

Chapter 6

Needs Assessment Summary

CHAPTER 6

NEEDS ASSESSMENT

6.1 INTRODUCTION

The purpose of the Comprehensive Wastewater Management Planning (CWMP) project is to address wastewater and nutrient management issues for all areas of the Town of Barnstable. The purpose of the Needs Assessment Report is to clearly define the wastewater and nutrient-related needs of the Town and identify data gaps that need to be addressed as the Project proceeds so that solutions to the needs can be found in subsequent phases of the Project.

The purpose of this chapter is to summarize these wastewater and nutrient management needs as developed and described in previous chapters.

6.2 WASTEWATER AND NUTRIENT MANAGEMENT PLANNING HISTORY IN BARNSTABLE AND RELATED NEEDS

The Town initiated its last wastewater planning process in 1993 with the 20-year planning period of 1994 to 2014. The project was completed in 2007 with state approval of the Final Wastewater Facilities Plan and Final Environmental Impact Report, March 2007 (2007 WWFP). The main focus of that planning project was to address surface and groundwater problems caused by failing septic systems (and even systems that were operating properly but were still impacting drinking waters). The following list briefly summarizes the main recommendations of that project. (A complete listing of the findings and recommendations of that project can be found in Chapter 2.)

- Upgrade and expand the Hyannis Water Pollution Control Facility.
- Extend sewers to the Wastewater Areas of Concern (AOC) in the eastern portion of the Town to address the water quality problems in these areas.
- Defer decision on many of the AOCs in the western portion of the Town until nitrogen limits are set by the state and federal governments.

- ▶ Address wastewater problems in several AOCs with Board of Health solutions and public water supply.

Many of the recommendations have been completed, including:

- ▶ Upgrade and expansion of the Hyannis WPCF.
- ▶ Initial sewer extensions in the eastern portion of the Town.
- ▶ Board of Health solutions and extension of public water supply to the AOCs that need these types of solutions.
- ▶ Developed nutrient limits of most of the Town's coastal estuaries.

The extension of sewers in the eastern portion of the Town has been slowed by the Town's historic policy/practice that sewer extension costs be paid by the properties being served by the sewers through property betterments. Several residents in the sewer extension areas have argued against this policy/practice. As a result, the Town has been investigating alternative funding methods for the Clean Water Projects.

A clear policy that addresses funding methods for the Clean Water Projects is needed to implement the projects recommended by the 2007 WWFP, as well as to provide guidance to the CWMP project.

6.3 REGIONAL WASTEWATER AND NUTRIENT MANAGEMENT ISSUES AND RELATED NEEDS

There are several regional wastewater and nitrogen management issues that must be addressed as part of this CWMP Project, as briefly listed below:

- ▶ The Massachusetts Estuaries Project has developed nitrogen limits for many coastal estuaries and their watersheds on Cape Cod and (with the help of the Town) for most of Barnstable's estuaries.
- ▶ There is Cape-wide and Town-wide concern about the high cost to mitigate the nitrogen loadings and meet the new nitrogen limits.
- ▶ The watersheds of several Town estuaries extend into the neighboring Towns of Mashpee, Sandwich, and Yarmouth.

- The Towns of Mashpee and Yarmouth have been working on comprehensive wastewater and nutrient management planning projects for several years, and Sandwich will initiate a project in 2010 or 2011.
- The Cape Cod Water Protection Collaborative is the County entity tasked with supporting the Cape Towns with their planning projects. They have identified the shared estuaries of (and watersheds to) Popponesset Bay and Lewis Bay as high-priority areas to find multi-town solutions.

The main wastewater and nutrient-related needs that result from these issues are summarized below:

- Coordination with the Towns of Mashpee, Sandwich, and Yarmouth; and with the Cape Cod Water Protection Collaborative to develop feasible solutions to the shared estuaries and watersheds is needed.
- The Town needs to consider all potential wastewater and nutrient management solutions that could reduce costs to the Town and Town residents.

6.4 TOWN VISION AND GOALS WITH RESPECT TO WASTEWATER AND NUTRIENT MANAGEMENT PLANNING

Barnstable’s most recent completed Local Comprehensive Plan articulates a Town vision as well as several Comprehensive Plan Goals as listed below.

Vision. “The seven diverse yet interconnected villages of Barnstable form one community that is an integral part of Cape Cod. As the Town in 2008 has been shaped by its past, through this plan Barnstable will shape a sustainable future. The Town will preserve its history, environment and community for future generations through active stewardship of community character and quality of life while balancing growth, infrastructure and natural systems.”

Comprehensive Plan Goals. The following goals are stated for the Comprehensive Plan:

1. Sustain diverse villages and livable neighborhoods for year-round residents while providing housing opportunities for all.
2. Preserve, protect, and enhance sensitive natural habitats and systems.

3. Provide Town services and infrastructure through an efficient, planned, and prioritized process.
4. Support and manage the regional resources and services unique to Cape Cod.
5. Preserve and enhance historic and maritime character, public viewsheds, and cultural landscapes.
6. Enhance pedestrian activity in historic village centers.
7. Preserve and enhance access to public spaces, including the waterfront.
8. Foster and support the creative economy, which includes history, culture, and arts.
9. Promote traffic reduction, traffic management, alternate transportation modes, property interconnections, and travel demand management.
10. Foster and support public transit while planning for associated parking, pedestrian and bicycle travel needs.
11. Allow development review to be more efficient for applicants and Town regulatory bodies in a predictable and fair manner.
12. Develop and support a process to encourage private investments and support appropriate economic development.
13. Fully integrate implementation of plan goals, actions, and strategies into the municipal budget and capital planning process.

This vision and these Town goals need to guide the formation of the Comprehensive Wastewater Management Plan.

6.5 ESTIMATED LAND USE GROWTH PROJECTIONS IN BARNSTABLE AND RELATED NEEDS

Evaluations completed as part of this Project, and summarized in Chapter 5, provide estimates of the existing and future land use in the Town. Use of the Town’s Geographic Information System (GIS) has developed this information in terms of the number of residential dwellings and the amount of non-residential building space for each property in the Town as allowed by current zoning. These estimates are summarized below in terms of land use increase (percent [%]) for each of the villages.

TABLE 6-1

PROJECTED LAND USE INCREASES PER VILLAGE AREA¹

VILLAGE	RESIDENTIAL DWELLINGS	NON-RESIDENTIAL SQ-FT AREA
Cotuit	120%	190%
Osterville	120%	220%
Marstons Mills	120%	200%
Centerville	110%	170%
Hyannis	140%	310%
Barnstable	200%	350%
W. Barnstable	170%	220%

These projected increases in land use as allowed by current zoning will add to the wastewater and nutrient loading problems. They need to be considered as solutions are developed.

6.6 WATER QUALITY NEEDS

A. **Estuarine Water Quality Needs.** The impacts and nitrogen limits to estuarine water quality have been researched and documented by the Massachusetts Estuaries Project and MassDEP for Popponessett Bay, Rushy Marsh, Three Bays System, Centerville River System, Halls Creek, and Lewis Bay. The impacts and nitrogen limits to the estuarine water quality in Barnstable Harbor have not yet been researched and documented. These nitrogen limits are needed to complete the CWMP Project and develop a Town-wide Plan.

The nitrogen limits developed to date are summarized in Chapter 5 and are illustrated on Figure 5-1 and in Appendix 5-4 for the existing and build-out conditions. Figure 5-1 illustrates the percent of existing wastewater (septic system) nitrogen load that must be removed to meet the nitrogen total maximum daily load (TMDL) limits. The figure offers a broad perspective look at the amount of wastewater nitrogen loading that needs to be addressed. The figure (and the additional information in Appendix 5-4) indicates that the nitrogen mitigation needs to be focused on specific watersheds and subwatersheds. Some subwatersheds need 100 percent wastewater nitrogen removal to meet the limits.

Septic system discharges have been found by the MEP to be the largest source of nitrogen to the Town's estuaries. Typically, these discharges comprise 75 percent to 85 percent of the nitrogen load from the watershed. Fertilizers and runoff from roads and roofs are the other two controllable nitrogen sources and typically comprise 5 percent to 10 percent of the watershed nitrogen loadings. This distribution is site specific for each watershed. Though septic systems are by far the largest source in Barnstable, fertilizers and runoff should be managed to reduce their loadings or, at the least, prevent the loads from these sources to increase. These sources are typically managed through "best management practices" that are typically implemented through increased awareness of these sources and public education. Public education on proper management of these two nitrogen sources is needed.

B. Pond Water Quality Needs. Phosphorus is typically the limiting nutrient for fresh water systems; therefore, it is the nutrient that stimulates excess algae production and produces water quality problems in ponds. There are no phosphorus TMDLs for Barnstable's ponds, but there has been much monitoring and analysis of pond data in the past.

As part of this Needs Assessment phase of the Project, the pond data was evaluated, and an Action Plan was developed for the ponds. The evaluation, findings, and main recommended actions are summarized in Table 5-3. The full report on this evaluation is attached in Appendix 5-1.

Many of the ponds are showing signs of water quality impact, and the Action Plan needs to be initiated to develop further information and begin remediation.

C. Groundwater Quality and Drinking Water Supplies. The drinking water quality, as indicated by the water supply annual Consumer Confidence Reports (CCR) is good. The 2007

WWFP investigated nitrogen impacts to the water supplies and found that most were well protected. Three zones of contribution to water supplies in the eastern portion of the Town were recommended for sewer extension to further protect the water supplies. These areas are the CO7, BWST1, and BWMEL1 areas, as illustrated on Figure 2-1. These sewer extensions need to proceed to further protect these water supplies.

Nitrogen discharges from septic systems previously were the main concern to the water supply zones of contribution. More recently, concerns have been raised about a new category of water contaminant called Contaminants of Emerging Concern (CECs). This general category includes three subgroups: endocrine disrupting compounds, pharmaceuticals, and personal care products. These compounds and potential contaminants are not currently regulated by the federal government because their toxicity is not well understood. Many of these compounds originate from the medications and personal care products that we use and discharge to our septic systems and wastewater treatment facilities.

Advanced wastewater treatment facilities, such as the Hyannis Water Pollution Control Facility and the Marstons Mills Wastewater Treatment Facility, are believed to provide better removals of these compounds than individual septic systems, but there is a lack of data on the performance of individual septic systems for these containments.

MassDEP revised their groundwater discharge regulations in March 2009 to require that all treatment facilities with flows greater than 10,000 gallons per day remove the total organic carbon (TOC) component of their wastewaters to less than 3 mg/L if the discharge is greater than a two-year travel time from the well, and less than 1 mg/L if the travel time is less than two years. TOC is not a contaminant by itself, but it is a surrogate of the CECs because most of the CECs are comprised of organic carbon. Research indicates that if the TOC concentration is low, the concentrations of the CEC will be low or non-detectable. This regulatory change has a big impact on the Hyannis Water Pollution Control Facility and the Marstons Mills Wastewater Treatment Facility, both of which discharge their treated waters to zones of contribution to public water supply wells with travel times greater than two years.

The Town needs to develop a plan as part of this CWMP Project on how it will meet this new regulation.

The Cape Cod Commission has been retained by the Town to re-delineate the zones of contribution to the water supplies in the Town. As part of this effort, the Town and this Project will need to:

- Work with the Commission, the water purveyors, and MassDEP on the re-delineation.
- Create revised zoning overlays to correspond with the new delineations.

6.7 WASTEWATER TREATMENT AND RECHARGE FACILITIES AND RELATED NEEDS

Most of the properties in the Town are served by individual on-site septic systems that have been documented as contributing the largest percentage of nitrogen (75 to 85 percent) to the coastal estuaries. Nitrogen discharges from these systems need to be remediated to meet the nitrogen TMDLs. These systems also discharge large quantities of phosphorus that is impacting water quality in the freshwater ponds. Phosphorus discharges from these systems need to be remediated to address pond water quality impacts.

A group of 71 individual Innovative and Alternative (I/A) septic systems as regulated by MassDEP and the Title 5 regulations are operating in Barnstable. These systems are typically designed to remove approximately 50 percent of the nitrogen in the wastewater and meet a limit of 19 mg/L total nitrogen. Research at the Otis On-Site Septic System Test Facility at the Massachusetts Military Reservation indicates that these systems typically can meet this limit when they are properly designed and operated with a consistent wastewater flow. Data analysis by the Barnstable County Department of Health and Environment on the I/A systems actually installed at Cape Cod properties indicates that only 60 percent of the installed systems meet the 19 mg/L limit. Data review of the 71 systems in Barnstable indicates similar performance.

There are two privately owned wastewater treatment facilities in Barnstable located at the Cotuit Landings Stop & Shop and at the Cape Regency Skilled Nursing and Rehabilitation Center. They are sized for approximately 20,000 gpd, and both have demonstrated good nitrogen removal performance to meet their discharge limit of 10 mg/L total nitrogen.

The Town owns and operates three treatment facilities:

- Hyannis WPCF
- Marstons Mills WWTF
- Red Lily Pond Cluster System

These treatment facilities and their collection systems are illustrated on Figure 1-1, and their “needs” are summarized below:

A. **Hyannis WPCF.** The Hyannis WPCF treats an average flow of 1.46 million gallons per day (mgd) and a maximum-month average flow of 1.94 mgd. It has recently been upgraded and expanded and has a maximum-month capacity of 4.2 mgd. The treatment facility has excellent performance and averages 5 mg/L total nitrogen in the treated water as compared to a MassDEP discharge limit of 10 mg/L.

MassDEP has recently (March 2009) revised their groundwater discharge regulations to require a total organic carbon (TOC) limit in the treated water because the recharge is in a zone of contribution to public water supply wells. This project will need to develop a plan (as part of the CWMP) to meet these new TOC limits.

The capacity of the sand infiltration beds has been estimated based on text-book information that may not be accurate for the sandy soil conditions at the site. Therefore, the sand bed capacity may be even greater. A hydraulic loading test in the sand beds would provide a more empirical measure of the capacity of these beds which may become important in the future if some of the bed areas need to be used for new treatment facilities. A hydraulic load test needs to be completed to better estimate the capacity of the sand infiltration beds.

The Hyannis WPCF has a collection system that has grown over time, and its ability to accept more flow is not clearly defined. A computer model was developed for the Hyannis Growth Incentive Zone (GIZ) area of Hyannis when the Town was evaluating that area for the GIZ. The existing computer model should be expanded to cover the whole collection system. This will allow a better understanding of its capacity and how the existing system can be most efficiently expanded to pick up additional flow.

B. Marstons Mills WWTF. The Marstons Mills WWTF serves an elementary school, a middle school, and a residential development of 30 homes. The WWTF was recently upgraded and is performing well. Similar to the Hyannis WPCF, its recharge is in a zone of contribution to a public water supply well and, as such, the WWTF will need to increase its treatment to meet the new TOC discharge limit (discussed earlier in this chapter) of 3 mg/L. The CWMP Project will need to evaluate options to meet this new limit.

C. Red Lily Pond Cluster System. This cluster system serves several homes adjacent to Red Lily Pond and Elizabeth Lake. It does not have a discharge permit, and its treatment performance is expected to be similar to a conventional Title 5 septic system. No modifications to this system are indicated at this time.

6.8 INFORMATIONAL NEEDS (DATA GAPS)

The preceding sections summarized the wastewater and nutrient management needs in Town. Some of these are informational needs for the Project Team to continue and complete the CWMP Project. The informational needs as identified in previous chapter sections are listed below.

- Nitrogen TMDL for Barnstable Harbor to be developed by the Massachusetts Estuaries Project and MassDEP.
- Nitrogen TMDL for Lewis Bay. (The Town has received the Massachusetts Estuaries Technical Report on this estuary but still needs the TMDL Report.)
- Revised funding policy for Clean Water Projects in Barnstable.
- Collaborative input from the neighboring towns of Mashpee, Sandwich, and Yarmouth; and the Cape Cod Water Protection Collaborative on reducing nitrogen loadings to the shared watersheds of Popponesset Bay, Three Bays System, Barnstable Harbor, and Lewis Bay.
- Informational needs related to the Barnstable Ponds Action Plan including needed sampling and analysis data.
- Possible revisions to water supply well zones of contribution being completed by the Cape Cod Commission with coordination with the water purveyors and MassDEP.
- Refinement of the sand infiltration bed capacity at the Hyannis WPCF based on a hydraulic load test to assist in future treated water recharge evaluations.
- Expansion of the sewer system computer model to assist in future wastewater collection evaluations.

These informational needs shall be considered and addressed as the project proceeds.

6.9 NO ACTION ALTERNATIVE

The No Action Alternative is always developed as part of a CWMP project to identify the likely outcome of not acting on the current wastewater problems in the Town of Barnstable. Degradation of Popponesset Bay, Three Bay System, Centerville River System, and Lewis Bay will continue from the excessive nitrogen loading in the watersheds to these water bodies, primarily from the on-site septic systems. The MEP technical reports used colored maps to illustrate how the nitrogen concentrations would increase from their current levels to the projected buildout levels defined by current zoning. The increased nitrogen would promote further algal blooms, fish kills, eel grass loss, and other impacts to the habitat of the marine estuaries.

A portion of the Eastern side of Barnstable probably would be sewered as allowed by the 2007 Wastewater Facilities Plan. These areas are illustrated on Figure 2-1.

If the Town did not demonstrate progress to meet the nitrogen TMDLs, MassDEP would most likely initiate an enforcement action against the Town as allowed by state law¹.

If the Town did not demonstrate progress to meet the new TOC discharge limit, MassDEP would most likely initiate an enforcement action against the Hyannis WPCF and the Marstons Mills WWTF as allowed by state law¹.

If progress is not made on the Barnstable Ponds Action Plan, pond water quality will decline.

6.10 NEXT STEPS TO IDENTIFY SOLUTIONS FOR WASTEWATER NEEDS.

The Needs Assessment Report documents the second phase of the project. (The first phase was the development of nutrient limits which was initiated several years ago and is summarized in this Needs Assessment Report.) The next phase of the project will identify and screen alternative solutions to meet the wastewater and nutrient management needs. These technologies and

¹ Based on discussions with the Cape Cod Water Protection Collaborative and MassDEP.

solutions will be described, and advantages and disadvantages will be summarized. Infeasible technologies and solutions will then be eliminated from further evaluation. The subsequent phases will evaluate the feasible technologies and solutions in detail, and present the recommended CWMP with draft and final Environmental Impact Reports. Also a public education/participation program will be provided throughout the project to inform and involve the public in this effort.

