Attachment 2

Report

Town of Salisbury, MA

Ammonia Nitrogen Removal
Engineering Report

CONTRACT NO: 2110582

February 2012

Weston&Sampson

Weston & Sampson Engineers, Inc.
100 International Drive, Suite 152
Portsmouth, NH 03801

www.westonandsampson.com
Tel: 603-431-3937 Fax: 603-433-4358

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1.0 BACKGROUND

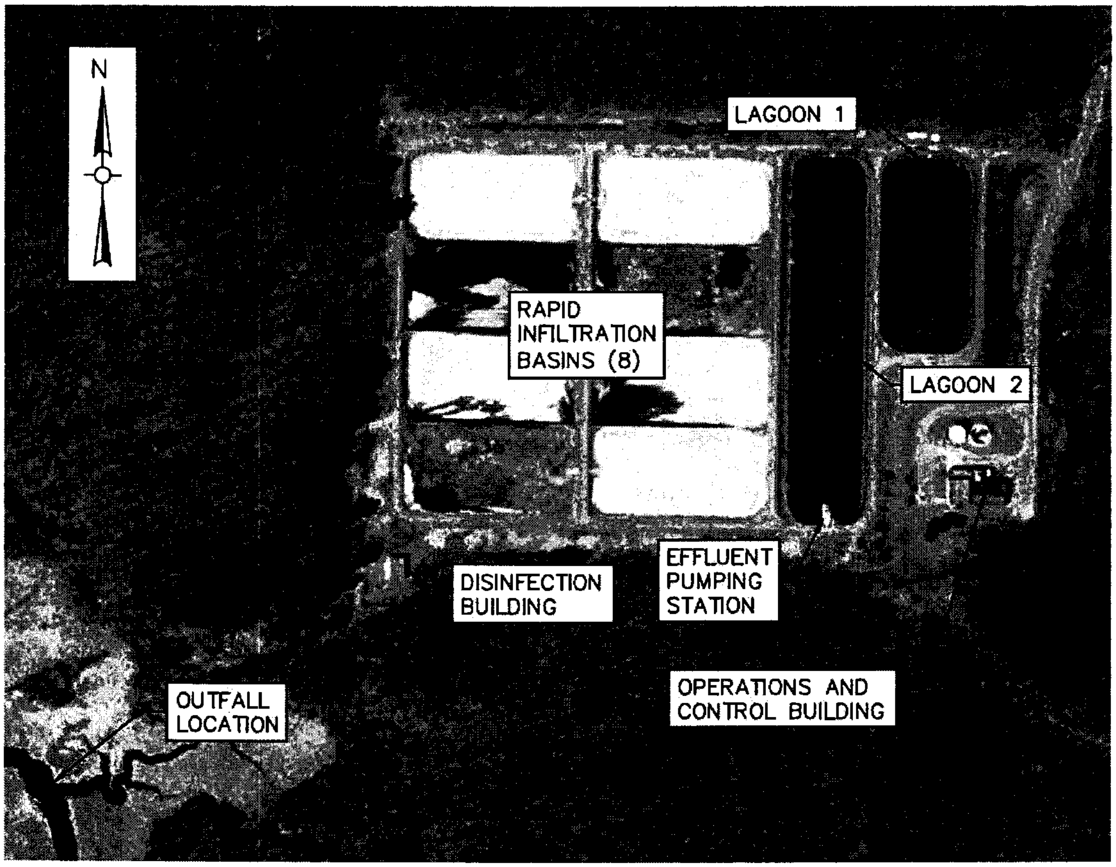
In accordance with Section III.1 of Administrative Order Docket No. 11-012 (the AO), this Ammonia Nitrogen Removal Engineering Report (the Engineering Report) describes the measures proposed and taken by the Town of Salisbury (the Town) to achieve compliance with the permitted effluent ammonia nitrogen limits at the Salisbury Wastewater Treatment Plant (WWTP), evaluates the results of these measures, and evaluates additional measures of achieving full compliance with effluent ammonia nitrogen limits.

1.1 Description of Existing Facilities

The Town of Salisbury's Wastewater Treatment Plant (WWTP) was constructed in 1986. The WWTP has a design flow of 1.3 million gallons per day (mgd). Influent to the WWTP flows through a manual bar screen into Lagoon 1. Lagoon 1 has a surface area of approximately 54,000 square feet and a maximum depth of approximately 16 feet, providing an operational volume of approximately 5 million gallons. Lagoon 1 is subdivided into two cells by a float-supported baffle. From Lagoon 1, wastewater flows by gravity to Lagoon 2, which has a surface area of approximately 66,000 square feet, a maximum depth of approximately 16 feet, and an operational volume of approximately 7 million gallons. Lagoon 1 and the first portion of Lagoon 2 are aerated using coarse bubble diffusers supplied by four fifty (50) horsepower blowers located in the WWTP building. No aeration is applied to the second portion of Lagoon 2 in order to facilitate solids settling and liquid separation.

From Lagoon 2, wastewater is pumped to one of eight lined rapid infiltration basins, each of which has an approximate surface area of 55,000 square feet and an approximate 10 foot depth of sand over an underdrain system. Discharge to the basins is rotated to control biological growth within the basins and allows systematic maintenance. Filtered lagoon effluent is disinfected using ultraviolet disinfection, reaerated through a gravity drop manhole, and discharged into a tidal creek that drains to the Merrimack River (Merrimack River Basin; State Code 84). Figure 1-1 shows the layout of the WWTP site.

Figure 1-1: WWTP Site Plan



1.2 Regulatory History

The WWTP was constructed under the Innovative/Alternative Grant Program and operates under National Pollutant Discharge Elimination System (NPDES) permit number MA0102873. The permit was renewed in 2007 and became effective on January 1, 2008 with critical permit limits summarized in Table 1-1. Ammonia nitrogen limits apply between May 1 and October 31 of each year; this period is referred to as the nitrification season.

Table 1-1: Summary of NPDES Critical Permit Limits

Parameter	Item	Units	Effluent Limit: May 1 to October 31	Effluent Limit: November 1 to April 30
Flow	Average Monthly	mgd	1.3	1.3
CBOD	Average Monthly	mg/l	5	5
	Average Weekly	mg/l	7	7
	Maximum Daily	mg/l	Report	Report
TSS	Average Monthly	mg/l	5	5
	Average Weekly	mg/l	7	7
	Maximum Daily	mg/l	Report	Report
Dissolved Oxygen	Minimum	mg/l	6	6
Ammonia Nitrogen (May 1 – Oct 31)	Average Monthly	mg/l	5	Report
	Average Weekly	mg/l	7	Report
	Maximum Daily	mg/l	10	Report
Total Copper	Average Monthly	µg/l	3.1	3.1
	Maximum Daily	µg/l	4.8	4.8
Whole Effluent Toxicity (LC_{50})	Average Monthly	%	≥100	≥100
Whole Effluent Toxicity (Chronic NOEC)	Average Monthly	%	≥100	≥100

The WWTP historically met all NPDES permit limits. However, a series of permit exceedences for ammonia nitrogen occurring between 2004 and 2007 led EPA to issue Administrative Order No. 07-037 in 2008 (the 2008 AO). As required by the 2008 AO, Weston & Sampson submitted a Wastewater Treatment Plant Evaluation Report (the Evaluation Report) on behalf of the Town that evaluated the potential causes of the ammonia nitrogen violations at the WWTP and identified potential corrective actions to improve ammonia nitrogen removal. The Evaluation Report concluded that the WWTP was exceeding the permitted ammonia nitrogen effluent limit in May and June, when the growth rate of nitrifying bacteria is too low to support nitrification. The root cause of this low growth was thought to be temperature related, with lower than ideal pH as a secondary factor. Specific ammonia nitrogen limit exceedences occurring at other times were linked to the WWTP's inability to retain nitrifying bacteria in the influent end of Lagoon

1during high flows. The Evaluation Report identified a number of options for improving performance and achieving more consistent permit compliance.

Following submittal of the Evaluation Report, initial meetings were held in 2008 with representatives of the Town, the United States Environmental Protection Agency (EPA), and the Massachusetts Department of Environmental Protection (DEP). Much of this discussion centered on the issues identified with the WWTP and the potential corrective actions presented in the Evaluation Report. In addition, the more unconventional alternative of evaluating the location of the WWTP outfall was considered, which would enable the re-establishment of the receiving water discharge requirements. EPA and DEP responded favorably to the concept, while indicating that such discussions would require the involvement of other regulatory stakeholders. Prior to implementing costly WWTP upgrades, the Town sought to continue these discussions; unfortunately, the necessary follow-up meetings did not materialize.

In July 2011, EPA issued Administrative Order No. 11-012 (the 2011 AO) to the Town, citing periodic violations of the ammonia nitrogen effluent discharge limit and consistent violations of the total copper effluent discharge limit. Table 1-2 lists the ammonia nitrogen permit violations that have occurred since the effective date of the permit.

Table 1-2: Summary of Ammonia Nitrogen NPDES Permit Exceedences

Parameter	Number of Exceedences
Average Month	19
Average Week	70
Maximum Day	120
Total	209

Per the requirements of the 2011 AO, this Engineering Report focuses on ammonia nitrogen removal; a subsequent report will be issued to address total copper removal. In addition to requiring the submittal of this Engineering Report, the 2011 AO specifically states that one option considered should be the relocation of the WWTP outfall to a location providing greater dilution, as discussed during the 2008 meeting.

While preparing this Engineering Report, the Town and its representatives met with EPA and DEP on November 30, 2011 to discuss the 2011 AO and the Town's preliminary proposed approaches to achieving permit compliance. During this meeting, modifying the WWTP to discharge on a tidal cycle and thus potentially achieve greater dilution was discussed as a possible alternative to relocation of the outfall. As a result, this option has been added to the Engineering Report.

1.3 Previous Permit Compliance Measures

Until more permanent WWTP improvements could be put into place, the WWTP operators have implemented operational changes in an effort to improve permit compliance. The 2008 Plant Evaluation Report concluded that the high effluent ammonia nitrogen concentrations were primarily attributable to low growth rates of nitrifying bacteria caused by low temperatures. Therefore, efforts were made to increase the population of these bacteria. To this end, the operators have experimented with the use of commercially available products containing pre-grown bacteria to augment the available population of nitrifying bacteria. In 2010, drums of EcoClear, produced by Eco Scientific, Inc. of Westlake, Ohio, were added to Lagoon 1 to test the potential effectiveness of this bio-augmentation (seeding) strategy. EcoClear includes a proprietary mix of bacteria types and was initially purchased in drums and added directly to the lagoons using a chemical metering pump. Laboratory results in September and October of 2010 indicated that periods of time during which EcoClear was added to the lagoons appeared to coincide with greater levels of short-term nitrification.

In 2011 bio-augmentation was continued on a larger scale by purchasing a concentrated EcoClear product. Batches of bacteria were grown on-site by supplying nutrients and compressed air to a small batch tank, from which the product was supplied to the first cell of Lagoon 1. Feeding of these cultivated nitrifier began in May 2011 and continued through the nitrification season. After limited effects were observed, pre-grown drums of EcoClear identical to those used in 2010 were also used. Bio-augmentation was implemented strictly as a temporary solution until longer term upgrades discussed in the 2008 Evaluation Report were implemented.

While the WWTP operators noted positive impacts in 2010, results in 2011 were inconsistent and no comprehensive data is available to evaluate overall effectiveness.

In addition to bio-augmentation, the operations staff removed settled sludge from Lagoon 2 in April of 2011 to increase the settling capacity of the lagoons. Sludge was dewatered on-site using a high speed centrifuge and the centrate was returned to Lagoon 1. A total of approximately 232 dry tons of dewatered sludge were removed, resulting.

P:\SALISBURY MA\2110582 - NPDES AO ASSISTANCE\120 - REPORTS PRESENTATIONS\AMMONIA REMOVAL ENGINEERING REPORT - FINAL.DOCX

2.0 EVALUATION OF AMMONIA NITROGEN REMOVAL CAPACITY

Removal of ammonia nitrogen from wastewater is dependent on nitrification. Nitrification is a two-step biological process in which *nitrosonomas* bacteria convert the ammonia nitrogen (NH_4) to nitrite (NO_2) and *nitrobacter* bacteria then convert NO_2 to NO_3. Both steps require oxygen, and as a result an aerobic environment is needed for effective nitrification to occur. The sections below consider the influent strength and volume, as well as factors impacting bacterial growth, in order to evaluate the WWTP's capacity to consistently support nitrification.

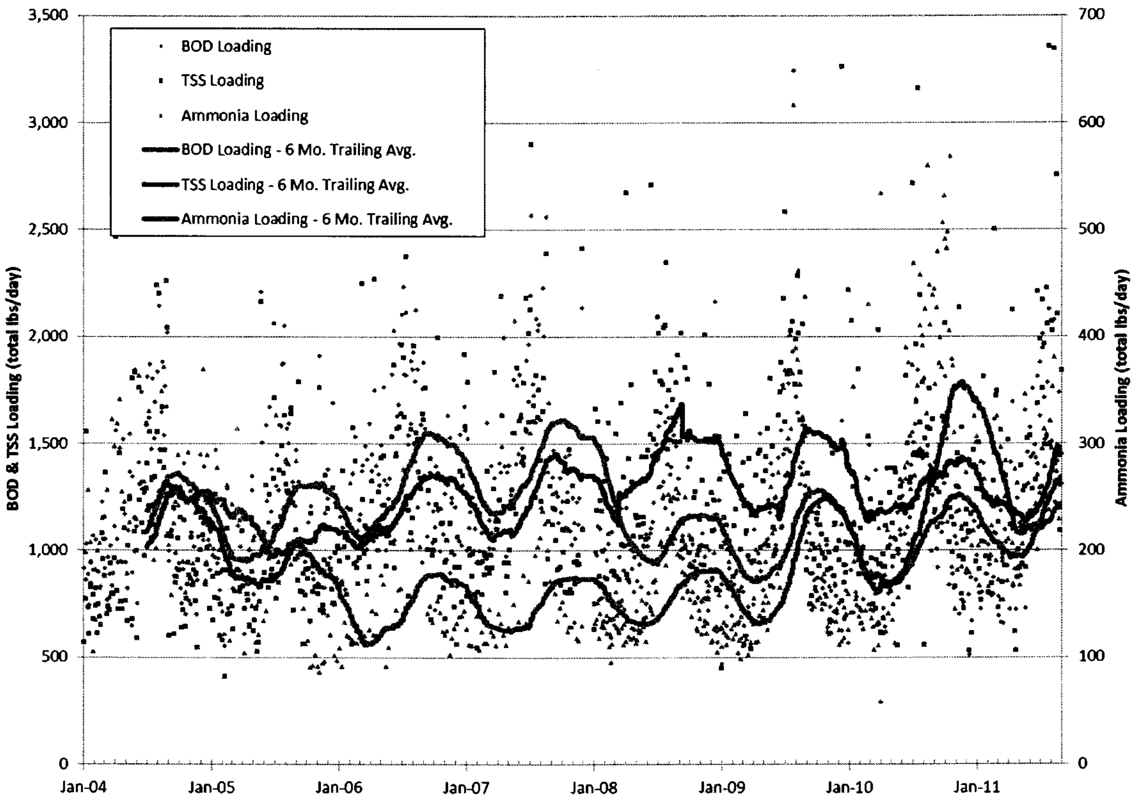
2.1 Summary of Influent and Effluent Data

Table 2-1 shows a summary of annual influent loadings to the WWTP, including ammonia nitrogen as well as biochemical oxygen demand (BOD_5) and total suspended solids (TSS) for purposes of comparison. Influent loading (total pounds per day), rather than concentration (milligrams per liter), is used for the purpose of this evaluation because it accounts for the effects of influent flow, to better demonstrate the total impact to the WWTP. Figure 2-1 represents the loading data graphically, and lists six-month trailing averages for each parameter to show seasonal and annual variations in loading.

Table 2-1: Influent Loading Summary

Year	Flow		BOD_5		TSS		Ammonia	
	Average (mgd)	*90th Perc. (mgd)*	*Average (lbs)*	*90th Perc. (lbs)*	*Average (lbs)*	*90th Perc. (lbs)*	*Average (lbs)*	*90th Perc. (lbs)*
2004	0.62	0.76	1,154	1,686	1,075	1,555	244	329
2005	0.66	0.87	1,137	1,625	974	1,357	180	276
2006	0.79	0.94	1,363	1,839	1,233	1,726	151	209
2007	0.74	0.93	1,416	1,998	1,241	1,813	151	216
2008	0.81	1.02	1,029	1,449	1,460	1,970	157	226
2009	0.79	0.98	1,046	1,521	1,325	2,002	191	318
2010	0.82	1.02	1,071	1,471	1,296	1,805	274	455
2011	0.79	0.95	1,261	1,763	1,424	2,133	237	298
2009-2011	0.80	0.97	1,109	1,562	1,339	2,028	233	389

Figure 2-1: Influent Loading Summary

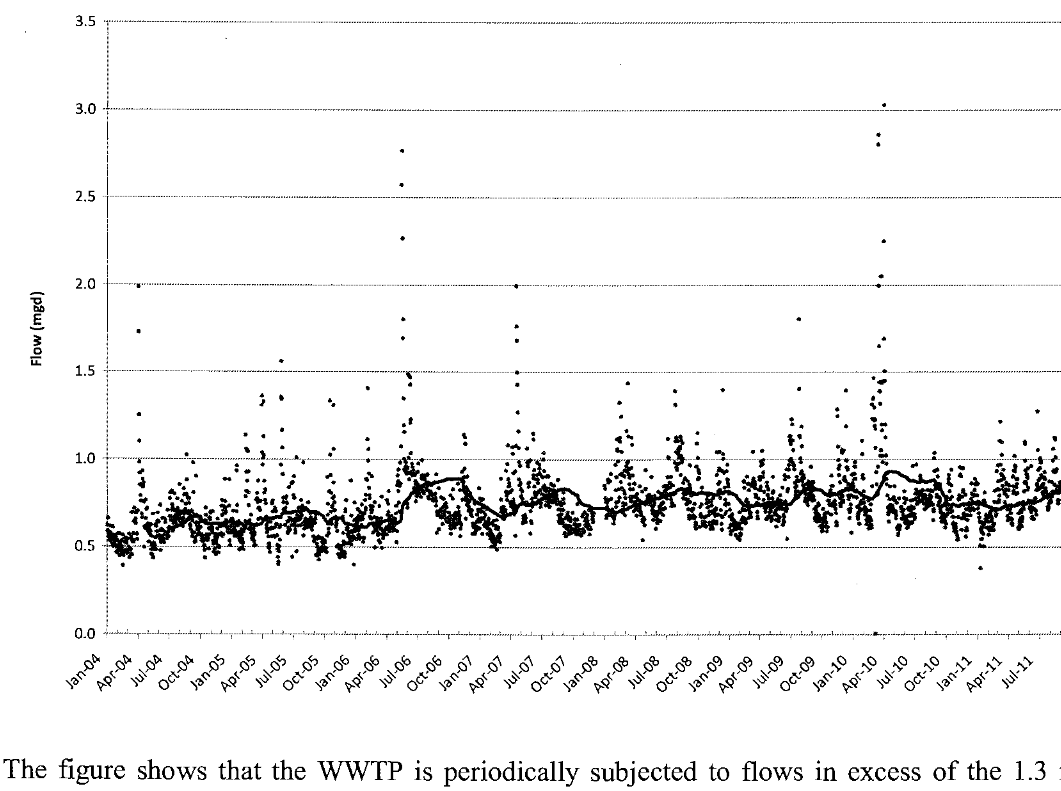


The data indicate that average daily flow has steadily increased since 2004. TSS loading has increased proportionally to the flow increase, while BOD_5 loading has remained relatively constant. Comparing the average data for 2009 through 2011 to the data for 2004, average daily flows have increased 29%, BOD_5 loading has decreased 4%, and TSS loading has increased 23%. Ammonia nitrogen loading has varied significantly from year to year, with lows occurring during 2006 and 2007 and a high reached during 2010. As shown in Figure 2-1, this high loading in 2010 occurred between June and October, coinciding with the nitrification season. The reason for this apparent one-year increase in influent loading is not known. However, overall it does not appear that ammonia nitrogen permit exceedences referenced in the 2011 AO are the result of increased influent loadings.

2.2 Flow Analysis

As shown in Table 2-1, the WWTP has seen relatively steady increases in influent flow over the past eight years. In addition to the overall changes in flow, it is important to consider the incidence of extreme flow events, as these may result in "wash out" of nitrifying bacteria populations from the lagoons that typically require significant time to rebuild. Figure 2-2 shows daily flow data from 2004 to 2011, with a six-month trailing average to show seasonal and annual trends. Please note that, for clarity, two high flow events in excess of 3.5 mgd occurring in 2006 have been omitted from the graph in order to more clearly show the trend of increasing average flows.

Figure 2-2: Influent Flow Summary



The figure shows that the WWTP is periodically subjected to flows in excess of the 1.3 mgd design flow. These periods of excessive influent flow are relatively uncommon, occurring one to two times per year. However, in some cases, heavy rains result in extended periods of high flow; for instance, during March of 2010, influent flow for 13 of 31 days exceeded the design flow.

During the period shown in Figure 2-2, the periods of excessive flow, defined as at least two days of flow in excess of the average day design flow during a seven day period, break down by month as follows:

- One (1) occurred in February,
- Two (2) occurred in March,
- Three (3) occurred in April,
- Two (2) occurred in May, and
- One (1) occurred in June.

The timing of high flow events at the beginning of the nitrification season is problematic because it is likely to eliminate populations of nitrifying bacteria at a time when low temperatures will result in slow growth rates and a slow recovery from the high flow event. Based on these data, we conclude that means of mitigating the impact of these high flow events must be considered.

2.3 Nitrification Analysis

The biological nitrification process requires several environmental factors within the aerated lagoon to be successful, including:

- Sufficient detention time,
- Sufficient dissolved oxygen levels,
- Near neutral pH and sufficient buffering capacity,
- Sufficient water temperature,
- Sufficient growth of nitrifying bacteria, and
- Absence of factors inhibiting bacterial growth.

The 2008 Evaluation Report prepared by Weston & Sampson considered each of these factors and concluded that low water temperature was the primary contributing factor causing poor nitrification, with low pH as a secondary contributing factor. For this Engineering Report, we have updated the 2008 analyses to include operational data through 2011. It is important to note that the 2008 analysis concluded that the existing biological treatment process was able to support nitrification beginning in June or July of each year, as evidenced by effluent ammonia nitrogen values consistently below permit limits. However, in both 2010 and 2011 the WWTP experienced extended periods of high effluent ammonia nitrogen, well after this time. This indicates that during these years a primary factor other than temperature contributed to limited or inconsistent nitrification.

2.3.1 Detention Time

The 2008 Evaluation Report found that detention time was not a limiting factor for nitrification because average monthly flows in May and June, the beginning of the nitrification season, were typically lower than during the summer months. In general this pattern has continued, and it does not appear that detention time is a significant factor in the limited nitrification that occurs early in the nitrification season. However, as discussed in Section 2.2, discrete high flow events are likely to have an impact due to the loss of nitrifying bacteria during these short periods where detention is sharply reduced by unusually high flows.

2.3.2 Dissolved Oxygen Levels

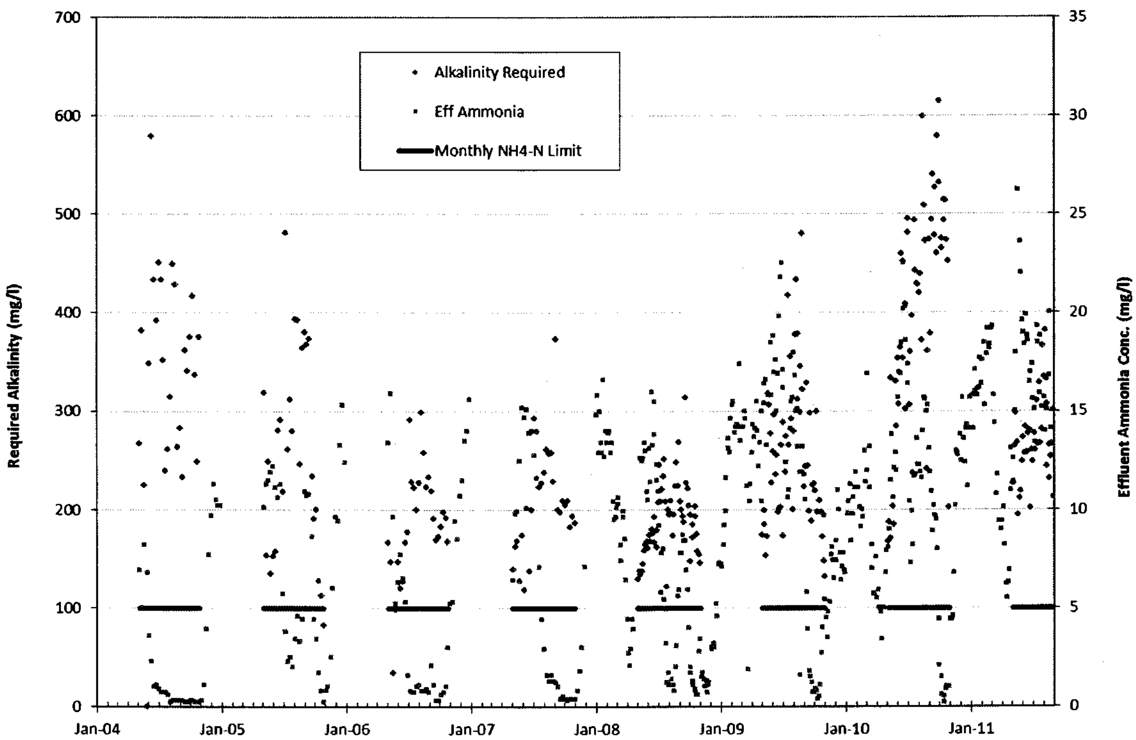
The WWTP operators routinely monitor dissolved oxygen (DO) levels in Lagoon 1 using handheld instrumentation and report that DO typically ranges from 3.5 mg/l to 5 mg/l during the nitrification season. This is in excess of the 2.0 mg/l required to support nitrification. However, no system for collecting standardized DO data (i.e. at a specific location and specific time of day) on a regular basis exists. This will be discussed further in the recommendations section.

2.3.3 pH Levels and Buffering Capacity

Influent pH levels are monitored daily and range from 6.8 to 7.6 throughout the nitrification season and are regarded as the best available approximation of pH within Lagoon 1, where most nitrification can be expected to occur. pH levels of 7.2 to 9.0 provide the best environment for nitrification. Influent pH levels are frequently below this range, particularly in recent years. As a result, pH adjustment to maintain consistent pH above 7.2 would likely be a worthwhile means of enhancing nitrification performance.

In addition to influent wastewater potentially having a pH lower than ideal for maintaining nitrification, the nitrification process consumes alkalinity and reduces the buffering capacity of the wastewater as it moves through the lagoons. From a theoretical stoichiometric basis, 7.14 mg/l of alkalinity are required to fully nitrify each 1 mg/l of ammonia nitrogen. Figure 2-3 compares this theoretical required alkalinity to effluent ammonia nitrogen concentrations and the seasonal ammonia nitrogen limit.

Figure 2-3: Theoretical Required Alkalinity and Effluent Ammonia



The data represented in the figure show that theoretical alkalinity requirements range widely during the nitrification season as a result of variations in influent ammonia nitrogen. Required alkalinity peaked above 500 mg/l during the period of high ammonia nitrogen concentrations observed in 2010, discussed previously in Section 2.1. Data on actual alkalinity in the lagoons are not available as regular measurements are not taken. This will be discussed further in the recommendations section.

In general it does not appear that periods with higher effluent ammonia nitrogen, and thus more frequent permit exceedences, are associated with high alkalinity requirements. Based on field readings, the WWTP staff reports that alkalinity in Lagoon 1 is typically around 200 mg/l but has been observed well below 100 mg/l. Although these measurements are far below the calculated theoretical alkalinity required to complete nitrification, the data indicate that successful nitrification has nonetheless occurred during the latter portion of most nitrification seasons, even in 2010 when the highest alkalinity requirements were observed.

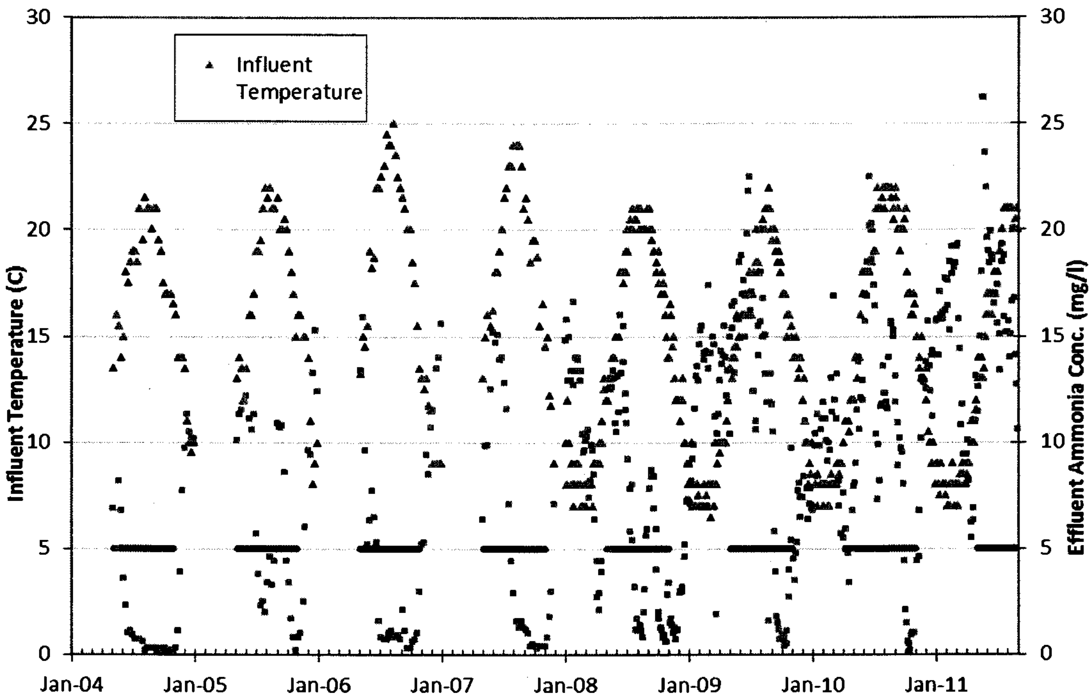
Even so, low alkalinity has the dual effect of (1) limiting the nitrification reaction and (2) buffering low pH that can separately impede the nitrifying bacteria. At present, WWTP staff must manually add alkalinity to Lagoon 1 when low pH levels are observed. No pH monitoring system or automated alkalinity metering system is in use. As previously recommended in the 2008 Evaluation Report, providing an improved method of controlling alkalinity will enhance the nitrification potential of the WWTP.

2.3.4 Water Temperature

Nitrification is greatly affected by temperature. The optimum growth rate of nitrifying bacteria is typically obtained with temperatures between 25° C to 30° C. Growth rates are greatly diminished in wastewaters having temperatures less than 10° C.

Influent water temperatures are measured daily at the WWTP but lagoon water temperatures are not generally recorded. Historical data, based on grab samples taken from the lagoons, indicate that the lagoon water temperature is lower than the influent water temperature in the spring and slightly higher than the influent water temperature in summer and fall months. Influent water temperatures range from 13° C to 18° C in May and early June and typically remain between 16° C and 24° C from mid June through early November. The water temperature within the first lagoon is usually at or below 10° C in early May. Figure 2-4 shows influent temperature, effluent ammonia nitrogen concentrations, and the seasonal ammonia nitrogen limit.

Figure 2-4: Influent Temperature and Effluent Ammonia



The figure shows that in previous years (i.e. 2004 to 2008) the relationship between influent temperature and effluent ammonia nitrogen was relatively clear. As influent temperature and thus lagoon temperatures rose in the early months of the year, effluent ammonia nitrogen concentrations dropped. However, in 2009, 2010 and 2011 this relationship is no longer clear. In both 2009 and 2010, for instance, effluent ammonia nitrogen only dropped significantly late in the nitrification season when influent temperatures were already well below summer peaks.

2.3.5 Growth Rate Evaluation

Nitrosomonas is the limiting bacteria for the biological nitrification process. These bacteria have a specific growth rate affected by water temperature and pH. In general, when the growth rate, adjusted for pH and water temperature, is less than 0.5 days^{-1}, it is difficult to sustain sufficient *nitrosomonas* bacteria to support nitrification.

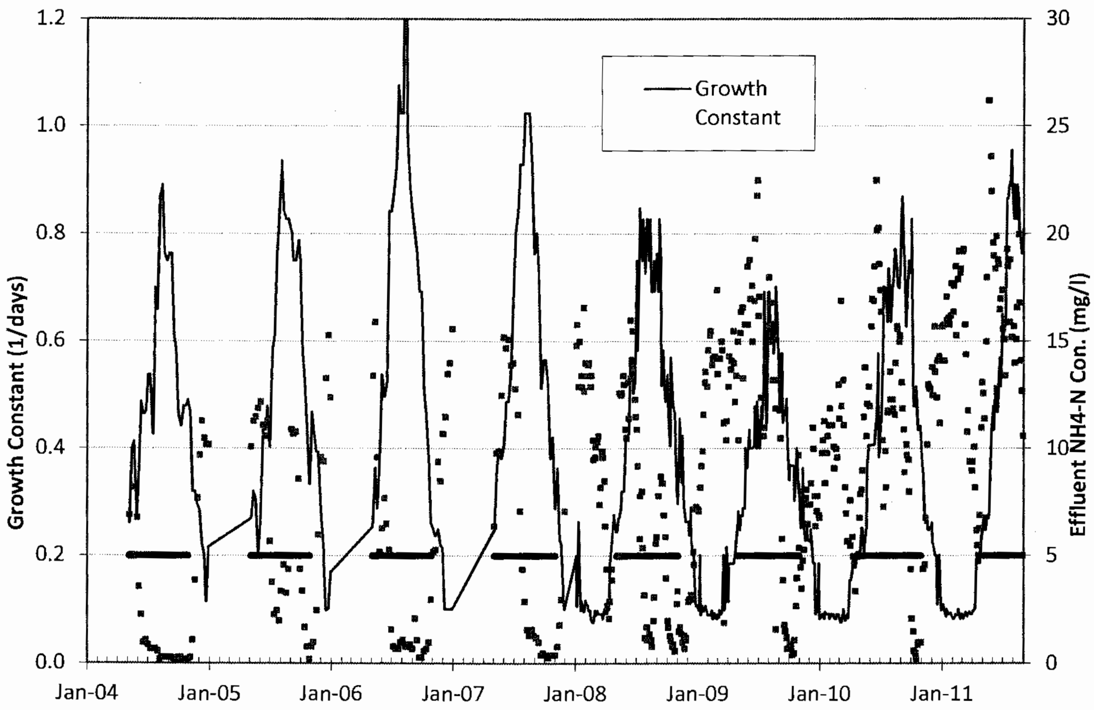
In the 2008 Engineering Report, WWTP operational data were used to calculate the maximum growth rate. The growth rate at the WWTP was found to range from 0.70 $days^{-1}$ to 1.00 $days^{-1}$ in July, August and September of any given year, which is sufficient to support nitrification. For each year, the point at which the *nitrosomonas* growth rate rose above 0.5 $days^{-1}$ was calculated. This analysis has been extended to 2011 and is summarized in Table 2-2.

Table 2-2: Summary of *Nitrosomonas* Growth Rate Analysis Results

Year	Average Calculated Growth Rate ($days^{-1}$)				Date of Stabilization
	May	June	July	Aug – Oct	
2004	0.34	0.47	0.58	0.64	June 30
2005	0.28	0.40	0.70	0.70	July 6
2006	0.37	0.68	0.98	0.76	May 31
2007	0.36	0.55	0.88	0.68	June 20
2008	0.32	0.53	0.77	0.75	June 11
2009	0.31	0.43	0.55	0.48	July 29
2010	0.30	0.43	0.65	0.66	July 7
2011	0.30	0.52	0.80	0.83	June 8

The calculated maximum growth rates for 2010 and 2011 are consistent with the earlier data, with stabilization above 0.50 $days^{-1}$ occurring in June and July. However, in 2009 the growth rate stabilized later than usual and dropped earlier than usual, declining below 0.50 $days^{-1}$ by early September rather than in October as typical. Figure 2-5 shows the results of the growth rate along with the effluent ammonia nitrogen concentration and seasonal ammonia nitrogen limit.

Figure 2-5: ***Nitrosomonas*** **Growth Rate and Effluent Ammonia**



The calculated maximum growth rate includes temperature, and as a result the patterns seen in Figure 2-4 are also visible in Figure 2-5. In earlier seasons (2004 to 2008) a correlation can be seen between rising maximum growth rate and a decrease in effluent ammonia nitrogen concentrations. The unusually low growth rates calculated for 2009 were primarily the result of low influent pH readings during that year, as well as relatively low summer influent temperatures. Nitrification performance for 2009 was relatively poor, but appears to have followed the earlier correlation between growth rate and effluent ammonia nitrogen. However, in 2010 and 2011 this correlation is no longer apparent. The drop in effluent ammonia nitrogen late in the 2010 nitrification season occurred well after the increase in the maximum *nitrosomonas* growth rate.

Overall, it appears that the clear correlation observed in the 2008 Evaluation Report between maximum *nitrosomonas* growth rate and effluent ammonia levels is no longer consistent. It is possible that this is the result of the combined effects of low pH/alkalinity with the previously observed seasonal temperature issues. However, given the significant changes in nitrification performance in 2010 and 2011, we believe other factors should also be considered.

2.3.6 Inhibitory Chemicals

In addition to the factors discussed previously, nitrification can also be negatively impacted by any chemicals that directly inhibit bacterial growth. The most likely source of such chemicals in Salisbury is the presence of campgrounds with sewer connections, including the Salisbury Beach State Reservation (the Reservation), with 484 camp sites, and the private Beach Rose RV Park, with 50 RV sites. Both campgrounds accept discharges from RV sewage tanks. Chemical additives that kill or inhibit biological growth are frequently added to RV sewage tanks in order to minimize the generation of odorous compounds. Common additives include formaldehyde-methanol, paraformaldehyde, phenol-based compounds, and quaternary ammonium compounds. Enzyme-based additives designed to be less harmful to wastewater treatment systems are also available and are mandated or suggested for use in some areas. However, Massachusetts has no restrictions on RV tank additives.

The Town has initiated discussions with the Massachusetts Department of Conservation and Recreation (DCR), which operates the Reservation, regarding the high organic loadings and inhibitory chemicals being that are believed to be discharged from the Reservation to the Town's wastewater system. As a result, DCR has initiated a project to investigate discharges from the Reservation and implement pretreatment to comply with the Town's sewer ordinance. This work will be discussed further in later sections.

3.0 EVALUATION OF AMMONIA NITROGEN COMPLIANCE OPTIONS

As directed by the 2011 AO, this Engineering Report focuses on identifying available options for improving the ammonia nitrogen removal performance of the WWTP. However, because effective ammonia nitrogen removal is also dependent on the efficient operation of the WWTP, options targeting WWTP treatment optimization are also discussed.

The sections below are divided by the general type of work and the specific steps to be taken by the Town. The schedule associated with each option is discussed in Section 4.0.

3.1 Influent Control

As discussed in Section 2.3.6, inhibitory chemicals in the influent to the WWTP can have a significant impact on ammonia nitrogen removal by eliminating nitrifying bacteria or slowing their action. This is particularly harmful during periods where other factors, such as temperature, may already be negatively impacting bacterial growth and activity. The results of the theoretical growth rate analysis discussed in Section 2.3.5 indicate that other factors beyond temperature and alkalinity may have become more significant factors in the WWTP's nitrification performance in recent seasons. In order to assess whether inhibitory chemicals are responsible for this change, data gathering beyond that required by the NPDES permit is needed. In addition, it will be important to work closely with DCR, the operator of the most significant potential source of inhibitory chemicals.

3.1.1 Influent sampling

In order to more accurately assess the prevalence and impact of inhibitory chemicals in the WWTP influent, a sampling program shall be developed and implemented. This sampling program will collect data during the summer when the Reservation is active and shall focus on chemicals known to be present in RV tank discharges that may be harmful to WWTP performance, including but not limited to: formaldehyde-methanol, paraformaldehyde, phenol-based compounds, and quaternary ammonium compounds. Samples shall be collected concurrently with required weekly permit sampling for conventional parameters to confirm the presence of these chemicals and determine their impact on the nitrification process.

3.1.2 DCR work at Salisbury Beach State Reservation

In response to notification by the Town that high organic loadings and inhibitory chemicals were apparently being discharged from the Reservation to the Town's wastewater system, DCR has begun work on a project to implement pretreatment at the Reservation. As this work proceeds the Town and its Consultants will need to work with DCR to ensure that adequate data is gathered and a treatment solution is designed that will result in significant reductions in the strength of wastewater discharged by the Reservation. Should data gathering be conducted at the Reservation, this program shall be coordinated with the influent quality monitoring conducted at the WWTP to allow an assessment of the portion of inhibitory chemicals and conventional loading received at the WWTP relative the quantities discharged at the Reservation.

3.2 Process Monitoring and Control

The instrumentation used by the WWTP operators to monitor the wastewater treatment processes occurring in the lagoons has never been significantly modified or upgraded. As demonstrated by the uncertainty regarding the factors influencing poor nitrification performance discussed in Section 2.3, improving ammonia nitrogen removal will require additional data for process control. Increased sampling will satisfy some of these data needs in the short term. However, implementing permanent methods of monitoring and recording process data, using more reliable collection methods, will allow for greater control of WWTP performance.

3.2.1 Process sampling

In accordance with the requirements of the NPDES permit, current sampling at the WWTP is conducted on the WWTP influent and effluent. However, understanding the processes occurring within the WWTP, particularly processes like nitrification that are influenced by many factors, requires additional monitoring. The sampling program shall be designed with input from the WWTP operational staff. Sampling points are expected to include the outlet of both Lagoon 1 and 2, and sampling at the midpoint of each lagoon may also be beneficial. Sampling parameters shall include, at a minimum, temperature, BOD_5, TSS, ammonia nitrogen, nitrate, nitrite, DO, pH, alkalinity, and total copper. Samples shall be collected concurrently with weekly permit samples.

3.2.2 Installation of permanent monitoring instrumentation

Installing permanent instruments to monitor critical process parameters will allow for closer tracking of nitrification and other processes by the operators and allow for more targeted action to address observed problems. For instance, monitoring DO will allow aeration rates to be increased when necessary to support nitrification and reduced during other periods to conserve energy. New instrumentation may be placed at one or two locations; further study will be required to determine the best location(s) for process control instrumentation, although the midpoint or outlet of Lagoon 1 are the most likely locations. The new instruments (probes) will include, at a minimum, DO and pH.

Installing instruments will require design and construction of a rack, boom, or other mounting point for the probes, conduit to provide power to the probes, and a location for instrument readouts. It may be possible to use the existing shed adjacent to Lagoon 1 to house the instrument readouts, although long term the instrument readouts will be located in the main WWTP building.

3.3 Tidal Effluent Discharge

In the 2011 AO, the Town was directed to consider extension of the WWTP effluent outfall in order to achieve greater dilution and potentially reduce the effluent permit limits. This option is discussed in Section 3.4; however, it should be noted that the WWTP was originally designed to discharge on a tidal cycle as a means of achieving the same objective of greater dilution. Several discharges in New England have been permitted by EPA Region 1 and delegated states for tidally-timed discharges. These include sea product processing plants in Lubec and Milbridge, Maine and facilities in Swansea, Dighton and Dorchester, Massachusetts.

The existing outfall discharges to a tidal creek that varies significantly in volume and velocity over the course of the day due to the influence of the tidal cycle. The WWTP has a significant storage capacity due to its lagoon volume and discharging effluent only during periods when the tide is high would provide greater dilution in the receiving water without requiring significant modifications to the WWTP or its operations.

Despite its original design, the WWTP has never been operated on a tidal cycle due to the EPA's earlier decision to maintain a dilution factor based on stream flow during low tide, regardless of effluent discharge timing. However, the 2011 AO offers an opportunity to reevaluate this option and initiate a new discussion with EPA regarding the basis of their requirements.

3.3.1 Work Plan development and approval

Evaluating the impact by tidal discharge on dilution in the receiving waters will require a comprehensive study by specialists. A Work Plan will be developed to describe the required data and analyses and the field studies required to gather the data. It appears that two potential approaches to the study are available. In the first, a field study using tracer dyes to measure actual dilution at the existing outfall would be conducted at times selected to represent tidal cycle effects in the receiving water as well as seasonal changes. The second option would be to collect data on flow and bathymetry of the receiving stream in order to construct a computer model of the stream, allowing virtual evaluation of a variety of scenarios. Although these methods are not mutually exclusive, it will be necessary to further analyze the costs and benefits of each approach before finalizing the Work Plan. After review by the Town, this Work Plan will be presented to EPA and DEP for discussion and approval to ensure that work undertaken is consistent with the data needs and policies of the regulatory agencies.

3.3.2 Dilution factor study

Following approval by the regulatory agencies, the Work Plan will be implemented to collect data and study the potential impacts of tidal discharge on dilution in the receiving waters. Depending on the method selected to conduct the study, the work may consist of a series of field work periods followed by data analysis, or a shorter initial period of field work followed by a longer period of modeling. The results of the Work Plan will be used to assess the environmental impact associated with effluent discharge at various points in the tidal cycle.

3.3.3 Design and construction

In order to implement tidal discharge from the WWTP on a pilot basis, the controls and instrumentation included in the original construction of the WWTP must be evaluated for viability. It is anticipated that much of this equipment will require replacement due to its age.

The controls and instrumentation are required in order to monitor the tidal cycle, automatically discharge effluent during the selected portion of the tidal cycle, and activate alarms and other emergency measures when high flow conditions in the lagoons require immediate discharge.

3.4 Outfall extension

As discussed in Section 3.3, extension of the WWTP outfall to achieve greater dilution in the receiving water is an option identified by the EPA. Due to the cost and time associated with designing, permitting, and constructing the extension, tidal discharge has been identified as a practicable, low impact alternative option. If the dilution factor study resulting from the tidal discharge trial is successful, this method will be proposed to EPA in place of outfall extension. If the tidal discharge approach is not approved as an alternative, outfall extension will be considered further. This approach will be vetted through EPA and DEP with the development of an approvable work plan.

3.4.1 Design and construction

The first step in designing the outfall extension will be selection of a route for the new outfall pipe. A route will be selected based on factors such as the ownership of parcels to be crossed, the number and length of required stream crossings, and any permitting issues identified along the potential routes. Preliminary assessments show that the total extension length is likely to range from 2,000 feet to 2,500 feet depending on the selected route. In addition to the route, the best method of installation will need to be selected, in particular whether the pipe will installed using trenchless or conventional open-trench methods.

3.4.2 Permitting

In advance of final design, a major permitting effort will be needed to allow the construction of the outfall extension. Based on preliminary analysis, the anticipated area of impact will trigger requirements for the following permits:

- Notice of Intent to the Salisbury Conservation Commission for work in wetland resource areas, 100-year flood zone, and 200-foot Riverfront Protection Area

- Project review by the Massachusetts Natural Heritage and Endangered Species Program (NHESP) for work in species habitat
- Chapter 91 license from Massachusetts DEP for placement of a new structure in a tidal waterway
- Army Corps of Engineers permit for fill/excavation in navigable waters
- Water Quality Certificate for fill within NHESP habitat.

The total time required to submit and obtain the required permits is expected to range between 12 and 18 months. At this time an Environmental Notification Form (ENF) is not expected to be required as the proposed work appears to fall below the required thresholds. However, an ENF could be triggered by the decision of the agencies involved, for instance if NHESP determines that the construction will be considered a "take" of NHESP habitat. Triggering an ENF will extend the required permitting period and increase the permitting cost.

3.4.3 Dilution factor study

As with the evaluation of tidal discharge, evaluating the potential impact of extending the outfall will require a comprehensive study by specialists. The study is expected to follow the same general outline as the proposed dilution study for tidal discharge. A work plan will be developed to describe the required data and analyses and the field studies required to gather the data. After implementing this work plan, data analysis and water quality modeling will be used to assess the environmental impact associated with effluent discharge at the prospective new discharge location or locations.

3.5 Energy Audit

Many of the modifications and upgrades proposed in this report will result in greater energy use and operational costs at the WWTP. As of the writing of this report, the Town is conducting a town-wide energy audit in order to identify opportunities to maximize energy efficiency, and as a major energy user, it is expected that the results of the audit will include recommendations for the WWTP. The results of the audit will be incorporated into the design of modifications to the WWTP.

3.6 WWTP Upgrades

The following items are independent upgrades to the WWTP intended to improve performance and thus enhance ammonia nitrogen removal. Each upgrade can be implemented alone or in tandem with other options; however, some upgrades are likely to be redundant. All upgrades would require a design and permitting effort, as well as construction delivery method and construction phase services. The potential upgrades have been listed in order of priority, with the most easily implemented upgrades given highest priority.

3.6.1 Preliminary design development

Before undertaking upgrades to the WWTP, a preliminary design will be developed to identify short-term work to be undertaken and describe the proposed work and schedule. After review by the Town, this preliminary design will be presented to EPA and DEP for discussion.

3.6.2 Alkalinity adjustment

As discussed in Section 2.3.3, alkalinity adjustment in the lagoons is currently accomplished manually by adding large doses of sodium bicarbonate to Lagoon 1 to raise alkalinity when low alkalinity is observed. Low alkalinity has detrimental effects on nitrification performance, and a more regulated method of controlling alkalinity is likely to be beneficial. Installation of permanent alkalinity monitoring instrumentation was recommended in Section 3.2.2; installation of chemical feed equipment to automatically dose sodium bicarbonate or another chemical based on alkalinity and/or pH results will work with this instrumentation. The likely dosing location is the inlet of Lagoon 1, although this location will be selected based on the results of the sampling proposed in Section 3.3.1. Chemical feed equipment will be located in a new enclosure near the feed point, although it may be possible to use the existing shed located adjacent to the lagoons.

3.6.3 Blower replacement

The existing aeration blowers have been in operation since the WWTP was commissioned in 1986. Four blowers are located in the main WWTP building; three are typically operated during the summer months and two are operated in the winter. As these blowers are nearing the end of their design life, replacement with new, more efficient models shall be considered. The new blowers would be equipped with variable frequency drives (VFDs) allowing the aeration output to be tailored to meet the DO requirements of the lagoons, in tandem with the DO instrumentation recommended in Section 3.3.2. Use of VFDs frequently results in significant energy savings and utility rebates can typically be obtained to pay a portion of the installation cost. Effective aeration is a critical element in nitrification performance, and upgrading some or all of the blowers will allow the operations staff to ensure that aeration performance does not degrade as the blowers require more maintenance at the end of their operational life.

3.6.4 Aeration system replacement

The coarse bubble aerators used in Lagoons 1 and 2 are maintained regularly by the WWTP operations staff but are largely original equipment. Using the DO information collected in the sampling program discussed in Section 3.2.1, upgrade of these aerators will also be evaluated to determine whether the system will benefit from replacement of some or all of the aerators, possibly with more efficient aerators such as fine bubble diffusers. More efficient aeration should result in energy savings and better process control.

3.6.5 Lagoon baffle replacement

Lagoon 1 is currently divided into two cells by a lagoon baffle. However, this baffle is in very poor condition and is likely far more permeable than originally designed. Replacing the baffle would be relatively inexpensive and would restore the lagoon to its original design configuration. An intact baffle will prevent short-circuiting of the lagoon which should improve nitrification and promote better DO control and aeration efficiency.

3.6.6 Lagoon cover installation

As discussed in Section 2.3.4, water temperature in the lagoons is a significant factor in maintaining effective ammonia nitrogen removal performance. A common method of addressing low water temperature in wastewater lagoons is the installation of insulated lagoon covers to retain heat from the influent wastewater and biological activity within the lagoons. The covers typically float on the surface of the lagoon. The most cost effective approach would likely be to install covers on Lagoon 1 and the aerated portion of Lagoon 2.

3.6.7 Major WWTP modifications

As discussed in the previous sections, the focus of ammonia nitrogen removal improvements will be minor upgrades to the WWTP and modifications to the outfall to increase dilution in the receiving water. However, if the use options are not found to be adequate and/or feasible, a range of more significant and capital-intensive upgrades are available. A preliminary survey of these options has been conducted and the most likely options are summarized below.

Aerated lagoons do not retain biomass (bacteria) well and as a result are an inefficient method of treating wastewater relative to their volume. High flow events exacerbate this problem by "sweeping" a large percentage of the existing biomass (suspended growth) out of the lagoons, requiring a recovery period before full treatment efficacy is restored. One method of increasing biomass in the lagoons is to add plastic media to one or both lagoons that will provide surface area for fixed biomass growth to supplement the suspended growth biomass. Floating or side-mounted mixers can also be installed in the lagoons to improve aeration and mixing in the lagoons, both of which will typically improve nitrification performance. Implementing these upgrades will require the installation of new infrastructure such as the mixers and screens at the lagoon outlets to retain the media.

Another means of improving performance is to increase biosolids in the lagoons by installing pumps and piping to return a portion of flow from the end of Lagoon 2 to a point near the Lagoon 1 inlet. A more advanced version of the system would also include a clarifier system to concentrate biomass before returning it to Lagoon 1. This type of system was proposed in the 2008 Evaluation Report. At a minimum, new pumps and piping will be required to implement this upgrade. Baffles would likely be included as well, beginning with the baffle replacement described in Section 3.6.5, and potentially including additional baffles as well.

The final option will be to design and construct a new treatment reactor to supplement the lagoons. The most likely technologies to be used for this reactor are a sequencing batch reactor (SBR) which performs mixing, aeration, reaction, and settling in series in a single tank, or a moving bed bioreactor (MBBR) in which media are used to provide a high surface area for combined fixed and suspended growth bacteria in an aerated tank, thereby increasing the biomass per unit of volume.

P:\SALISBURY MA\2110582 - NPDES AO ASSISTANCE\120 - REPORTS PRESENTATIONS\AMMONIA REMOVAL ENGINEERING REPORT - FINAL.DOCX

4.0 RECOMMENDATIONS AND SCHEDULE

The following section summarizes recommendations for implementing select options discussed in Section 3 for improving ammonia nitrogen removal. In accordance with the requirements of the 2011 AO, a proposed schedule for implementation is also included.

4.1 Recommendations

It is recommended that top priority be given to implementing the compliance options described in Sections 3.1 and 3.2. These options have the least capital cost of the options discussed. Both of these options involve wastewater sampling, which is time-sensitive due to the need to collect samples during particular seasons and as the basis of design for future efforts. While the sampling program is underway, design, permitting, and construction of permanent process monitoring equipment can be initiated. Coordination with DCR on their efforts at the Salisbury Beach State Reservation is also discussed in Section 3.1; this work is expected to be ongoing.

Following initiation of the sampling efforts, investigation of tidal discharge as discussed in Section 3.3 shall begin. Tidal discharge can be implemented on a full-scale pilot basis with only minimal modifications to the WWTP's controls and instrumentation, unlike the outfall extension which will require a major permitting and construction effort. If, during the development of the Work Plan on tidal discharge or the ensuing dilution factor study, it is determined that tidal discharge is not a viable option, the outfall extension option will be advanced in accordance with the negotiated schedule.

The results of the energy audit discussed in Section 3.5 will be incorporated into the upgrade process. This work is expected to be conducted in February 2012. The results of the audit will allow an energy use baseline to be developed, which can be used to support applications for energy incentive funds available from utility providers.

Following review of the results of the energy audit, preliminary design of upgrades to the WWTP will be initiated. Initially, these options will be limited to those that can be implemented in approximately the next year, including addition of alkalinity adjustment and replacement of blowers as described in Sections 3.6.2 and 3.6.3. The selection and design of more complex upgrades will be re-evaluated, based on the results of the sampling programs conducted as part of the Section 3.1 and 3.2 work and the results of the tidal discharge evaluation. In particular, the options described in Section 3.6.7 require the construction of major infrastructure modifications at the WWTP and will require a significant design effort based on the results of the previous methods for improving performance. Such capital projects are not warranted if the dilution factor and effluent limits can be re-established.

4.2 Proposed Schedule

Figure 4-1 below summarizes the proposed schedule milestones for the items discussed in Section 4.1. Note that for many items no schedule has yet been set because selection and implementation of these options is dependent on the results of other options to be implemented earlier.

4.3 Conclusion

In conclusion, improving ammonia nitrogen removal at the Salisbury WWTP is expected to include a number of simultaneous efforts to identify and implement process improvements. The Town looks forward to discussing the proposed work with EPA and DEP.

P:\SALISBURY MA\2110582 - NPDES AO ASSISTANCE\120 - REPORTS PRESENTATIONS\AMMONIA REMOVAL ENGINEERING REPORT - FINAL.DOCX

APPENDIX A

National Pollutant Discharge Elimination System (NPDES) Permit

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act as amended, (33 U.S.C. §§1251 et seq.; the "CWA"), and the Massachusetts Clean Waters Act, as amended, (M.G.L. Chap. 21, §§26-53),

Salisbury Sewer Commission

is authorized to discharge from the facility located at

Salisbury Wastewater Treatment Plant
187 Elm Street
Salisbury, MA 01950

to receiving water

a tidal creek that drains to the Merrimack River (Merrimack River Basin; State Code 84)

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective on the first day of the calendar month immediately following sixty days after signature.

This permit and the authorization to discharge expire at midnight, five (5) years from the last day of the month preceding the effective date.

This permit supersedes the permit issued on February 21, 2002.

This permit consists of 11 pages in Part I including effluent limitations, monitoring requirements, Attachment A. Toxicity Test Procedures, Attachment B. Sludge Compliance Guidance and, 25 pages in Part II. Standard Conditions.

Signed this 9th day of October, 2007 effective 1/1/08

/S/ SIGNATURE ON FILE expires 1/1/13

Director
Office of Ecosystem Protection
Environmental Protection Agency
Boston, MA

Director
Division of Watershed Management
Department of Environmental Protection
Commonwealth of Massachusetts
Boston, MA

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning the effective date and lasting through expiration, the permittee is authorized to discharge treated effluent from outfall serial number 001. Such discharge shall be limited and monitored by the permittee as specified below. The effluent sampling location is after UV disinfection.

Effluent Characteristic	Units	Effluent Limits			Monitoring Requirements	
		Average Monthly	Average Weekly	Maximum Daily	Measurement Frequency	Sample Type[3]
Flow	MGD	1.3	----	----	Continuous	Recorder
Flow[2]	MGD	Report	----	Report	Continuous	Recorder
$CBOD_5$ [4]	mg/l	5	7	Report	2/Week	24-Hour Composite[5]
	lbs/day	54	76	Report	2/Week	24-Hour Composite[5]
TSS [4]	mg/l	5	7	Report	2/Week	24-Hour Composite[5]
	lbs/day	54	76	Report	2/Week	24-Hour Composite[5]
pH		(See Condition I.A.1.b. on Page 5)			1/Day	Grab[5]
Dissolved Oxygen	mg/l	6 mg/l minimum			1/Day	Grab[5]
Fecal Coliform[1,6]	cfu/100 ml	50	75	100	3/Week	Grab
Enterococci[1,6]	cfu/100 ml	35	----	104	3/Week	Grab
Copper, Total[7,8]	ug/l	3.1	----	4.8	1/Month	24-Hour Composite[5]

Effluent Characteristic	Units	Discharge Limitation			Monitoring Requirement	
		Average Monthly	Average Weekly	Maximum Daily	Measurement Frequency	Sample Type[3]
Total Ammonia Nitrogen, as N (Nov. 1- April 30)	mg/l	Report	Report	Report	2/Week	24-Hour Composite[5]
Total Ammonia Nitrogen, as N (May 1- Oct. 31)	mg/l	5.0	7.0	10.0	2/Week	24-Hour Composite[5]
Total Kjeldahl Nitrogen	mg/l	Report	----	Report	1/Month	24-Hour Composite[5]
Total Nitrate	mg/l	Report	----	Report	1/Month	24-Hour Composite[5]
Total Nitrite	mg/l	Report	----	Report	1/Month	24-Hour Composite[5]
LC_{50}[10,12]	%	≥100			4/year[9]	24-Hour Composite[5]
Chronic NOEC[11,12]	%	≥100			4/year[9]	24-Hour Composite[5]

All samples shall be representative of the effluent that is discharged through outfall 001.

Footnotes:

1. Required for State Certification.

2. Report annual average, monthly average, and the maximum daily flow. The limit is an annual average, which shall be reported as a rolling average. The value shall be calculated as the arithmetic mean of the monthly average flow for the reporting month and the monthly average flows of the previous eleven months.

3. All required effluent samples shall be collected at the point specified on page 2 of the permit. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

   A routine sampling program shall be developed in which samples are taken at the same location, same time and same days of every month. Occasional deviations from the routine sampling program are allowed, but the reason for the deviation shall be documented in correspondence appended to the applicable discharge monitoring report.

   All samples shall be tested using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. All samples shall be 24-hour composites unless specified as a grab sample in 40 CFR §136.

4. Sampling required for influent and effluent.

5. A 24-hour composite sample shall consist of at least twenty-four (24) grab samples taken during one consecutive 24-hour period, combined proportional to flow or continuously collected proportionally to flow. Daily grab samples are collected during regular operating working hours. Regular operating working hours are Monday through Friday, 7:00 am to 3:00 pm.

6. The permittee shall achieve the enterococci limits in accordance with the compliance schedule found in Part E. 2 of the permit. Enterococci samples shall be taken concurrently with one of the required fecal coliform samples. The monthly average limit for fecal coliform is expressed as a geometric mean. The units may be expressed as MPN for samples tested using the Most Probable Number method, or colony forming units (CFU) when using the Membrane Filtration method.

7. The minimum detection level (ML) for copper is defined as 3.0 ug/l. This value is the minimum detection level for copper using the Furnace Atomic Absorption analytical method. For effluent limitations less than 3.0 ug/l, compliance/non-compliance will be determined based on the ML. Sample results of 3.0 ug/l or less shall be reported as zero on the discharge monitoring report.

8. The permittee shall comply with the copper monthly limitation of 3.1mg/l and a daily maximum limitation of 4.8 in accordance with the schedule contained in Section E of the permit. The permittee shall report the monthly average and daily maximum copper level during the interim period.

9. The permittee shall conduct chronic (and modified acute) toxicity tests four times per year. The chronic test may be used to calculate the acute LC_{50} at the 48-hour exposure interval. The permittee shall test the Inland Silverside (*Menidia berllina*). Toxicity test samples shall be collected during the second week of the months of March, June, September and December. The test results shall be submitted by the last day of the month following the completion of the test.

The results are due April 30, July 31, October 31 and, January 31, respectively. The tests must be performed in accordance with test procedures and protocols specified in **Attachment A** of this permit.

Test Dates Second Week in	**Submit Results By:**	**Test Species**	**Acute Limit LC_{50}**	**Chronic Limit C-NOEC**
March June September December	April 30 July 31 October 31 January31	Menidia beryllina (Inland Silverside) See Attachment A	$\geq$100%	$\geq$100%

10. The LC_{50} is the concentration of effluent which causes mortality to 50% of the test organisms. Therefore, a 100% limit means that a sample of 100% effluent (no dilution) shall cause no more than a 50% mortality rate.

11. C-NOEC (chronic-no observed effect concentration) is defined as the highest concentration of toxicant or effluent to which organisms are exposed in a life cycle or partial life cycle test which causes no adverse effect on growth, survival, or reproduction at a specific time of observation as determined from hypothesis testing where the test results exhibit a linear dose-response relationship. However, where the test results do not exhibit a linear dose-response relationship, the permittee must report the lowest concentration where there is no observable effect. The 100% limit is defined as a sample which is composed of 100% effluent. This is a maximum daily limit derived as a percentage of the inverse of the dilution factor of 1.

12. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall follow procedures outlined in **Attachment A Section IV., DILUTION WATER** in order to obtain permission to use an alternate dilution water. In lieu of individual approvals for alternate dilution water required in **Attachment A**, EPA-New England has developed a Self-Implementing Alternative Dilution Water Guidance document (called "Guidance Document") which may be used to obtain automatic approval of an alternate dilution water, including the appropriate species for use with that water. If this Guidance document is revoked, the permittee shall revert to obtaining approval as outlined in **Attachment A**. The "Guidance Document" has been sent to all permittees with their annual set of DMRs and Revised Updated Instructions for Completing EPA's Pre-Printed NPDES Discharge Monitoring Report (DMR) Form 3320-1 and is not intended as a direct attachment to this permit. Any modification or revocation to this "Guidance Document" will be transmitted to the permittees as part of the annual DMR instruction package. However, at any time, the permittee may choose to contact EPA-New England directly using the approach outlined in **Attachment A**.

Part I.A.1. (Continued)

a. The discharge shall not cause a violation of the water quality standards of the receiving waters.

b. The pH of the effluent shall not be less than 6.5 nor greater than 8.5 and not more that 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

c. The discharge shall not cause objectionable discoloration of the receiving waters.

d. The effluent shall contain neither a visible oil sheen, foam, nor floating solids at any time.

e. The permittee's treatment facility shall maintain a minimum of 85 percent removal of both total suspended solids and biochemical oxygen demand. The percent removal shall be based on monthly average values.

f. If the average annual flow in any calendar year exceeds 80% of the facility's design flow, the permittee shall submit a report to MassDEP by March 31 of the following calendar year describing plans for further flow increases and discuss how the permittee will remain in compliance with the effluent limitations in the permit.

2. All POTWs must provide adequate notice to the Director of the following:

a. any new introduction of pollutants into that POTW from an indirect discharger in a primary industry category discharging process water; and

b. any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

c. for purposes of this paragraph, adequate notice shall include information on:

(1) The quantity and quality of effluent introduced into the POTW; and

(2) Any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

3. Prohibitions Concerning Interference and Pass Through:

Pollutants introduced into POTW's by a non-domestic source (user) shall not pass through the POTW or interfere with the operation or performance of the works.

4. Toxics Control

a. The permittee shall not discharge any pollutant or combination of pollutants in toxic amounts.

b. Any toxic components of the effluent shall not result in any demonstrable harm to aquatic life or violate any state or federal water quality standard which has been or may be promulgated. Upon promulgation of any such standard, this permit may be revised or amended in accordance with such standards.

c. Chlorine is not monitored or limited in this permit, therefore, the use of chlorine for effluent disinfection is prohibited.

5. Numerical Effluent Limitations for Toxicants

EPA or MassDEP may use the results of the toxicity tests and chemical analyses conducted pursuant to this permit, as well as national water quality criteria developed pursuant to Section 304(a)(1) of the Clean Water Act (CWA), state water quality criteria, and any other appropriate information or data, to develop numerical effluent limitations for any pollutants, including but not limited to those pollutants listed in Appendix D of 40 CFR Part 122.

B. UNAUTHORIZED DISCHARGES

The permittee is authorized to discharge only in accordance with the terms and conditions of this permit and only from the outfall listed in Part I A.1.of this permit. Discharges of wastewater from any other point sources, including sanitary sewer overflows (SSOs) are not authorized by this permit and shall be reported in accordance with Section D.1.e. (1) of the General Requirements of this permit (Twenty-four hour reporting).

Notification of SSOs to MassDEP shall be made on its SSO Reporting Form (which includes MassDEP Regional Office telephone numbers). The reporting form and instruction for its completion may be found on-line at http://www.mass.gov/dep/water/approvals/surffms.htm#sso.

C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance of the sewer system shall be in compliance with the General Requirements of Part II and the following terms and conditions:

1. Maintenance Staff

The permittee shall provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit.

2. Preventative Maintenance Program

The permittee shall maintain an ongoing preventative maintenance program to prevent overflows and bypasses caused by malfunctions or failures of the sewer system infrastructure. The program shall include an inspection program designed to identify all potential and actual unauthorized discharges.

3. Infiltration/Inflow Control Plan:

The permittee shall develop and implement a plan to control infiltration and inflow (I/I) to the separate sewer system. The plan shall be submitted to EPA and MassDEP **within six months of the effective date of this permit** (see page 1 of this permit for the effective date) and shall describe the permittee's program for preventing infiltration/inflow-related effluent limit violations, and all unauthorized discharges of wastewater, including overflows and by-passes due to excessive infiltration/inflow.

The plan shall include:

- An ongoing program to identify and remove sources of infiltration and inflow. The program shall include the necessary funding level and the source(s) of funding.

- An inflow identification and control program that focuses on the disconnection and redirection of illegal sump pumps and roof down spouts. Priority should be given to removal of public and private inflow sources that are upstream from, and potentially contribute to, known areas of sewer system backups and/or overflows.

- Identification and prioritization of areas that will provide increased aquifer recharge as the result of reduction/elimination of infiltration and inflow to the system.

- An educational public outreach program for all aspects of I/I control, particularly private inflow.

Reporting Requirements:

A summary report of all actions taken to minimize I/I during the previous calendar year shall be submitted to EPA and the MassDEP annually, **by March 31**. The summary report shall, at a minimum, include:

- A map and a description of inspection and maintenance activities conducted and corrective actions taken during the previous year.

- Expenditures for any infiltration/inflow related maintenance activities and corrective actions taken during the previous year.

- A map with areas identified for I/I-related investigation/action in the coming year.

- A calculation of the annual average I/I, the maximum month I/I for the reporting year.

- A report of any infiltration/inflow related corrective actions taken as a result of unauthorized discharges reported pursuant to 314 CMR 3.19(20) and reported pursuant to the Unauthorized Discharges section of this permit.

D. ALTERNATE POWER SOURCE

In order to maintain compliance with the terms and conditions of this permit, the permittee shall continue to provide an alternative power source with which to sufficiently operate its treatment works (as defined at 40 CFR 122.2).

E. SCHEDULE OF COMPLIANCE

1. No later than two years from the effective date of the permit, the permittee shall achieve compliance with the monthly average and daily maximum copper limits of 3.1 mg/l and 4.8 mg/l. During the interim, the permittee shall report the monthly average and daily maximum results for copper. At the end of this two year period, the copper limits in the permit go into effect.

   If the permittee reliably achieves the effluent limit prior to the end of the two year schedule, it shall notify EPA on its monthly discharge monitoring report and the final limit will go into effect on the first day of the month following notification.

2. No later than one year from the effective date of the permit, the permittee shall achieve compliance with the monthly average and daily maximum limits for enterococci. During the interim, the permittee shall report the monthly average and daily maximum values once per week.

F. SLUDGE CONDITIONS

1. The permittee shall comply with all existing federal and state laws and regulations that apply to sewage sludge use and disposal practices and with the CWA Section 405(d) technical standards.

2. The permittee shall comply with the more stringent of either the state or federal (40 CFR Part 503), requirements.

3. The requirements and technical standards of 40 CFR Part 503 apply to facilities which perform one or more of the following use or disposal practices:

   a. Land application - the use of sewage sludge to condition or fertilize the soil
   b. Surface disposal - the placement of sewage sludge in a sludge-only landfill
   c. Sewage sludge incineration in a sludge-only incinerator

4. The 40 CFR Part 503 conditions do not apply to facilities which place sludge within a municipal solid waste landfill. These conditions also do not apply to facilities which do not dispose of sewage sludge during the life of the permit but rather treat the sludge (e.g. lagoons- reed beds), or are otherwise excluded under 40 CFR 503.6.

5. The permittee shall use and comply with the attached compliance guidance document to determine appropriate conditions. See **Attachment B.** Appropriate conditions contain the following elements:

   - General requirements
   - Pollutant limitations
   - Operational Standards (pathogen reduction requirements and vector attraction reduction requirements)
   - Management practices
   - Record keeping
   - Monitoring
   - Reporting

Depending upon the quality of material produced by a facility, all conditions may not apply to the facility.

6. The permittee shall monitor the pollutant concentrations, pathogen reduction and vector attraction reduction at the following frequency. This frequency is based upon the volume of sewage sludge generated at the facility in dry metric tons per year:

less than 290	1/ year
290 to less than 1500	1 /quarter
1500 to less than 15000	6 /year
15000 +	1 /month

7. The permittee shall sample the sewage sludge using the procedures detailed in 40 CFR 503.8.

8. The permittee shall submit an annual report containing the information specified in the guidance by **February 19**. Reports shall be submitted to the address contained in the reporting section of the permit. Sludge monitoring is not required by the permittee when the permittee is not responsible for the ultimate sludge disposal. The permittee must be assured that any third party contractor is in compliance with appropriate regulatory requirements. In such case, the permittee is required only to submit an annual report by **February 19** containing the following information:

* Name and address of contractor responsible for sludge disposal
* Quantity of sludge in dry metric tons removed from the facility by the sludge contractor

G. MONITORING AND REPORTING

1. Reporting

Monitoring results obtained during the previous month shall be summarized for each month and reported on separate Discharge Monitoring Report Form(s) postmarked no later than the 15th day of the month following the effective date of the permit.

Signed and dated originals of these, and all other reports required herein, shall be submitted to the Director and the State at the following addresses:

Environmental Protection Agency
Water Technical Unit (SEW)
P.O. Box 8127
Boston, Massachusetts 02114

The State Agency is:

Massachusetts Department of Environmental Protection
Northeast Region
Bureau of Resource Protection
205B Lowell Street
Wilmington, MA 01887

Signed and dated Discharge Monitoring Report Forms and toxicity reports required by this permit shall also be submitted to the State at:

Massachusetts Department of Environmental Protection
Division of Watershed Management
Surface Water Discharge Permit Program
627 Main Street, 2nd floor
Worcester, MA 01887

H. STATE PERMIT CONDITIONS

This Discharge Permit is issued jointly by the U. S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) under Federal and State law, respectively. As such, all the terms and conditions of this Permit are hereby incorporated into and constitute a discharge permit issued by the Commissioner of the MassDEP pursuant to M.G.L. Chapter 21, §43.

Each Agency shall have the independent right to enforce the terms and conditions of this Permit. Any modification, suspension or revocation of this Permit shall be effective only with respect to the Agency taking such action, and shall not affect the validity or status of this Permit as issued by the other Agency, unless and until each Agency has concurred in writing with such modification, suspension or revocation. In the event any portion of this Permit is declared, invalid, illegal or otherwise issued in violation of State law such permit shall remain in full force and effect under Federal law as an NPDES Permit issued by the U.S. Environmental Protection Agency. In the event this Permit is declared invalid, illegal or otherwise issued in violation of Federal law, this Permit shall remain in full force and effect under State law as a Permit issued by the Commonwealth of Massachusetts.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND
ONE CONGRESS STREET
BOSTON, MASSACHUSETTS 02114-2023

FACT SHEET

DRAFT NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES.

NPDES PERMIT NO.: MA0102873

NAME AND ADDRESS OF APPLICANT:

Salisbury Sewer Commission
Elm Street
Salisbury, MA 01950

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Salisbury Sewer Commission
Elm Street
Salisbury, MA 01950

RECEIVING WATER: **a tidal Creek to the Merrimack River (Merrimack River Basin and Coastal Drainage Basin)**

CLASSIFICATION: SA

I. *Proposed Action*

The above named applicant has requested that the U.S. Environmental Protection Agency (EPA) reissue its National Pollutant Discharge Elimination System (NPDES) permit to discharge into the designated receiving water.

The existing NPDES permit was issued on February 21, 2002 and expired on February 21, 2007. The applicant submitted a complete application for permit reisssuance on August 21, 2006 therefore, the existing permit will be administratively extended and continue in effect until the new permit is issued, according to 40 CFR 122.21.

II. *Type of Facility and Discharge Location*

The facility is an advanced wastewater treatment plant with seasonal nitrification. It serves approximately 5000 people and treats municipal wastewater only. The draft permit has been written to reflect the current operations and conditions at the facility and authorizes a discharge from Outfall 001 to a tidal creek that flows to the Merrimack River.

III. *Description of Discharge*

A quantitative description of the facility's discharge in terms of significant effluent parameters based on recent monitoring data between January 1, 2006 and March 1, 2007, is shown in Table 1 of this fact sheet.

Figure 1 of the fact sheet is a map showing the geographic location of the facility and Figure 2 is a diagram of the facility's treatment process.

IV. ***Limitations and Conditions***

The effluent limitations and the monitoring requirements may be found in the draft NPDES permit.

V. ***Permit Basis and Explanation of Effluent Limitation Derivation***

The Town of Salisbury operates the 1.3 million gallons per day (MGD) wastewater treatment facility, which was built in 1987. The collection system is 100 percent sanitary sewers. The treatment train consists of an aerated lagoon system followed by rapid sand infiltration and ultraviolet disinfection. There are seventeen pump stations in Salisbury; all are operated and maintained by the Town.

Sludge is digested aerobically, stabilized with lime, then trucked off-site for incineration.

POTW Discharges

Overview of Federal and State Regulations

General Requirements

EPA is required to consider technology and water quality requirements when developing permit effluent limits. Technology based treatment requirements represent the minimum level of control that must be imposed under Sections 402 and 301(b) of the Clean Water Act (CWA), see 40 CFR 125 Subpart A. For publicly owned treatment works (POTWs), technology based requirements are effluent limitations based on secondary treatment as defined in 40 CFR Part 133.

EPA regulations require NPDES permits to contain effluent limits more stringent than technology-based limits where more stringent limits are necessary to maintain or achieve federal or state water quality standards.

Under Section 301(b)(1)(C) of the CWA, discharges are subject to effluent limitations based on water quality standards. The Massachusetts Surface Water Quality Standards include requirements for the regulation and control of toxic constituents and also require that EPA criteria, established pursuant to Section 304(a) of the CWA, shall be used unless a site specific criterion is established. The state will limit or prohibit discharges of pollutants to surface waters to assure that surface water quality standards of the receiving waters are protected and maintained, or attained.

The permit must limit any pollutant or pollutant parameter (conventional, non-conventional, toxic, and whole effluent toxicity) that is or may be discharged at a level that caused, has reasonable potential to cause, or contribute to an excursion above any water quality criterion. An excursion occurs if the projected or actual in stream concentrations exceed the applicable criterion.

In determining reasonable potential, EPA considers: (1) existing controls on point and non-point sources of pollution; (2) pollutant concentration and variability in the effluent and receiving water as determined from the permittee's most recent permit application, discharge monitoring reports and State Water Quality reports, (3) sensitivity of the species to toxicity testing, (4) statistical approach outlined in Technical Support Document for Water Quality-based Toxics Controls, (USEPA ,1991) in Section 3 and, where appropriate, (5) dilution of the effluent in the receiving water.

A permit may not be renewed, reissued, or modified with less stringent limitations or conditions than those contained in the previous permit unless in compliance with the anti-backsliding requirement of the CWA. EPA's anti-backsliding provisions, found in Section 402(o) of the CWA and 40 CFR 122.44(l), generally prohibit the relaxation of permit limits, standards, and conditions. Therefore, the effluent limits in a reissued permit must be at least as stringent as those of the previous permit except under certain limited circumstances defined in Section 402(o) of the CWA and 40 CFR Part 122.44(l).

III. *Water body Classification and Usage*

The classification of the receiving water has changed in the draft permit from SB to SA. The facility discharges to an unnamed tidal creek as noted in Section II. Type of Facility and Discharge Location of this fact sheet. The unnamed tidal creek where the final effluent is discharged is not listed in 314 CMR 4.05, Classes and Criteria in the Massachusetts State Water Quality Standards. Unlisted waters are covered in 314 CMR 4.06(4) which require unlisted coastal and marine waters be classified as SA and presumed High Quality Waters.

Flow

Federal regulations at 40 CFR122.45(b)(i) require that effluent limits be calculated based on design flow of the facility. The design flow rate of this treatment facility is 1.3 MGD. The flow limit will remain the same as in the existing permit and shall be measured continuously. The permittee shall report the annual average flow using the annual rolling average method noted in Footnote 2 of the draft permit. The monthly average flow recorded for the period of January 2005 through March 2007 ranged between 0.51 MGD and 1.35 MGD and the annual average flow ranged between 0.61MGD and 0.70 MGD.

Available Dilution

Water quality limits in the draft permit are based on water quality criteria and the available dilution during 7Q10 low flow conditions in the receiving stream at or near the point of discharge. The 7Q10 is the lowest observed mean river flow for seven consecutive days recorded over a ten year recurrence interval. For rivers and streams, Title 314 CMR 4.03(3)(a) requires that the 7Q10 be used to represent the critical hydrologic conditions at which water quality must be met.

At times during the summer, stream flow in the tidal creek may be minimal such that during low flow periods the effluent may discharge to a wetland. As a result, there is no stream flow to provide dilution when the discharge is at low tide. Therefore, a dilution factor of 1 is used for water quality based effluent limits in the draft permit; the same dilution factor used in the current permit. Limits based on numeric water quality criteria are equivalent to the criteria when the dilution factor is one.

Biochemical Oxygen Demand (BOD)$_5$ and Total Suspended Solids (TSS)

The BOD_5 and TSS effluent limits shall remain the same as in the existing permit. The limits are more stringent than secondary requirements found at 40 CFR Part 133. They are based on the 1979 facilities planning study and subsequent environmental impact report that were prepared when the facility was designed.

A review of BOD_5 and TSS data submitted on the monthly discharge monitoring reports showed no exceedances for either parameter between January 2005 and January 2007. The permittee reported meeting the 85% removal requirement for BOD_5 and TSS for the last several years.

Dissolved Oxygen (DO)

A dissolved oxygen limitation of 6.0 mg/l is in the draft permit. This limit is included to ensure that the discharge does not cause or contribute to a violation of the Massachusetts Surface Water Quality Standards, 314 CMR 4.05 (4)(b)(1). The water quality standards require that the dissolved oxygen concentration in Class SA water shall not be less than 6.0 mg/l unless background conditions are lower. A monitoring frequency of once per day is in the draft permit.

Monthly monitoring data is not available at this time because the existing permit does not have a dissolved oxygen limitation. Limited data on dissolved oxygen from the facility's toxicity tests indicate that the final effluent will meet this requirement.

pH

The draft permit established pH limitations based on State Water Quality Standards. The State's standards are more stringent than the pH limitations set forth in 40 C.F.R. 133.102. In accordance with 314 CMR 4.05(4)(a)(3), the pH for Class SA waters shall be in the range of 6.5 through 8.5 standard units and not more than 0.2 standard units outside the background range. There shall be no change from background conditions that would impair any use assigned to this Class. The frequency of monitoring is once per day. The pH data submitted for the period from January 2005 through January 2007 shows occasional violation of the minimum pH level.

Bacteria limits, Fecal Coliform, and Enterococci

The fecal coliform limits in the draft permit are the same as those in the existing permit. The existing permit contains a monthly average geometric mean limit of 50 organisms/100 ml, a weekly average geometric mean limit of 75 organisms/100 ml and, a maximum daily limit of 100 organisms/100 ml. These limits were established to minimize impacts on water quality conditions in the receiving water and are based on the 1979 facilities plan and subsequent environmental reports.

The permittee reported no exceedances for fecal coliform between January 2005 and March 2007.

In addition to the fecal coliform limits, the draft permit includes effluent limits for enterococci based on promulgated federal water quality criteria established to protect primary contact recreational uses (see 40 CFR 131 dated November 2004). MassDEP has adopted the same numeric criteria for enterococci in its water quality standards. The federal criteria will be withdrawn upon EPA approval of the state criteria.

The criteria require that no single enterococci sample exceed 104 colonies per 100 ml and that geometric mean of all samples taken within the most recent six months based on a minimum of five samples shall not exceed 35 enterococci colonies per 100 ml in non-bathing beaches. The draft permit has a monthly average limit of 35 enterococci colonies per 100 ml and a maximum daily limit of 104 colonies per 100 ml. The draft permit includes a compliance schedule of one year to attain the new enterococci limit.

Toxic Pollutants

EPA is required to limit any pollutant that is or may be discharged at a level that caused, or has reasonable potential to cause, or contribute to an excursion above any water quality criterion. See 40 CFR §122.44(d) (1) (VI). Data submitted with the permit renewal application and previous monitoring data were compared to possible effluent limitations to determine if there is a reasonable potential to cause or contribute to a violation of water quality.

The calculations for toxic metals were based on the EPA National Recommended Water Quality Criteria: 2002 (EPA-822-R-02-047), as adopted in the Massachusetts Water Quality Standards 314 CMR 4.05(5)(e).

Metals

Certain metals in waters can be toxic to aquatic life. There is a need to limit toxic metal concentrations where the discharge has the reasonable potential to cause or contribute to an exceedance of water quality standards. The limitations for toxic metals are based on the EPA National Recommended Water Quality

Criteria: 2002 (EPA-822-R-02-047), as adopted in the Massachusetts Water Quality Standards 314 CMR 4.05(5)(e).

Copper
The current permit has a maximum daily reporting requirement for copper levels in the effluent. The range reported between January 2005 and January 2007 were between 7 ug/l and 26 ug/l. For marine water, the acute water quality criteria for copper is 4.8 ug/l and the chronic criteria is 3.1 ug/l This indicates there is reasonable potential that levels in the effluent will exceed water quality criteria.

Average monthly limit = 3.1 ug/l   Maximum daily limit = 4.8 ug/l

The draft permit includes a two year compliance schedule for meeting the monthly average and maximum daily copper limit. See Section E in the draft permit. If, prior to the required compliance date the permittee believes it can reliably achieve the effluent limitation in the permit, it shall notify EPA on its monthly discharge monitoring report, and the final limit will go into effect on the first day of the month following notification.

Nutrients
Nutrients are compounds containing nitrogen and phosphorus. Although nitrogen and phosphorus are essential for plant growth, high concentrations of either can cause eutrophication, a condition in which aquatic plant and algal growth is excessive. Plant and algae respiration and decomposition reduces oxygen concentrations in the water, creating poor habitat for fish and other aquatic animals. Nitrogen in the form of ammonia can be toxic to aquatic life, and can also deplete dissolved oxygen in the receiving water due to dissolved oxygen used in the breakdown of ammonia to nitrate/nitrite

The effluent from the Salisbury facility discharges to a marine water. The toxicity level of ammonia is based on the salinity, temperature and pH of the receiving water (USEPA 1999).

Ammonia -Nitrogen
The seasonal effluent limitations and reporting requirements for ammonia-nitrogen in the current permit are based on achieving the water quality standards for dissolved oxygen and have remained unchanged in the draft permit. The seasonal limits from May 1 through October 31 are 5 mg/l for the average monthly limit, 7 mg/l for the weekly average limit and, 10 mg/l for the maximum daily limit; ammonia-nitrogen monitoring and reporting are required for the remainder of the year

There were several exceedances reported between May 2005 and October 2006. See Table 2 below for ammonia levels in the effluent between January 2006 and January 2007.

Table 2

Date	**Average Monthly Ammonia, mg/l**	**Average Weekly Ammonia, mg/l**	**Max. Daily Ammonia, mg/l**
January 2007	16.3	1.8	1.9
December 2006	13.7	0.9	1.2
November 2006	7.8	10.7	10.7
October 2006	1.3	3.0	3.0
September 2006	1.0	2.1	2.1
August 2006	0.9	1.1	1.1
July 2006	0.8	1.0	1.0
June 2006	5.3	7.7	7.7
May 2006	10.1	15.9	15.9

April 2006	12.5	13.8	13.8
March 2006	8.3	9.2	9.2
February 2006	11.1	13.3	13.3
January 2006	14.5	13.8	13.8

The draft permit includes a reporting requirement for the concentration and mass levels of total nitrite, total nitrate and Total Kejdahl Nitrogen.

To determine if cold weather ammonia limits were necessary during this permit reissuance, the EPA reviewed the Ambient Water Quality Criteria for Ammonia (Saltwater) -1989, USEPA 440/66/004. Instream data on the pH, temperature and salinity of the receiving water were needed to determine ammonia criteria. In this case, the location of the final discharge is inaccessible, therefore the Agency assumed the following conditions of the receiving water as required in the ambient criteria document stated above,USEPA 440/66/004 ; a pH of 7.0 (typical of marine water), a salinity of 10g/kg (the discharge is located in a estuary) and a range of the receiving water temperature between 0^0 C and 10^0 C. Based on these parameters, the acute criteria range for total ammonia is between 191 and 270 mg/l, and the chronic criteria would be between 29 and 41. Both the acute and chronic criteria are above levels in the effluent so winter ammonia limits in the permit are not needed at this time.

Whole Effluent Toxicity Testing
Under Section 301(b)(1) of the CWA, discharges are subject to effluent limitations based on water quality standards. The Massachusetts Surface Water Quality Standards [314 CMR 4.05(5)(e)], include the following narrative statements and require that EPA criteria established pursuant to Section 304(a)(l) of the CWA be used as guidance for interpretation of the following narrative criteria:

> "*All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife. Where the State determines that a specific pollutant not otherwise listed in 314 CMR 4.00 could reasonably be expected to adversely affect existing or designated uses, the State shall use the recommended limit published by EPA pursuant to 33 U.S.C. 1251 §304(a) as the allowable receiving water concentrations for the affected waters unless a site-specific limit is established. Site specific limits, human health risk levels and permit limits will be established in accordance with 314 CMR 4.05(5)(e)(1)(2)(3)(4).*"

National studies conducted by the EPA have demonstrated that domestic sources contribute toxic constituents to POTWs above those which may be contributed from industrial users. These pollutants include metals, chlorinated solvents, aromatic hydrocarbons and other constituents. EPA Region I current policy is to include toxicity testing requirements in all permits, while Section 101(a)(3) of the CWA specifically prohibits the discharge of toxic pollutants in toxic amounts.

Based on the potential for toxicity resulting from domestic sewage, and in accordance with EPA regulations and policy, the draft permit includes chronic and acute toxicity limitations and monitoring requirements. (See, e.g. Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants", 50FR30784 (July 25, 1985); see also EPA Technical Support Document for Water Quality-Based Toxics Control," (EPA/505/2-90-001, September 1991).

The principal advantages of biological techniques are: (1) the effects of complex discharges of many known and unknown constituents can be measured only by biological analysis; (2) bioavailability of pollutants after discharge is measured by toxicity testing including any synergistic effect of pollutants;

and (3) pollutants for which there are inadequate analytical methods or criteria can be addressed. Therefore, toxicity testing is being used in connection with pollutant-specific control procedures to control the discharge of toxic pollutants.

The Massachusetts Water Quality Standards Implementation Policy for the Control of Toxic Pollutants in Surface Waters (February 23, 1990) requires 7-day chronic and modified acute toxicity testing four times per year for discharges having a dilution factor of less than 10.

The LC_{50} limit remains at 100% based on the Massachusetts Implementation Policy.

The chronic no observed effect concentration (C-NOEC) whole effluent toxicity limit is calculated using the instream waste concentration (IWC) of the effluent. The IWC is the inverse of the dilution.

C-NOEC = 1/ dilution factor = 1/1 = 1.0 = 100 %

This is the same limit that is in the existing permit.

The draft permit will continue to require testing one specie only, the inland silverside, *Menidia beryllina.* The tests results for the last two years are shown in (Table 4) and are within the permit limits. The toxicity test schedule has been changed from what is in the current permit. Testing is currently done in March, June, September and December but the draft permit requires the test be conducted in the second week of January, April, July and October. See page 5 of the draft permit. EPA and MassDEP require all facilities discharging into the Merrimack Watershed to use this schedule in an effort to determine the collective impact to the watershed. See Permit **Attachment A,** Freshwater Chronic Toxicity Test Procedure and Protocol, for a description of the testing requirements.

VI. *Unauthorized Discharges*

The permittee is not authorized to discharge wastewater from any pump station emergency overflow. Overflows, including sanitary sewer overflows (SSOs), must be reported in accordance with reporting requirements found in Part II. General Requirements, Section D.1.e. of the permit (24-hour reporting). If a discharge does occur, the permittee must notify the EPA, the MassDEP, and others, as appropriate (i.e. local Public Health Department), both orally and in writing as specified in the draft permit.

VII. *Operation and Maintenance of the Sewer System*

The Town of Salisbury owns, operates and maintains the sewer collection system that transports sewage to the treatment plant.

Infiltration/Inflow Requirements

The draft permit includes requirements for the permittee to control infiltration and inflow (I/I). Infiltration is groundwater that enters the collection system though physical defects such as cracked pipes or deteriorated joints. Inflow is extraneous flow entering the collection system through point sources such as roof leaders, yard and area drains, sump pumps, manhole covers, tide gates, and cross connections from storm water systems.

Significant I/I in a collection system may displace sanitary flow, reducing the capacity and the efficiency of the treatment works, and may cause bypasses to secondary treatment. It greatly increases the potential for sanitary sewer overflows (SSO) in separate systems.

The permit standard conditions for 'Proper Operation and Maintenance' are found at 40 CFR §122.41(e). These require proper operation and maintenance of permitted wastewater systems and related facilities to achieve permit conditions. Similarly, the permittee has a 'duty to mitigate' as stated in 40 CFR §122.41 (d). This requires the permittee to take all reasonable steps to minimize or prevent any discharge in violation of the permit which has a reasonable likelihood of adversely effecting human health or the environment. EPA and MassDEP maintain that an I/I removal program is an integral component to insuring permit compliance under both of these provisions.

MassDEP has stated that inclusion of the I/I conditions in the draft permit shall be a standard State Certification requirement under Section 401 of the Clean Water Act and 40 CFR 124.55(b).

VIII. *Pretreatment*

The facility does not treat pollutants from major industrial facilities. Pollutants introduced into the POTW by a nondomestic source shall not enter the POTW or interfere with the operation or performance of the works.

IX. *Sludge Information and Requirements*

Section 405(d) of the Clean Water Act requires that sludge conditions be included in all POTW permits. The sludge conditions in the draft permit satisfy this requirement and are taken from EPA's Standard for the disposal of sewage sludge (40 CFR 503). Attachment B of the permit is the Sludge Compliance Guidance and provides guidance on sewage sludge use and disposal practices.

In an effort to improve nitrification, the permittee had sludge dredged from the lagoons in 2003 and 2005. Prior to 2003, the lagoons had never been dredged. The Town's budget for the plant now includes dredging for the lagoons every two years. The sludge is transported offsite to Synagro/NETCO in Woonsocket, RI for incineration.

X. *Essential Fish Habitat (EFH)*

Under the 1996 Amendments (PL 104-267) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C.§ 1801 et seq. (1998)), EPA is required to consult with National Marine Fisheries Service (NMFS) if EPA's action or proposed actions that it funds, permits, or undertakes, "may adversely impact any essential fish habitat." 16 U.S.C.§ 1855(b). The Amendments broadly define "essential fish habitat" as waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. 16 U.S.C.§ 1802(10). Adverse impact means any impact, which reduces the quality and/or quantity of EFH. 50 C.F.R.§ 600.910(a). Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g. loss of prey, reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. Id.

Essential fish habitat is only designated for fish species for which Federal Fisheries Management Plans exist. 16 U.S.C.§ 1855(b)(1)(A). The U.S. Department of Commerce on March 3, 1999 approved EFH designations for New England.

A review of the relevant essential fish habitat information provided by NMFS indicated that Essential Fish Habitat does not exist in the vicinity of the proposed discharge.

EPA has determined that a formal EFH consultation with NMFS is not required because the proposed discharge will not adversely impact EFH.

XI. *Endangered Species Act*

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA) grants authority to and imposes requirements upon Federal agencies regarding endangered or threatened species of fish, wildlife, or plants ("listed species") and habitat of such species that has been designated as critical (a "critical habitat"). The ESA requires every Federal agency, in consultation with and with the assistance of the Secretary of Interior, to insure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The United States Fish and Wildlife Services (USFWS) administers Section 7 consultations for fresh water species, where as the National Marine Fisheries Services (NMFS) administers Section (7) consultations for marine species and anadromous fish.

EPA believes the authorized discharge from this facility is not likely to adversely affect any federally-listed species, or their habitats. This preliminary determination is based on the location of the outfall, and the reasons provided in the EFH discussion (Section X of this fact sheet). EPA is seeking concurrence with this opinion from NOAA Fisheries and the USFWS through the informal ESA consultation process.

XII. ***State Certification Requirements***

The staff of the State Water Pollution Control Agency has reviewed the draft permit. EPA has requested permit certification by the State pursuant to 40 CFR.124.53 and expects that the draft permit will be certified.

XIII. ***Public Comment Period, Hearing Requests and Procedures for Final Decision***

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to U.S.EPA, Massachusetts Office of Ecosystem Protection (CMA), One Congress Street- Suite 1100, Boston, Massachusetts 02114-2023. Any person, prior to such date, may submit a request in writing for a public hearing to consider the draft permit to EPA and the State Agency. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public hearing may be held after at least thirty days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on the draft permit the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the comment period, and after a public hearing, if such hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice.

XIV. ***EPA and MA DEP Contacts***

Additional information concerning the draft permit may be obtained between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays from:

Betsy Davis
US Environmental Protection Agency
1 Congress Street
Suite 1100 (CPE)
Boston, Massachusetts 02114-2023
Telephone: (617) 918-1576

or

Paul Hogan
MA Department of Environmental Protection
Division of Watershed Management
627 Main Street
Worcester, MA 01608
Telephone: (508) 767-2796

Stephen S. Perkins, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency

Date:

Attachment A of the Fact Sheet
Salisbury Wastewater Treatment Plant
Summary of NPDES Permit Reporting Requirements Dates

Permit Page	Requirement and Dates	Submit to:
5	Whole Effluent Toxicity Tests results are due April 30, July 31, October 30 and January 31.	EPA/MassDEP
7	The permittee shall develop and implement a plan to control I/I to the separate sewer system. The plan shall be submitted to EPA and MassDEP six months from the effective date of the permit. See Part 1.C.3.	EPA/MassDEP
8	A summary report of all actions taken to minimize I/I during the previous calendar year shall be submitted to EPA and the MassDEP annually by the permittee by the anniversary date of the effective date of the permit	EPA/MassDEP
10	The permittee shall submit an annual report containing the information specified in the sludge section of the permit by February 19.	EPA/MassDEP
10	Monitoring results obtained during the previous month shall be summarized for each month and reported on separate Discharge Monitoring Report Form(s) postmarked no later than the 15th day of the month following the effective date of the permit.	EPA/MassDEP

APPENDIX B

Administrative Order

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912

JUL 13 2011

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Neil J. Harrington
Town Manager
Town of Salisbury
5 Beach Road
Salisbury, MA 01952

Re: In the Matter of Town of Salisbury, Massachusetts
Administrative Order Docket No. 11-012

Dear Mr. Harrington:

Enclosed is an Administrative Order ("Order") issued by the U.S. Environmental Protection Agency ("EPA") pursuant to Section 309(a)(3) of the Clean Water Act (the "Act"), 33 U.S.C. § 1319(a)(3). The Order is based on violations of the National Pollutant Discharge Elimination System ("NPDES") permit issued to the Salisbury wastewater treatment facility and Section 301(a) of the Act, 33 U.S.C. § 1311(a).

Specifically, the Order finds that the Salisbury wastewater treatment facility has consistently discharged total copper and periodically discharged ammonia-nitrogen in concentrations in excess of the effluent limitations contained in Permit No. MA0102873. The Order requires that, by December 31, 2011, the Town shall submit an ammonia nitrogen removal engineering report recommending additional controls needed to achieve compliance with the ammonia nitrogen limit. The ammonia nitrogen removal engineering report shall among other alternatives, evaluate the feasibility of relocating the WWTF outfall to a location providing greater dilution by the receiving waters, and shall include a proposed schedule for implementing these controls. The Order also requires that within 545 days of receipt of the Order the Town shall submit a copper optimization engineering report evaluating the controls needed to achieve compliance with the total copper limit, including a proposed schedule for implementing these controls. The Order is effective upon receipt. Violation of the terms and conditions of this Order may subject the Town to further enforcement action under the Act.

II. FINDINGS

The Director makes the following findings of fact:

1. The Town of Salisbury (the "Town" or "Permittee") is a municipality, as defined in Section 502(4) of the Act, 33 U.S.C. § 1362(4), established under the laws of the Commonwealth of Massachusetts.
2. The Town is a person under Section 502(5) of the Act, 33 U.S.C. § 1362(5). The Town is the owner and operator of a publicly-owned treatment works (the "POTW") from which pollutants, as defined in Section 502(6) of the Act, 33 U.S.C. § 1362(6), are discharged from a point source, as defined in Section 502(14) of the Act, 33 U.S.C. § 1362(14), to an unnamed tidal creek, a Class SA waterway, that drains to the Merrimack River, a Class SB waterway, which flows into the Atlantic Ocean. Both waterways are waters of the United States, as defined in 40 C.F.R. § 122.2, and navigable waters under Section 502(7) of the Act, 33 U.S.C. § 1362(7). The POTW includes a 1.3 million gallon per day ("MGD") advanced wastewater treatment facility ("WWTF") that discharges an annual average daily flow of 0.7 MGD of treated wastewater to the unnamed tidal creek.
3. Section 301(a) of the Act, 33 U.S.C. § 1311(a), makes unlawful the discharge of pollutants to waters of the United States except in compliance with, among other things, the terms and conditions of an NPDES permit issued pursuant to Section 402 of the Act, 33 U.S.C. § 1342.
4. On October 9, 2007, the Permittee was issued NPDES Permit No. MA0102873 ("NPDES Permit") by the Director of the Office of Ecosystem Protection of EPA, Region I, under the authority of Section 402 of the Act, 33 U.S.C. § 1342. The NPDES Permit became effective on January 1, 2008 and expires on December 31, 2013.
5. The NPDES Permit authorizes the Permittee to discharge pollutants from the WWTF (Outfall No. 001) to the unnamed tidal creek, subject to the effluent limitations, monitoring requirements and other conditions specified in the NPDES Permit.
6. Part I.A.1. of the NPDES Permit includes concentration effluent limitations for, among other things, total copper and total ammonia nitrogen.
7. Part I.E.1. of the NPDES Permit provides that no later than two years from the effective date of the NPDES Permit, i.e. January 1, 2010, the Permittee shall achieve compliance with the monthly average and daily maximum limitations for total copper established by the NPDES Permit.
8. Since January 1, 2010, the Permittee has consistently discharged wastewater containing total copper in excess of the effluent limits set forth in the NPDES Permit.

9. Part I.A.1. of the NPDES Permit establishes seasonal monthly average, weekly average, and daily maximum effluent concentration limitations for total ammonia nitrogen that are in effect from May 1st until October 31st, annually.

10. Since the effective date of the NPDES Permit, the Permittee has frequently discharged wastewater containing total ammonia nitrogen in excess of effluent limits set forth in the NPDES Permit.

11. The Permittee's discharges of pollutants in excess of the limits contained in the NPDES Permit violate the conditions of the NPDES Permit and, therefore, violate Section 301(a) of the Act, 33 U.S.C. § 1311(a).

III. ORDER

Accordingly, it is hereby ordered that:

1. Total Ammonia Nitrogen Removal

a. By December 31, 2011, the Permittee shall submit to EPA and the Massachusetts Department of Environmental Protection ("MassDEP") for review and approval a detailed engineering report (the "Ammonia Nitrogen Removal Engineering Report") describing the measures taken by the Permittee to achieve compliance with the NPDES Permit's total ammonia nitrogen limit, evaluating the results of these measures, and evaluating any additional controls needed to achieve full compliance with the NPDES Permit's total ammonia nitrogen limits. The Ammonia Nitrogen Engineering Report shall among other alternatives, evaluate the feasibility of relocating the WWTF outfall to a location providing greater dilution by the receiving waters. The Ammonia Nitrogen Engineering Report shall recommend measures to achieve compliance with the effluent limits and include a schedule for implementing these controls (the "Ammonia Nitrogen Implementation Schedule").

b. The Ammonia-Nitrogen Implementation Schedule submitted pursuant to Paragraph III.1.a. of this Order shall be incorporated and enforceable hereunder upon the Implementation Schedule's approval by; and as amended by, EPA.

2. Copper Optimization

a. Within 545 calendar days of receipt of this Order, the Permittee shall submit to EPA and the MassDEP for review and approval a detailed engineering report (the "Copper Optimization

Engineering Report") including a schedule for implementing controls to achieve full compliance with the NPDES Permit's total copper limits (the "Copper Implementation Schedule"). The Copper Optimization Engineering Report shall be consistent with the Copper Optimization Scope of Work included as **Attachment A.**

b. The Copper Implementation Schedule submitted pursuant to Paragraph III.2.a. of this Order shall be incorporated and enforceable hereunder upon the Implementation Schedule's approval by, and as amended by, EPA.

3. Interim Effluent Limitations

a. From the effective date of this Order and until the earliest of (1) the date that EPA modifies the terms and conditions of the interim limits or (2) the date that EPA determines that the Town has not complied with the interim milestones set forth in this Order or (3) the date for completion of the relevant Implementation Schedule, the Permittee shall, at a minimum, comply with the interim effluent limitations and monitoring requirements contained in **Attachment B** of this Order.

b. The Permittee shall also comply with all effluent limitations, monitoring requirements and other conditions specified in the NPDES Permit for the parameters not covered in **Attachment B.**

4. Quarterly Progress and Work Projection Reports:

Beginning with the calendar quarter ending September 30, 2011 and continuing through the calendar quarter when the controls to achieve full compliance with the NPDES Permit's ammonia nitrogen and copper limits are completed and fully operational, the Permittee shall submit quarterly reports on the Town's progress in implementing the provisions of this Order. The reports shall be submitted by the last day of the month following the calendar quarter monitoring period. At a minimum, these progress reports shall include a description of:

a. The activities undertaken during the reporting period directed at achieving compliance with this Order;

b. The status of all plans, reports, and other deliverables required by this Order that the Town completed and submitted during the reporting period; and

c. The expected activities to be completed during the next reporting period in order to achieve compliance with this Order.

IV. NOTIFICATION PROCEDURES

1. Where this Order requires a specific action to be performed within a certain time frame, the Permittee shall submit a written notice of compliance or noncompliance with each deadline. Notification shall be mailed within fourteen (14) days after each required deadline. The timely submission of a required report shall satisfy the requirement that a notice of compliance be submitted.

2. If noncompliance is reported, notification shall include the following information:

   a. A description of the noncompliance;

   b. A description of any actions taken or proposed by the Permittee to comply with the lapsed schedule requirements;

   c. A description of any factors that explain or mitigate the noncompliance; and

   d. An approximate date by which the Permittee will perform the required action. After a notification of noncompliance has been filed, compliance with the past-due requirement shall be reported by submitting any required documents or providing EPA with a written report indicating that the required action has been achieved.

3. Submissions required by this Order shall be in writing and shall be submitted to the following addresses:

U.S. Environmental Protection Agency, Region I
Office of Environmental Stewardship
5 Post Office Square – Suite 100
Boston, MA 02109-3912
Attn: George W. Harding, P.E.

and

Massachusetts Department of Environmental Protection
Northeast Regional Office
205B Lowell Street
Wilmington, MA 01887
Attn: Kevin Brander

V. GENERAL PROVISIONS

1. The Permitee may, if it desires, assert a business confidentiality claim covering part, or all, of the information requested in the manner described by 40 C.F.R. § 2.203(b). Information covered by such a claim will be disclosed by EPA only in accordance with the procedures set forth in 40 C.F.R. Part 2, Subpart B. The Permittee should carefully read the above-cited regulations before asserting a business confidentiality claim since certain categories of information are not properly the subject of such a claim. For example, the Act provides that "effluent data" shall in all cases be made available to the public. See Section 308(b) of the Act, 33 U.S.C. § 1318(b).

2. This Order does not constitute a waiver or a modification of the terms and conditions of the NPDES Permit. The NPDES Permit remains in full force and effect. EPA reserves the right to seek any and all remedies available under Section 309 of the Act, 33 U.S.C. § 1319, as amended, for any violation cited in this Order.

3. This Order shall become effective upon receipt by the Permittee.

07/12/11
Date

Susan Studlien
Susan Studlien, Director
Office of Environmental Stewardship
Environmental Protection Agency, Region I

ATTACHMENT A

COPPER OPTIMIZATION SCOPE OF WORK

The report shall include:

I. BACKGROUND AND PROBLEM STATEMENT

A. A description of the nature and extent of the NPDES Permit effluent violations for copper and other metals and a description of the equipment used to sample the final effluent noting any metal components (i.e. copper tubing).

B. An analysis of historical influent monitoring data including the results of the monitoring required under Paragraph III of this Attachment to locate and quantify the sources of the influent copper loadings to the Publicly-Owned Treatment Works (POTW) and to account for influent copper variability.

C. An inventory of each discrete category of copper sources and an estimate of each category's annual mass contribution relative to the total POTW loading. The analysis shall include both short-term (daily, weekly) and long-term (seasonal) fluctuations from each source. Where monitoring data are not available, estimates and the source of each estimate shall be provided. At a minimum, the following potential sources of copper shall be evaluated:

1. Public and private water supply(ies) that provide water to the users of the Permittee=s collection system including any private sources that supply water to industrial users of the Permittee=s collection system;

2. Significant Industrial Users (SIUs) of the Permittee=s collection system;

3. Industrial/commercial sources that are known to, or are suspected of, discharging copper. These shall include, but not be limited to, industries that do not meet the definition of a SIU, medical facilities, printers, schools, laboratories, photo processing operations, laundry and dry cleaning operations, and other institutions that may discharge wastewater to the POTW;
   a. Domestic, commercial, and industrial septage, hauled

wastewater, or liquid sludge received from other POTWs as well as landfill leachate that is treated at the POTW;

b. Household domestic wastewater that includes chemical additives, particularly copper-based root control additives; and

c. Side-stream flows from sludge dewatering, compost area runoff, or any other internal plant flow or treatment chemical process.

As part of these evaluations, the Permittee shall assess the impact of copper on the POTW influent and effluent, sludge quality, sludge processing, activated sludge (concerns/inhibition), the receiving water and aquatic life.

D. A mass balance delineating the sources of copper entering the POTW and the fate of copper within the POTW;

E. A determination of the projected maximum allowable POTW headworks loading for each discrete category of copper discharged to the POTW, a description of the specific treatment technologies and source reduction initiatives that will be implemented to meet the projected maximum allowable POTW headworks loadings, schedules for the implementation of the selected treatment technologies and source reduction measures, and an estimate of the expected copper reductions associated with the implementation of the selected treatment technologies and source reduction measures.

II. DISCRETE COPPER SOURCE INVESTIGATIONS

A. WATER SUPPLY

1. The evaluation of the domestic drinking and industrial water supply(ies) that serve(s) the users of the POTW shall, at a minimum, include:

   a. A determination of the quantity and percent of the total copper loading in the POTW influent that can be attributed to the copper found in the raw water supply(ies) as well as the copper that has leached from homeowner distribution systems;

   b. An evaluation of the feasibility (consisting of a desktop and/or demonstration study) and status of implementation of various corrosion control technologies, including, but not limited to, each of the following, applied separately, and where appropriate in combination with one another, to achieve optimal corrosion control for that particular water system:

(1) Alkalinity and pH adjustment;

(2) Calcium hardness adjustment; and

(3) Phosphate or silicate-based corrosion inhibitors (The evaluation of phosphorus-based additive alternatives must also consider the impacts of the additional phosphorus on receiving water quality).

c. An assessment of the impact of the additional treatment options on other drinking water quality parameters (e.g. lead, alkalinity, pH, bacteria, calcium, disinfection byproducts formation, taste, odor, color, etc...) within the water supply system;

d. An evaluation of the materials that comprise the water distribution system;

e. Identification of chemical, physical, and other constraints that may affect the implementation of a particular treatment option for the drinking water supply;

f. A description of each water supply's management, its relation to the POTW authority and the water supply's compliance status with the requirements of EPA's Lead and Copper Rule. Identify any barriers to a coordinated, cost-effective joint approach to copper reduction in the water supply(ies) beyond the minimum requirements of the Lead and Copper Rule. Identify what actions can be taken to overcome the identified barriers.

B. EVALUATION OF INDUSTRIAL USERS

An evaluation of the copper contributions from the industrial users to the POTW that shall include:

1. INVENTORY

Identification, listing, and evaluation of all industrial and commercial users that discharge copper to the POTW. These sources may include, but are not limited to, significant industrial users[1], such as electroplaters, metal finishers, metal fabrication and machine shops,

---

[1] *Under 40 C.F.R. 403.3(t), the term Significant Industrial User means any industrial user subject to Categorical Pretreatment Standards under 40 C.F.R. 403.6 and 40 C.F.R chapter I, subchapter N, or any other industrial user that discharges an average of 25,000 gallons per day or more of process waste water to the POTW or contributes a process waste stream which makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant.*

leather tanning and textile mills. Other potential industrial/commercial copper sources may include medical facilities, printers, schools, laboratories, photo processing operations, laundry and dry cleaning operations, or other institutions that may contribute wastewater to the POTW where dyes or other products used in these operations may contain copper. The amount of copper annually discharged from these sources to the POTW shall be expressed in pounds and as a percent of the total amount of copper being introduced to the POTW from all sources.

2. LOCAL LIMITS EVALUATION

   a. An evaluation of the adequacy of any existing local limit for copper (or other metal of concern) developed by the POTW. The evaluation shall include a comprehensive headworks analysis that quantifies the total amount of copper being introduced to the POTW from all categories of sources and the maximum allowable headworks loading from all categories of sources.

   b. Based upon the headworks analysis, and the other evaluations included in the Scope of Work, determine the need to:

      (1) develop a local limit for copper;
      (2) revise any existing local limit(s) for copper; and
      (3) expand the applicability of the limit(s) to include new industrial/commercial users if the evaluations conducted in this scope of work reveal that more stringent controls are necessary.

   c. The local limits evaluation shall be performed in accordance with EPA=s Guidance Manual for the Development and Implementation of Local Discharge Limitations Under the Pretreatment Program (Dec.,1987). In the event that the Copper Optimization Engineering Report and headworks analysis determines that the treatment modifications and source reduction measures selected by the Permittee under Paragraph IV.D. of this Scope of Work are not expected to result in the POTW=s compliance with its NPDES Permit copper limits, and that the local domestic/background copper loadings will continue to be greater than the maximum allowable headworks loading allowing no allocation for any pollutant loadings from industrial users, a local limit for copper must be established in accordance with Paragraph II.B.2.d. In the event that the treatment modifications and source reduction measures selected by the Permittee under Paragraph IV.D. of this Scope of Work are expected to result in the POTW's compliance with its NPDES Permit copper limits, the local limits established for copper must be consistent with the maximum allowable industrial headworks loading.

d. Under those circumstances where the headworks loading analysis determines that there is no allocation for any pollutant loadings from industrial users due to contributions from other sources, the copper local limit must be developed at a level equal to the POTW᾿s NPDES copper limit, adjusted to reflect the POTW᾿s removal efficiency for copper. For example, if the POTW᾿s NPDES permit monthly average copper limit is 15 micrograms/liter (ug/l) and the POTW is capable of removing 80% of the copper discharged to the POTW, the monthly average local limit for copper would be established at (15 ug/l)/(0.2) or 75 ug/l.

e. The development of the local limit for copper or revisions to the local limit for copper under this paragraph shall be included as a separate section of the engineering report that must be submitted pursuant to Paragraph III.1. of this Order for EPA's review and concurrence.

3. <u>TECHNOLOGY/PRETREATMENT EVALUATION</u>

An evaluation of industry-specific treatment technologies or operational modifications that must be implemented to ensure compliance with the local limits calculated for copper in Paragraph II.B.2. above. The evaluation can be conducted by the Permitee or can be delegated to the industrial/commercial user. The evaluation of facility-specific treatment technologies or operational modifications necessary to comply with any local limits established under this Order shall include, but shall not be limited to, the following:

a. The name and location of the industrial/commercial facility (the "facility");

b. A description of the operations conducted and major products produced at the facility with a specific emphasis on those activities and operations that contribute copper to the facility's wastewater;

c. An evaluation of the characteristics of the wastewater discharged to the POTW, including additional representative sampling necessary to quantify the copper contribution from the facility;

d. A description of the wastewater treatment unit operations and processes employed at the facility including an estimate of the annual mass copper removal efficiency of the treatment facilities with specific emphasis on those operations and processes that remove copper;

e. A detailed description of all treatment technologies and operational modifications that may potentially reduce the quantity of copper discharged from the facility, including an estimate of the expected annual copper reduction and capital and operation and maintenance cost associated with the implementation of each alternative; and

f. Prioritization of the alternatives based upon their expected effectiveness, technical and economic feasibility.

4. POLLUTION PREVENTION EVALUATION

In addition to the technology/pretreatment evaluation required in Paragraph II.B.3. above, the POTW shall develop, or require each of the commercial/industrial users that discharge copper to the POTW to develop, a Waste Minimization Plan for the purpose of further reducing the copper loadings from each industrial/commercial user through pollution prevention/source reduction alternatives. At a minimum, the Waste Minimization Plan for each significant source of copper, shall include, but shall not be limited to, the following information:

a. The name of the industrial/commercial facility and location of the site;

b. A general description of the major products manufactured and produced at the facility;

c. A process flow diagram of the unit operations highlighting those activities and operations that contribute copper to the facility's wastewater;

d. An evaluation of source reduction approaches available to the generator that may reduce copper in the commercial/industrial wastestreams. The evaluation shall consider at least the following areas:

(1) Raw materials changes;
(2) Operational process changes;
(3) Product quality changes; and
(4) Administrative steps taken to reduce copper including but not limited to:
    (a) Inventory Control;
    (b) Employee Award Programs;
    (c) In-house Policies;
    (d) Employee Training;
    (e) Corporate or Management Commitment, and
    (f) Other Programs or Approaches;

e. An evaluation of the effects of the source reduction methods on emissions and discharges to other media;

f. The report shall prioritize each evaluated approach and shall also discuss the following:
   (1) Expected change in the amount of copper generated;
   (2) Technical and financial feasibility; and
   (3) Employee health and safety implications;

g. A list of alternatives not selected for further evaluation as a potentially viable source reduction approach and a rationale for rejecting each alternative.

5. RECOMMENDATIONS

Evaluate combinations of both pretreatment technologies and pollution prevention approaches to determine the most effective course of metals reduction.

C. <u>SEPTAGE, LEACHATE, AND OTHER HAULED WASTES</u>

1. SEPTAGE

a. Report the quantity and category (homeowner, commercial, neighboring community, etc...) of septage received at the POTW and the total annual copper loading as a percentage of the total annual copper loading to the POTW. Provide the basis for the measurement or estimate. Describe any chemical monitoring, tracking, or permit system used to control the level of septage discharged to the POTW;

b. Identify the copper loading from each category of septage on an average daily and annual basis, describing whether there are seasonal changes in the amount or character of the septage;

c. If septage discharges are accepted from communities not served by the same water supplier as the POTW, these discharges must be sampled, and separately identified as part of the program outlined under Paragraph III. Describe whether the contributing communities comply with EPA's Lead & Copper Rule and whether they have taken any additional corrosion control measures to reduce copper beyond the requirements of the Lead & Copper Rule.

2. LEACHATE
   a. Identify the name and location of the source, and the location of the discharge of any leachate received by the POTW; and
   b. Report the average daily, monthly average and annual volume of leachate received by the POTW. Characterize the chemical content of the leachate and determine the total annual copper loading of the leachate as a percentage of the total annual copper loading to the POTW providing the basis for the measurement or estimate. Describe any chemical sampling, tracking, or permit system used to monitor or regulate the leachate received by the POTW.

3. OTHER HAULED WASTEWATERS
   a. If the Permittee accepts non-septage hauled wastewater from industrial or commercial establishments, describe the approval process for individual or contract dischargers citing any sampling protocols and the local sewer use ordinance, where applicable.
   b. Identify all non-septage wastewaters hauled to the POTW and describe the chemical monitoring and the tracking or permit system used to control such discharges.
   c. Report the amount of non-septage wastewater delivered to the POTW on an average daily and annual basis.
   d. Determine the non-septage hauled waste copper loading as a percent of the total POTW loading. Provide the basis for the measurement or estimate.

4. Identify control strategies for septage, leachate and other hauled wastes including scheduling modifications, chemical treatment at

the point of injection, restrictions on, or banning of, categories of discharges, or other means of improved management controls and prioritize the alternatives based upon their expected effectiveness, technical and economic feasibility.

D. HOUSEHOLD DOMESTIC WASTES

1. Identify through a residential survey, by sales analyses of products commonly available in the region, or by estimate of domestic chemical product usage, the amount of copper that may be discharged to the collection system from the use of household chemical products.

2. Estimate the usage of copper-based root control products within the sewered and non-sewered septage-generating service areas. Consider homeowner and contractor use of these chemical additives.

3. Estimate the annual household domestic waste copper loading as a percent of the total annual POTW copper loading providing the basis for the measurement or estimate.

4. Propose the development and implementation of public outreach and programs that educate consumers regarding the impact of household products on the environment and the availability of alternative products.

5. Consider bans on sales or use of products associated with increased levels of copper in the POTW effluent and explain the rationale and limitations for either implementing or not implementing any bans.

E. SIDE-STREAM OR INTERNAL FLOWS

1. Describe the POTW unit operations and processes and provide a process flow diagram highlighting side-stream return flows from sludge dewatering, compost area runoff, and locations of septage introduction, chemical addition, etc...

2. Identify the quantity of all wastewater treatment chemical additives

used at the POTW, chemical makeup, injection points, and seasonal or episodic usage patterns.

3. Evaluate the annual side-stream and internal copper loading as a percent of the total annual POTW copper loading providing the basis for the measurement or estimate.

4. Identify alternative POTW management or treatment options for the reduction of copper in side-streams, internal flows, or chemical usage and implementation time frames for each considered option.

III. POTW MODIFICATIONS

A. An assessment of the percent of the annual copper loading in the wastewater influent that has historically been removed by the POTW noting any seasonal variations.

B. Provisions for a sampling program that shall be initiated within 90 days of the issuance of this Order, in which weekly monitoring of the level of total and dissolved copper in the POTW influent and effluent, side-streams, and any leachate discharged to the collection system or wastewater treatment facility shall be conducted. This sampling program shall continue for three consecutive months and shall be comprised of twenty-four hour composite samples. Influent and side-stream sampling shall be coordinated with effluent copper sampling and shall be representative of all flows entering the POTW. The results of this monitoring shall be included as a separate table in the report.

C. Provisions for a sampling program that shall be initiated within 90 days following the issuance of this Order, in which weekly monitoring of the level of total and dissolved copper in septage and any hauled wastewater discharges to the POTW shall be conducted. Representative weekly grab samples shall be taken for three consecutive months. Where possible, the grab samples shall be coordinated with the composite sampling requirements of Paragraph III.B. The results of this monitoring shall be included as a separate table in the report.

D. Provisions for a three-month sampling program that shall be initiated within 90 days of the issuance of this Order, in which weekly monitoring of the level of total and dissolved copper in the effluents from various unit processes at the POTW (i.e. primary effluent, secondary effluent, final effluent, sludge, etc...) are used to develop a mass balance that characterizes the level of copper removal through the various treatment operations. Where possible, the samples shall be coordinated with the composite sampling requirements of Paragraphs III.B and III.C. Identify gaps in this mass balance exercise explaining where copper "losses" may have occurred. The results of this monitoring shall be included as a separate table in the report.

E. A summary of the results of the monitoring required in III.B., III.C., and III.D. above, including an assessment of the magnitude and variability of the level of copper entering the POTW to determine whether all likely sources of copper have been identified and whether effluent variability correlates to influent variability or is the result of treatment variability or other factors.

F. A quality assurance/quality control program to ensure that appropriate sampling and analytical techniques and chain of custody procedures are implemented such that the monitoring results of the sampling programs are accurate at the levels required by the permit's effluent limits (i.e. clean techniques are used where required and the analytical equipment used to analyze the samples is capable of achieving the detection levels required by the NPDES permit effluent limit).

G. An evaluation of the POTW's ability to achieve greater removals of copper through operational changes, including but not limited to, single-point and multiple-point chemical addition, and/or installation of additional treatment. These evaluations shall include an assessment of the level of copper that is expected to be removed through the implementation of the evaluated treatment plant modifications.

H. Development of capital and operational costs and schedules for implementing any improvements necessary at the POTW to reduce the copper content in the effluent.

IV. RANKING OF SOURCES AND CONTROL STRATEGIES

A. Rank each category of copper sources, including side-stream sources, by annual average quantity and percent contribution to the overall POTW loading. If important seasonal differences exist, rank the sources during the various seasons.

B. Summarize the influent and effluent copper reduction potential of each of the alternatives evaluated under Paragraphs II and III.

C. For each alternative that is likely to reduce the level of copper discharged by the POTW, evaluate the technical, political, and economic feasibility of the alternative and rank each alternative with regards to effectiveness and implementability.

D. Select the options, or mix of alternatives, that provide the greatest likelihood of achieving significant effluent copper reduction leading to compliance with the POTW effluent limits.

E. Include specific schedules for the implementation of each of the alternatives selected under Paragraph IV.D and propose a monitoring program that will determine the effectiveness of the completed treatment modifications and source reductions measures.

ATTACHMENT B

INTERIM EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (From the effective date of this Order and until the earliest of (1) the date that EPA modifies the terms and conditions of the interim limits or (2) the date that EPA determines that the Town has not complied with the interim milestones set forth in this Order, or (3) the date for completion of the relevant Implementation Schedule)

Effluent Characteristic	Discharge Limitations		Monitoring Requirements	
	Concentration			
	Average Monthly	Maximum Daily	Measurement Frequency	Sample Type
Total Copper[1]	25 ug/l	Report	~~1/Week~~ 1/Month	24-hr composite
Total Ammonia Nitrogen, as N (Nov. 1- June 15)[2]	Report	Report	2/Week	24-Hr composite
Total Ammonia Nitrogen, as N (June 15- Oct. 31)[3]	10 mg/l	Report	2/Week	24-Hr composite

---

1 The permittee shall operate the treatment system at all times to optimize the removal of copper.

2 The permittee shall operate the treatment system at all times to optimize the removal of ammonia nitrogen.

3 The 10 mg/l interim limit is a seasonal average, i.e. the average of all Total Ammonia Nitrogen samples collected between June 15 and October 31. The seasonal average result shall be reported on the October discharge monitoring report. The permittee shall report the average monthly and maximum daily results for each month during the season. The permittee shall operate the treatment system at all times to optimize the removal of ammonia nitrogen.