP project entitled *Protecting Coastal Waters through Watershed-Wide Permitting and Nutrient Trading in Three Massachusetts Estuaries*, (including Popponesset Bay) better known as the “Pilot Project,” to develop guidance and permitting tools in four (4) areas: watershed-based permitting, cross-community interaction and regulation, nitrogen trading issues such as trading mechanisms, monitoring, and compliance, and MADEP policy and permitting for watershed-based nutrient control. The project has also involved investigating possible nitrogen load

allocations to the three towns that share the watershed as well as the use of watershed modifications to promote greater natural attenuation of nitrogen in the watershed.

These four regional projects discussed above have developed valuable information that will enhance the Town's WNMP.

### **1.3 PROJECT SCOPE**

The WNMP Project Scope is divided into the following phases listed below:

- Phase I      Review of Existing Data
- Phase II      Needs Estimates/Projected Flows
- Phase III     Screening of Alternative Technologies and Techniques
- Phase IV     Development and Evaluation of Alternative Scenarios
- Phase V      Conceptual Design and Cost Estimates for Selected Scenarios
- Phase VI     Recommended Plan
- Phase VII    Preliminary Designs and Costs for Effluent Pipeline
- Phase VIII   Environmental Review Documents
  - Environmental Notification Form (ENF) and MEPA Unit/CCC Joint Review Form Document
  - Needs Assessment Report
  - Screening Analysis Report
  - Alternative Plan and Draft Environmental Impact Report (EIR)
  - Alternative Plan and Final EIR
- Phase IX     Public Participation Outreach
- Phase X      Project Administration

## **1.4 ENVIRONMENTAL REVIEW PROCESS**

A Joint Environmental Review Process by the EOEA MEPA Unit (MEPA Unit) and CCC has been initiated for this Project. As such the following five (5) documents will be prepared and submitted for review:

- ENF and MEPA Unit/CCC Joint Review Process Application Form
- Needs Assessment Report
- Alternatives Screening Analysis Report
- Draft Nitrogen and Wastewater Management Plan and EIR
- Final Nitrogen and Wastewater Management Plan and EIR

The ENF and Joint Review Process Application Form was submitted for MEPA and CCC review in September 2001, and the subsequent Certificate of the Secretary of Environmental Affairs was filed on November 9, 2001. The full Certificate is attached in Appendix A.

All of the documents to be reviewed by MEPA and CCC will be prepared in accordance with the Memorandum of Understanding between the CCC and the Secretary of Environmental Affairs. Each of these documents will be submitted to MADEP, the MEPA Unit, the CCC, and other interested parties for review and comment. Each document will be submitted with the Proposed Scope of Work for the next document to be produced. It is hoped that this approach will promote the public involvement and comment needed to build a consensus for implementation of the recommended plan.

## **1.5 FORMATION OF A COMMUNITY ADVISORY COMMITTEE (CAC)**

The Town of Mashpee has formed a Community Advisory Committee (CAC) to advise the Sewer Commission on the Project and to assist in its implementation. The CAC includes the following representation:

- A representative from each of the five (5) electoral precincts of Mashpee

- Representatives from the following organizations:
  - Mashpee Board of Health
  - Mashpee Conservation Commission
  - Mashpee Waterways Commission
  - Mashpee Historical Commission
  - Mashpee Wampanoag Indian Tribal Council
  - Mashpee Shellfish Commission
  - Mashpee Chamber of Commerce
  - Mashpee Environmental Coalition
- A representative from the adjoining Towns of Barnstable, Falmouth, and Sandwich

## 1.6 PURPOSE AND ORGANIZATION OF NEEDS ASSESSMENT REPORT

The Needs Assessment Report is written to summarize the work identified in Phase I and Phase II of the Project Scope. This includes the research and description of existing and future conditions in the PPA as related to nitrogen loads and related water quality issues.

This Needs Assessment Report is divided into ten chapters. **Chapter One** presents general introductory information about the Watershed Nitrogen Management Planning Project. **Chapter Two** describes the technical documents reviewed along with Town and regional data. **Chapter Three** identifies the regulatory issues (local, regional, State, and Federal) that must be considered during the Project. **Chapter Four** discusses the Massachusetts Estuaries Project's efforts related to the PPA. **Chapter Five** describes the PPA's existing conditions related to environmental resources and demographics. **Chapter Six** describes the PPA's existing wastewater treatment facilities. **Chapter Seven** discusses the existing and future wastewater flows and nitrogen loading. **Chapter Eight** evaluates and identifies the wastewater nitrogen priority areas in the PPA. **Chapter Nine** provides a summary of the wastewater nitrogen needs. **Chapter Ten** identifies funding opportunities that are available.

## **Chapter 2**

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### **Data Review**



## CHAPTER 2

### DATA REVIEW

#### 2.1 INTRODUCTION

This chapter provides an overview of information used in preparing the Phase I Needs Assessment Report. The chapter includes a brief summary of past plans, reports, studies, and planning documents associated with wastewater planning in the Town of Mashpee.

#### 2.2 COASTAL EMBAYMENT REPORTS AND DATA

The following coastal embayment-related technical reports and data were reviewed for this Needs Assessment Report:

A. **“Sources of Bacterial and Nutrient Contamination in the Mashpee River, Santuit River, and Shoestring Bay – Interim Report” October 1987, K-V Associates, Inc.**

This study looked into the sources of bacterial and other contamination in the Mashpee and Santuit River Corridors. The following summarizes the main points of the study:

- Bacterial contamination in the Mashpee River Corridor appears related to wildfowl sources.
- The major source of bacteria in Shoestring Bay appears to originate from a region just to the north of the School Street Bridge. The report was inconclusive, but presented the possibility that domestic sources could be the source.
- Septic source point discharges are uncommon along the river shorelines. However, septic leachate may be seasonally significant.
- Over 56 and 49 locations of surface runoff and visually apparent groundwater discharge were identified along the Mashpee and Santuit River Corridors, respectively.

**B. “Winter Conditions, Storm Discharge and Recharge Zone Delineation for the Mashpee River, Quaker Run, and the Santuit River” May 1988, K-V Associates, Inc.**

This study was undertaken as a supplement to the October 1987 study done by K-V Associates to more fully define the flow and water quality conditions along the river systems discharging into Shoestring Bay. The following conclusions were reached after water quality sampling and flow measurements:

- The river systems are largely dependent upon groundwater for flow with a discharge volume of 24 million gallons per day (mgd), 1.2 mgd, and 11 mgd respectively for the Mashpee River, Quaker Run, and Santuit River.
- In all three stream/estuarine systems, an increase in phosphorus concentration occurs as freshwater grades into brackish water.
- Generally, nitrogen decreases as freshwater changes to saltwater (the report did identify that this was not true for two regions along the Mashpee and Santuit Rivers).
- Bacterial concentrations in water samples were relatively low during winter compared to their summer conditions.

The recharge zones were delineated for the stream and river systems varying in size from the Mashpee River (2,053 acres), Santuit River (827 acres), to the small Quaker Run (106 acres).

**C. “A Cumulative Impact Assessment Plan to Reduce and Control Sources of Contamination in the Mashpee and Santuit/Shoestring Bay River Estuaries” June, 1991, K-V Associates, Inc.**

The purpose of this Mashpee River (and Shoestring Bay) Modeling Study was to provide long term management guidance for preserving the quality of the river. K-V Associates developed a simple linear model of the fresh water portion of the river, which was combined with the Ketchum Model for estuarine mixing. This model was combined with sampling results from previous studies to form a sensitivity matrix. This matrix could then be used to test the response

of water quality to engineering changes within the basin. All of the information was compiled to assess nutrient loadings and develop mitigation measures.

K-V Associates recommended the following mitigation measures to combat the adverse effects of nitrogen loadings in the river basins:

- Nitrogen Control – Recommendation included a 3-phase plan for achieving denitrification on large sewage systems, new residential homes, and existing homes.
- Bacterial Control – Recommendations included continued monitoring, roadway runoff control, and improved septic failure detection.
- River Eutrophication – Recommendation was planning and implementation of a riverbank improvement program.
- Harbor Management – Recommendations included limitations on in-water mooring areas and maintenance dredging to maintain flushing.
- Organizational – Recommendations were for modification of the Conservation Commission to a Conservation/Restoration Commission and creation of a Tree/River Warden position.

**D. “The Technical Bulletin on Nitrogen Loading (TB91-001)” 1992, Eichner and Cambareri**

This bulletin was developed by the Cape Cod Commission (CCC) to help identify sources of nitrogen and establish concentrations for nitrogen loading assessments of individual watershed parcels. It also provides justification for water quality standards for nitrogen that are found in the Regional Policy Plan (also developed by the CCC).

**E. “Assessment of Coastal Nitrogen Loading and Nitrogen Management Alternatives: Popponesset Bay (Draft)” November 1995, Cape Cod Commission**

The purpose of this study was to quantify the relative sensitivity of the Popponesset Bay subembayments to nitrogen loadings from wastewater, lawns, runoff, and precipitation.

Using a flushing load, the CCC determined the following critical loads for the subwatersheds:

- Shoestring Bay – 12,119 kilograms per year (kg/yr)
- Mashpee River – 1,020 kg/yr
- Entire Popponesset Bay system – 230,522 kg/yr

The Commission also evaluated current and projected land use provided by the Mashpee Planning Department for the various subwatersheds, and the additional nitrogen loading expected from future development based on water use (current density and average commercial water use) assumptions. The assessment determined that although Popponesset Bay as a whole has the assimilative capacity to accommodate existing and future nitrogen loads, the subembayments of Mashpee River and Shoestring Bay, when considered separately, already have nitrogen loads that exceed assimilative capacity. The CCC went on to recommend improved nitrogen removal during wastewater treatment and a reduction in nitrogen loading within these two subwatersheds to address this issue.

#### **F. “The Ecology of the Waquoit Bay National Estuarine Research Reserve” 1996, Massachusetts Department of Environmental Management**

This document discusses the ecology of the Waquoit Bay National Estuarine Research Reserve (WBNERR) including human and animal habitats, the geologic history and glaciation of the area, response to urban development, and management issues regarding eutrophication, nutrient loading, endangered species, and others.

The main points of the section entitled “Modeling Nitrogen-Loading to Coastal Waters” were most pertinent to this discussion and are discussed briefly below:

- Nitrogen-loading models under evaluation on Cape Cod differ with regard to the inclusion of wet and dry atmospheric deposition, the importance of losses of nitrogen in septic system plumes and the aquifer, and the effects of travel time of groundwater.

- The model used in this study included nitrogen contributions from atmospheric deposition (about 15 kg TDN/hectare/13 lb-acre), fertilizer inputs, and on-site septic systems (about 3-5 kg/person/day); and losses from volatilization, uptake, adsorption, and denitrification, depending on the travel pathway.
- Nitrogen loading to Waquoit Bay lags behind the rate of development by almost a decade due to the time of travel of groundwater, about 0.3-1 meter/year.
- Nitrogen loading has a direct effect on the organisms in an estuarine ecosystem, including *Phytoplankton*, *Microalgae*, *Gracilaria tikvahiae*, *Cladophora vagabunda*, Eelgrass, Shellfish, Amphipods, Isopods, and others.

**G. “Nutrient Related Water Quality within the Popponesset Bay System, Part I: Summer Survey of Nutrient and Oxygen Levels” December 21, 1997, Brian L. Howes and David R. Schlezinger, School for Marine Science and Technology (SMAST).**

The purpose of this study was to determine if there was currently any nutrient related water quality degradation of any of the Popponesset Bay’s component embayments. The results indicated that the component sub-embayments of Mashpee River, Ockway Bay, and Shoestring Bay showed a range of nutrient related water quality impacts from highly impacted (Mashpee River) to moderate-high impact (Ockway and Shoestring Bays).

The report also discusses the issue of nutrient related water quality degradation resulting from nitrogen loading, and the sources of this nitrogen.

**H. “Nutrient Management of the Popponesset Bay System: Quantitative Assessment of Nitrogen Loading Tolerances of Component Sub-Embayments” June 12, 1999, Brian L. Howes, Ph.D., SMAST at the University of Massachusetts—Dartmouth**

This report presented a progress report to the Town of Mashpee Watershed Committee on the on-going assessment of the Popponesset Bay System to support nutrient management and restoration plans. The preliminary results of the study were as follows:

- Total nitrogen and chlorophyll levels throughout the Popponesset Bay system were generally at least 2 times that of the water in Nantucket Sound.
- The Mashpee River showed oxygen depletion and some of the highest chlorophyll-a levels (indicative of high algae concentrations) reported for any Cape Cod embayment.
- The ecological and water quality data collected was to be used to determine nitrogen loading tolerances for each component system.

#### I. **Massachusetts Estuaries Project (MEP) Documents:**

The following reports were developed by MEP for watersheds in the PPA:

- “Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Popponesset Bay, Mashpee and Barnstable, Massachusetts” Final Report – September 2004.
- “Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Quashnet River, Hamblin Pond, and Jehu Pond, in the Waquoit Bay System of the Towns of Mashpee and Falmouth, MA” Final Report – January 2005.
- “FINAL: Popponesset Bay total Maximum Daily Loads for Total Nitrogen” April 10, 2006.
- “FINAL DRAFT: Quashnet River, Hamblin Pond, Little River, Jehu Pond, and Great River in the Waquoit Bay System Total Maximum Daily Loads for Total Nitrogen” October 14, 2005.

The purpose, methodology, and findings of these reports are discussed in greater detail in Chapter 4.

In addition to the MEP reports listed above, the Technical Report and Draft Total Maximum Daily Load (TMDL) Report for the Three Bays estuary have been released (a small portion of the Town of Mashpee is included in the Three Bays watershed). The Technical Report was released in April 2006, and the Draft TMDL Report is dated December 28, 2006. The Draft TMDL Report presents one scenario to achieve the proposed TMDLs that would require removal

of varying amounts of wastewater-generated nitrogen. Some subwatersheds are identified as requiring as high as 100% septic nitrogen removal. The Three Bays reports were completed as part of the Town of Barnstable's nutrient management plan, which is in the process of developing nitrogen limits for all of the significant estuaries within Barnstable. Once the TMDLs for Barnstable's estuaries are completed, the nutrient management plan will be used to evaluate and implement wastewater and nitrogen management solutions to meet the specified goals and limits for restoring water quality.

## **2.3 WASTEWATER REPORTS AND DATA**

The following wastewater-related technical reports and data were reviewed for this Needs Assessment Report:

### **A. "Town of Mashpee Facility Plan (Draft)" April 1988, Weston & Sampson, Inc.**

This report was conducted by Weston & Sampson, Inc. (W&S) to evaluate the existing wastewater treatment and disposal facilities for the Town, predict future wastewater and septage volumes, and select and design a new wastewater management solution. At the time, residents of Mashpee utilized an on-lot disposal system of cesspools and septic tanks. Throughout the 1980's, monthly and annual septage volumes steadily increased and surpassed Board of Health (BOH) limitations. Results from a 1986 questionnaire answered by residents from Popponesset, New Seabury, Seconsett Island, Central Mashpee, and Pond Areas were also used in needs assessment. Based on this information and projected population and land use development, W&S determined existing and future wastewater flows for winter and summer conditions. After conducting an alternatives analysis of various wastewater treatment technologies, the recommendation was to haul sewage to a septage treatment facility located on the parcel of Town owned land on Ashers Path, which was occupied at the time by a sanitary landfill. The report also details a preliminary design of the facility, including a financial plan, recommended method of financing, and operation and maintenance of the facility.

**B. “East Mashpee Subregional Treatment Facility Environmental Notification Form (ENF)” September 1988, DeFeo, Wait & Associates, Inc.**

This ENF was submitted for the proposed East Mashpee Subregional Wastewater Treatment Facility (WWTF). Also included are the design report and feasibility study for the WWTF, and the Geohydrological/Environmental Evaluation Report prepared by Goldberg-Zoino and Associates, Inc.

The facility was designed to utilize Rotating Biological Contactor (RBC) technology along with secondary and tertiary processes to treat a maximum daily flow of 250,000 gallons per day (gpd) coming from the Willowbend, Dolphin Bay, Cranberry Hollow, and Stratford Ponds developments in East Mashpee. The following were evaluated as potential sites that could accommodate a WWTF and effluent disposal facilities:

- Landfill Site - Located on the north side of Ashers Path and currently occupied by the Town of Mashpee Solid Waste Transfer Station and Police Department firing range.
- Peck Site - Located on the north side of Quinaquisset Avenue west of the Santuit River. The site is undeveloped at this time, but mostly owned by the Mashpee Conservation Commission.
- Antunes Site – Located on the west side of Orchard Road at the intersection of Quinaquisset Avenue. This site is presently developed as a residential subdivision.
- Houston Site – Located on the east side of Mashpee Neck Road at Simons Narrows. The site consists of four parcels which have since been developed.
- Marsters Site – Located at the east side of Mashpee Neck Road, north of Dry Hollow Lane. A residential subdivision has been developed on this site.

The landfill site at Ashers Path was chosen as the most appropriate site for this design. A wastewater collection system was also designed, involving lift stations on the north side of Quinaquisset Avenue and on Noisy Hole Road, gravity sewers, and pressure sewers.



**C. “Wastewater Management Study for Seconsett and Monomoscoy Islands”  
December 1990, Dames & Moore**

The purpose of this study was to evaluate wastewater management options for Seconsett and Monomoscoy Islands that would reduce organic and nutrient loadings to nearby Waquoit Bay. The study looked at 245 existing homes plus flow from the existing boat yard (using 1988 data) for a total residential and commercial average daily wastewater flow of 52,000 gpd. Future flow, including inflow and infiltration, was estimated at 75,370 gpd.

Based on these conditions, Dames & Moore evaluated two alternatives – collection system for off-island treatment and collection system with on-island treatment. The on-island option was estimated to cost \$4,700,000 in 1990 dollars. Based on this cost and the high land requirements for this option, the report recommended and provided the preliminary design for a collection system that would convey individual septic tank effluent to an off-island treatment facility. The facility was estimated to cost \$3,450,000 in 1990 dollars.

**D. “Feasibility Analysis of Septage Pretreatment at the MMR WWTF” May 1995,  
Dufresne-Henry, Inc.**

This study evaluated the feasibility of implementing a septage pre-treatment facility at the wastewater treatment facility located on the Massachusetts Military Reservation (MMR) to accommodate septage generated in the towns of Sandwich and Mashpee. The following summarizes the findings of the study:

- At the time of the study, septage from the Town of Mashpee was transported to the Barnstable wastewater treatment facility or to facilities off Cape Cod for treatment.
- The report recommended a pretreatment train consisting of the following components: preliminary screening and grit chamber, flow equalization, sludge thickening and dewatering, filtrate equalization, odor control, and solids stabilization.

- The study provided preliminary designs and cost estimates for dewatering using the existing belt filter press and for dewatering through the installation of a recessed chamber press.

**E. “Sewer Extension Permit Application Submittal Data – Shoestring Bay Estates Sewage Pump Station” August 17, 1998, Earth Tech**

This document provides wet well calculations and curve data for the Shoestring Bay pumping station, which services the development at Willowbend. It also provides specifications for the grinder pumps, control panel, generator set, generator accessories, and transfer switch associated with the pumping station.

**F. “New Seabury Development Project ENF” November 1999, Earth Tech, Inc.**

This ENF details potential environmental impacts and permitting requirements for the New Seabury development project at the following locations:

- Spinnaker Cove
- Sea Quarters Condominium Complex
- Popponesset Inn
- Poppy Place
- New Seabury Country Club and vicinity
- Flat Pond Subdivision (including Promontory Point Condominium)
- Green Golf Course (site of existing WWTF)

Also included is the request for a Phase One waiver for construction of the golf course clubhouse, golf cart storage building, and the wastewater treatment facility. The determinations for this Phase One Waiver include:

- The potential impacts of the Phase One, taken alone, are insignificant.

- Ample and unconstrained infrastructure exists to support Phase One of the New Seabury redevelopment program.
- The project is severable.
- The Agency Action on Phase One will ensure due compliance with Massachusetts Environmental Policy Act (MEPA) and 301 CMR 11.00 prior to Commencement of any other phase of the Project.

The following approvals were required to construct the New Seabury Development Project:

- ENF and Environmental Impact Report (EIR) for MEPA approval
- Groundwater Discharge Permit under 314 CMR 5.00
- Sewer connection/extension permit under 314 CMR 7.00
- Massachusetts Department of Environmental Protection (MADEP) Approval to construct a WWTF under 314 CMR 12.00
- Order of Conditions under the Massachusetts Wetland Protection Act (WPA)

Attachment F of the ENF is the Preliminary Engineering Report for the Proposed WWTF and disposal facilities at New Seabury. This report details the wastewater collection, treatment, and disposal process, as well as calculations for design flow and sizing of tanks (See Chapter 6 of this report for a detailed description of this facility).

**G. “The Neighborhoods of Mashpee Commons DEIR and Final DRI Submittal” March 15, 2000, Mashpee Commons, L.P.**

The purpose of the Mashpee Commons Development of Regional Impact (DRI) Submittal is to demonstrate that the Mashpee Commons Master Plan meets the goals of the Cape Cod Commission’s Regional Policy Plan and the Town of Mashpee’s Local Comprehensive Plan in the following aspects of its development:

- Community Character
- Heritage Preservation

- Affordable Housing
- Transportation
- Natural Resources and Open Space
- Water Resources
- Solid and Hazardous Waste Management
- Construction Impacts

This document also includes the following Draft Environmental Impact Reports (DEIR) which are included as part of the MEPA review process:

- Transportation DEIR/DRI, Vanasse & Associates, Inc.
- Mesoscale Air Quality Analysis, Tech Environmental, Inc.
- Water Resources DEIR, Sanborn, Head & Associates (SHA)

Within the Water Resources section of the DEIR is a report prepared by SHA detailing the permit modification application, an estimation of future wastewater and nitrogen loadings, and stormwater best management practices. A report on Mashpee Commons WWTF expansion alternatives written by Dufresne-Henry is also included in this section.

#### **H. “Draft Environmental Impact Report – New Seabury Development Project” October 2000, Earth Tech**

This report includes descriptions of the proposed developments at New Seabury as appropriate to the discussion of potential environmental impacts and mitigation of these impacts. The New Seabury development activities at the time were:

- Completion of the Sea Quarters Condominium – 50 units
- Completion of the Promontory Point Condominium – 24 units
- Development of the Flat Pond subdivision - +/- 30 single-family homes
- Development of Spinnaker Cove – 8 single-family units and a 4,000 square foot commercial building

- Redevelopment of the Popponesset Inn and associated recreation facilities
- Completion of the Bluff Lots east of the Popponesset Inn – 5 single-family homes
- Condominium development around Popponesset Inn – 51 units
- Poppy Place – 14 single-family lots
- Replacement of golf course clubhouse
- Condo development around the golf course clubhouse – 87 units
- Construction of the new golf course maintenance facility
- Upgrade of the Green Golf Course and a portion of the Blue Course
- Mixed use development in Section 5
- Construction of a 300,000 gpd WWTF to service the new development, clubhouse, and Popponesset Inn

Development in Section 5 of the New Seabury property is described in detail in this DEIR as it is a site of potential historic significance and also contains two public water supply wells and their corresponding Zone II Aquifer Protection Districts.

The following approvals and permits were required by the state for this project:

- ENF as part of the MEPA review process
- Phase I Waiver Request (MEPA)
- Draft EIR (MEPA)
- Groundwater Discharge Permit (MADEP)
- Chapter 91 License for Spinnaker Cove Development (MADEP)
- Disposal Works Construction Permit for WWTF and for temporary systems at clubhouse, maintenance facility, and recreation complex (BOH)
- Building Permits (Building Department)

Most of these developments will feed into the existing WWTF, which is permitted to handle 300,000 gpd. Additional mitigation measures include the use of Best Management Practices (BMPs), the implementation of a Stormwater Pollution Prevention Plan, limitations on the area of manicured lawn in developments that are adjacent to the Mashpee Water District wells, and

the installation of monitoring wells associated with the wastewater treatment facility discharge and public water supply wells.

The projected increase in water use resulting from the developments at New Seabury (16,000 gpd) is expected to be supplied by the addition of two water supply wells (at Mashpee Village and Turner Road #2), and possibly by the Upper Cape Regional Water Supply Cooperative on the Massachusetts Military Reservation.

#### **I. “Master Plan for Mashpee Commons FEIR/DRI” January 2001, Mashpee Commons, L.P.**

Water Resource impacts associated with earlier proposals for the development of Mashpee Commons such as stormwater runoff, increased domestic wastewater generation, and increased water supply demand were addressed in this document. The Master Plan proposes an upgrade to the existing treatment plant to accommodate the increased wastewater load resulting from new development, and also to include existing properties in the area. The capacity of the treatment system was based on the average daily flow during the peak month of the year (due to the seasonal variation of flows). For nitrogen removal, wastewater characteristics based on an average annual flow were used to design a “no net increase” in nitrogen loading into the Mashpee River watershed. The treatment plant will be upgraded to treat an anticipated 195,000 gpd and achieve an average of 4 milligrams per liter (mg/L) Total Nitrogen through tertiary treatment.

The Master Plan also details environmental impacts of the Mashpee Commons development project on the following:

- Natural Resources and Open Space
- Solid and Hazardous Waste
- Transportation
- Affordable Housing
- Heritage Preservation and Community Character

The development of the Mashpee Commons Neighborhoods and the upgrade of the WWTF are phased out over fifteen (15) years to allow the plans to evolve with changing needs of the community.

**J. “Final Environmental Impact Report (FEIR) – New Seabury Development Project”  
March 2001, Earth Tech**

This report was written to address comments regarding the DEIR that was filed in October, 2000. The report presents the comments and responses, and updated the status of the project at the time. The questions that were addressed included some that are relative to the Watershed Nitrogen Management Plan (WNMP) process. One comment was in reference to Mashpee’s proposal to dispose of 500,000 gpd of wastewater at New Seabury. The response included the following comments:

- Although the area was identified as an ideal location for wastewater disposal, no firm proposals were in place to move forward with the plan.
- At the time, effluent disposal was intended to be by means of deep well injection, which “is not yet a fully accepted technology in Massachusetts”.
- The proposal would require large amounts of land acquisition by the Town, which would have to be bought from the owner or taken by eminent domain.

Additional comments recommended further groundwater modeling to determine the potential impacts on drinking water supply wells and the potential for groundwater mounding as a result of New Seabury’s proposed 300,000 gpd discharge. The response included the following comments:

- Wastewater-impacted groundwater would take several years to reach Zone II boundaries. Saltwater intrusion would be a much greater concern during extended pumping periods.

- The groundwater mound, with all irrigation wells off, was projected to be 0.8 feet. The elevation of the groundwater near the wells was still determined to be higher than the elevation of the projected mound. This would indicate that the potential for the wastewater to impact the drinking water supply was minimal.

Excerpts of the FEIR are attached in Appendix B. For detailed comments and responses, please refer to the actual document.

## **2.4 OTHER REPORTS AND DATA**

The following other technical reports and data were reviewed for this Needs Assessment Report:

### **A. “Mashpee Water District Annual Reports,” Mashpee Board of Water Commissioners.**

The addition of Pump Station #5 at Turner Road, designed by Dufresne-Henry, Consulting Engineers, added up to 600 gallons per minute (gpm) to the available water supply in Mashpee. Construction of the Belcher well pumping station was completed in 2006, providing an additional 1 mgd to Mashpee’s water supply.

### **B. “Stormwater Report on Runoff to Mashpee and Santuit Rivers from Public Ways” May 17, 2006, Charles L. Rowley & Associates**

This report was written for the town of Mashpee Planning Board after several stormwater runoff sites were inspected. The runoff sites were located on public ways and discharged to either the Mashpee River or the Santuit River. The report summarizes observations, identifies discharge points, and presents conclusions for the following sites:

- Route 130 at the Mashpee River and Herring Run
- Santuit River at Quinaquisset Avenue



- Santuit River at Route 130 and Route 28
- Santuit River at Old Mill Road
- Quinaquisset Avenue at the Mashpee River Woodlands area

## **Chapter 3**

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# **Regulatory Issues**

## CHAPTER 3

### REGULATORY ISSUES

#### 3.1 INTRODUCTION

This chapter presents the environmental regulations affecting wastewater facilities in Massachusetts and the Project Planning Area (PPA). Federal, State, regional, and Town governments have enacted various environmental regulations, which relate to the collection, treatment, and discharge of wastewater. Federal regulations are contained in the Code of Federal Regulations (CFR) and are enforced by the United States Environmental Protection Agency (USEPA). Massachusetts regulations are contained in the Code of Massachusetts Regulations (CMR) and are enforced by the Massachusetts Department of Environmental Protection (MADEP). Regionally, the Cape Cod Commission (CCC) has adopted a Regional Policy Plan, which provides guidance and goals for development and environmental protection on Cape Cod. Locally, the Towns in the PPA have adopted Board of Health (BOH), conservation, and zoning regulations and Town Bylaws to protect the health of the citizens. The Towns in the PPA are also required to have developed Local Comprehensive Plans to provide growth management and environmental protection for the future. These regulations, plans, Bylaws, and guidance documents are intended to protect public health and the natural environment.

Following is a brief summary of some of the regulations that are more applicable for this project. This is not intended to be a comprehensive statement of everything that is involved in the various regulations. For details on any of the requirements, refer to the actual laws or regulations.

#### 3.2 FEDERAL REGULATORY ISSUES

A. **NEPA.** The National Environmental Policy Act of 1970 (NEPA) provides the basis for the

protection of the environment. This act ensures that environmental information is provided to the public for use in the decision making process for projects that might affect the environment. According to regulations, the “NEPA process is intended to help public officials make decisions that are based on an understanding of environmental consequences; and take actions that protect, restore, and enhance the environment.” This policy has been established to eliminate redundancy and combine NEPA requirements with other concerned agencies’ requirements. The NEPA process is the forerunner of similar environmental review processes adopted by State and regional agencies; it allows for the assessment and identification of alternatives for projects concerning the environment. The Town of Mashpee is not expected to enter into the NEPA process as the WNMP Study is regulated by the Massachusetts Environmental Policy Act (MEPA) and the CCC’s Development of Regional Impact (DRI) review process as described in following sections.

### **3.3 STATE REGULATORY ISSUES**

**A. On-Site Treatment and Discharge.** Title 5 of the Massachusetts State Environmental Code provides minimum standards for the “protection of public health, safety, welfare and the environment by requiring the proper location, construction, upgrade, and maintenance of on-site sewage disposal systems and appropriate means for the transport and disposal of septage.” The regulations contained in 310 CMR 15.00 come under the jurisdiction of the MADEP and are enforced in conjunction with local health departments through permits, inspections, and financial penalties.

As defined by the regulations, an individual sewage disposal system is “a system or series of systems for the treatment and disposal of sanitary sewage below the ground surface.” Systems typically consist of a septic tank, a distribution box, and a soil absorption system. These systems may also include tight tanks, shared systems, or alternative systems if allowed by local and state regulations. The design considerations for Title 5 systems include minimum setbacks, minimum separation from groundwater, sizing guidance, and soil requirements.