MEMORANDUM

August 12, 2024

TO: Historical Memo

FM: Matt Macdonald

RE: Vashon Wastewater Treatment Plant – July 2024

The Vashon Wastewater Treatment Plant effluent met all water quality requirements in July 2024. Effluent Biochemical Oxygen Demand (BOD_5) averaged 4.4-mg/l and Total Suspended Solids (TSS) averaged 9.1-mg/l. BOD_5 and TSS removals were 99% and 98%, respectively. All required analytical testing was completed in July.

July 2024 had a below-average amount of rainfall with 0.16-inches of rainfall recorded at the nearby Judd Creek station and 0.16-inches of rainfall recorded at SeaTac Airport; the 30-year historical average for SeaTac Airport in July is 0.60-inches. Influent flow averaged 0.067 million gallons per day (MGD) in July 2024, making it the lowest monthly average flow since June 2014. The historically low flows roughly coincide with the repair of the influent level transmitter mounting bracket on June 3 and are being investigated to determine if there are additional issues with the influent flow measurement. The maximum daily flow of 0.073-MGD occurred on July 20. Peak hourly flow on July 20 was 0.098-MGD during which the average turbidity was approximately 9-NTU. Effluent temperature in July averaged 21.7°C.

The oxidation ditch was operated at an average solids retention time[1] of 31-days. The dissolved oxygen (DO) control set-point was 0.8-mg/L. Mixed liquor TSS averaged 4,300-mg/L, and ranged from 4,000-mg/L to 4,600-mg/L. The sludge volume index, which measures the mixed liquor's settling characteristics, fell rapidly in July from approximately 200-mL/g to 90-mL/g. An estimated 6,317 dry pounds of waste activated sludge was hauled to South Plant for further treatment in July.

Clarifier # 2 was in service in July. Two clarifiers are not needed during the dry season so one is removed from service for maintenance and energy savings. The UV system operated with both units in Auto.

A set of samples was collected on July 9 and July 17 for nutrient analysis. Monthly total nitrogen (TN) removal was 97%, with an average effluent TIN concentration of 0.4-mg/L (0.32-mg/L NH_3-N and 0.1-mg/L NO_2+NO_3 as N). The average daily effluent TIN load was 0.2-lbs/day as N, which results in 7-lbs of TIN as N discharged in July. The cumulative annual TIN loading is 532-lbs[2]. Effluent total phosphorus (Total-P) was 6.8-mg/L. 100 lbs soda ash was added to the ditch for pH adjustment.

[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.

[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.

The issue with effluent pH measurement dropping when plant flow is stopped continued in July. During dry weather when plant influent flow is low, batch wasting drops the level in the clarifier, which temporarily stops effluent flow and causes the effluent pH probe to read erroneously low.

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
2.070	0.067	0.054	0.071	0.16

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	4.4	99	30	9.1	98	200	E2.2

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	5.0	45	11.6	400	E1.3
Week 2	45	5.6	45	11.2	400	E4.1
Week 3	45	3.9	45	9.3	400	E4.2
Week 4	45	3.4	45	5.7	400	E3.5
Week 5	45	3.8	45	6.3	400	E0.6

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 %
0.32	0.1	0.4[4]	2.3	7	532	97%

[3] TIN = Total Inorganic Nitrogen = NH_3 + NO_2+NO_3 (as N)

[4] Due to rounding errors, the monthly average NH_3-N and NO_2+NO_3 as N don't always add up to the monthly average TIN.