

Memorandum

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Subject **Town of Orleans, MA
Water Quality and Wastewater Planning
Task Number 1 – Facilities Engineering
Technical Memorandum on Septage Management Options - Revised**

Project Number 60476644

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

Date June 1, 2016 (Revised March 30, 2018)

1. Background

The purpose of this Technical Memorandum is to summarize the septage management options from the properties that will continue to utilize on-site wastewater disposal systems after construction of the Downtown Area and Meetinghouse Pond Area WWTFs and their collection systems.

2. Current On-Site Wastewater Management

Regular maintenance of an individual on-site wastewater system, whether it is a conventional septic system, an innovative/alternative (I/A) system, or a cesspool, is the single most important consideration in making sure the system works well over time. Regular septage solids pumping helps prevent solids from escaping into the soil absorption system (SAS) and clogging soil pores. Periodic septage solids pumping are typically all that is necessary for Title 5 individual on-site wastewater systems. Individual on-site wastewater systems which use I/A systems require additional annual operation and maintenance including inspections and utility costs, in addition to the periodic septage solids pumping.

A properly designed septic tank has sufficient space for up to three to five years' safe accumulation of sludge. When the sludge level increases beyond this point, the wastewater has less time to settle and more solid wastes escape into the SAS. If the SAS becomes so clogged that it cannot absorb liquid at the rate at which it enters the tank, the plumbing will "back up" or unsanitary wastewater will bubble to the surface.

The periodic septage solids pumping are handled by private service companies who pump, and haul septic tank solids to a WWTF or regional septage receiving facility, such as the former Tri-Town Septage Treatment Facility. The service company is responsible for providing tank trucks and equipment for pump-out and hauling. In addition, the hauler is required to provide the details of the pump-out including (how many gallons were pumped out of the tank, the date, the charges, and any other pertinent results) to the Board of Health.

Pump-outs are scheduled at appropriate intervals for residential properties by the owner and for commercial properties either by owner request or contract schedule. Although the septage solids pumping frequency is a function of use, MassDEP recommends that an on-site wastewater system be pumped at least once every three years for residential properties that do not utilize a garbage disposal and every year for residential properties that do utilize a garbage disposal.

In 2015 a “Septage and Food Waste Market Study Technical Memorandum” prepared by Stantec Consulting Service Inc. for the Town of Orleans projected septage quantities through 2040 (see Table 1). The Technical Memorandum indicated that neither septage nor food waste is expected to increase significantly in the future (up to 2040). This was based on the fact the: (a) The population growth rate has been steadily declining for decades and from 2000 to 2010 the growth rate was -3.8 percent; (b) Residential development and tourism have remained steady with minor fluctuation due to economic conditions; and (c) On an annual basis septage volumes will likely decline due to changes in sewerage in various Cape Communities including Orleans and Eastham.

Table 1 - Current and Projected Annual Septage Quantities

Town	2010 - 2013	2014 - 2020	2021 - 2025	2026 - 2030	2031 - 3025	2036 - 2040
Orleans	2,211,043	2,212,000	1,836,000	1,571,000	1,372,000	1,173,000
Brewster	2,119,460	2,120,000	2,120,000	2,120,000	2,120,000	2,120,000
Eastham	1,339,122	1,340,000	1,340,000	1,340,000	1,139,000	1,139,000
P-Town	1,051,803	1,052,000	1,052,000	1,052,000	1,052,000	1,052,000
Wellfleet	804,476	805,000	805,000	805,000	805,000	805,000
Harwich	668,587	669,000	669,000	669,000	603,000	483,000
Truro	615,003	616,000	616,000	616,000	616,000	616,000
Dennis	207,908	208,000	208,000	208,000	208,000	208,000
Other	190,419	191,000	191,000	191,000	191,000	191,000
Totals	9,207,819	9,213,000	8,837,000	8,572,000	8,106,000	7,787,000

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 sewerage footprint (area of Town and number of properties to be sewerage) 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: (a) about 315 parcels encompassing Downtown Orleans (228,500 gpd) to be treated at a new wastewater treatment facility and groundwater effluent disposal area; and (b) about 405 parcels within the Meetinghouse Pond sub-watershed (105,000 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 (August 2017) 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. 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.

The former Tri-Town Septage Treatment Facility was 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 received and treated septage and FOG from the three District towns, in addition to lesser quantities from surrounding town on the lower/outer Cape (see Table 1).



Rated for 45,000 gallons of septage per day (gpd), it was designed to thicken/condition/dewater septage solids prior to eventual shipment offsite. Liquid reject streams from these processes were 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 reached the end of their useful life. Equipment obsolescence and parts availability were problematic. From a treatment perspective, the Tri-Town Septage Treatment Facility was not designed to achieve the levels of TN treatment that would be required under a new discharge permit (TN of 10 mg/l or less).

Over the several years, the Towns of Orleans, Eastham and Brewster 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 which is when the previous GWDP expired and no renewal application was planned to be submitted to MassDEP. In February 2016 members of the Tri-Town Septage Treatment Facility District voted to close and decommission the Tri-Town Septage Treatment Facility no later than June 1, 2016. The facility closed in June 2016 and is in the process of being demolished, with anticipated completion of June 2018.

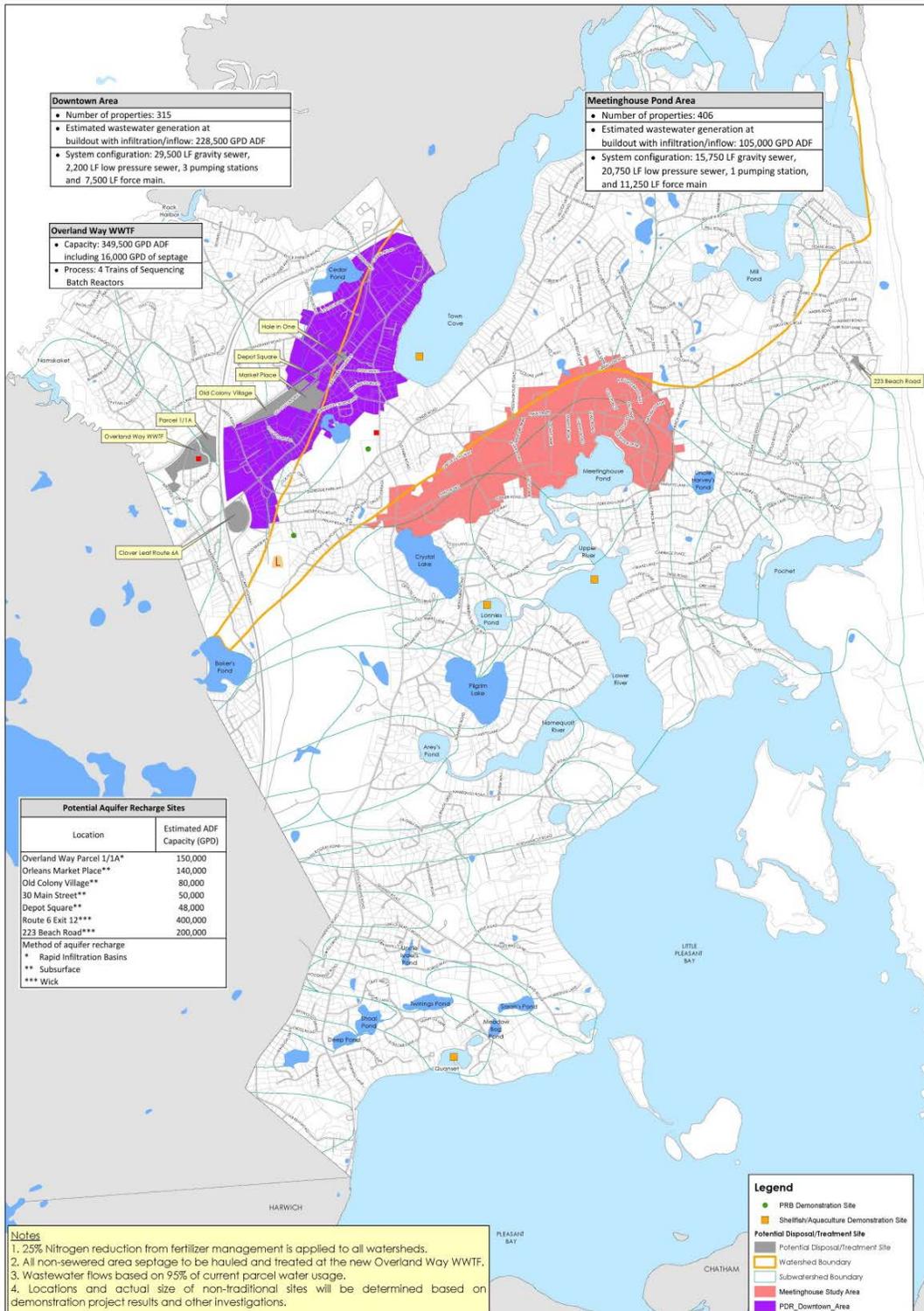


AUGUST 2017

CONCEPTUAL APPROACH TO MEET ORLEANS WATER QUALITY GOALS

TOWN OF ORLEANS
MASSACHUSETTS



5. Historical Market Share

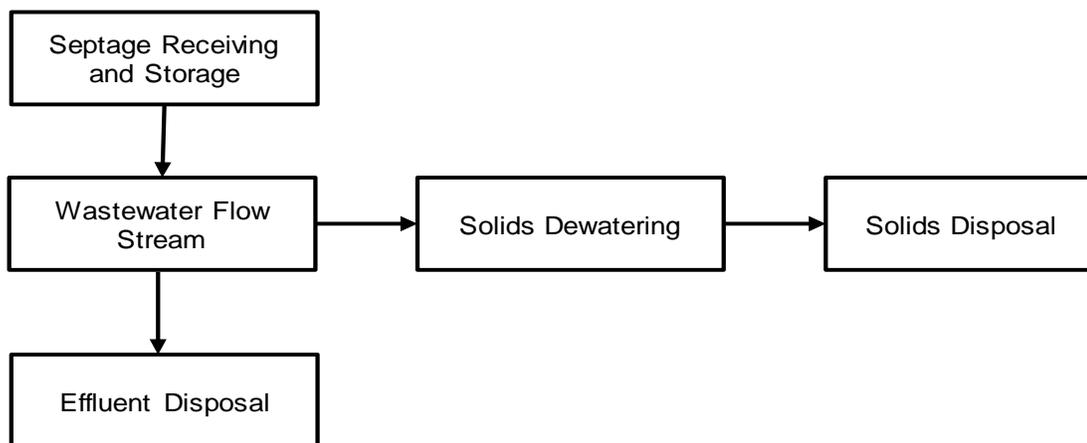
The Tri-Town Septage Treatment Facility historical treated volume was around 8 to 9 MG/year. It is anticipated that this volume will shrink due to a number of factors such as proposed wastewater system being constructed in various areas of the lower Cape including Orleans; Chatham; and Harwich. In addition, the existing Yarmouth-Dennis Septage Treatment Facility has been aggressively seeking to increase its annual throughput.

In order to restore this service to the residents of Orleans, as well as the Lower and Outer Cape towns (see Table 1), it is estimated that a future design volume of about 6 MG/year is a reasonable and conservative value to be assumed for the restart of wastewater and septage treatment operations once the a new WWTF comes on line in. The 6 MG/year represents an estimated future recovery based on the historical load at Tri-Town. For example, it assumes that a higher percentage of Orleans and outer Cape would return to Orleans, but a much lower percentage of towns closer to Yarmouth-Dennis would return to Orleans, resulting in a net recovery of approximately 67 percent of the former septage receiving business.

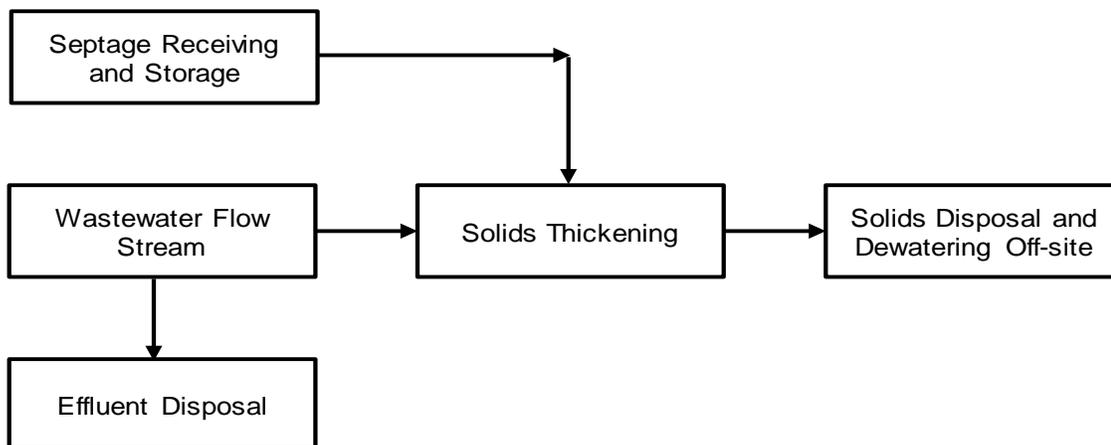
6. Incremental Cost for Septage Processing

A key consideration In restoring septage solids processing service to the residents of Orleans, as well as the Lower and Outer Cape towns (see Table 1) is the incremental capital cost and operation and maintenance cost for a facility designed for treating both domestic wastewater and septage (a “combined facility”) as compared to processing septage solids at another regional septage processing facility. The incremental capital cost and operation and maintenance cost to incorporate septage processing will vary depending upon how the septage will be processed. Using a future design volume of about 6 MG/year and a combined facility located at the former Tri-Town Septage Treatment Facility site, the following two alternatives have been considered:

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



- Alternative No. 2 - Accept, screen, and blend with WWTF biosolids for thickening and offsite disposal.



The incremental capital cost and operation and maintenance cost for each of these alternatives as shown in Table 2.

**Table 2
Incremental Capital and Annual O&M Costs**

Alternative	Estimated Incremental Capital Cost	Estimated Incremental Annual O&M Cost
1	\$2,000,000	\$365,000
2	\$500,000	\$233,000

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.

7. Tipping Fees and Revenues

Tipping Fees are utilized to recover the costs for the amortized capital (ie. process equipment) and operation and maintenance costs (ie labor, chemicals, utilities, transportation, 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.

The total capital and operation and maintenance costs for Alternative No. 2 would be approximately \$0.044 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; and
- \$233,000 per year estimated incremental Annual O&M Cost.

The tipping fee charged at the new facility would be set above the handling cost (e.g. \$0.05) at a fair market value, considering other treatment and disposal options available to haulers. It is anticipated that a reasonable, competitive price will be in the order of \$0.10 to \$0.12 per gallon, which is competitive with the Yarmouth-Dennis facility at \$0.10 per gallon. It is anticipated that as long as the fees remain competitive, lower and outer Cape haulers would still consider Orleans as a viable cost-effective disposal option compared with driving further distances to Yarmouth-Dennis or other off-Cape facilities. A sensitivity analysis on tipping fee versus revenue potential is provided in Table 3 below.

Table 3
Tipping Fees vs. Revenue Sensitivity Analysis

	Annual Cost (\$/year)	Tipping Fee (\$/year)	Net Revenue (\$/year)
\$0.04	\$266,250	\$240,000	(\$26,250)
\$0.044	\$266,250	\$266,250	\$0
\$0.05	\$266,250	\$300,000	\$33,750
\$0.06	\$266,250	\$360,000	\$93,750
\$0.07	\$266,250	\$420,000	\$153,750
\$0.08	\$266,250	\$480,000	\$213,750
\$0.09	\$266,250	\$540,000	\$273,750
\$0.10	\$266,250	\$600,000	\$333,750
\$0.11	\$266,250	\$660,000	\$393,750
\$0.12	\$266,250	\$720,000	\$453,750

Tipping fees and septage/grease receiving policies from nearby facilities were updated as of March 2018, and are provided in Table 4. It is important to note that some of the lower cost locations have policies that do not allow them to accept septage from out of town (i.e. – Chatham, Falmouth), so in terms of evaluating competitiveness in the local market, Yarmouth-Dennis is the best point of comparison.

It should be noted that maintaining a lower tipping fee will not always translate into a savings for the property owners with on-site systems since septage haulers may not lower their price because of a lower Tipping Fee as compared to other septage processing facilities. It was initially suspected that when the Tri-Town Septage Treatment Facility shut down, there would be a significant price increase to homeowners due to longer haul distances and higher costs of treatment at other Cape facilities. Preliminary inquiries with septage haulers do not indicate that prices have increased significantly since the June 2016 analysis. It is expected that, due to the costs of transportation using Route 6 in the Summer season to mid-or off-Cape facilities, the much shorter distance to a new WWTF in Orleans at a fair market price will quickly reach the 6 MG/year design volume assumed above, assuming that the total volume of the Lower and Outer Cape on-site systems will be approximately 8,000,000 to 9,000,000 gal/year (see Table 1). There was no indication that exclusive agreements between haulers and receiving facilities exist that would prevent haulers from moving their business to a new facility in Orleans should that be a more cost effective option for them.

**Table 4
Tipping Fees by Facility**

Facility	Septage Receiving Policy	Septage Tipping Fee (\$/gal)	Grease Receiving Policy	Grease Tipping Fee (\$/gal)
On-Cape Facilities				
Barnstable	Barnstable, Sandwich, Mashpee, and any other town as long as the truck contains, even in part, septage from one of these identified towns	\$0.105	Barnstable, Sandwich, and Mashpee	\$0.105
Chatham	Chatham only	\$0.09	Chatham only	\$0.14
Falmouth	Falmouth only	\$0.08 (winter) \$0.095 (summer)	Falmouth only	\$0.08 (winter) \$0.095 (summer)
Yarmouth-Dennis	All Cape towns	\$0.10	All Cape towns	\$0.19
Off-Cape Facilities				
Wareham ^(Note 1)	Wareham and Bourne only	\$0.10	Everywhere	\$0.10

Notes:

1. Wareham tipping fees have not yet been confirmed for 2018. The fees presented were as of June 2016. The On-Cape facilities did not see an increase in tipping fees during this time frame.

8. Recommendation

It is recommended that a new WWTF include the receiving and processing of septage which uses Alternative No. 2 be selected as a means to process septage. This is based on the following:

- Reduced Capital and O&M Cost as Compared to Alternative 1;
- Reduced operation and maintenance costs (ie. labor, utilities, transport, etc.) as Compared to Alternative 1;
- Reduces the pollutant loading required to be handled and therefore the wastewater liquid processing equipment sizing by processing septage separately and only processing the filtrate from septage solids thickening;
- Maintains local control over a tipping fees as compare to another regional septage processing facility; and
- Creates a Revenue Stream to Offset Some of the Operating Costs as Compared to Not Including Septage Processing.

It is recommended that, for planning purposes, that a Tipping Fee of \$0.10 per gallon be utilized, which would be sufficient to cover the capital and operation and maintenance costs and create a net benefit of approximately \$335,000 per year (not including financing costs) to offset 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	3,600	
BOD, mg/l	2,300	
NH3, mg/l	95	
 <u>Solids Production</u>		
TSS, tons/year	86	
Assumed sBOD/BOD Ratio	47%	
Assumed TSS Capture in Thickening, %	95%	
Assumed Thickend Sludge Solids, %	5%	
BOD Remaining in Filtrate, lbs./year	52,335	
Additional WAS, tons/year	13.1	
Disposal Cost, \$/gal	\$0.11	
Solids Disposal, \$/year		\$52,047
 <u>Polymer Usage</u>		
Dose, lbs./ton	6	
Cost, \$/lb.	\$2.75	
Polymer, \$/year		\$1,628
 <u>Additional Oxygen</u>		
AOR, lbs./hour	9.0	
SOR, lbs./hour	19.9	
Assumed Tank Depth, feet	20	
Assumed SOTE, %	40%	
Air Required, scfm	48.1	
Blower Power, HP	2.20	
Electricity Unit Cost, \$/kwh	\$0.15	
Additional Power, \$/year		\$2,271
 <u>Labor</u>		
Assume labor increase, FTE	1	
FTE Cost, \$/year	\$90,000	
Labor Cost, \$ year		\$90,000
 <u>Incremental Maintenance Cost</u>		
Supplemental Maintenance Costs, % of Ops Costs	20%	
Maintenance, \$/year		\$29,189
 TOTAL O&M COSTS		 \$175,135
CONTINGENCY, %		33%
GRAND TOTAL		\$233,000

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