City of Tacoma Comments on Birch Bay and Big Lake Draft NPDES Permits Review Comments – Optimization

July 24, 2020

1. Section S11 Nutrient Optimization Plan

Draft permit Section S11. Nutrient Optimization Plan calls for an optimization plan to be submitted within 12 months of the permit effective date. This time frame is too short for any substantive plan to be developed that would inform the realistic potential for nutrient reduction in existing treatment facilities for several reasons. Further, the foundation in nitrogen monitoring data for the effluent and the individual unit treatment processes is not robust enough to support an optimization analysis in a short 12 month time frame. Monthly effluent nitrogen data is not sufficient to inform nutrient optimization because it does not represent the variability in effluent nutrients that is known to occur on a much more frequent basis.

An essential first step in nutrient optimization is a monitoring plan designed specifically to inform the documentation of a baseline for existing effluent performance, as well as provide the foundation of tracking changes in effluent performance with efforts made in optimization. Without that, it will not be possible to conduct trends analysis to determine whether or not optimization efforts are effective, or whether changes in effluent quality are simply the result of changes in monitoring. Further, optimization planning requires that monitoring data is available for plant influent wastewater, and individual unit treatment processes within the plant, because that data is essential to understanding current performance, as well as conducting analysis and modeling to simulate potential optimization enhancements.

Optimization planning should begin with a Quality Assurance Project Plan (QAPP) for influent, effluent, and treatment process monitoring designed with the specific intent of quantifying historical effluent nitrogen treatment and supporting optimization efforts. Optimization planning can be initiated in conjunction with enhanced monitoring, but planning is unlikely to be completed in 12 months due to the lack of sufficient monitoring data. The initial monitoring effort to support optimization planning should include sampling on a frequent basis (e.g. daily, 3X per week, or weekly) to document variability during key periods (e.g. dry weather, wet weather, winter, summer, shoulder seasons, etc.). Sampling frequency may be reduced over time, but monitoring should extend over a multi-year period to capture influences of weather, seasonal loadings, service area changes, treatment process variations, plant upsets, etc.

A QAPP is the professional best practice for environmental monitoring generally required by regulatory agencies to be prepared, reviewed, and approved prior to data collection. Ecology provides guidance on QAPPs in both reports and permit writer guidance. Ecology's "Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies" (Ecology Publication 04-03-030) states the following:

> "Each environmental study conducted by or for the Washington State Department of Ecology must have an approved Quality Assurance (QA) Project Plan. The QA Project Plan describes the objectives of the study and the procedures to be followed to achieve those objectives. The QA

> Project Plan is a product of a systematic planning process." (https://fortress.wa.gov/ecy/publications/SummaryPages/0403030.html)

Ecology's "Water Quality Program Permit Writer's Manual" states the following regarding the preparation of a QAPP to address the specific issues being investigated:

> "The permit manager and permittee must understand the purpose of data collection, or the end use goal, because it may affect the data management procedures including statistical evaluations conducted on the analytical results. The data validation step following sample collection and analysis ensures results are usable to satisfy project objectives. Study objectives include determination of initial method target levels and the intended use of the final product. Essentially, successful study objectives involve knowing the question the additional monitoring is going to attempt to answer and what kind of data is needed to meet that end. When determining study objectives, permit writers should think about the problem statement. What are you trying to do? Making a decision verses estimating a problem are two examples of different study objectives." (https://fortress.wa.gov/ecy/publications/publications/92109.pdf)

Draft permit Section S11. specifies that "treatment efficiency optimization must evaluate" a list of considerations including operational adjustments, anoxic zones, septage receiving policies, side-stream management, and/or minor upgrades. These considerations may, or may not be appropriate or feasible for any given treatment facility. Minor upgrades are defined as costs not exceeding 5% of the annual equipment and supplies budget, which may, or may not be an appropriate metric for an investment linked to optimization. This specificity may not be compatible with site specific circumstances and may unnecessarily constrain the potential for creative considerations to be included in optimization planning, and may omit promising new options from consideration, such as new technology, automation, reclamation and reuse, etc.

Rather than attempt to define what constitutes an optimization plan in discharge permit language, a more appropriate approach would be for the permit to specify the application of existing wastewater industry nutrient optimization resources to be used to benefit from experience in other locations. In this way, the scoping process for a unique facility optimization plan can apply an existing framework, as well as tailor the plan to site specific conditions. The following reference documents provide a framework for nutrient optimization, examples of nutrient optimization plans, and contemporary assessments of nutrient removal treatment technologies.

Water Research Foundation (WRF4973) Nutrient Optimization

(https://www.waterrf.org/research/projects/guidelines-optimizing-nutrient-removal-plant-performance)

- The WRF 4973 Nutrient Optimization project provides a structure and framework for optimization that distinguishes between optimizing an existing secondary treatment plant, or an existing nutrient removal facility. As part of that framework, basic themes are characterized to further organize optimization planning.

Water Research Foundation (WRF NUTR5R14g) Nutrient Removal Challenge Synthesis Report

(Water Research Foundation. 2019. "Nutrient Removal Challenge Synthesis Report." WRF NUTR5R14g/4827g.)

- This report is the culmination of more than a decade of wastewater nutrient removal research work by the Water Research Foundation, including publications by more than 30 Principal Investigators, and hundreds of collaborators from consulting firms, universities, and regulatory agencies. This synthesis report provides a concise summary of the most important aspects of state-of-the-art research conducted on nitrogen and phosphorus removal.

Bay Area Clean Water Agencies Nutrient Reduction Study. 2018. "Potential Nutrient Reduction by Treatment Optimization, Sidestream Treatment, Treatment Upgrades, and Other Means. (https://bacwa.org/wp-content/uploads/2018/06/BACWA_Final_Nutrient_Reduction_Report.pdf)

- This report provides a recent example of a nutrient reduction study for a west coast estuary that was prepared to evaluate potential nutrient discharge reduction by treatment optimization, sidestream treatment, and by treatment upgrades or other means. The purpose was to support the effort to track and evaluate treatment plant performance, fund nutrient monitoring programs, support load response modeling, and conduct studies to better understand treatment plant optimization opportunities and upgrade needs to achieve nutrient removal.

Water Environment Federation (WEF) Manual of Practice 34. "Nutrient Removal, WEF MOP 34." New York: McGraw Hill Professional."

- Reference Chapter 3 Overview of Nutrient Removal Processes for a framework of various technologies and processes for nutrient removal and potential pathways for converting from secondary treatment to nutrient removal.

EPA Nutrient Control Design Manual – State of Technology Review Report. (https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=203844)

- This document presents findings from an extensive review of nitrogen and phosphorus control technologies and techniques currently applied and emerging at municipal wastewater treatment plants (WWTP). It includes information on the importance of nutrient removal, the properties and analytical techniques for nitrogen and phosphorus species, and the principles behind biological nitrogen and phosphorus removal and chemical phosphorus precipitation.

Draft permit Section S11. specifies that "…planning level evaluation must also include estimates for nutrient load reductions from changes…" However, that will not be possible without more robust monitoring data collected in accordance with a QAPP for monitoring designed to inform the requirement for quantifying and tracking changes in nitrogen loadings. The permit requirements should be modified to call for the preparation of a QAPP for monitoring and the timeframe allowed for that activity should be based upon the development of the QAPP. Therefore, the appropriate permit requirement would be to develop and implement a QAPP for nitrogen monitoring within 12 months of the permit effective date, not the optimization plan. The optimization planning process should be sustained through the period of the permit.

The appropriate permitting requirement for optimization planning should be based upon scoping the optimization process within 12 months of the permit effective date, to produce a multi-year framework for optimization studies consistent with the wastewater industry guidance cited above. The scoping process should consider the site specific circumstances associated with the existing treatment facilities and the unique characteristics of the service area, wastewater sources, solids processing, physical plant space requirements, growth in flows and loadings, compliance with other regulatory requirements, etc.