

Date: 5/7/2024

Prepared by: Michael Falk, PhD, PE

Reviewed by: Dave Clark, PE

Project: BACWA

SUBJECT: ESCALATED COSTS FOR THE 3RD NUTRIENT WATERSHED PERMIT

Introduction

As part of the 1st Regional Nutrient Watershed Permit (R2-2014-0014) requirements, construction, operational and maintenance (O&M), and total present value costs were developed for reducing nutrient discharge loads at 37 publicly owned treatment works (POTWs) across the Bay (HDR, 2018). The costs were focused on optimization through upgrades to meet various nutrient targets at each POTW.

The nutrients of interest at the onset of the 2018 study were ammonia, total inorganic nitrogen (TIN; TIN = ammonia plus nitrite plus nitrate), and total phosphorus (TP). As the science on the Bay has advanced, the effort has shifted from focusing on all three nutrient groups to an emphasis on TIN. As such, the required facilities are not as substantial. The facility needs associated with the 2018 study were updated to reflect the focus towards TIN.

Since publishing the 2018 study, the costs associated with constructing and operating such treatment facilities have increased. The costs in 2018 dollars were escalated to 2023 dollars to reflect current dollars. Note: rather than escalate to 2024 dollars, the decision was made to keep in 2023 dollars to align with the costs developed as part of 2nd Regional Nutrient Watershed Permit (R2-2019-0007; HDR, 2023) requirements.

This brief memorandum is intended to summarize the results for escalating the results from the 2018 study to 2023 dollars.

Methods

As part of updating the facility needs to focus on reducing TIN loads, the study team removed all previously costed facilities that would have little or no impact on TIN load reduction (e.g., granular media filtration that was previously included for removing TP).

Upon updating the facility needs, the 2018 report construction dollars were updated accordingly. Note: the 2018 cost estimates were predicated on using the San Francisco Bay Engineering News Record (ENR) Construction Cost Index (CCI) value of 12,014.72 (January 2018). To escalate forward, the construction costs were based on the San Francisco Bay ENR CCI value of 15,595.35 (May 2023). To escalate the costs forward to 2023 dollars, the 2018 report values were multiplied by the ratio of the San Francisco Bay ENR CCI 2023 and 2018 values as follows:

$$\begin{aligned} & 2023 \text{ Construction Cost} \\ &= 2018 \text{ Construction Cost} \times \frac{\text{San Francisco Bay ENR CCI Index 2023 (15,595.35)}}{\text{San Francisco Bay ENR CCI Index 2018 (12,014.72)}} \end{aligned}$$

Note: the ratio of ENR CCI Indices for 2023 to 2018 is 1.298 (i.e., 15,595.35 ÷ 12,014.72).

As for escalating the operational and maintenance (O&M) costs forward, a similar approach that also relied on region specific indices was applied. The team relied on the Bay Area Consumer Price Index (CPI) as it includes energy, fuels, labor, etc specific to the Bay Area.

The 2018 Bay Area CPI value for 2018 was applied (value of 281.308 for February 2018). To escalate forward, the Bay Area CPI for 2023 was applied (value of 338.496 for April 2023). Note: the Bay Area CPI value is performed every even month so the escalation was based on February 2018 and April 2023 values. Such values were within one-month of those used for the construction cost estimates and thus deemed reasonable. To escalate the costs forward to 2023 dollars, the 2018 report values were multiplied by the ratio of the Bay Area CPI 2023 and 2018 values as follows:

$$\begin{aligned} &2023 \text{ Net Present Value O\&M Cost} \\ &= 2018 \text{ Net Present Value O\&M Cost} \times \frac{\text{Bay Area CPI 2023 (338.496)}}{\text{Bay Area CPI 2018 (281.308)}} \end{aligned}$$

Note: the ratio of Bay Area CPI Indices for 2023 to 2018 is 1.203 (i.e., $338.496 \div 281.308$).

Results

A summary of the costs in both 2018 and 2023 dollars for reducing TIN discharge loads during the dry season and year-round are provided in Tables 1 and 2, respectively. For both construction and O&M, the costs increased between 3 to 4 percent annually from 2018 to 2023.

Similar to the 2018 study, the total present values costs associated with implementing both optimization and sidestream is on the order of \$1 Bil. The total present values costs increase exponentially to values greater than \$10 Bil while implementing either Level 2 or 3 upgrade. The costs increase for year-round TIN load reduction as the new facilities would need to be sized to accommodate the larger loads associated with wet weather events.

References

HDR (2018) Nutrient Reduction Study: Potential Nutrient Reduction by Treatment Optimization, Sidestream Treatment, Treatment Upgrades, and Other Means. Prepared for the Bay Area Clean Water Agencies, Oakland, CA.

HDR (2023) Nutrient Reduction Study: Regional Evaluation of Potential Nutrient Discharge Reduction by Water Recycling. Prepared for the Bay Area Clean Water Agencies, Oakland, CA.

Table 1. Summary of Dry Season TIN Discharge Load Reduction and the Corresponding Cost Estimates in 2018 and 2023 Dollars

Treatment	TIN Discharge Load Reduction	Costs in 2018 \$			Costs in 2023 \$		
		Construction (2018 \$ Mil)	Present Value O&M (2018 \$ Mil)	Total Present Value (2018 \$ Mil)*	Construction (2023 \$ Mil)	Present Value O&M (2023 \$ Mil)	Total Present Value (2023 \$ Mil)*
Optimization	5%	88	71	159	114	85	200
Sidestream	19%	385	308	694	500	371	870
Level 2 (15 mg N/L)	54%	6,430	1,994	8,424	8,350	2,400	10,750
Level 3 (6 mg N/L)	67%	7,650	2,570	10,220	9,930	3,090	13,020

* The total present values might vary from the sum of the construction and present value O&M values due to rounding.

Table 2. Summary of Year-Round TIN Discharge Load Reduction and the Corresponding Cost Estimates in 2018 and 2023 Dollars

Treatment	TIN Discharge Load Reduction	Costs in 2018 \$			Costs in 2023 \$		
		Construction (2018 \$ Mil)	Present Value O&M (2018 \$ Mil)	Total Present Value (2018 \$ Mil)*	Construction (2023 \$ Mil)	Present Value O&M (2023 \$ Mil)	Total Present Value (2023 \$ Mil)*
Optimization	7%	94	79	174	122	96	220
Sidestream	19%	385	308	693	500	371	870
Level 2 (15 mg N/L)	57%	6,836	2,184	9,020	8,870	2,630	11,500
Level 3 (6 mg N/L)	82%	8,220	3,276	11,496	10,670	3,940	14,610

* The total present values might vary from the sum of the construction and present value O&M values due to rounding.