

Date: **February 6, 2023**

Project No.: **20985**

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

From: **Mike Giggey**

Subject: **Orleans Wastewater Management Planning  
Core Service Areas for Phase 3 Sewers**

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Questions were raised at the January 26, 2023 WMAC meeting about the extent of sewers needed near Crystal Lake, Pilgrim Lake and Lonnie's Pond. At the request of the Committee, I have looked into the sewer service area options in light of both phosphorus and nitrogen removal needs. This memo summarizes my findings.

I accessed and analyzed the spreadsheets that support the 2006 MEP report. In most areas, the Pleasant Bay Watershed Permit relies on the nitrogen load estimates and load thresholds presented by SMAST in that report. I found several items pertinent to this discussion:

- The MEP report relies on a 12-month set of water consumption records for estimating the nitrogen loads in Orleans (mid 2003 to mid 2004). For most of the subwatersheds of interest to the Phase 3 sewer area, it appears that the average per-lot water use in 2003-04 was significantly higher than comparable data presented by AECOM for this sewer project. If the target removal is based on the prior (higher) flows per lot, using the current (lower) water use will require more sewer homes than the MEP basis.
- The sub-watershed nitrogen loads for Crystal Lake and Pilgrim Lake include the loads from land uses in the areas contributing to the Cliff Pond Well and the Gould Pond Well. The inclusion of these wellfield loads may result in an overstatement of loads and load removal needs for Lonnie's Pond.
- Sub-watershed loads were estimated by SMAST for "Lonnie's Stream" (the Pilgrim Lake herring run) and for "Lonnie's River" (its outlet). The loads for Lonnie's River were included in the overall loading to Lonnie's Pond in the MEP report and in the Cape Cod Commission's allocation of loads by town. This may overstate the nitrogen control needs in Lonnie's Pond.

Taken together, these findings suggest that the MEP report and the TMDL are conservative with respect to the nitrogen control needs for Lonnie's Pond and Arey's Pond. A prudent approach would be to develop a core area for Phase 3 sewers that can be expanded in the future, if necessary once these conservative factors can be better assessed.

With the goal of phosphorus removal in the two lakes and reduction of nitrogen loads to Lonnie's Pond, the core sewer area could include:

1. All of the developed properties upgradient of Crystal Lake and within 10 years travel time of the lake (This should cover all of the parcels targeted for phosphorus control in the lake management report).
2. Most of the developed properties upgradient of Pilgrim Lake that are targeted for phosphorus control, but not the lots along Route 28. (Five or six parcels needing phosphorus control would be deferred until a later phase, when they could be served in a future project focused on Arey's Pond.)
3. About 50% of the developed parcels in the Lonnie's Pond subwatershed (less than 10-year travel time). (Connect lots along Monument Road and those to the east of Monument Road, but not along Route 28.)
4. All of the lots in the Lonnie's Stream sub-watershed.
5. The lots along Route 28 near Finlay Road that should be served to complete the Meetinghouse Pond nitrogen removal goal.

This core service area would address most of the phosphorus control needs for Crystal and Pilgrim Lakes, as well as about 50% of the septic load to Lonnie's Pond (after considering the shellfish harvesting credit of 96 kg/yr). That 50% removal of septic load is the fundamental basis for the Lonnie's Pond TMDL, regardless of the water use basis. A later phase of the sewer project could address:

- the few lots needing phosphorus control at the south end of Pilgrim Lake,
- any adjustments related to the conservative factors included in nitrogen loads,
- any safety factor related to the reliability of the Lonnie's shellfish harvesting project,
- growth in unsewered portions of these sub-watersheds, and
- Brewster's needs.

The next step should be a revision of the practical sewer layouts by AECOM and a re-computation of the associated nitrogen removals. Once that layout is completed and the loads analyzed, it may be necessary to refine this core sewer area to better reflect the target of 50% reduction in septic load.