

Date: **April 11, 2023**

Project No.: **20985**

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

From: **Mike Giggey**

Subject: **Orleans Wastewater Management Planning  
Town-wide Progress toward Nitrogen Removal Goals**

As we are developing a town-wide plan for wastewater and nitrogen management, it is appropriate to consider the progress to date in completed and upcoming projects. This is an important topic for public outreach as well. Accordingly, we have prepared this memo to provide you with our best current estimates.

The attached table presets our best estimates of the nitrogen removal benefits of the first three phases of the sewer program, as well as the performance of non-traditional approaches (shellfish harvesting and PRB). The first column of the table presents the nitrogen removal targets, either as codified in the Pleasant Bay Watershed Permit, or as derived from MEP reports for Nauset Harbor and Rock Harbor. Actual or expected removals are shown in the next set of columns, based on water consumption data provided by AECOM or from separate reporting for the Lonnie's Pond shellfish project and the Middle School PRB study. The last column of this table shows the remaining load removal requirement.

The broad picture is as follows through Phase 3:

	Nauset Harbor	Rock Harbor	Pleasant Bay	Total
Phase 1	1,656	1,501	0	3,157
Phase 2	99	0	1,873	1,972
Phase 3	201	0	274	475
Non-traditional	161	0	67	228
<b>Total</b>	<b>2,117</b>	<b>1,501</b>	<b>2,214</b>	<b>5,832</b>
Goal	5,000	1,500	6,980	13,480
<b>% Complete</b>	<b>42%</b>	<b>100%</b>	<b>32%</b>	<b>43%</b>

Nauset Harbor removals are depicted in the green-shaded part of the table. Rock Harbor removals are in the tan portion of the chart. Pleasant Bay removals are shaded in blue. The table also shows the nitrogen removal in the Little Namskaket watershed that is associated with Phase 1; note that no nitrogen removal is required there.

This attached table should serve as a way to periodically update the town's progress toward its nitrogen removal goals.

In reviewing this table, several points should be considered:

1. Nitrogen removal goals for the Nauset Harbor system are based on the 2012 MEP report. We know that Eastham wishes to modify the watershed loads estimates there to reflect Eastham's new water supply system. New water use data for Eastham may increase Orleans' share of nitrogen removal needs in that watershed. The same may apply to the Rock Harbor system.
2. The 2012 MEP report for the Nauset system includes the recommendation that no nitrogen removal is needed in the Mill Pond sub-watershed. Declining water quality in that embayment may mean that some nitrogen removal is warranted, which is not reflected in the attached table.
3. The MEP report for Rock Harbor viewed Cedar Pond as an estuarine water body with no nitrogen removal needs. If hydrologic changes there allow Cedar Pond to act as a fresh waterbody, then some of the nitrogen removal reported in the attached table may be overstated due to natural attenuation.

Considering these caveats, these data show that Orleans will have accomplished about 43% of its nitrogen removal goals by the completion of Phases 1, 2 and 3, and the continued performance of the non-traditional measures.

Once Phase 3 is complete, the remaining load removal needs will be:

- Pleasant Bay: 4,766 kg/yr
- Nauset Harbor: 2,883 kg/yr
- Total: 7,649 kg/yr

without considering possible Mill Pond needs or the dynamics of Cedar Pond.

Note that the nitrogen removal accomplishments do not include any credit for reduced residential fertilizer use, and that the nitrogen removal goals do not include any growth since the MEP reports.

# ORLEANS WASTEWATER MANAGEMENT PLANNING

Progress Toward Expected Nitrogen Removal Requirements

Loads in kg/yr

11-Apr-23

Sub-watershed	Req'd Load Removal	Load Removals by Sewer Phase					Load Removal Remaining
		Phase 1	Non-Trad	Phase 2	Phase 3	Total	
Town Cove	5,000	1,656	161	76	201	2,094	2,906
Mill Pond	-	-	-	23	-	23	(23)
<b>Total--Nauset Harbor</b>	<b>5,000</b>	<b>1,656</b>	<b>161</b>	<b>99</b>	<b>201</b>	<b>2,117</b>	<b>2,883</b>
Cedar Pond	-	566	-	-	-	566	(566)
Rock Harbor	1,500	935	-	-	-	935	565
<b>Total--Rock Harbor</b>	<b>1,500</b>	<b>1,501</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1,501</b>	<b>(1)</b>
Meetinghouse Pond	1,876	-	-	1,689	34	1,723	153
Lonnie's Pond	284	-	67	-	240	307	(23)
Arey's Pond	113	-	-	-	-	-	113
River--upper	375	-	-	152	-	152	223
River--Lower	518	-	-	2	-	2	516
Namequoit River	348	-	-	-	-	-	348
PahWah Pond	413	-	-	-	-	-	413
Quanset Pond	227	-	-	-	-	-	227
Pochet Neck	1,569	-	-	30	-	30	1,539
Pleasant Bay aggregate	1,257	-	-	-	-	-	1,257
<b>Total--Pleasant Bay</b>	<b>6,980</b>	<b>-</b>	<b>67</b>	<b>1,873</b>	<b>274</b>	<b>2,214</b>	<b>4,766</b>
Little Namskaket	-	{665}	-	-	-	{665}	
<b>TOTAL</b>	<b>13,480</b>	<b>3,157</b>	<b>228</b>	<b>1,972</b>	<b>475</b>	<b>5,832</b>	<b>7,648</b>