To: Mike Domenica and Stacie Smith

From: Paul R. Ammann

Subject: Comments on Stantec's Slides for WQAP Meeting #5, October 22, 2014. Sites Selected for Treated Wastewater Discharge.

Date: November 28, 2014

I have reviewed more of the slides by Stantec for Meeting #5, particularly those focused on potential disposal sites for treated wastewater and have some comments which are grouped according to the water body into which they would discharge.

Stantec considered a total of 28 sites for potential disposal of treated wastewater; only 7 passed an initial screening. I have prepared some comments on each of these 7 sites. I have also reviewed the Stantec summaries of the other 21 sites that were evaluated.

Stantec assumed, as a basis for evaluating the possibilities for potential disposal sites, that the processed wastewater discharged from treatment plants would contain 5 mg nitrogen per liter (5 mg/L).

Summary

Little Namskaket Marsh Watershed

Stantec identified three properties in this watershed that could receive and percolate into the groundwater between **510,000** and **1,276,000** gallons of treated wastewater. At an estimated **5** mg/L nitrogen, the wastewater would contain **3,500** and **8,800** kilograms of nitrogen on an annual basis. However, MEP has determined that the maximum amount of nitrogen that could be added to the marsh without impairment is **1,800 kilograms per year**, equivalent to **260,000** gallons of wastewater per day. Accordingly, only **20%** to **51%** of the potential capacity of these three properties could be used according to MEP calculations.

Atlantic Ocean

Two locations were listed for handling treated wastewater that would discharge into the Atlantic Ocean. Stantec calculated that collectively these two sites could disperse from **215,000** to **536,000** gallons per day. At **5** mg/L the wastewater would contain **1,500** to **3,700** kilograms of contained nitrogen. Since the Atlantic might be considered as an

infinite sink for nitrogen, these quantities would not limit the quantity of wastewater released at these locations. Although these two properties are a distance from most sections of Orleans, they should be considered in the first tier of locations for discharge of treated wastewater because it will not negatively impact the local environment.

Pleasant Bay Watersheds

Stantec identified two properties in the watershed for the disposal of treated wastewater. Collectively Stantec calculated that these two locations could safely release **75,000** to **187,000** gallons of treated wastewater containing 5 mg/L. The wastewater would contain between **510** and **1,280** kilograms of nitrogen.

General Comments

Discharge of treated wastewater at the Atlantic Ocean sites is not generally sensitive to the nitrogen concentration unless there are some regulations under statutes of the Commonwealth.

If properties located in the Little Namskaket Marsh and the Pleasant Bay watersheds were to be used and the total contained nitrogen limited the amount of wastewater that could be consideration should be given to reducing the nitrogen concentration after treatment to less than **5** mg/L. This objective has been demonstrated to be feasible in at least several commercially operating systems.

I. Stantec Considered the Following 7 Disposal Sites:

Little Namskaket Marsh

- **Site 5. 9 West Road. Skaket Corner**.

"Carver-Hinesburg loamy coarse sands, undulating & rolling, Plymouth loamy coarse sand, 3 to 8 percent, very stony, Eastchop loamy fine sand, 0 to 3 percent slopes."

The total property area is given by Stantec as **12.1** acres. Stantec estimates that **20%** of this area, or **2.4** acres (**105,000** square feet), could be used for a new leachfield. Furthermore, Stantec estimates the percolation rate in this area to be between **2** and **5** gallons per square foot per day. At these rates, between **210,000** and **527,000** gallons of treated wastewater could be discharged at this location per day. The two alternatives are summarized in Table 1.

Table 1. Potential Discharge Rates at Skaket Corners

Percolation Rate, Gal per Day/SF	Percolation Rate, Gpd	Nitrogen Release Kg/d @ 5 Mg/Liter
2	210,000	1,456
5	527,000	3,641

in the 2008 Report[1] MEP determined the threshold nitrogen load for Little Namskaket Marsh in the 2001 – 2004 time frame was **12.38** Kg nitrogen per day. The computed load at that time was **7.43** Kg nitrogen per day. Thus MEP would allow an additional daily load of **4.95** Kg nitrogen, or **1,800 Kg** nitrogen per year. Note in the table above that Stantec would consider additional nitrogen loadings of **1,460** to **3,640** kilograms per day at the Skaket Corners location. ***At a treated wastewater flow rate of 260,000 gallons per day, the MEP threshold nitrogen limit for Little Namskaket Marsh would be reached at a total nitrogen concentration of 5 mg/L.***

Action Items.

- There are one or more existing leachfields at the Skaket Corners locations. These treated wastewater leachfields must have been permitted by the Orleans Board of Health. Stantec should review the records on file at the

[1] Massachusetts Estuaries Project, Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Little Namskaket Marsh Estuarine System, Orleans, MA, *FINAL REPORT – December 2008, page 98.*

Orleans Health Department for the measured percolation rates and reevaluate this area for disposal of large quantities of treated wastewater.

- The Orleans Consultant and Stantec have maintained that all properties located along West Road have to be connected to a "sewage collection and treatment system" because of the possible impact on Little Namskaket Marsh. Yet, they suggest the possibility of adding even larger quantities of nitrogen to the marsh by disposal of future treated wastewater in the Little Namskaket Marsh watershed. Stantec and the Orleans Consultant should reconcile these two opposing facts.

- **Site 6. Route 6A. Mass DOT.**

"Carver-Hinesburg loamy coarse sands, Carver-Hinesburg loamy coarse sands, undulating."

The total property area is given by Stantec as **5.5** acres. Stantec estimates that **40%** of this area, or **2.2** acres (**95,800** square feet) could be used for a new leachfield. Furthermore, Stantec estimates the percolation rate in this area to be between **2** and **5** gallons per square foot per day. At these rates, between **192,000** and **479,000** gallons of treated wastewater could be discharged at this location per day. The two alternatives are summarized in Table 2.

Table 2. Potential Discharge Rates at Route 6, MassDOT.

Percolation Rate, Gal per Day/SF	Percolation Rate, Gpd	Nitrogen Release Kg/d @ 5 Mg/Liter
2	192,000	1,325
5	479,000	3,310

In the 2008 Report[1] MEP determined the threshold nitrogen load for Little Namskaket Marsh in the 2001 – 2004 time frame was **12.38 Kg** nitrogen per day. The computed load at that time was **7.42** Kg nitrogen per day. Thus MEP would allow an additional daily load of **4.95** Kg nitrogen, or 1**,808 Kg** nitrogen per year. Note in the table above that Stantec would consider additional nitrogen potential additional loadings of **1,325** to **3,310** kilograms per day at the Route 6A Cloverleaf. At a treated wastewater flow rate of **260,000** gallons per day the MEP threshold limit for Little Namskaket Marsh would be reached.

Action Items.

- The Orleans Consultant and Stantec have maintained that all properties located along West Road had to be connected to a "sewage collection and treatment" systems because of the possible impact on Little Namskaket Marsh. Yet, they propose to add even larger quantities of nitrogen to the marsh by disposal of future treated wastewater. Stantec and the Orleans Consultant should reconcile these two opposing facts.

- **Site 7. Bakers Pond Road. N-Star Electric.**

"Carver coarse sands, undulating and 8 to15 percent slopes."

The total property area is given by Stantec as **6.2** acres. Stantec estimates that **20%** of this area, or **1.2** acres (**54,000** square feet) could be used for a new leachfield. Furthermore, Stantec estimates the percolation rate in this area to be between **2** and **5** gallons per square foot per day. At these rates, between **108,000** and **270,000** gallons of treated wastewater could be discharged at this location per day. The two alternatives are summarized in Table 3.

Table 3. Potential Discharge Rates Bakers Pond.

Percolation Rate, Gal per Day/SF	Percolation Rate, Gpd	Nitrogen Release KG/d @ 5 Mg/Liter
2	108,000	750
5	270,000	1,870

in the 2008 Report[1] MEP determined the threshold nitrogen load for Little Namskaket Marsh in the 2001 – 2004 time frame was **12.38** Kg nitrogen per day. The computed nitrogen load at that time was **7.42** Kg nitrogen per day. Thus MEP would allow an additional daily load of **4.95** Kg nitrogen, or **1,808** Kg nitrogen per year. Note in the table above that Stantec would consider additional nitrogen loadings of **7500** to **1,870** kilograms per year at the Bakers Pond/N-Star location, some of which could approach or exceed the MEP threshold limit.

Action Items.

- The Orleans Consultant and Stantec have maintained that all properties located along West Road had to be connected to a "sewage collection and treatment" systems because of the possible impact on Little Namskaket Marsh. Yet, they propose to add even larger quantities of nitrogen to the

marsh by disposal of future treated wastewater. Stantec and the Orleans Consultant should reconcile these two opposing facts.

- **Summary of Potential Sites Discharging to Little Namskaket Marsh Watershed**

The quantities of treated wastewater and contained nitrogen at the low and high percolation rates of **2** gallons per day per square foot are summarized in Tables 4 and 5. If developed as described above, about ½ million gallons of wastewater could be discharged low percolation rates and nearly 1.2 million gallons per day at the high rates. However, according to the MEP, the limiting nitrogen discharge rate into Little Namskaket Marsh (to be consistent with the MEP threshold limit is **1,800 kilograms per year** and **260,000** gallons of treated wastewater per day (at **5** mg nitrogen per liter). These limits that were defined by MEP in its Report on Little Namskaket Marsh establish a cap on the discharge capacity of the three sites.

Table 4. Low Percolation Rates

Alternative	Percolation Rate, Gpd	Nitrogen Release, Kg/d @ 5 Mg/Liter
Site 5	**210,000**	**1,456**
Site 6	**192,000**	**1,324**
Site 7	**108,000**	**746**
Subtotal	**510,000**	**3,526**

Table 5. High Percolation Rates

Alternative	Percolation Rate, Gpd	Nitrogen Release, Kg/d @ 5 Mg/Liter
Site 5	**527,000**	**3,641**
Site 6	**479,000**	**3,310**
Site 7	**270,000**	**1,866**
Subtotal	**1,276,000**	**8,817**

Atlantic Ocean

- **Site 15. 178 Beach Road. Mayo Property**.

"Mapunit Name Nantucket sandy loam, 3 to 15 percent slopes, Carver-Hinesburg loamy coarse sands, undulating."

The total property area is given by Stantec as **6.7** acres. Stantec estimates that **20%** of this area, or **1.3** acres (**58,400** square feet) could be used for a new leachfield. Furthermore, Stantec estimate the percolation rate in this area to be between **2** and **5** gallons per square foot per day. At these rates, between **117,000** and **292,000** gallons of treated wastewater could be discharged at this location per day. The two alternatives are summarized in Table 6.

Table 6. Potential Discharge Rates at 178 Beach Road.

Percolation Rate, Gal per Day/SF	Percolation Rate, Gpd	Nitrogen Release Kg/d @ 5 Mg/Liter
2	117,000	806
5	292,000	2,016

Action Items.

- Since it is likely that the wastewater discharged at this site would have no restrictions on nitrogen content, this property could be developed if available. Stantec might obtain percolation rate data for leachfields on neighboring properties as a first step to confirming the assumed treated wastewater discharge rates on the property.

- Standard percolation measurements to confirm the possible release rates might be undertaken if the property is being seriously considered for future use.

- **Site 16. 223 Beach Road. Town of Orleans (Hubler Motel)**.

"Mapunit Name Ipswich, Pawcatuck, and Matunuck peats, 0 to 1 percent slopes, Carver coarse sand, 8 to 15 percent slopes, Carver-Hinesburg loamy coarse sands, undulating."

The total property area is given by Stantec as **5.6** acres. Stantec estimates that **20%** of this area, or **1.1** acres (**48,900** square feet) could be used for a new leachfield. Furthermore, Stantec estimate the percolation rate in this area to be between **2** and **5** gallons per square foot per day. At these rates, between **98,000** and **244,000** gallons of treated wastewater could be discharged at this location per day. The two alternatives are summarized in Table 7.

Table 7. Potential Discharge Rates at 232 Beach Road.

Percolation Rate, Gal per Day/SF	Percolation Rate, Gpd	Nitrogen Release Kg/d @ 5 Mg/Liter
2	98,000	674
5	244,000	1,685

Action Items.

- Since this water discharged at this site would have no restrictions on nitrogen content, this property could be developed if available. Stantec might obtain percolation rate data for leachfields on neighboring properties as a first step to confirming the assumed treated wastewater discharge rates on the property.

- Standard percolation measurements to confirm the possible release rates might be undertaken if the property is being seriously considered for future use.

- **Summary of Potential Sites Discharging to the Atlantic Ocean.**

The quantities of treated wastewater and contained nitrogen at the low and high percolation rates of **2** gallons per day per square foot are summarized in Tables 8 and 9. If developed as described above, about **¼** million gallons of wastewater could be discharged low percolation rates and about **½** million gallons per day at the high rates.

According to the MEP, there is **no limit** on the discharge to the Atlantic Ocean. Consequently these are ideal sites for the discharge of treated wastewater if they can be developed for this purpose and if the preliminary assessment of the percolation rates is validated.

Table 8. Low Percolation Rates

Alternative	Percolation Rate, Gpd	Nitrogen Release, Kg/d @ 5 Mg/Liter
Site 15	**117,000**	**806**
Site 16	**98,000**	**674**
Subtotal	**215,000**	**1,480**

Table 9. High Percolation Rates

Alternative	Percolation Rate, Gpd	Nitrogen Release, Kg/d @ 5 Mg/Liter
Site 15	**292,000**	**2,016**
Site 16	**244,000**	**1,685**
Subtotal	**536,000**	**3,701**

Pleasant Bay Watersheds

- **Site 21. 61 Namequoit Road. Sparrow II**.

"Carver coarse sand, 3 to 15 percent slopes."

The total property area is given by Stantec as **2.0** acres. Stantec estimates that **20%** of this area, or **0.4** acres (**14,420** square feet), could be used for a new leachfield. Furthermore, Stantec estimates the percolation rate in this area to be between **2** and **5** gallons per square foot per day. At these rates, between **35,000** and **87,000** gallons of treated wastewater could be discharged at this location per day. The two alternatives are summarized in Table 10. In terms of the discharge of treated wastewater, this is a small site but it may be adequate for a cluster system.

Table 10. Potential Discharge Rates at 61 Namequoit Rd.

Percolation Rate, Gal per Day/SF	Percolation Rate, Gpd	Nitrogen Release Kgs/Year @ 5 Mg/L
2	**35,000**	**241**
5	**87,000**	**602**

Action Items.

- Treated wastewater discharged at this site would migrate into the Namequoit River, which, according to the MEP, has limitations to nitrogen concentrations. Stantec might obtain percolation rate data for leachfields on neighboring properties as a first step to confirming the assumed treated wastewater discharge rates on the property.

- Standard percolation measurements to confirm the possible release rates might be undertaken if the property is being seriously considered for future use, particularly in conjunction with a local cluster system.

- **Site 25. 46 Tar Kiln Road. Norgeot**.

"Carver coarse sand, 3 to 35 percent slopes."

The total property area is given by Stantec as **8.2** acres. Stantec estimates that **5.5%** of this area, or **0.45** acres (**19,650** square feet) could be used for a new leachfield. Furthermore, Stantec estimate the percolation rate in this area to be between **2** and **5** gallons per square foot per day. At these rates, between **39,000** and **98,000** gallons of treated wastewater could be discharged at this location per day. The two alternatives are summarized in Table 11. In terms of the discharge of treated wastewater, this is a small site but it may be adequate for a nearby cluster system.

Table 11. Potential Discharge Rates at 46 Tar Kiln Rd.

Percolation Rate, Gal per Day/SF	Percolation Rate, Gpd	Nitrogen Release Kg/d @ 5 Mg/Liter
2	39,000	271
5	98,000	680

Action Items.

- Treated wastewater discharged at this site would migrate into Tar Kiln Stream and Pleasant Bay. Stantec might obtain percolation rate data for leachfields on neighboring properties as a first step to confirming the assumed treated wastewater discharge rates on the property.

- Standard percolation measurements to confirm the possible release rates might be undertaken if the property is being seriously considered for future use.

- **Summary of Potential Sites Discharging to the Pleasant Bay Water Shed.**

According to MEP an excess of wastewater flow from septic systems has elevated the concentrations of nitrogen in in the terminal ponds of the Pleasant Bay System. The proposed discharge of treated wastewater at 5 milligrams nitrogen per liter would substitute for septic tank discharge typically containing more than **20** milligrams per liter. While these two sites may serve a useful purpose, they do not appear to be priority locations.

The quantities of treated wastewater and contained nitrogen at the low and high percolation rates of **2** gallons per day per square foot are summarized in Tables **12** and **13**. If developed as described above, about **75,000** gallons of wastewater could be discharged low percolation rates and about **187,000** gallons per day at the high rates.

These sites would be useful primarily for cluster projects in the vicinity. A nitrogen balance would be required to determine the net reduction of nitrogen transport into the local water body(ies).

Table 12. Low Percolation Rates

Alternative	Percolation Rate, Gpd	Nitrogen Release, Kg/d @ 5 Mg/Liter
Site 21	**35,000**	**241**
Site 25	**40,000**	**271**
Subtotal	**75,000**	**512**

Table 13. High Percolation Rates

Alternative	Percolation Rate, Gpd	Nitrogen Release, Kg/d @ 5 Mg/Liter
Site 21	**87,000**	**602**
Site 25	**98,000**	**679**
Subtotal	**185,000**	**1,281**

II. Stantec Eliminated the Following Sites:

- Site 2- **Mass DOT Cloverleaf at Highway**. No comment.

- Site 3-**17 Nell Way**. This property discharges into the groundwater of the Namskaket Marsh watershed. The Orleans Board of Selectmen decided that there should be no future release of treated wastewater (and nitrogen) into the groundwater into this watershed. Stantec has identified Sites 5, 6 and 7 in Little Namskaket Marsh watershed as being potential locations for the discharge of treated wastewater.

- Site 4. **40 Bakers Pond Road**. This property might be considered as a secondary, or backup, location for wastewater discharge. It is a distance from Namskaket Marsh and Stream and from Little Namskaket Marsh. Did Stantec calculate the dilution of treated waste water by normal precipitation,

and therefore the nitrogen concentration, by the time it reached the Namskaket and Little Namskaket Marsh areas? In other words. did Stantec calculate the average annual wastewater flow compared to normal yearly precipitation?

- Site 8- **N-Star Electric on 9 Lots Hollow Road**. The total area of the property is **2.5** acres. Stantec notes that this property drains via groundwater into Rock Harbor Marsh (and boat basin?) and Cedar Pond. There is no empirical data showing that water quality in the Rock Harbor Marsh or boat basin, or in Cedar Pond, has been impacted by groundwater.

  Eastham and Orleans, with the support of Orleans consultant, Mike Domenica, plan to actively pursue a change in classification for the Rock Harbor boat basin. In its 2008 Report, MEP determined that Rock Harbor Marsh is healthy. Furthermore there is no empirical data showing that the boat basin is, or would be, impaired by the discharge of treated wastewater at this location. Stantec should provide calculations to show the quantity and concentration of nitrogen at the receptors by release to the groundwater at this location.

- Site 9- **140 Route 6A, Orleans Market Place**. Stantec notes that this **9.4** acre property drains via groundwater into the Rock Harbor Marsh watershed and hence to the marsh, the boat basin and Cedar Pond. MEP determined that Rock Harbor Marsh is healthy. Furthermore there is no empirical data showing that the boat basin is, or would be, impaired by the discharge of treated wastewater at this location. Orleans consultant, Mike Domenica, supports this determination. Stantec should provide calculations to show the quantity and concentration of nitrogen at the receptors by release to the groundwater at this location.

- Site 12- **139 Main Street, American Legion Property.** The groundwater at this property discharges into Town Cove. In its 2012 Report MEP determined that nitrogen levels in Town Cove are elevated. This property is currently used by the Town Hall for its wastewater discharge and has two leachfields, each with a capacity of about 2,000 gallons per day. [Stantec should check with the Orleans Board of Health for the specifics on the two leachfields.] The system only serves Town Hall and the daily average flow is about **220** to **240** gallons per day, only about 10% of the system capacity.

  The existing leachfields are under “grass fields”; there is additional room for an expanded leachfield under the macadam parking lot on the property.

Percolation tests were conducted on the property in 2005 or 2006 and should be available. Stantec should calculate the maximum quantity of wastewater flow that the property could accommodate and both the quantity and concentration of nitrogen that would reach Town Cove. This property might be considered for disposal of treated wastewater from a nearby cluster system if it can be demonstrated that there could be a significant net reduction of nitrogen flow into Town Cove.

- Site 13- **54 Hopkins Lane, Community Gardens**. Groundwater from this **11** acre property discharges directly into Town Cove which MEP has determined has elevated concentrations of nitrogen. Observations in the summer of 2014 have shown that algae appeared along the edges of the Cove. Stantec should develop calculations to project the concentration and load of nitrogen that would enter Town Cove from this location if it were used as a treated wastewater disposal site.

  This large property is used in the summer by local residents for growing vegetables and other plants. Stantec should consider whether the property could be used for surface disposal (summer peak flows) of treated wastewater

- Site 14- **100 Dunlukin Lane, N-Star-II**. Groundwater from this property drains into Mill Pond. The property contains wetlands and is in a flood zone and therefore is unusable for treated wastewater disposal.

- Site 17- **7 Barley Neck Road, Nauset Marine**. Groundwater from this property discharges directly into Meetinghouse Pond which MEP has determined has elevated concentrations of nitrogen. Stantec should develop preliminary calculations to project the concentration and load of nitrogen that would enter Town Cove from this location if it were used as a treated wastewater disposal site.

- Site 19- **353 South Orleans Road, Sparrow I**. Groundwater from this property discharges into Arey's Pond which is restricted as an ACEC. Arey's Pond has also exhibited elevated nitrogen concentrations, degraded water quality and an impaired benthic habitat.

- Site 20- **35 Namequoit Road. Town of Orleans Conservation Land**. Stantec describes this property as being within a Zone II public water supply. However, it would appear that the groundwater discharges away from the public water supply and toward Namequoit River and the Pleasant Bay System. In its May 2006 Report MEP identified the Namequoit River as being impaired by elevated concentrations of nitrogen.

  To consider this property as a location to discharge treated wastewater, two factors should be evaluated:

  1) Would Orleans, as owner of the conservation land permit the construction of either a treatment facility or a leachfield, or both, at this location, and

  2) If the first is acceptable, could Stantec show that a lower net discharge of nitrogen into the local water bodies could be achieved?

- Site 22- **44 Arey's Lane. AP Boatyard.** This is a **4.5** acre property; **2** acres are under a conservation restriction. Groundwater from this property may discharge to either Pilgrim Lake or Arey's Pond. No further comment on this property.

- Site 23- **95 Arey's Lane. Thayer Lane**. This is a **6.8** acre property that Stantec has listed as vacant-recreation. Stantec suggests that this property could not be used to discharge treated wastewater because it is within an "ACEC". But there are houses in this general area; septic tanks associated with these properties discharge into Namequoit River or Pilgrim Lake. Stantec should explain why this property couldn't be used to treat septic tank effluent from adjoining properties, reduce the nitrogen concentration and therefore lower the net amount of nitrogen discharging into either of the two receiving water bodies. A local cluster system might be economically viable.

- Site 24- **75 Viking Road. Viking Pt.** This is a **1.9** acre property that Stantec has listed as vacant. Stantec suggests that this property could not be used to discharge treated wastewater because it is within a 100-year flood zone, it has a "long shore-line", and its discharges into The River, an "ACEC". But there are a few houses in this general area; septic tanks associated with these properties discharge into The River. Stantec should explain why this property couldn't be used to treat septic tank effluent from adjoining properties, reduce the nitrogen concentration and therefore lower the net amount of nitrogen discharging into either of the receiving water body.

- Site 26- **48 Tar Kiln Road.** This is a **2.1** acre property; the groundwater discharges into Tar Kiln Stream and ultimately into Pleasant Bay. Stantec has determined that this location cannot be used to discharge treated wastewater because it is located in a 100-year flood zone.

- Site 27- **33 Snow Shore Road. Seal Lane.** This **9.2** acre, residential property is at the shore of Nauset Marsh. Stantec has determined that this property could not be used for discharge of treated wastewater because of a "long shoreline". Stantec also noted that this property is in a "flood zone" and the groundwater would discharge to an ACEC. Also this is a remote location relative to developed properties, although it might be used as a discharge point for a local cluster system.

- Site 28- **237 Beach Road. Benz Corporation.** Stantec determined that this **3.9** acre commercial property could not be used to discharge treated wastewater because it is "in a national park". This statement doesn't make any sense.

  Just below this property, the Town of Orleans has a septic system and leachfield in the Town parking lot on the beach to serve public restrooms and Liam's restaurant/snack bar. Why is this property any different?