

Date: **March 2, 2023**

Project No.: **20985**

To: **Orleans Wastewater Management Advisory Committee (WMAC)**

From: **Mike Giggey**

Subject: **Orleans Wastewater Management Planning
Nitrogen Load Reductions in the Meetinghouse Pond Sub-Watershed**

One of the very important upcoming WMAC activities is the updating of the nitrogen removal plan for the Pleasant Bay watershed. This memo is intended to contribute to that effort by presenting data on the expected nitrogen removals for Phase 2 of the sewer system, focused on Meetinghouse Pond.

Recall that Orleans' obligation under the Pleasant Bay Watershed Permit is the removal of about 7,000 kg/yr of "current" nitrogen load, plus 100% of the increase in load since the 2006 MEP report. In the latest annual report under the Watershed Permit, removals of Orleans' loads were documented to be 84 kg/yr from the Lonnie's Pond shellfish harvest and 241 kg/yr as a 25% credit for town-wide residential fertilizer control. That current total of 325 kg/yr was expected to increase this year to 337 kg/yr based on an additional credit of 12 kg/yr from the shellfish harvesting project. When the Permit was issued, Orleans expected that its 5-year removal would be 514 kg/yr, indicating a current shortfall of 177 kg/yr. That shortfall is being addressed in the planning for Phase 3.

In the second 5-yr period of the Permit (2023 to 2028), Orleans projected an additional removal of about 4,200 kg/yr. The first portion of that removal is expected to be associated with the full sewerage of the Meetinghouse Pond sub-watershed. About 93% of that sub-watershed would be sewerage in Phase 2 of the sewer program, with another 2% of the septic load captured as part of Phase 3. A future phase will address the remaining 5%.

Based on recent planning activities for Phase 3, we are now able to update the estimated removals associated with the Meetinghouse Pond sewer project. Based on 2021-to-2022 water use, the expected removals are:

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| • Phase 2 (complete by 2026) | 1,680 kg/yr (adjusted for private well use) |
| • Phase 3 (complete by 2028) | <u>40 kg/yr</u> |
| • Subtotal | 1,720 kg/yr |
| • Future phase (not scheduled) | <u>90 kg/yr</u> |
| • Total | 1,810 kg/yr |

Based on the loads presented in the 2006 MEP report and the Targeted Watershed Management Plan, it was expected that full sewerage of this sub-watershed would remove 1,870 kg/yr. The current water consumption data lead to a removal that is only 97% of the numerical requirement, even though 100% of the septic load would be removed.

(This circumstance is similar to the one we uncovered for Lonnie’s Pond, where 50% removal of the MEP septic load appears to require sewerage many more than 50% of the homes.)

It is also important to note that the 1,870 kg/yr removal requirement is based on Orleans’ water consumption data over 12 months in 2002 to 2003, so it does not include any growth that may have occurred since then. S Mast updated its load estimates in 2021, based on 2011-to-2015 water consumption, some land use changes, and a somewhat revised set of supporting data. That updated septic load estimate is 2,127 kg/r, an increase of about 260 kg/yr, or 14% over the MEP estimate. An increase of this amount seems high based on my observations. Recall that we considered a 5% growth rate in the planning for Phase 3. If that 5% allowance is applied to Meetinghouse Pond, then about 80 kg/yr would be considered “new load” that should not be counted toward the original target.

Interestingly, the more recent (2021) S Mast load estimate is based on a water use dataset for a drier period (compared to the MEP report), so some of the apparent increase may be associated with more intense irrigation. On the other hand, the data reported by AECOM (2014 to 2022) comes from an even drier period. Clearly the data are not clear-cut.

Of the 241 kg/yr allowance for town-wide residential fertilizer control, 35 kg/yr is associated with the Meetinghouse Pond sub-watershed.

Here is a simple recap:

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| • MEP (2002-03 data) | septic load = 1,871 kg/yr | summer rain deficit = 1.0 inch |
| • S Mast (2011-15) | septic load = 2,127 kg/yr | summer rain deficit = 2.7 inches |
| • AECOM (2021-22) | septic load = 1,810 kg/yr | summer rain deficit = 3.7 inches |
| • This memo (2021-22) | septic load = 1,730 kg/yr | with 5% growth since 2006 |

If the fundamental requirement is for Orleans to remove 100% of the septic load, that requirement will nearly have been met after Phase 3. If the numerical goal governs, and there is a 5% growth allowance, then there will still be over 140 kg/yr to be removed some other way.

This analysis leads to some important considerations:

- A house count should be conducted to determine the number of new houses since 2006.
- A plan should be developed to deal with the homes that would not be sewerage in Phases 2 and 3
- The large growth estimated by S Mast in its 2021 report should be reviewed to see how much is associated with dry-year flows and the change in estimating approach.

I will be prepared to discuss these issues at the March 9 WMAC meeting.