MEMORANDUM

November 13, 2023

TO: Historical Memo

FM: Matt Macdonald

RE: Vashon Wastewater Treatment Plant – October 2023

The Vashon Wastewater Treatment Plant effluent met all water quality requirements in October 2023. Effluent Biochemical Oxygen Demand (BOD_5) averaged 3.8-mg/l and Total Suspended Solids (TSS) averaged 4.7-mg/l. BOD_5 and TSS removals were 99% and 99%, respectively. All required analytical testing was completed in October.

October 2023 had less rainfall than the historical average with 3.47-inches of rainfall recorded at the nearby Judd Creek station and 2.89-inches of rainfall recorded at SeaTac Airport; the 30-year historical average for SeaTac Airport in October is 3.91-inches. Influent flow averaged 0.143 million gallons per day (MGD) in October 2023. The maximum daily flow of 0.202-MGD occurred on October 24 in response to 0.65-inches of rain. Peak hourly flow on October 24 was 0.336-MGD during which the average turbidity was <6-NTU. Effluent temperature in October declined from 18.4℃ to 17.1℃.

The oxidation ditch was operated at an average solids retention time[1] of 14-days. The dissolved oxygen (DO) control set-point was 1.0-mg/L until October 10 when it was lowered to 0.8-mg/L to improve denitrification. Mixed liquor TSS averaged 3,700-mg/L, and ranged from 3,500-mg/L to 3,900-mg/L. The sludge volume index, which measures the mixed liquor's settling characteristics, increased over the month from approximately 125-mL/g to approximately 170-mL/g. An estimated 2,100 dry pounds of waste activated sludge was hauled to South Plant for further treatment in October.

Clarifier #1 was in service for the duration of the month. 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 October 3, October 18 and October 31 for nutrient analysis. Monthly total nitrogen (TN) removal was 95%, with an average effluent TIN concentration of 1.3-mg/L (0.10-mg/L NH_3-N and 1.2-mg/L NO_2+NO_3 as N)[2]. The average daily effluent TIN load was 1.4-lbs/day as N, which results in 44-lbs of TIN as N discharged in October. The cumulative annual TIN loading is 405-lbs[3]. Effluent total

[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] Due to rounding errors, the monthly average NH_3-N and NO_2+NO_3 as N October not add up to the monthly average TIN.

[3] 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.

phosphorus (Total-P) was 3.1-mg/L, resulting in a Total-P removal of 65%. No soda ash was added to the ditch for pH adjustment.

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
4.442	0.143	0.119	0.202	3.47

Table 2. Summary of Monthly Compliance/Exceptions

Biochemical Oxygen Demand 5-day			Total Suspended Solids			Fecal Coliform (no./100 mL)	
Permit mg/L	Actual mg/L	Rem %	Permit mg/L	Actual mg/L	Rem %	Permit	Actual
30	3.8	99	30	4.7	99	200	E1.1

Table 3. Summary of Weekly Compliance/Exceptions

	Biochemical Oxygen Demand (mg/L)		Total Suspended Solids (mg/L)		Fecal Coliforms (Organisms/100 mL)	
	Permit	Actual	Permit	Actual	Permit	Actual
Week 1	45	3.2	45	3.4	400	<1
Week 2	45	4.4	45	5.8	400	<1
Week 3	45	4.2	45	4.8	400	E2.6
Week 4	45	3.4	45	4.7	400	E1.4

Table 4. Summary of Effluent Nitrogen

Average NH_3 mg/L as N	Average $NO_{2+}NO_3$ mg/L as N	Average TIN[4] 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 %
0.10	1.2	1.3[5]	1.9	44	405	95%

[4] TIN = Total Inorganic Nitrogen = NH3 + NO2+NO3 (as N)

[5] 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.