

To: File
From: P. R. Ammann
Subject: **Septage Treatment at the Chatham Plant**
Date: December 13, 2013

Introduction

The Chatham plant receives an annual average of approximately 1,325 gallons of septage per day; all of this waste material is from the town of Chatham and represents an average of about 500,000 gallons per year. The rate of septage that the plant can receive is based on the plant design, the nitrogen requirements specified in the effluent discharge permit and the operating conditions.

The question is:

Under what conditions could the Chatham plant handle the 10 million gallons of septage now delivered to the Tri-Town facility annually? How much would it cost to modify the plant?

Summary

This rough analysis of the septage limitations at the Chatham plant is based on a report prepared by GHD Engineers.¹ There are three primary constraints at the existing Chatham Sewage Treatment Plant that prevent the receipt and processing of 10,000,000 million gallons of septage per year.

1. The limitation in the Discharge Permit to a total of **9,132** pounds of nitrogen of per year. This will be achieved when the plant is operating at the design capacity to treat of all sewage from Chatham and part of Harwich. ***Until full capacity is approached (sometime in the 2030s), additional septage would not cause a violation of this part of the discharge permit!***
2. The discharge permit specifies an annual average effluent concentration limit of 3 milligrams of nitrogen per liter (mg/l), and with a maximum of 10 mg/l at one reading. Since the beginning of operation at low sewage rates, the plant has allegedly achieved this goal. ***However, the addition of septage to the current plant operation, without some equipment modification, could lead to a violation of this requirement in the discharge permit.***

¹ "Chatham WPCF Septage Evaluation Report, Town of Chatham", GHD Engineers, Massachusetts, January 2013.

3. The modifications that would be needed in the plant to accept 30,000 gallons of septage per day (10,000,000 gallons per year) within the first 20 years of operation are:
 - a. **Wastewater Treatment:** A new process line for just the wastewater contained in the septage in order to address the high BOD content (~7,000 mg/liter) and the high nitrogen concentration (~200 to 500 mg/liter), especially the high proportion of "refractory" TKN component.
 - b. **Sludge Dewatering:** A new sludge filter will be required to handle the higher loads of biomass and suspended solids from the septage.
 - c. **Sludge Storage:** Additional storage tank capacity will be required because of the larger amount of sludge produced from the septage materials fed into the plant.
4. Chatham would have an opportunity to increase revenues from processing septage by about \$500 to \$700,000 per year. The investment requirement may be only on the order of \$2 or \$3 million to modify the plant. ***GHD would have to determine the new investment requirements in detail.***

Discussion of the Major Process Steps

- 1) Septage Receiving Capacity:** Currently the plant has capacity to accept 300 gallons of septage per minute. No Backup! [GHD Report, January 2013, Page 1] Assuming that a 3,000 gallon truck discharges a load of septage every half hour, the capacity would be 3,000 X 2 per hour X 8 hours per day = 48,000 gallons per day. [Page 6] ***This would NOT be a bottle neck for the receipt of the Tri-Town Septage capacity*** (approximately 33,000 gallons per day).
- 2) Septage Storage:** One 42,000 gallon tank – Septage Holding Tank No. 5. (1 ¼ days capacity with Tri-Town Septage delivery rate). [Page 7.] ***A second tank might be required to handle the Tri-Town septage deliveries.***
- 3) Sludge Storage Capacity:** The Chatham plant has two 105,000 gallon concrete storage tanks. These are re-furbished from the old concrete structures that were part of the original sewage treatment facility. [GHD, Page 7.] According to the GHD Report, there is capacity for sludge storage through approximately 2032. The addition of 30,000 gallons of septage will

reduce the sludge storage by about 650 gallons per day, or a negligible amount compared to the sludge storage of about 210,000 gallons. [GHD, Page 8, Figure 5-1.] ***Sludge storage does not appear to be a limitation to handling 30,000 gallons of septage for several more years.***

There are two more old tanks that can be refurbished in the future.

- 4) Sludge Dewatering Capacity:** The NEW 1-meter Belt Filter can handle 3,600 gallons and 600 dry pounds of sludge per hour. At 6 hours operation per day, the new Belt Filter can process 21,600 gallons of sludge per day in a five-day week. There is a 20-year old backup Belt Filter, but it is not a dependable machine. [GHD, Page 9.]

The new belt filter has excess capacity to dewater sludge until about 2020 when a new filter must be installed. [GHD, Page 9, Figure 5-2.] ***To process more septage, Chatham would have to install the filter earlier than presently contemplated.***

- 5) Liquid Treatment Capacity:** The existing sewage treatment plant has the capacity to up to 2,500,000 million gallons of liquid wastewater per day; ***adding septage would not require additional capacity***, but the capability to recycle treated wastewater to control the nitrogen concentration in the discharged effluent might require some engineering changes.

- 6) Nitrogen Removal Requirements:** The Chatham Plant has two requirements for its effluent discharge: (1) total nitrogen discharge must be less than 9,132 pounds per year, and (2) the average annual concentration must less than 3 mg/Liter. According to GHD the total nitrogen limit is not a problem until the plant reaches full capacity of over 3 million gallons of sewage per day. However, total nitrogen content of septage is the challenge. At 400 mg/liter average total nitrogen concentration in septage, 10 million gallons of septage per year would deliver about 33,300 pounds of nitrogen annually. Even if 99 per cent of this nitrogen were removed it would still contribute 333 pounds to the effluent, or about 3.65% of the permitted limit. If the limit were not increased by MassDEP, processing septage would reduce the amount of sewage that could be handled in the plant towards the end of the 30-year program of constructing sewers in Chatham and Harwich. The TKN component of sewage and septage is also of concern as it is "refractory" and difficult to destroy. **GHD** would have to consider this matter in the operation of the plant.

7) Biochemical Oxygen Demand (BOD): The existing plant has a design capacity for approximately 5,200 pounds of BOD per day. This is the requirement when Chatham completes its first phase of sewerage the town (1,800,000 gallons of sewage per day). 30,300 gallons of septage per day would impose an oxidation requirement of nearly 1,600 pounds of equivalent BOD per day. If combined into the existing wastewater treatment facility, it would reduce the capacity for sewage treatment by 6 years. Alternatively, a new process line could be installed on the site to process or pre-treat the 30,100 gallons of septage per day. ***The cost of this additional equipment would have to be estimated by GHD.***

Potential Revenues

Assuming a marginal cost for treating septage at about 3 to 5 cents per gallon and a tolling fee of 10 cents per gallon, Chatham could realize a gain of \$500 to \$700,000 per year by processing all of the septage now being handled at the Tri-Town location in Orleans.

Capital Investment Required

As outlined in the previous pages, Chatham would be required to make some additional investment to accommodate the septage. These needs are summarized in the table below; GHD would have to prepare the design requirements and estimate the capital cost and timing for the plant modifications.

Item	Basis	Year Needed	Est. Cost
Septage Receiving	None Required	In place	NA
Septage Storage	Add 42,000 gal tank	2015	
Sludge Storage Capacity	None Required	In place	
Filter Belt – Sludge Dewatering	2-meter wide	2020	NA
Liquid Treatment Capacity	Volume capacity exists. New piping may be required to handle high nitrogen concentrations from septage.	2015	NA
TKN Capacity	GHD would have to look at possible changes to plant design.	2015	NA