

Memorandum

To George Meservey, Director of Planning & Community Development
Michael Domenica, PE, Program Manager

CC Betsy Shreve, AICP, AECOM Project Director
Jeff Reade, AECOM
Paula Winchell, AECOM

Subject **Town of Orleans, MA**
Water Quality and Wastewater Planning
Task Number 1.c. – Facilities Preliminary Design
Technical Memorandum on Septage Processing

Project Number 60476644

From Thomas Parece, P.E., AECOM Project Manager

Date 04/04/16

1. Background

The purpose of this Septage Technical Memorandum is to summarize the septage solids management from the properties that will continue to utilize on-site wastewater disposal systems.

2. Current On-Site Wastewater Management

Septage solids management is typically all that is necessary for Title 5 or other individual on-site wastewater systems. It is handled by a private service company who pick-up, haul, and dispose of septic tank solids. Disposal is typically at a WWTF or regional septage receiving facility. The service company is responsible for providing tank trucks and equipment for pump-out, and hauling. Pump-outs are scheduled at appropriate intervals (typically every 2 to 3 years) for residential properties by the owner and for commercial properties either by owner request or contract schedule. The hauler is responsible for making arrangements for the sludge to be further processed for beneficial use or disposal at a suitable facility and for presenting records to the local Board of Health.

a. Advantages

- Tanker truck is equipped with vacuum pump-out; no equipment is needed at the property;
- Low capital cost;
- Uncomplicated and easily implemented;
- Potential savings using liquid disposal;
- Guaranteed disposal; and
- Minimal maintenance – all tank contents are removed.

b. Disadvantages

- Not a sludge reuse option;
- **Minimal attenuation of N release to groundwater;**
- Uncertain long-term costs;
- System performance not typically monitored except during pump-outs; and
- Risk of system issues if pump-outs not completed when necessary.

3. Consensus Plan

The Orleans Water Quality Advisory Panel (OWQAP) was convened to achieve consensus and build widespread community support for a customized, affordable water quality management plan for the Town of Orleans. The panel consisted of stakeholder representatives (Orleans Selectmen and representatives of engaged citizen constituencies), and liaisons from key town boards and commissions, organizations, neighboring towns, and regional, state, and federal partners. The OWQAP met for twelve half-day meetings starting in July 2014, all of which were open to public attendance and comment.

The Project is necessary in order to reduce excessive nitrogen discharges to the Town's ponds, estuaries and embayments. The Project is the first to implement a "Hybrid" approach under the Cape Cod 208 Water Quality Plan, recently approved by both USEPA and MassDEP. The Project consists of conceptual and preliminary design to update the Comprehensive Wastewater Management Plan (CWMP) completed by the Town in 2011 to reflect the Consensus Plan (Water Quality Management Plan) developed by the Town in 2015. The Project goal is to minimize the proposed sewered footprint (area of Town and number of properties to be sewered) to the greatest extent possible by maximizing the use of several the non-traditional technologies (Coastal Habitat Restoration, Aquaculture, Floating Constructed Wetlands, and Permeable Reactive Barriers).

The Project includes two areas for sewers: (1) about 350 parcels encompassing Downtown Orleans (250,000 gpd) to be treated at a new wastewater treatment facility and groundwater effluent disposal area; and (2) about 375 parcels within the Meetinghouse Pond sub-watershed (110,000 GPD), to be treated at a new satellite treatment facility and groundwater effluent disposal area.

The resulting map (Figure. 1), entitled Conceptual Approach to Meet Orleans Water Quality Goals (March 2015) shows the agreed upon water quality management plan and indicates the two proposed wastewater collection areas. This map also the number of lots and associated wastewater flows from Downtown Area and Meetinghouse Pond Area wastewater collection areas of Orleans and therefore shows the remaining areas of the Town that will rely on on-site wastewater disposal and septage processing.

4. Tri-Town Septage Treatment Facility

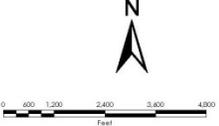
The Consensus Plan addresses the requirement of septage processing by stating that the new wastewater treatment facility will be designed to treat septage as well as the wastewater from the Downtown Area of Orleans. In addition, the Consensus Plan stated that septage storage and treatment capacities will be evaluated for appropriate sizing, to avoid competition based on tipping fee/price. This will allow the Town to continue to meet the septage treatment needs of the businesses and residents of Orleans and the Lower/Outer Cape, while generating revenue that will lower customer rates in Orleans.

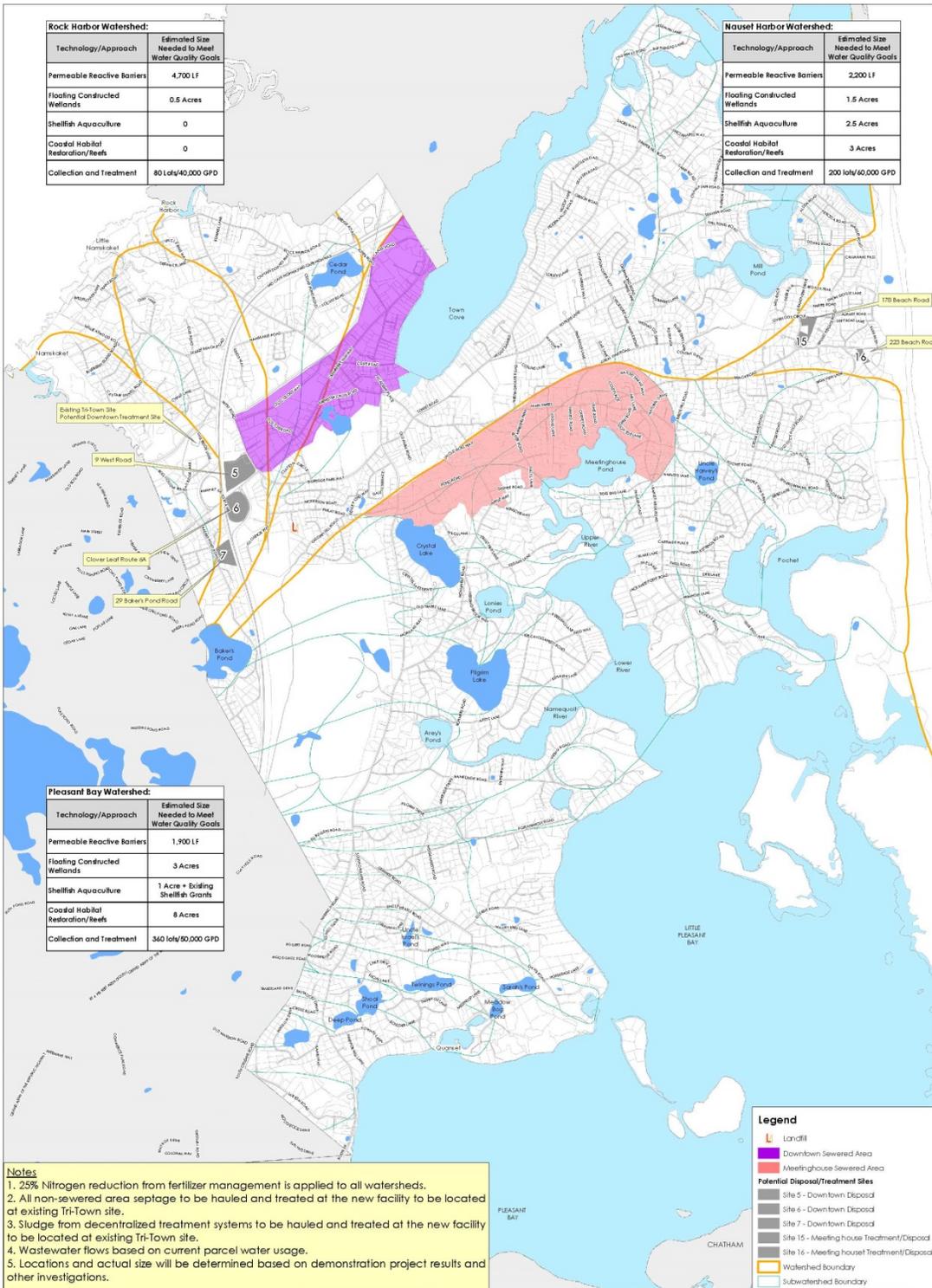


MARCH, 2015

CONCEPTUAL APPROACH TO MEET ORLEANS WATER QUALITY GOALS

TOWN OF ORLEANS
MASSACHUSETTS





The Tri-Town Septage Treatment Facility is located on Overland Way near the intersection of Route 6 and Route 6A. Owned and operated by the Orleans-Brewster-Eastham Groundwater Protection District (The District), it receives and treats septage and FOG from the three town comprising The District, in addition to lesser quantities from surrounding town on the lower/outer Cape. Rated for 45,000 gallons of septage per day (gpd), it is designed to thicken/condition/dewater septage solids prior to eventual shipment offsite. Liquid reject streams from these processes are collected and treated in a biological



process consisting of rotating biological contactors (RBCs) prior to sedimentation, filtration, and ultimate discharge to rapid infiltration beds located on the site. Built in the late 1980's, and partially upgraded in the mid-1990's, many of the Tri-Town Septage Treatment Facility systems are reaching or have reached the end of their useful life. Equipment obsolescence and parts availability are problematic. From a treatment perspective, the Tri-Town Septage Treatment Facility is not designed to achieve the levels of TN treatment that would be expected from a modern treatment process (TN of 10 mg/l or less). Operation and maintenance costs and requirements are well known; and given that there are few if any cost effective disposal options for septage for the towns comprising The District, upgrades to the Tri-Town Septage Treatment Facility to extend its useful life and achieve better levels of TN treatment need to be part of any evaluation process. The facility's proximity to the commercial center of Orleans as well as some of the more densely populated residential areas in the town make the evaluation of expanding the capabilities of the Tri-Town Septage Treatment Facility to receive collected raw sewage as well as septage worthy of serious consideration.

Over the past few years, the Towns of Orleans, Eastham and Brewster have had ongoing discussions about the closure of the Tri-Town Septage Treatment Facility. In November and December 2015, members of the Tri-Town Septage Treatment Facility District voted not to extend the three-town agreement to operate the Tri-Town Septage Treatment Facility beyond December 31, 2016. In February 2016 members of the Tri-Town Septage Treatment Facility District voted to close the Tri-Town Septage Treatment Facility no later than June 1, 2016.

5. Historical Market Share

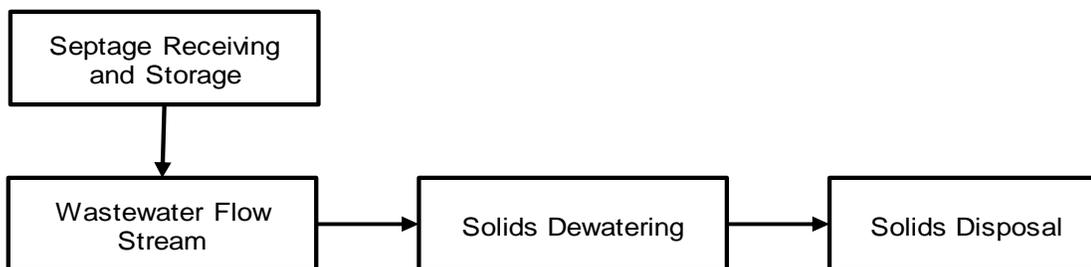
The Tri-Town Septage Treatment Facility historical market share has been around 8 to 9 MG/year. It is anticipated that this volume will shrink due to a number of factors such as proposed wastewater system being constructed in various areas of the lower Cape including: (a) Orleans; (b) Chatham; and (c) Harwich. In addition, other facilities getting more aggressive to capturing market share including the existing Yarmouth-Dennis Septage Treatment Facility.

While maintaining this service to the residents of Orleans as well as the lower Cape, it is estimated that a future volume of about 6 MG/year is a reasonable value to be utilized for future design considerations. It should be noted that there is some risk of other operations eroding this estimate while the existing Tri-Town Septage Treatment Facility WWTF is off-line and until a new WWTF is operational.

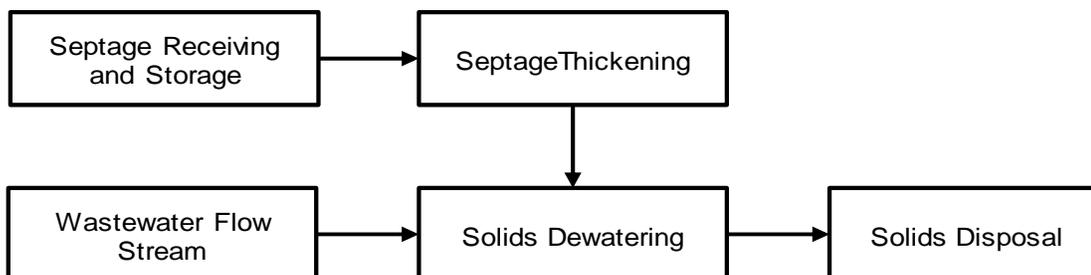
6. Incremental Cost for Septage Processing

As part of a new WWTF, the incremental capital cost and operation and maintenance cost to incorporate septage processing will vary depending upon how the septage will be processed. The following two alternatives have been identified:

- Alternative No. 1 - Accept, Degrit, Store, Blend Septage into Wastewater Stream, and Dewater Solids.



- Alternative No. 2 - Accept, Degrit, Store, Thicken, Blend Liquid (filtrate) into Wastewater Stream, and Blend Solids into Solids Stream for Dewatering.



The incremental capital cost and operation and maintenance cost for each of these alternatives as shown in Table 1.

| Alternative | Estimated Incremental Capital Cost | Estimated Incremental Annual O&M Cost |
|-------------|------------------------------------|---------------------------------------|
| 1 | \$2,000,000 | \$350,000 |
| 2 | \$500,000 | \$225,000 |

Notes:

- Alternative 1 costs are based on previous studies completed for the Town of Orleans, MA
- See attachment for Estimated Incremental Annual O&M Cost for Alternative 2

It is recommended that Alternative No. 2 be selected as a means to process septage. This is based on the following:

- Reduced Capital Cost as Compared to Alternative 1;
- Reduces Impact to Wastewater Processing;
- Combining Septage Solids with WWTF Solids Improves Dewatering;
- Thickened/Dewatered Solids Reduces Transport Costs;
- Provide a Service to the Residents of Orleans; and
- Creates a Revenue Stream to Offset Some of the Operating Costs as Compared to Not Including Septage Processing.

3. Tipping Fees and Revenues

Tipping Fees are utilized to recover the costs for the capital (ie. process equipment) and operation and maintenance costs (ie labor, chemicals, utilities, etc.) to accept and process septage as well as dispose of the septage residuals. The Tri-Town Septage Treatment Facility District has historically charged the residents of Orleans around \$0.10 per gallon during the summer season and reduced it during the winter season. Tipping Fees for providing service to areas located outside of Orleans have been slightly higher.

In order to recover the capital and operation and maintenance costs for Alternative No. 2, it is estimated that the minimum Tipping Fee should be \$0.05 per gallon based on the following:

- 6,000,000 gallons per year;
- \$500,000 Estimated Incremental Capital Cost spread evenly over 20 years with a 3 percent interest rate;
- \$250,000 per year Estimated Incremental Annual O&M Cost with and adjustment for inflation at 3 percent per year; and
- $((\$500,000/20 \text{ Years})+(\$250,000 /\text{per year}))/6,000,000 \text{ gallons per year} = \0.049 , Say \$0.05

While establishing a Tipping Fee sufficient enough to cover the capital and operation and maintenance costs, increasing the Tipping Fee should be considered in order to create funds for asset management and/or to offset other capital and operation and maintenance costs at the proposed WWTF.

It should be noted that maintaining a lower Tipping Fee will not always translate into a savings for the property owners since septage haulers may not to drop their price because of a lower Tipping Fee as compared to other septage processing facilities. Conversely, when the Tri-Town Septage Treatment Facility shuts down it is anticipated that there could be a price spike due to a significant loss in competition in the area and that the septage haulers will pass on to homeowners.

4. Regional Septage Processing Facility

The concept of a Regional Septage Processing Facility in lieu of accepting and processing septage at a new WWTF located at Overland Way was reviewed. The key consideration is the payback and cost per user for septage receiving at a new WWTF as compared to the cost per user at a regional facility.

- Based on Alternative 2, the incremental capital and operation and maintenance costs for receiving and processing septage are \$500,000 and \$225,000, respectively. Receiving 6,000,000 gallons per year and a tipping fee of \$0.10 equals annual revenue of \$600,000 resulting in less than a one year payback. Based on a typical pump-out volume of 1,500 gallons and the average historical cost of each pump-out of between \$200 and \$400 every 3 years, the user cost is estimated at \$100 per year. At a cost of \$300 per pump-out and a tipping fee of \$0.10 per gallon, the labor and expenses to transport the septage to the facility is half of the user cost. This equals to \$7.50 per mile based on a 20 mile round trip.
- When the Tri-Town Septage Treatment Facility shuts down it is anticipated that there could be a price spike due to a significant loss in competition in the area and that the septage haulers will pass the additional cost onto the users. In addition, the cost to haul the septage to another facility such as -Yarmouth Septage Facility or Wareham WWTF will add additional cost to the haulers which will also be passed on to the users. Using a tipping fee of \$0.10 per gallon, a labor and expense cost of \$7.50 per mile, and disposal at the Yarmouth Septage Facility would equal a pump-out cost of \$420 or a user cost estimated at \$140 per year. This equates to a 40 percent increase above disposal at a new WWTF located in Orleans.

5. Recommendation

Discussions have occurred regarding the implementation of a Regional Septage Processing Facility via a new regional government intervention to ensure a "fair and equitable market" place. Although this is a possibility in the long term, in the short term, a cost-effective solution is necessary to continue to provide this service to the residents of Orleans. Therefore, it is recommended that a new WWTF include the receiving and processing of septage.

It is recommended that a Tipping Fee of \$0.10 per gallon per used which is sufficient enough to cover the capital and operation and maintenance costs and creates funds for asset management and/or to offset other capital and operation and maintenance costs at the proposed WWTF.

Basis of Calculations for Alternative No. 2

| | | |
|--|-----------|------------------|
| Annual Deliveries, gallons | 6,000,000 | |
| TSS, mg/l | 3,639 | |
| BOD, mg/l | 2,297 | |
| NH3, mg/l | 95 | |
| <u>Solids Production</u> | | |
| TSS, tons/year | 86 | |
| Assumed sBOD/BOD Ratio | 47% | |
| Assumed TSS Capture in Dewatering, % | 95% | |
| BOD Remaining in Filtrate, lbs./year | 56,853 | |
| Additional WAS, tons/year | 14 | |
| Disposal Cost, \$/ton | 375 | |
| Transportation Cost, \$/ton | 33 | |
| Solids Disposal, \$/year | | \$41,041 |
| <u>Polymer Usage</u> | | |
| Dose, lbs./ton | 20 | |
| Cost, \$/lb. | \$2.69 | |
| Polymer, \$/year | | \$5,411 |
| <u>Additional Oxygen</u> | | |
| AOR, lbs./hour | 12 | |
| SOR, lbs./hour | 27 | |
| Assumed Tank Depth, feet | 20 | |
| Assumed SOTE, % | 40% | |
| Air Required, scfm | 66 | |
| Blower Power, HP | 4 | |
| Electricity Unit Cost, \$/kwh | \$0.15 | |
| Additional Power, \$/year | | \$3,939 |
| <u>Labor</u> | | |
| Assume labor increase, FTE | 1.0 | |
| FTE Cost, \$/year | \$90,000 | |
| Labor Cost, \$ year | | \$90,000 |
| <u>Incremental Maintenance Cost</u> | | |
| Supplemental Maintenance Costs, % of Ops Costs | 20% | |
| Maintenance, \$/year | | \$28,078 |
| TOTAL O&M COSTS | | \$168,469 |
| CONTINGENCY, % | | 33% |
| GRAND TOTAL | | \$225,000 |