

# Pleasant Bay Nitrogen Management

## *Preparing for an Updated Watershed Permit for Orleans*

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### Overview of Today's discussion

#### Growth in Watershed Loads

- How much growth will occur in the Pleasant Bay watershed?
- How much of that growth should be built into the Watershed Permit?

#### Pace of Sewering

- Is the pace of the sewer master plan sufficient?
- What implementation schedule is the Town willing to commit to?

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## Estimate of Nitrogen Removal Requirements

	<u>Pleasant Bay</u>	<u>Town-Wide</u>
Baseline needs	7,000 kg/yr	13,500 kg/yr
Growth in watershed loads	900	2,000
Mill Pond needs		600
Allowance for Brewster trading	(200)	(300)
Allowance for WWTF discharge		???
Total	<u>7,900 kg/yr</u>	<u>16,100 kg/yr</u>
Removal provided for in Master Plan	6,800 kg/yr	13,900 kg/yr
Non-sewer credits already achieved	<u>300</u>	<u>200</u>
Total	<u>7,100 kg/yr</u> 89%	<u>14,100 kg/yr</u> 88%

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## PBA Approach to Updating "Current" Nitrogen Loads

- Basis for the Watershed Permit
  - 2006 MEP Report updated for Harwich in 2010
  - Water use from 2002 to 2006 (say mid-year of 2003)
- 2021 SMAST Report under SNEP grant
  - Water use from 2011 to 2015 (say mid-year of 2013)
  - Overall load increase from 48,500 to 49,800 kg/yr (2.6% over 10 years)
  - Individual sub-watersheds showed large increases and large decreases
- Towns have agreed to measure growth in two parts for the new Permit
  1. Segment 1: MEP report to SNEP report
  2. Segment 2: SNEP Report to planning horizon selected by each town

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## Orleans Growth Estimates

- Segment 1: MEP Report to SNEP Report 480 kg/yr
- Segment 2: Next 20 years 400 kg/yr
- Load increase to be incorporated in new Permit 880 kg/yr ??
  
- What is relative increase?
 

	<u>w/o growth</u>		<u>w/ growth</u>
◦ Watershed load, kg/yr	14,643	880	15,523 (+6%)
◦ Threshold load, kg/yr	<u>7,724</u>	0	<u>7,724</u>
◦ Removal need, kg/yr	6,980	880	7,860 (+13%)
◦ Removal need, %	48%	100%	51%

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## Growth estimate

Growth	Pleasant Bay	Remainder of Town	Total Town Wide
Potential new dwellings through build-out	300	300	600
Past growth rate	9 dwellings/yr	9 dwellings/yr	18 dwellings/yr
Growth rate over next 20 years	6 dwellings/yr	7 dwellings/yr	13 dwellings/yr
New dwellings over next 20 years	120	140	260
New dwellings on public sewer system	40	50	90
New dwellings not on public sewer system	80	90	170
Growth in nitrogen load to embayments	400 kg/yr	450 kg/yr	850 kg/yr

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## What Degree of Nitrogen Control is Acceptable?...and When?

• 100% removal by end current permit	(2038)	Permit Yr 20
• 100% removal 20 years from now	(2043)	Permit Yr 25
• 75% removal 20 years from now	(2043)	Permit Yr 25
• 75% by end of current permit	(2038)	Permit Yr 20
	<u>w/o growth</u>	<u>w/ growth</u>
• 100% removal	6,980 kg/yr	7,860 kg/yr
• 75% removal	5,240 kg/yr	5,900 kg/yr

Note lack of clarity in how DEP will interpret the new watershed permitting regulations

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## How fast should the Sewer Master Plan be Implemented?

### Options for implementation

- Option 1 as per master plan, 3-year cycle
- Option 2 faster than master plan, 2-year cycle
- Option 3 slower than master plan, 4-year cycle
- Option 4 hybrid plan, 4-year cycle but combine Phases 4 and 5

How does each option perform with respect to time to reach 75% of goal?

Consider this question with and without growth

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Progress toward attainment - no growth (Goal=6,980 kg/yr)

Option	Year	75% of Goal	90% of Goal	95% of Goal
Option 1: 3-yr cycle	Calendar year	2043 (permit year 25)	2046 (permit year 28)	2049 (permit year 31)
Option 2: 2-yr cycle	Calendar year	2038 (permit year 20)	2040 (permit year 22)	2042 (permit year 24)
Option 3: 4-yr cycle	Calendar year	2048 (permit year 30)	2052 (permit year 34)	2056 (permit year 38)
Option 4: 4-yr cycle (combine Ph 4/5)	Calendar year	2044 (permit year 26)	2048 (permit year 30)	2052 permit year 34)

Progress toward attainment - with growth (Goal = 7,860 kg/yr)

Option	Year	75% of Goal	90% of Goal	90% of Goal
Option 1: 3-yr cycle	Calendar year	2046 (permit year 28)	2064 (permit year 46)	After 2064
Option 2: 2-yr cycle	Calendar year	2040 (permit year 22)	2052 (permit year 34)	After 2064
Option 3: 4-yr cycle	Calendar year	2052 (permit year 34)	2064 (permit year 46)	After 2064
Option 4: 3-yr cycle (combine Ph 4/5)	Calendar year	2048 (permit year 30)	2064 (permit year 46)	After 2064

## Pace of Implementation

### Conclusions

- Without growth, Orleans can reach 75% attainment (Permit Year 25) with Option 1 (3-year cycle)
- Without growth, Orleans can reach 75% attainment (Permit Year 20) with Option 2 (2-year cycle)
- With growth, Option 2 is only way to get to 75% attainment by Permit Year 25
- In general, 880 kg/yr of growth adds 2 to 4 years to time to show attainment

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## Considerations in Establishing Pace of Sewering

- Growth is very hard to predict
- Watershed Permit allows mid-course corrections every 5 years
- Knowledge of Pleasant Bay systems is evolving
- Current levels of funding are not likely to be available over the long-term
- Orleans has many other significant capital needs
- Sewer master plan schedule (Option 1) defers any more progress on Nauset Harbor until 2052 (nearly 30 years from now)

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## Considerations in Establishing the Pace of Sewering

### Knowledge of Pleasant Bay systems is evolving

Current Permit includes large N removal in the Pochet Neck sub-watershed, but consider the impacts of Orleans documenting attenuation in that system:

Un-attenuated load, kg/yr	3,070	3,070	3,070
Attenuation, %	0%	30%	50%
Attenuated load, kg/yr	3,070	2,150	1,540
Threshold load, kg/yr	1,500	1,500	1,500
Removal need, kg/yr	1,570	650	40
Change from current permit	0	-920	-1,460
Current growth allowance, kg/yr		880	

At 30% attenuation, reduced Pochet N removal need is about equal to growth allowance.

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## Progress toward attainment - with growth & 30% Pochet Attenuation

Option	Year	75% of Goal	90% of Goal	95% of Goal
Option 1: 3-yr cycle	Calendar year	2043 (permit year 25)	2046 (permit year 28)	2049 (permit year 31)
Option 2: 2-yr cycle	Calendar year	2038 (permit year 20)	2040 (permit year 22)	2042 (permit year 24)
Option 3: 4-yr cycle	Calendar year	2048 (permit year 30)	2052 (permit year 34)	2056 (permit year 38)
Option 4: 4-yr cycle (combine Ph 4/5)	Calendar year	2044 (permit year 26)	2048 (permit year 30)	2052 permit year 34)

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## Goal of Revised PB Plan for Orleans

1. Define specific N removal projects (say Sewer Phase x)
2. Specify expected N removal in each benefitted sub-watershed
3. Specify technology to be used
4. Prepare back-up plan for non-traditional technology (e.g., PRBs)
5. Develop a schedule to place each project in each 5-yr permit segment
6. Determine percent of total removal need achieved in next 20 years
7. Defend that rate of progress if <75% N removal achieved in 20 years

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## Next Steps

- Review this approach to estimating growth in N loads and decide on the best growth allowance.
- Consider these four options, and other options, for implementing the sewer master plan
- Begin to prepare a short report to the PB Alliance documenting the changes Orleans wishes to make in the Watershed Permit

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# THANK YOU

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