

MEMORANDUM

April 11, 2024

TO: Historical Memo

FM: Matt Macdonald

RE: Vashon Wastewater Treatment Plant – March 2024

The Vashon Wastewater Treatment Plant effluent met all water quality requirements in March 2024. Effluent Biochemical Oxygen Demand (BOD₅) averaged 2.0-mg/l and Total Suspended Solids (TSS) averaged 3.6-mg/l. BOD₅ and TSS removals were 99% and 98%, respectively. All required analytical testing was completed in March.

March 2024 had a below-average amount of rainfall with 3.12-inches of rainfall recorded at the nearby Judd Creek station and 2.36-inches of rainfall recorded at SeaTac Airport; the 30-year historical average for SeaTac Airport in March is 4.17-inches. Influent flow averaged 0.257 million gallons per day (MGD) in March 2024. The maximum daily flow of 0.411-MGD occurred on March 1 as a result of approximately two inches of rainfall on the last two days of February. Peak hourly flow on March 1 was 0.548-MGD during which the average turbidity was <5-NTU. Effluent temperature in March averaged 12.5°C, rising from 11.0°C to 13.9°C over the month.

The oxidation ditch was operated at an average solids retention time¹ of 25-days. The dissolved oxygen (DO) control set-point was 0.8-mg/L. Mixed liquor TSS averaged 5,300-mg/L, and ranged from 5,000-mg/L to 5,700-mg/L. The sludge volume index, which measures the mixed liquor's settling characteristics, averaged 160-mL/g. An estimated 5,300 dry pounds of waste activated sludge was hauled to South Plant for further treatment in March.

Both clarifiers were in service at the beginning of March. Clarifier 2 was taken out of service for repair on March 6 due to a failed sludge collector. It will remain in service for the dry season. The UV system operated with both units in auto.

On March 6 there was a period of approximately 2.5 hours where effluent flow leaving the plant was stopped and the UV disinfection system continued to operate. Due to the level of the UV effluent pipe, several inches of water remain in the UV system after the effluent flow stopped. The pH probe, located in the UV effluent box, remained submerged in the retained water that was being irradiated for the duration of the event. When plant effluent flow resumed and pushed the retained water past the pH probe, the measured pH dropped abruptly. To determine the cause of the apparent low pH, the event was replicated on March 11 with additional pH and temperature sampling with a portable pH probe. The

¹ This is not a true solids retention time but rather a metric that is proportional to the solids retention time (the inverse of the Food to Microorganism ratio). It is used for historical consistency.

additional sampling showed that the temperature of the retained water increased modestly, from an initial temperature of around 12°C to a peak of less than 15°C. According to the portable pH probe, the pH of the retained water did not change significantly. The installed probe showed both an inaccurate pH and temperature measurement when the temperature of the effluent increased suddenly, indicating an issue with probe's temperature compensation. For reporting purposes, data where the pH probe reading was unstable (approximately 15 minutes) was excluded from the DMR. As a corrective action, the installed pH probe is being replaced.

A set of samples was collected on March 5 and March 20 for nutrient analysis. Monthly total nitrogen (TN) removal was 93%, with an average effluent TIN concentration of 1.5-mg/L (<0.02-mg/L NH₃-N and 1.5-mg/L NO₂+NO₃ as N). The average daily effluent TIN load was 3.2-lbs/day as N, which results in 98-lbs of TIN as N discharged in March. The cumulative annual TIN loading is 272-lbs². Effluent total phosphorus (Total-P) was 0.7-mg/L. No soda ash was added to the ditch for pH adjustment.

² As a "Permittee with a small TIN load", the Vashon Wastewater Treatment Plant does not have a numeric "action level" for annual cumulative TIN load under the Puget Sound Nutrient General Permit.

Table 1. Summary of Monthly Flow & Rain

Monthly Total Flow Volume, MG	Monthly Average Flow, MGD	Minimum Daily Flow, MGD	Maximum Daily Flow, MGD	Total Rainfall, Inches
7.963	0.257	0.204	0.411	3.12

Table 2. Summary of Monthly Compliance/Exceptions

Biochemical Oxygen Demand 5-day			Total Suspended Solids			Fecal Coliform (CFU/100 mL)	
Permit mg/L	Actual mg/L	Rem %	Permit mg/L	Actual mg/L	Rem %	Permit	Actual
30	2.0	99	30	3.6	98	200	<1.0

Table 3. Summary of Weekly Compliance/Exceptions

	Biochemical Oxygen Demand (mg/L)		Total Suspended Solids (mg/L)		Fecal Coliforms (CFU/100 mL)	
	Permit	Actual	Permit	Actual	Permit	Actual
Week 1	45	1.8	45	3.8	400	<1
Week 2	45	1.7	45	3.0	400	<1
Week 3	45	1.9	45	3.0	400	<1
Week 4	45	2.3	45	4.5	400	<1

Table 4. Summary of Effluent Nitrogen

Average NH ₃ mg/L as N	Average NO ₂ +NO ₃ mg/L as N	Average TIN ³ mg/L as N	Average TKN mg/L as N	Monthly TIN lbs as N	Annual TIN lbs as N	Average Monthly Total N removal %
<0.02	1.5	1.5 ⁴	0.8	98	272	93%

³ TIN = Total Inorganic Nitrogen = NH₃ + NO₂+NO₃ (as N)

⁴ Due to rounding errors, the monthly average NH₃-N and NO₂+NO₃ as N don't always add up to the monthly average TIN.