Project Narrative
Project No.’s 01, 02, and 03
A. Project Summary

The objective of the Project(s) included in this Project Evaluation Form (PEF) is to address the needs identified in the ongoing Comprehensive Wastewater Management Planning (CWMP) in the Town of Falmouth, MA. These needs primarily are focused on addressing the Total Maximum Daily Loads (TMDLs) for nitrogen in their coastal estuaries. However the CWMP also addresses other public health and wastewater related issues in Town as part of the planning process.

The Town of Falmouth has been working diligently to address impacts to the Town’s coastal estuaries, freshwater ponds and natural resources while balancing these with the needs to address public health concerns and the protection of public and private drinking water supplies. The Town has the largest number of coastal embayment watersheds located completely within their town boundaries and is in the process of completing several CWMP and Targeted Watershed Management Plan (TWMP) project components to address these needs.

The Town’s current CWMP Project is being completed to provide an environmentally and economically sound approach for wastewater and nitrogen management in the planning area and with recommendations for West Falmouth Harbor for the next 20 years and with a perspective on the build-out conditions. The CWMP evaluates the Town’s existing wastewater treatment facilities; assesses the wastewater and nitrogen-related needs in the planning area; evaluates appropriate mitigation measures for those needs; and develops a recommended plan for improved wastewater and nitrogen management systems. The primary focus of the project is to identify and evaluate cost-effective and appropriate technologies and approaches for the planning area and West Falmouth Harbor, and initiate a plan to meet the nitrogen Total Maximum Daily Load (TMDL) limits for the marine waters in these areas.

The Town of Falmouth is located in the southwestern portion of Cape Cod as shown in Figure ES-1 (Appendix A). This figure also identifies the planning area as the watersheds to Little, Great, Green, Bournes, Eel Ponds and Waquoit Bay as well as the West Falmouth Harbor Watershed. All of the estuarine waters in the Planning Area are impacted by excessive nitrogen loadings in the watersheds to these waters.

The Town of Falmouth is committed to improving the water quality of its estuaries, and in November 2006, prepared its “Wastewater and Nutrient Management Vision and Strategies,” as contained in Appendix 1-2 (Appendix B). The Town’s vision statement from this document is:

“Vision - By comprehensively and effectively managing its wastewater and other nutrient sources, Falmouth will improve water quality, protect public health and enhance the Town’s economic vitality. Falmouth will offer its residents, visitors and future generations healthy waters in order to sustain the Town’s property values and vibrant economy.”

The Town of Falmouth is faced with several wastewater-related problems in this Planning Area and Town-wide as it plans to protect its coastal environment and plans for growth. Nitrogen loadings from the Town’s coastal watersheds are causing an overproduction of algae in several coastal estuaries, and these loadings are impacting the water quality and marine resources in the estuaries. The Massachusetts Estuaries Project has recently completed several studies that indicate most of the nitrogen originates from wastewater sources. These reports have recommended extensive wastewater and non-wastewater nitrogen management. These wastewater and nitrogen management strategies are identified in this document and their implementation is recommended through an adaptive management approach. The Draft CWMP/DEIR of was issued in July 2012 and
resulted in the Secretary’s Certificate dated November 2012. The Town is preparing to issue their final CWMP/FEIR/TWMP as part of the MEPA review process in the Fall of 2013.

Three key components of the CWMP are being included in this PEF and they are:

1. Upgrade of the existing Blacksmith Shop Road Wastewater Treatment Facility (WWTF) to address the current effluent discharge permit requirements and needed facility upgrades. (identified as Project No. 01 in this PEF)

2. Sewer extension to the lower watershed area of Little Pond to begin mitigation of that water body and treated water recharge of up to 0.26 million gallons per day (mgd) outside of the West Falmouth Harbor Watershed at a new treated-water recharge site (identified as Project No. 02 in this PEF)

3. Inlet widening of Bournes Pond to increase tidal flushing and mitigate excessive nitrogen loading to this coastal estuary (identified as Project No. 03 in this PEF)

The Town is providing a single narrative for the three projects listed in this PEF but there are three PEF submittals, one for each project. Part I is the same for all three projects and all three PEFs. Parts II and III have been customized to fit the description of each project, per the requirements of the PEF application process, but the narrative text for Parts II and III are described below in this narrative.

Project No. 01—Upgrade of the Blacksmith Shop Road WWTF

The Blacksmith Shop Road WWTF has recently received a new effluent discharge permit which requires several improvements to its flow metering system and nitrogen removal optimization. The WWTF has a design capacity of 1.2 million gallons per day (mgd) which is sufficient for the additional flow that would be collected from the Little Pond Sewer Service Area. The WWTF Site is illustrated on Figure ES-4 (Appendix A).

This upgrade will provide the improvements needed to current and future operations for the new discharge permit. These improvements are discussed in detail in Tech Memo WW-1 (Appendix 4-29 from the CWMP) and are included in Appendix J of this document.

Project No. 02—Sewer Extension to the Lower Watershed of Little Pond and Construction of the New Treated-Water Recharge Site

The proposed Little Pond Sewer Service Area is illustrated on Figure ES-3 (see Appendix A), and the system would collect wastewater from approximately 1,500 existing parcels. It would be a combination of gravity and low-pressure sewers and would include two new wastewater lift (pump) stations to convey the wastewater to the existing collection system and ultimately to the Blacksmith Shop Road WWTF. Minor revisions have been made to the sewer service areas subsequent to the 30% design and referenced technical memorandums. It should be noted that road listings identified in the Contracts 1, 2 and 3 tables below may adjust as design continues for these areas.

This sewer extension would significantly reduce the nitrogen loading to Little Pond. Water quality modeling indicates that this reduction would reduce the nitrogen concentration at the sentinel station of Little Pond from 0.837 mg/L to 0.495 mg/L. Although this reduction may not be enough to meet the TMDL threshold concentration of 0.450 mg/L, it is a major reduction. It will be augmented by additional removals provided by the non-traditional nitrogen methods to be proven by the demonstration projects such as the aquaculture project started in 2013. The collection system would be a multi-year effort and would be split into up to three contracts, Contract No. 1 (2-TW and 2-SW),
Contract No. 2 (2-N) and Contract No. 3 (2-SE). Post sewer installation monitoring will clarify many assumptions used to develop the MEP model.

**Contract 1—Little Pond Service Area Southwest (SRF 2014)**

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A new treated-water recharge site is recommended at Site 7, which is north of the West Falmouth Harbor Watershed illustrated on Figure ES-1 (see Appendix A). The eastern portion of the site is planned specifically for development to provide up to 0.26 mgd of capacity for the flow that would come from the Little Pond Sewer Service Area. The proposed facility at the east end of the site is illustrated in Figure ES-5 (see Appendix A). The project area is shown on the map included in Appendix C with pipe sizes.

The Town is also in the process of developing a flow neutral policy in order to seek SRF 0% funding.

These projects are discussed in detail in Appendix J, Tech Memos S-1 (Appendix 4-24 from the CWMP), S-2 (Appendix 4-25 from the CWMP), S-3 (Appendix 4-26 from the CWMP), PS-1
(Appendix 4-28 from the CWMP), WW-1 (Appendix 4-29) and TW-1 (Appendix 4-30 from the CWMP). Please note excerpts of these Tech Memos are included where appropriate.

Project No. 03—Inlet Widening of Bournes Pond

Bournes Pond was one of two estuaries identified by the Massachusetts Estuaries Project as being able to benefit from inlet opening. This technology would increase tidal exchange with Vineyard Sound to reduce the amount of nitrogen that would need to be removed from the watersheds through sewerage or other wastewater or nitrogen management approaches. A focused demonstration project has been completed as summarized in TM BP-1 (Appendix D) which presents preliminary design evaluations for an enlarged inlet and new bridge over Bournes Pond, as well as an analysis of the nitrogen-removal benefits of a larger inlet as determined by water-quality modeling. This project is described in detail in Appendix D (Appendix 3-4 of the CWMP), Tech Memo BP-1.

Summary of Previous Wastewater and Nitrogen Management Planning Evaluations and Reports

1981 Wastewater Facilities Plan

This planning project that ended in 1981 evaluated several wastewater and nitrogen related problems and provided the basis for the implementation of the following management steps and facilities:

- Elimination of the Woods Hole outfall that had served a collection system in Woods Hole
- Construction of the Blacksmith Shop Road Wastewater Treatment Facility (WWTF)
- Sewer extension to Main Street and South Davis Straits, portions of Falmouth Village, Surf Drive Beach area, and additional areas of Woods Hole

A Phase 2 portion of this plan recommended sewer extensions to portions of Falmouth Heights and Maravista Peninsula (portions are in the Planning Area and Little Pond Watershed) but were never implemented. Additional detail on this 1981 Facilities Plan is included in Appendix 2-1 (Appendix B).

2001 Wastewater Facilities Plan

This planning project that ended in 2001 evaluated several wastewater and nitrogen related problems and provided the basis for the implementation of the following management steps and facilities:

- Upgrade of the Blacksmith Shop Road WWTF to 1.2 million gallons per day (mgd) and to produce a well-treated effluent with nitrogen concentrations of 3 mg/L or less.
- Connection of the Falmouth High School to the WWTF

This plan also recommended sewer extensions to an area along North Davis Straits (most of this area is in the Planning Area and Little Pond Watershed), portions of Scranton Avenue, and portions of the West Falmouth Harbor watershed. These sewer extensions were never implemented. Additional details on this plan are included in Appendix 2-1 (Appendix B).

2003 Draft Wastewater Facilities Plan

A Draft Needs Assessment Report (October 2003) and Draft Alternatives Screening Analysis Report (January 2004) were prepared for portions of West Falmouth Harbor, Maravista and Falmouth
Heights. The Facilities Plan was not completed due to the need for nitrogen Total Maximum Daily Loads (TMDLs) for these water bodies.

**Ashumet Plume Nitrogen Offset Program**

This watershed and nitrogen management assessment evaluated nitrogen impacts to Great, Green, and Bourne Ponds; and recommended that engineered nitrogen mitigation efforts (sewers) be focused around Perch Pond and the middle portions of the watersheds to Great, Green, and Bourne Ponds (these areas are within the Planning Area). These recommendations never proceeded due—in part—to the need for nitrogen Total Maximum Daily Loads (TMDLs) for these water bodies.

**Massachusetts Estuaries Project (MEP) Evaluations and Resultant Nitrogen TMDL Limits**

The Massachusetts Estuaries Project (MEP) has completed technical reports for all of the estuaries in the Planning Area; and MassDEP and USEPA have adopted nitrogen TMDL Limits on all of these except Waquoit Bay. The TMDL on this estuary is expected in the next one to two years. A detailed description of the MEP and their work on the estuaries in the Planning Area:

1. MEP Technical Report for Quashnet River, Hamblin Pond, and Jehu Pond in the Waquoit Bay system (Waquoit-East Watershed); MEP, January 2005.

These wastewater and nitrogen management needs are a primary focus of this CWMP Project as documented in the October 2007 Needs Assessment Report.

**Previous Evaluations and Reports Completed as Part of this CWMP Project**

**Needs Assessment Report, October 2007**

This report summarized the wastewater and nutrient-related needs of the Planning Area focusing on the following topics:

- Town’s existing data and wastewater planning history
- Evaluation of the Blacksmith Shop Road WWTF, its capacity, and performance
- Evaluation of the existing centralized wastewater collection system
- Wastewater and nitrogen related problems in the Planning Area
- Evaluation of the No Action Alternative
- Summary of Needs Assessment

A more detailed description is provided in Appendix 2-3 (Appendix B) and the complete Needs Assessment Report is provided in Appendix 2-4 of the CWMP (not included in this application).
Alternatives Screening Analysis Report, November 2007

This report summarized the many possible alternative solutions that were identified and screened for use in the alternative wastewater management plans. Many alternatives were identified as detailed in Appendix 2-5 (see Appendix B). It resulted in three alternative management plans that were recommended for detailed evaluation. The full Alternatives Screening Analysis Report is contained in Appendix 2-6 of the CWMP (not included in this application).

Environmental Notification Form (ENF) Document, December 2007

The ENF Document summarized the findings of the Needs Assessment and Alternatives Screening Analysis Reports and submitted these findings with the ENF to initiate MEPA review of the Project. The Secretary of EEA provided a Project Certificate dated January 30, 2008 with comment letters. The ENF Document is attached as Appendix 2-7 of the CWMP (not included in this application).


The Draft Report was prepared after several years (February 2008 to July 2012) of detailed evaluations to include a December 2009 Draft Comprehensive Wastewater Management Plan and Draft Environmental Impact Report and Notice of Project Change (December 2009) which was updated by the July 2012 report. It was submitted for MEPA review in September 2012, and on November 14, 2012 the EEA Secretary provided a Project Certificate and comment letters from interested Project Stakeholders. This certificate and the comment letters are attached in Appendix 1-4 of the CWMP (excerpts of the certificate are located in Appendix L) with the Comment-Response Memo that describes how the comments were addressed (not included in this application).

The CWMP/FEIR/TWMP is the Final Report and is the revision of the Draft Report to present the detailed evaluations and the recommended plan as detailed in following sections and chapters of the document.

Regional Wastewater and Nitrogen Management Efforts that Have Influenced this CWMP

There are many regional wastewater and nitrogen management efforts that have influenced this CWMP. The Town has worked closely with Cape Cod Commission (CCC), MassDEP, Cape Cod Water Protection Collaborative (CCWPC), and the neighboring towns to coordinate their efforts. A complete list of these activities as they pertain to Falmouth is attached as Appendix 2-8 (Appendix B).

The most recent regional activity is the CCC development of regional wastewater management guidelines for towns completing CWMPs. Due to the CCC’s current effort to complete a 208 Regional Wastewater Management Plan (208 Plan), the CCC has defined a type of plan called a Targeted Watershed Management Plan (TWMP) that refers to CWMPs that focus on watersheds that are wholly contained in the Town (i.e. they are not shared or regional watersheds). The Town has met several times with CCC staff and it has been decided that the Falmouth CWMP will become a TWMP in addition to the State’s definition of a CWMP.

Another recent regional evaluation that developed information relative to Falmouth wastewater planning is the Appraisal Consulting Services for the Wastewater Treatment Systems at the Massachusetts Military Reservation (MMR). This evaluation was prepared by CH2MHill in December 2012 for the Massachusetts Development Finance Agency, with some funding from the Office of
Economic Adjustment, Department of Defense. The wastewater treatment system at MMR is owned by the United States Air Force. The purpose of the study was to define and evaluate all possible courses of action to reduce or eliminate costs to the Owner related directly to the operation and maintenance of the system. A secondary goal of the study was to identify Options for operating the system that might provide regional benefits to neighboring towns, either near term or long term. One regional scenario completed for Falmouth was the potential recharge of treated water from the Blacksmith Shop Road WWTF site at MMRs infiltration beds on the northwest side of the MMR. The main findings are:

- Falmouth would need to construct a pumping station and force main to deliver the treated wastewater to the MMR pipeline
- Under the current conditions, the MMR system could accommodate about 200,000 gallons per day from Falmouth
- The estimated capital costs including contingency was $9.55 million.

This document is available from the Massachusetts Development Finance Agency.

The Town has not currently committed to this plan, but continues to work cooperatively with MMR and its neighboring Towns.

B. **Public Health Criteria**

Falmouth is a popular destination for locals and visitors alike. The population of the Town of Falmouth, all of which will be affected by the proposed project, was most recently reported as 31,531 per the 2010 U.S. Census. This population increases significantly during the summer months from an influx of summer visitors and vacationers. A large number of boating areas and swimming beaches are available in Town. The CWMP notes that approximately 29 acres are designated as marinas, approximately 566 acres are designated as saltwater sandy beach, approximately 29 acres are designated as spectator recreation and approximately 31.5 acres are designated for water-based recreation (see Appendix A).

The reliance on onsite septic systems by this population has resulted in contaminated groundwater in the project area (as documented by the MEP Technical Reports) and the need to mitigate the excessive wastewater nitrogen loadings to the Town’s estuaries which includes Little Pond and Bournes Pond.

The public drinking water supply is currently of good quality, and is part of a designated sole source aquifer. Onsite septic systems do not provide significant removal of nitrogen or other potential contaminants. As existing land uses continue and the Town develops, through either new development or re-development of existing properties, all those properties on septic systems will impact the groundwater. Because standard Title 5 septic systems and cesspools do not remove significant portions of nitrogen, this nitrogen will continue leaching into the groundwater and the sole source aquifer.

In addition as documented by the Massachusetts Estuaries Project (MEP) amongst other studies, nitrogen and phosphorous from onsite septic systems have resulted in eutrophication of coastal and inland waters. Eutrophic water bodies have decreased water quality and the increased nutrient concentrations pose a potential threat to human and environmental health.
The main findings of the MEP reports indicate that significant quantities of nitrogen must be removed from the watersheds to restore the water quality and habitat of these estuaries. These reports also indicate that most of the nitrogen comes from individual septic systems in the watersheds. Figure ES-2 (Appendix A) illustrates the percentage of future wastewater nitrogen loadings that need to be removed to meet the nitrogen limits. These are very stringent limits. These reports are listed in the Project Summary above in Section A.

**Criteria #4—Widespread Septic System Failure**

The nitrogen TMDLs for the estuaries around Falmouth have indicated large percentages of nitrogen need to be removed from the watersheds (Figure ES-2 in Attachment A) in order to meet the TMDLs. Existing septic systems are not removing sufficient nitrogen from the wastewaters. These may not be “failing septic systems” by the historic meaning of the term (i.e. hydraulic failure), but they are “failing” to protect the environmental health of the estuaries as determined by the nitrogen TMDLs and they need to be remediated.

*(Specific to Project No.’s 01 and No. 02)*

As part of the CWMP planning effort and Falmouth Nutrient Management Project, it was estimated that less than 20 PERCENT of the properties in the Little Pond Service Area (essentially Maravista and Falmouth Heights) have septic systems newer than 1995, and that a large percentage of these properties are still on cesspools.

The Falmouth Mall and Admiralty Inn (information attached in Appendix M) have also been identified as an area struggling with its septic system. Construction of an expanded sewer collection system would allow the connection of this area and would address the potential failure of a large system with impacts to the general public, groundwater and local water bodies.

**Criteria #7 – Water Pollution Related Odor Problem**

*(Specific to Project No. 01)*

Technical Memorandum (TM) WW-1 (Appendix 4-29 of the Draft CWMP/FEIR/TWMP) is included in Appendix J of this application. The purpose of TM WW-1 is to evaluate the existing Falmouth WWTF and service vent in order to determine the treatment capacity of the facility and also identify operational limitations. The Town of Falmouth has documented periodic odor complaints for a number of years at the discharge location of the existing Jones Palmer Lift Station. The Service Road Vent is the location where the Jones Palmer Lift Station force main discharges to a gravity sewer upstream of the Town’s wastewater treatment plan. The Service Road Force Main and Vent is reviewed in the Collection System Odor Control Evaluation Final Report compiled by Stearns & Wheler in February 2009 (see Appendix WW-1-D) of the TM WW-1 located in Appendix J.

*(Specific to Project No. 02)*

The Town has also received several odor complaints and experienced fish kills in proximity to Little Pond that is attributed to low dissolved oxygen and poor water quality. News articles regarding the fish kills are included in Appendix N.
Criteria #10—Contaminated Groundwater as an “Other cause of the Environmental/Public Health Problem”

(Specific to Project No.’s 01 and 02)

The impact of septic systems and cesspools on the groundwater system is evident in the TMDLs (see Appendix E) but also in the closure of Little Pond as a shellfishing resource which was once open to shellfishing in the 1980’s. The Massachusetts Division of Marine Fisheries (DMF) has designated Little Pond as a “prohibited” shellfish area due to fecal coliform contamination (see Appendix F).

Criteria #15 and #16—Swimming Beaches and Boating Areas

The nitrogen TMDLs have indicated that the estuary waters do not meet the State’s criteria for marine surface waters in that they are swimmable, fishable and suitable for boating. Periodic algae blooms caused by the current excessive septic system nitrogen loads are causing the impacts to the swimmability and boatability of the waters, and shellfishing is currently prohibited in Little Pond (Appendices E and F). The public bathing beach identified as Bristol 1—East (see Appendix I) shows the closures at this location based on exceedances of Enterococcus bacteria. The state bacterial level is 104 cfu/100mL.

Criteria #17—Sensitive Population Affected

Specific to Project No. 01 and 02

By sewering this area of Town, the Town will be able to connect another school (Teaticket Elementary School) to its collection system, as schools contribute high nitrogen loads from their systems. This preventative measure would help protect the school’s particular at risk population from potential future failure of their onsite system.

Criteria #19, Other (Eutrophication of Coastal and Inland Waters)

The project is designed to address the nitrogen TMDLs and remediate the eutrophication found in Little Pond and Bournes Pond. The project will also protect West Falmouth Harbor from additional nitrogen loading.

C. Environmental Criteria

As discussed previously and documented in various reports, nutrient loading, primarily nitrogen from onsite septic systems, is the major contributor to degradation of the coastal water quality. Nitrogen TMDLs have been established for Falmouth’s estuaries. This project will address nitrogen removal more effectively by several improvements including nitrogen removal optimization as a result of the new effluent discharge permit, sewering of a significant portion of the Little Pond watershed area and improved flushing at the Bournes Pond inlet through means of a new bridge and wider opening.

As detailed in the MEP reports, habitat quality is clearly related to the level of nitrogen enrichment. Dissolved oxygen is one of the habitat quality indicators that is discussed in the MEP reports. As the nitrogen loading to the estuaries is reduced, dissolved oxygen levels will increase, providing higher quality habitats.
The MEP reports discuss the **aesthetic** degradation that results from nutrient enrichment of the estuaries. Abundant nitrogen promotes algal blooms, which appear as floating green mats on the water surface. Reduction of nutrient loading will reduce the frequency and intensity of algal blooms.

The majority of the estuaries in Falmouth currently exceed the **TMDL limits** issued by EPA and documented in the MEP reports issued for the Town (as listed previously). Sewering, WWTF improvements and the Bournes Pond Inlet have been identified as ways to achieve compliance with TMDLs or reduce nitrogen in order to meet TMDL limits.

As shown on Figure 7-5 (see Appendix A), the majority of Falmouth’s estuaries and freshwater ponds provide **endangered species habitat**. The quality of the water impacts the health and vitality of the entire ecosystem. Endangered species habitat may be lost as coastal estuaries and freshwater ponds are negatively impacted by nutrient loading.

As mentioned earlier, the drinking water supply wells for Falmouth draw from a **sole source aquifer**. The Long Pond water supply is also part of this same sole source aquifer.

The waters surrounding Falmouth are included in State-designated **ocean sanctuaries**.

Little Pond has also been closed to shellfishing since the 1980’s. Periodic fish kills have been reported as recently as 2012.

### Criteria #21 and #23—Aquatic Toxicity and Dissolved Oxygen

The eutrophication (exceeded nitrogen TMDLs) is causing excessive algae production which in turn reduces oxygen for the estuarine benthic communities. The loss of oxygen and the subsequent production of anoxic products such as hydrogen sulfide are toxic to these benthic communities. These criteria are impacting all projects as they relate to West Falmouth Harbor, Little Pond and Bournes Pond (see Appendix E).

### Criteria #22—Nutrients

Nitrogen impacts all three watersheds involved in these projects (West Falmouth Harbor, Little Pond and Bournes Pond). All have TMDLs and are listed on the 303d list for impaired waters (see Appendix G). All three projects will be implemented to address nitrogen loadings to each of these watersheds.

**(Specific to Project Nos. 1 and 2)**

This sewer extension would significantly reduce the nitrogen loading to Little Pond. Water quality modeling indicates that this reduction would reduce the nitrogen concentration at the sentinel station of Little Pond from 0.837 mg/L to 0.495 mg/L (Appendix A).

**(Specific to Project No. 03)**

The Bournes Pond inlet opening is expected to reduce the nitrogen loading to this area by 56 percent, thereby limiting the amount of sewering necessary in the future (see Appendix J).

### Criteria #25—Bacteria

**(Specific to Project No. 3)**

Bournes Pond is listed on the Final Pathogen TMDL for the Cape Cod Watershed (August 2009). Excerpt of this document is included in Appendix E.
Criteria #26—Turbidity

The excessive septic system nitrogen loads (documented in the nitrogen TMDLs) causes increased algae production and turbidity which in turn shades the eel grass. Eel grass shading due to turbidity is one basis of the nitrogen TMDL, impacting all projects as they relate to West Falmouth Harbor, Little Pond and Bournes Pond (Appendix E).

Criteria #27—Noxious Aquatic Plants

Similar to the discussion for Criteria #26, the septic system nitrogen causes production of noxious aquatic plants (algae) which causes turbidity and shades the eel grass which causes the nitrogen TMDL to be exceeded, impacting all projects as they relate to West Falmouth Harbor, Little Pond and Bournes Pond as documented in the TMDLs (Appendix E) and MEP reports.

Criteria #28—Aesthetics

Each of these waterbodies as documented in the MEP reports has been impacted by algal blooms (Appendix E). The Town of Falmouth Wetland Regulations specifically cite aesthetics as an important criteria regarding estuaries and specifically state:

Under Part II Sections 10.27(2)(e) regarding coastal characteristics

“(e) When coastal beaches are significant to recreation and aesthetics, the following characteristics are critical to the protection of those resource area values:

1. water quality”

and Section 10.25 Land Under the Ocean.

“(e) When land under the ocean is significant to recreation or aesthetics the following factors are critical to the protection of such resource area values:

1. a clear line of sight,
2. navigable waters
3. water quality,
4. finfish habitat, and
5. shellfish habitat.”

Water quality, finfish habitat and shellfish habitat are three of the resource areas identified as problems. Finfish and shellfish habitat relate to recreation and aesthetics and the TMDL degradation of these waters relates directly to water quality and impacts the other two factors as well. The Town has also received odor complaints and fish kills in proximity to Little Pond that have been attributed to low dissolved oxygen.

Criteria #29—Other (TMDL Limits Exceeded)

See Criteria # 19.

Criteria #36 and #40—Commercial Fishery/Shellfish Area, Recreational Fisheries/Shellfish Area

By addressing the TMDLs in each of these waterbodies, eel grass restoration and therefore finfish/shellfish habitat restoration would be reestablished. In addition reduction of septic system
pathogens and improved flushing will work towards improved water quality. (Appendix E). Based on a recent discussion with the Massachusetts DMF, if the water quality standards are met in Little Pond (especially for coliform), the shellfishing resource area may be re-opened for shellfishing.

D. Project Effectiveness

This proposed project will play a significant role in mitigation of the problems discussed in previous sections of this PEF. It is part of the overall nutrient mitigation program and is one of the Recommended Plan components from the CWMP/FEIR/TWMP. This project component is critical overall to the program’s success.

The Recommended Plan is the Town’s strategy: (1) to implement cost-effective wastewater and nutrient management for a 20-year period, with a 40-year perspective on the build-out of the Town; and (2) to meet the nitrogen TMDLs in cooperation with the neighboring towns of Sandwich, Bourne and Mashpee that share some of these watersheds.

The 20-year period is from 2015 to 2035, which is the estimated time period for the Little Pond sewer extension, Wastewater Treatment Facility (WWTF) upgrades, new treated-water recharge facility implementation, completion of the demonstration projects, and implementation of the feasible non-traditional technologies in the High-Priority Nitrogen Mitigation Areas.

Criteria #43—How and to what extent will the project eliminate or mitigate the problem?

D-1: Reduces Violations of Water Quality Standards

This project (No.’s 01 and 02) is designed to remove septic system nitrogen loads from the estuarine watersheds and “reduce violations of TMDL non-compliance” and improve performance at the Falmouth WWTF for nutrient removal.

Project No. 03 is designed to improve flushing of Bournes Pond, reducing the impact of nitrogen on the embayment and improving water quality.

D-2: Restores Designated Uses

This project is designed to restore the estuarine environmental health by meeting the nitrogen TMDL or significantly reducing the nitrogen loading in an effort to meet the TMDL (Project No.’s 02 and 03). Project 01 is required in order to maintain TMDL compliance with the WWTF discharge.

D-3: Reduces Potential Adverse Impacts to Sensitive Resources

This project is designed to reduce the current impacts to the benthic community caused by excessive nitrogen loading from septic systems as the basis of the nitrogen TMDL. (All projects)

D-4: Protects Designated Uses

By extending sewers, providing advanced treatment, and meeting the nitrogen TMDLs; projects (No. 01, 02 and 03) would be protecting the designated uses of the estuarine waters, pond waters, and sole source aquifer drinking water.

D-6: Protects Public Health Resources from Contamination

Similar to Section D-2, these projects (No. 01, 02 and 03) will protect the public health resource of clean drinking water for both public water supplies as well as private water supplies.
E. Program and Implementation Criteria

Criteria # 44—Recommended Implementation

The Town anticipates that they will have final MEPA approval by January 2014 and that MassDEP will have responded in a positive manner.

Project No. 1 and 2 are recommendations of a CWMP and of a TMDL. Project No. 03, widening the Inlet of Bournes Pond, is a demonstration project identified in the CWMP as part of the Town’s efforts to address all their TMDLs using an Adaptive Management process. Project No. 03 will be added to the CWMP as a Notice of Project Change to be submitted for review in late 2013.

Criteria # 45—Compliance and Enforcement

- Project No. 01—Compliance with Settlement Agreement (Appendix K)
- Project No. 02—Allows compliance with Admiralty Inn ACO (Appendix M)

F. Green Projects

Criteria # 49—Relative Benefit of the Project

Inlet Widening of Bournes Pond accomplishes the goal of removing nitrogen from this impaired watershed with no ongoing energy requirement. Furthermore, this project accomplishes this benefit at a significantly lower cost than sewering. The energy efficiency of inlet widening is noteworthy.

An average energy use per sewer unit is 650 kW-hr. Therefore, removing the equivalent of 400 homes without any energy use saves 260 MW-hr annually.

The EnergyStar Portfolio Manager Analysis tool calculates a plant’s energy usage based on existing bills and flows; from this analysis it was calculated that the WWTF at Blacksmith Shop Road expends 9 kBTU/gpd of wastewater treated (Appendix A, Chapter 7).

\[(9 \text{ kBTU/gpd}) \times (70 – 100 \text{ gpd/person}) \times (2.83 \text{ people/household}) = 1,783 – 2,547 \text{ kBTU/household}\]

Converting kBTU to kW-hr provides an average of 650 kW-hr. When this average is multiplied by 400 homes, we can calculate an average energy savings of 260,000 kW-hr or 260 MW-hr.

Cost comparison evaluations are documented in TM BP-1 located in Appendix D. The capital cost comparison evaluations using conservative assumptions for wastewater nitrogen are summarized below:

- The total capital cost of the new opening with double-span bridge is $5,520,000 as summarized earlier in this Technical Memorandum.
- The capital cost of removing 1,995 kg/yr of nitrogen with wastewater collection, advanced treatment, and treated water recharge outside of the watershed is estimated at 12,830,000 based on the following factors:
  - Wastewater system to be developed for 273 houses based upon:
    - 1,995 kg/yr divided by 7.3 kg/yr/house based on 151 gallons of water consumption/day/house at a wastewater nitrogen concentration of 35 mg/L. This flow and nitrogen concentration basis is from page 37 of the MEP Technical Report.
Estimated cost of $47,000 per house based on the capital cost incurred for the New Silver Beach Wastewater Project to sewer 231 properties in 2007 scaled to 2013 costs. Information on the costs and number of properties is attached in Appendix BP-1-3.

This cost comparison indicates that the cost to increase the inlet opening and remove 1,995 kg/yr of nitrogen is approximately 43 percent of the costs to provide conventional wastewater management to this area. Stating this comparison in another way, removing the 1,995 kg/yr of nitrogen with wastewater management would be approximately 2.3 times more expensive than opening the inlet.

There are many assumptions used in the cost comparison summarized above. They are believed to be conservative assumptions that are intended to not overstate the cost savings with the inlet opening. There is a second method to estimate the number of homes that would need to be sewered to remove the 1,995 kg/yr load which indicates an even greater cost savings for the inlet opening. The Massachusetts Estuaries Project (MEP) used additional factors in their nitrogen load calculations as indicated on page 33 of the Technical Report (attached in Appendix BP-1-3) as summarized below:

- The MEP assumed that 25 percent of the nitrogen discharged from each home is removed in the leach field as documented at MassDEP’s Alternative Septic System Test Center at MMR. This means that the nitrogen concentration from the septic system is reduced from 35 mg/L to 26.25 mg/L.
- The MEP assumed that only 90 percent of the water consumption at each home becomes wastewater due to non-potable water uses such as irrigation and other outdoor uses. This means that the wastewater flow transporting the 26.25 mg/L of nitrogen is 136 gallons per day instead of 151 gallons per day.

These two factors indicate a daily household nitrogen load of 4.9 kg/yr per house; therefore, there is a need to sewer 407 houses to remove the 1,995 kg of wastewater nitrogen that is actually entering the estuary. The cost to sewer 407 houses at $47,000/house would be $19,130,000 which would be over 3.4 times the cost of the inlet opening.

The two methods used above indicate that the cost savings is very significant.

H. Green Projects

EE4. Purchase and installation of premium motor for blower or pump (retrofit or upgrade).

(Specific to Project No. 01 and 02)

Improvements at the WWTF include replacement of existing sludge pumps, although the achieved energy efficiency has not been determined, these pumps would be replaced and result in new premium efficiency motors being installed (Appendix J, see page 23 of TM WW-1), the plant water system was also identified for replacement including a new VFD (Appendix J, see page 24 of TM WW-1).

Provisions were identified in the collection system evaluation for Lower Little Pond for potential pump improvements to the existing pumping stations (Inner Harbor, Shivericks Pond and Jones Palmer pumping stations) located in Appendix J (page 11 of TM S-1). Costs were carried as part of this project estimate.

EE5. Purchase and install variable speed drive or variable frequency drive (retrofit or upgrade)

See EE4.
EE7. Retrofit/upgrade of wastewater treatment processes  

(Specific to Project No. 01)  

Technical Memorandum WW-1 identifies several areas of improvement at their existing WWTF that will be designed with energy efficiency considerations as appropriate; while energy efficiency was not the primary focus of the needed improvements, there are energy savings associated with these upgrades. Improved aeration capacity, automation of chemical feed systems and flow pacing, sludge processing improvements, plant water system improvements including VFD replacement, and electrical improvements were all identified in this technical memorandum.

EE11. Building envelope retrofit/upgrades (insulation, windows, etc.).  

(Specific to Project No. 01)  

Page 29 of TM WW-1 identifies needed improvements (see Appendix J) to the existing boiler, water booster pump, air conditioning and windows. Energy efficiency improvements will be carefully considered and requirements will be identified during design, and will be coordinated with the Investment Grade Audit (IGA) currently being conducted by Trane, Inc. as part of a town-wide Energy Services Contract.

EI2. Decentralized wastewater treatment solutions to existing deficient or failing on site systems.  

(Specific to Project No. 03)  

The Bournes Pond Inlet opening project is a decentralized innovative approach that, as presented in TM BP-1 (Appendix D), will address a portion of the nitrogen loading to Bournes Pond with no ongoing energy use. In the technical memorandum it identifies the equivalent nitrogen removal capacity that would address “deficient” on-site septic systems that are unable to provide adequate nitrogen removal. Reconstruction of the inlet will remove the need for sewering or other wastewater treatment improvements for approximately 400 homes, while at the same time eliminating the energy requirements of pumping or treatment.

EI6. Projects that facilitate adaption of clean water programs and practices to climate change.  

(Specific to Project No. 02 and 03)  

Minimizing infrastructure development in areas likely to be impacted by climate change is an important planning consideration in the projects presented herein. Both the LPSA sewer extension project and the Bournes Pond Inlet opening project will be designed to consider impacts related to climate change. For example, the sewer service area has been carefully delineated to address the clean water issues related to Little Pond while excluding areas within the velocity zones and coastal dunes due to concerns over future sea level rise. As is evidenced by the LPSA map, roads closest to the shore are not being sewered in an effort to plan with sea level rise in mind. Bournes Pond will also limit infrastructure development in areas at risk to climate changes, as well as allowing a certain number of existing residents to remain on their septic systems and therefore limit growth and expansion within the already developed V zones.

WE7. Purchase/install replacement water meters and meter reading equipment.  

(Specific to Project No. 01 and 02)  

The Town intends to replace approximately 2,000 water meters at a total cost of $400,000 in the Little Pond Sewer Service Area and in the existing sewer service area. The new meters will provide for more accurate measurement of water consumption and be an incentive for water conservation. Falmouth’s wastewater consumer charges are based upon total water consumption at a parcel. Since wastewater
rates are approximately three times water rates, the consumer should take conservative measures to reduce total water and wastewater user fees.