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Memorandum

To	George Meservey, Director of Planning & Community Development Michael Domenica, PE, Program Manager
CC	Betsy Shreve, AICP, AECOM Project Director Jeffery Reade, AECOM WW Treatment, Reuse ad Biosolids Task Lead
Subject	**Town of Orleans, MA** **Water Quality and Wastewater Planning** **Task 2.a. Tri-Town Transition Requirements, Interim Use Option** **Deliverable 2.1 – Extend Facility Life**
Project Number	TBD
From	Thomas Parece, P.E., AECOM Project Manager
Date	10/22/15

1. Executive Summary

AECOM's contract with the Town of Orleans includes a task (2.a) to evaluate interim use options for the Tri-Town Septage Treatment Facility. This task requires a review and update of previous cost estimates with consideration that the interim use duration would likely be a 5-year permit extension beyond the currently scheduled closure date of December 2016. In addition to reviewing previous estimates, AECOM conducted its own facility assessment at the Facility on October 7, 2015. With the benefit of the previous evaluations and the October 7, 2015 assessment, capital expenditures needed to keep the systems operational through December 2021 were identified. Two approaches were taken to estimate capital costs. The first is based on repair/replacement of all items noted in the evaluation. The second estimate reflects the taking on of some risk of service disruption, by assuming a failure probability on individual components, and multiplying that probability by the component cost. AECOM has estimated a range of capital needs from $995,000 to $1,250,000, depending on the approach taken. Given that the long-term future of this facility is still undefined, AECOM believes it reasonable to take on some risk, and recommends the funding of $995,000 should it be desired to keep the facility online through December 2021. Additionally, AECOM recommends a single representative be assigned by the Tri-Town Board to assist facility staff in the prioritization and tracking of any capital funds appropriated.

2. Introduction

AECOM's contract with the Town of Orleans includes a task (2.a) to evaluate interim use options for the Tri-Town Septage Treatment Facility. This task included a review of previous evaluations of the facility by Wright-Pierce (2005), Stantec (2014), and MassDEP (2015) as well as periodic capital needs assessments conducted by facility staff. Subsequent to the review of this documentation, AECOM conducted its own facility wide condition assessment on October 7, 2015. The purpose of this assessment was to evaluate the current operational status of the facility as well as to develop an understanding of what capital expenditures priorities might be necessary if the Board opts to keep the facility operational for an additional five years (thru 2021) beyond its currently scheduled closure of December 2016. AECOM's team, consisting of Thomas Parece, Mark Owen, and Jeff Reade was accompanied by Facility's Chief Operator, Mr. Jay Burgess.

3. General Overview

A general overview of our findings is as follows. A list of capital needs to keep the facility operational through 2021 is presented in Appendix A, while photos highlighting some of the key issues observed are included in Appendix B.

a. General Facilities and Equipment

The Administration Building exterior appears weather worn with trim in some areas in need of replacement. AECOM understands that the wooden shingle and trim exterior is a façade for what is concrete block construction underneath. Any work on the wooden exterior would therefore be considered aesthetic only and not necessary to keep the facility operational through 2021. The roof however has some areas where roofing shingles have lifted. Facility staff have completed temporary repairs, however, a more permanent roofing repair is needed to prevent water intrusion and damage to electrical/instrumentation systems within the building.

Some issues with lighting in various locations within the facility were noted. Facility staff indicates some are simple bulb/ballast issues but others may require more extensive electrical work. While it can be argued that lighting is a normal routine maintenance expense and not a capital need, inadequate lighting is a safety concern for facility staff and a concentrated effort to assess and address all lighting issues at once should be considered. On a more positive note, there were no issues observed or reported associated with any of the switchgear or local panels on any of the process equipment.

Housekeeping in the facility is generally quite good, and it's apparent that facility staff strives to maintain the facility and its systems. There are some areas, however, where the corrosive nature of off-gasses from septage processing have taken their toll. One area that has risen to the level of a safety concern is the stairwell leading down to the grit feed pumps. The stairwell has corroded to the point where facility staff has had to make temporary repairs, however, it's clear that a full replacement is warranted. Facility staff indicates that MassDEP inspectors have stated that they will require this issue be addressed prior to any approval for the facility to operate beyond December 2016.

Another issue that was noted in the MassDEP inspection is the condition of the incoming potable water piping to the facility. An inspection of this piping reveals a coating failure and evidence of moderate to severe H_2S induced corrosion. The location of the piping, meter, and back-flow preventer up close to the wall of the building make maintenance of the coating system difficult and AECOM agrees with MassDEP's assessment that at this point, the piping and associated fittings need to be replaced. Facility staff suggests that if/when it is replaced, that it be slightly rerouted to provide better access for maintenance of the system.

The fire alarm system was upgraded within the past five years and is reportedly in good condition. Facility staff did not report any issues with HVAC systems throughout the facility. Heat and hot water are supplied by two sets of natural gas fired boilers which appear to be in satisfactory condition.

The facility uses an aging 10-wheel dump truck to transport dewatered biosolids ("cake") to a transfer station in Yarmouth for ultimate disposal "off-Cape". Without a detailed mechanical inspection of this vehicle, it's unclear whether it could be relied on through 2021, however, it would seem doubtful. A contingency plan for another solids removal mechanism should be explored (i.e. contract dumpsters). This would affect Operation and Maintenance expenses, however, it's likely this could be achieved with little to no expenditure in capital funds.

b. Receiving Area

Septage Receiving Bays - The facility was designed with two receiving bays where septage can be received. Each bay was originally equipped with a drive on/off scale, to provide a mechanism for quantifying the septage brought to the facility; however one has since corroded to the point of failure and has been removed by facility staff. Facility staff indicates that limiting access to one bay can result in a back-up of pumper trucks waiting to offload at the facility. The remaining scale appeared to be in fair condition however, its failure would provide no way for facility staff to quantify septage received, leaving staff with no recourse but to charge haulers for the full capacity of their trucks. Haulers carrying partial loads would likely go elsewhere resulting in a loss of revenue. A previous evaluation in 2014 estimated the cost of a replacement scale to be approximately $75,000. AECOM believes a more cost effective interim solution would be to install a metering station with magnetic flow meter and flow totalizer. This should be able to be installed within an existing bay and might be accomplished at an installed cost closer to $20,000 to $25,000.

Odor Control System - The odor control system for the receiving area consists of wet scrubbers followed by carbon adsorption. This equipment, while aging, appeared to be functioning adequately as there were no noticeable odors on the day of the visit. However facility staff report that there have been recent instances of odor break-thru during periods of heavy receiving and/or processing. The carbon in at least one of the canisters will need to be replaced to mitigate odors over the interim period. Only one of three chemical recirculation pumps is operable for the wet scrubber system. Replacement of at least one pump should be considered to provide reliable redundancy.

Septage/FOG Receiving Tanks - The tanks appear to be in good condition, as does the air mixing system. The mechanical mixer is out of service on one of the tanks, but the facility staff indicates that the air diffuser system does a reasonable job with mixing. There is some indication of grit/grease buildup within the tanks. Cleaning out of these tanks is a significant effort and beyond the resources of in-house staff and will need to be done in order to keep the facility online for an additional five years.

Screening - The original mechanically operated screen was inoperable and has been demolished and replaced with a manual bar rack. This requires the facility staff to clean the screenings off the bar rack manually. In addition to being a physically intensive operation, there is evidence of corrosion, to the point of impending structural failure of the main screen frame. While it is not recommended to do a complete upgrade of this area, some repair/replacement work will be necessary to keep this operation viable for an additional five years.

Degritting System - The degritting system is original and is working marginally. In addition, there is some evidence of the feed pumps suffering from abrasion within the volute. Both systems require some attention. It is feasible to avoid wholesale replacement, but some capital money will be needed to keep this important system operable for the interim period.

c. Solids Processing

Thickening Systems - Solid processing consists generally of thickening in gravity belt thickeners (GBTs), and dewatering in plate and frame presses. At the time of the visit, one of two GBTs was online and operating well. The other was in the process of maintenance, but there didn't appear to be any major issues with either. The thickened sludge pumps were both operable, but both are original and it's reasonable to assume they will require some capital repair/replacement work during the interim period.

Dewatering System - Dewatering is accomplished by two plate and frame presses. Both presses are reportedly in good mechanical condition, however, one unit needed work on the hydraulic system and both needed replacement of a safety interlock which is difficult to reset once tripped. These are an important element to the overall process and safety of the facility staff and will need to be addressed.

Odor Control System - Similar in function to the system serving the receiving area, there is a second odor control system comprised of a wet scrubber followed by carbon adsorption. The carbon in this system will need to be replaced as well.

d. Liquid Train Systems

Liquid train systems are those used to treat filtrate/pressate from the thickening and dewatering processes and include primary and secondary clarification, the Rotating Biological Contactors (RBCs), final filtration and UV disinfection, prior to discharge to the disposal beds. A highlight of needs within these systems is as follows:

Primary Clarifiers - One of the two units has been repaired, however, there are potential structural and safety issues with the steel internals of the second unit, providing no redundancy. While the structural concrete is in decent condition, all structural steel internals need replacement. Additionally, the primary sludge pumps are obsolete with replacement parts availability issues and should be replaced.

Original Lamella Clarifiers and Intermediate Pump Station - The facility was originally supplied with Lamella clarifiers for clarification of RBC effluent. They were made redundant by the addition in 1995 of more conventional secondary clarifiers, however they still are part of the flow path of effluent from the RBCs to the newer secondary clarifiers. Facility staff has expressed concern regarding the structural integrity of the Lamellas. Should they fail, they would result in a complete loss of filtrate processing capability and the flooding of the area housing the intermediate pumps that lift flow to the newer secondary clarifiers. Not being part of the current treatment scheme, the Lamellas do not require replacement per se, however piping modifications should be made to bypass them and eliminate the consequences of a vessel failure. Additionally, one of the two intermediate pumps that lift flow to the secondary clarifiers needs to be rebuilt/replaced.

Rotating Biological Contactors (RBCs) - The four RBCs are the heart of the liquid train system. Two of the units have been rebuilt in the past 10 years. Three are currently needed to handle facility flow, with one of the older units being kept offline in reserve. In order to maintain facility capacity at rated levels, one unit will almost certainly need to be refurbished. Two options are available:

- Replace both units or
- Refurbish just one of the older units with funds kept in reserve to refurbish a second unit should one of the duty RBCs fail. The standby unit will still be old and available for only limited service if one of the three duty units goes offline for any reason. The risk associated with this is the last remaining original unit failing before repairs could be made on one of the rebuilt units. Repairs might be expected to take up to three to four months.

4. Recommendations

A number of systems at the Tri-town Septage Treatment Facility are approaching or have already exceeded their useful life. Facility staff has managed to keep the facility operational through a combination of hard work and resourcefulness, however the expenditure of additional capital funds is unavoidable if the facility is going to be kept online for five years beyond the currently scheduled December 2016 closure date. Some of these systems may be reusable if a decision is made to build a new sewage/septage treatment facility at the site, while some would not. As a result, AECOM has approached this review from the perspective of limiting this work to the largest extent possible.

A list of recommendations with a brief explanation of each is included in Appendix A. These recommendations were compiled using two approaches. The first provides the highest probability of keeping the facility operational without interruption through December 2021 while the second explores cost savings opportunities.

If there is some tolerance for risk and the potential for short-term disruptions in facility availability the second approach may be considered. This was done by assessing the probability of that each of the recommendations would be absolutely necessary. If a specific recommendation was absolutely necessary to keep the facility operational, it received a rating of 100 percent. If there was a 50/50 chance that the facility could get by without implementing a given recommendation, it was assigned a rating of 50 percent. Safety issues and/or issues highlighted by the MassDEP were assigned a rating of 100 percent. The estimated cost of each recommendation was multiplied by its rating to come up with a pro-rated cost for that recommendation. This reduces the overall costs of the recommendations, but keeps a pool of money available to address issues that arise until December 2021. There is some risk that all of the recommended items become necessary, and as a result, the estimate arrived at would be insufficient to keep the facility on-line. If the cost saving approach is chosen, it should be done so with the understanding that there may be some additional need for capital expenditures.

The estimated capital cost for implementation of first approach is $1,250,000 (ENR = 10065 for October 2015). The estimated cost using the second approach prorated by the probability of individual component failure is $995,000 (ENR = 10065 for October 2015). These cost estimates are over and above what is included in the yearly maintenance budget. Both include a 30 percent allowance for contingency and 15 percent allowance for engineering support. While either of these estimates is in excess of the $500,000 estimated in the 2014 Stantec report, it should be noted that the goal of the 2014 evaluation was to keep the facility operational through 2016 while this most recent evaluation aims to keep the facility operational for an additional five years beyond that.

AECOM recommends the member towns of the Tri-Town Board allocate funds to support the $995,000 over the next five years. As previously noted, this approach involves a degree of risk because it is possible that all of the elements identified, in addition to those that are currently unforeseen, will need to be addressed. However, it is felt that it's a reasonable approach to mitigate short-term expenditures to the extent possible. In addition, AECOM recommends a single representative assigned by the Tri-Town Board be identified to assist facility staff in the prioritization and tracking of any capital funds appropriated.

Appendix A – Summary of Recommendations and Cost Estimate (2015 Dollars)

Recommendation	Description	Total Installed Cost	Probability of Needing to Be Done Prior to 2021	Prorated Cost
General Facilities & Equipment				
Building Roof (30' x 30' patch)	Bldg roof over admin area needs replacment soon to prevent water damage to electrical equipment housed below	$ 25,000	100%	$ 25,000
Lighting	Comprehensive review/repair needed, safety issue.	$ 5,000	100%	$ 5,000
Grit Pump Stairwell Replacement	Stairwell corroded to point of being safety issue. DEP mandate	$ 25,000	100%	$ 25,000
Potable water piping	DEP mandate	$ 6,500	100%	$ 6,500
Receiving Area				
New metering station	Only one scale operational. Metering station to provide redudancy.	$ 25,000	66%	$ 16,500
Odor Control Carbon	Carbon is spent	$ 30,000	100%	$ 30,000
Odor Control Chem Circ Pump	Only one pump operational. Buy new pump for redudancy.	$ 12,500	75%	$ 9,375
Receiving tank cleanout	Tanks full of grease/grit. Need to be cleaned to avoid damage to diffusers and potential clogs in downstream systems	$ 30,000	100%	$ 30,000
Receiving tank mixer	Mixer on one tank is out, however diffuser system still keeps tank mixed.	$ 30,000	50%	$ 15,000
Screening	Screen close to structural failure. Repace with manual unit, repair channel as needed	$ 20,000	100%	$ 20,000
Degritter	Only one unit operating with no redundancy, showing signs of decreased performance. Carry allowance to replace components as necessary.	$ 45,000	50%	$ 22,500
Grit Feed Pumps	Grit feed pumps subject to grit abrasion. Likely to fail. Replace one unit.	$ 45,000	100%	$ 45,000

Solids Processing				
Thickened sludge pumps	No reported issues but are showing signs of aging. Some allowance required for component repair/replacement to ensure redundancy.	$ 45,000	50%	$ 22,500
Press safety interlocks	Photo sensor to shut system off in case of personnel danger is faulty. Difficult to reset. Needs replacement to keep system operational and can't be bypassed because of safety.	$ 35,000	100%	$ 35,000
Press hydraulics	One press needs hydraulics work. Second should be redone to maintain redudancy.	$ 15,000	50%	$ 7,500
Odor Control Carbon	Carbon is spent	$ 20,000	100%	$ 20,000
Odor Control Chem Circ Pump	Only one pump operational. Buy new pump for redudancy.	$ 12,500	75%	$ 9,375
Liquid Train				
Primary Clarifier	One of two unit showing structural failure of internals. Replace to provide reliable redundancy.	$ 120,000	75%	$ 90,000
Primary Sludge Pumps	All three are obsolete with no spare parts availability. Replace 1.	$ 21,500	100%	$ 21,500
Re-pipe around Lamella Clarifiers	Lamella vessel in danger of structural failure. Recommend re-piping to bypass them.	$ 15,000	100%	$ 15,000
Intermediate Pumps	Both are 20 years old. Rebuild one to provide reliable redundancy.	$ 25,000	75%	$ 18,750
RBCs		$ -		
Replace One Unit	Two of four units are original, three needed for capacity. Replace one to provide three "newer" units. Limited upgrades on 2nnd unit for service as standby.	$ 125,000	100%	$ 125,000
Replace 2nd Unit	Replace both to provide reliable redundancy.	$ 100,000	50%	$ 50,000
	Sub-total	$ 833,000		$ 665,000
	Contingency (30%)	$ 250,000		$ 200,000
	Engineering (15%)	$ 163,000		$ 130,000
	Total	**$ 1,250,000**		**$ 995,000**

Appendix B – Site Photos
(All Photos Taken October 7, 2015)

Admin Building Siding and Trim

Admin Building Roof
(Bulge to right of vent)

Severe Corrosion in Grit Wetwell Staircase

Corrosion in Potable Water Piping

10-Wheel Dump Truck for Dewater Solids (“Cake”) Transport

Failed Receiving Area Floor Scale Panels

Main Odor Control Carbon Canisters

Main Odor Control Wet Scrubber Recirc Pump

Septage Equalization Tank Mixer

Septage Equalization Tank Diffused Air Mixing

Severe Corrosion on Receiving Area Screen

Aging Receiving Area Degritter

Grit Feed Pump – Corrosion and Abrasion Issues

Thickened Sludge Pumps in Need of Component Repair/Replacement

Lamella Clarifier Corrosion

Intermediate Pumps Requiring Rebuild

Four RBCs in Total – Two Original and at End of Life