

Memorandum

October 15, 2018

TO: Historical Memo

FROM: Carol Nelson, Process Analyst
Karla Guevarra, Process Analyst

SUBJECT: Brightwater Treatment Plant
September 2018 Operating Record

All discharge permit requirements were met in September at the Brightwater Treatment Plant (BWTP). All wastewater received MBR secondary treatment. Effluent BOD and TSS averaged 3.7-mg/L and <2.0-mg/L, respectively, and removals were both $\geq 99\%$. All Fecal Coliform results were <1.0-cfu/100-mL. Effluent pH was maintained between 6.6 and 7.3. Continuous dosing of caustic soda (25% NaOH) was required to assure permit compliance for pH.

Effluent flow to Puget Sound averaged 15.3-MGD. Effluent flow plus reclaimed water (RW) flow averaged 15.4-MGD. Influent flow averaged 15.8-MGD. 0.2-MGD of the higher influent flow was due to effluent recycled to the influent pump station (IPS) and BWTP. Effluent was also used for the flushing and testing of Aeration Basin (AB) 1 and primary clarifiers, and for filling Digester 1. 0.3-mgd of influent was redirected to other treatment plants, primarily to facilitate repairs to AB-1 and Digester 1.

September rainfall totaled 4.3-inches (local rain gauges). Rainfall at SeaTac Airport totaled 1.05-inches, which is 0.45-inches below normal. Most rain in the Woodinville area fell between Sept. 11 and Sept. 17 and on Sept. 24. Local area temperatures were 1°F above normal this month. Wastewater temperatures decreased nearly 1°F in September (from 74°F to 73°F).

All permit-required samples were collected and reported. Influent TSS values from Sept. 15 and 26 were rejected as abnormally low, most likely caused by plugging in the influent sample system. Influent sample BOD results for Sept. 15 were rejected for the same reason. Membrane effluent BOD values were substituted for final effluent BOD values on Sept. 5, 7-10, 12-13. Normally, final effluent BOD is <50% of membrane effluent BOD because the final effluent sample is chlorinated – and the membrane effluent sample is not. However, from Sept. 5 to 13, final effluent BOD were higher than membrane effluent BOD, most likely due to over-depletion of oxygen in the BOD test. Additional dilutions were subsequently run on samples received after Sept. 15 to improve reliability. Effluent BOD values for membrane effluent and final effluent are routinely well below 30-mg/L, and usually below 10-mg/L.

Influent Pumping: The influent flow was limited to 18-MGD this month to facilitate taking AB-1 out of service at month's end, and for process adjustments needed during summer. Only one influent raw sewage pump (RSP) is required for this operating range. Influent storage was used to minimize fill and draw operation of the RSPs; the minimum flow for the RSPs is 12-MGD. Each large RSP is energized once per month. Flows were controlled using the North Creek Connector gate. The influent channels at Brightwater were degreased.

Primary Treatment: Three of five primary clarifiers (PC) were in service all month. On Sept. 13, PC-1 was taken out of service and PC-2 was put into service to remove grease from PC-1.

Solids return flows were directed to PC-1 before Sept. 13 and PC-2 after Sept. 13. Regular Primary Screen cleaning continued.

Secondary Treatment: Two of the three AB's were in service this month. The MLSS averaged about 6160-mg/L and ranged from 4,600 to 7,300 mg/L. The solids retention time (SRT) averaged 11.3-days. The MLSS and SRT were lower than normal in order to achieve the D.O. levels needed for full nitrification with 2 AB's. Surface wasting was the primary method to maintain the MLSS and SRT. A foaming event that started in August continued into the first week of September. Additional flushing water, aeration air cycling, and increased surface wasting were used to decrease the foam.

In September, AB-1 repairs were completed on the damaged concrete roof and two sections of diffuser piping. Additional AB-1 work included installation of a flap gate in the trench between the anoxic and aeration zones. The diffusers in AB-1 were tested during the last week of the month. AB-1 is scheduled to return to service in October. In addition to these repairs, work continued to repair failed Aeration Blowers and capacitors.

Total-N removal averaged 37%. Full nitrification was achieved most of the month; effluent $\text{NH}_3\text{-N}$ averaged <2.5 mg/L for the month. However, during the first two weeks of the month, effluent ammonia ($\text{NH}_3\text{-N}$) was occasionally >10-mg/L because of low D.O.'s. D.O. levels increased significantly after Sept. 16 when the MLSS dropped below 6000 mg/L. Denitrification was incomplete; effluent nitrite/nitrate ($\text{NO}_2\text{+NO}_3$) averaged 34.7-mg/L as N. Influent TKN averaged 62.2-mg/L. Draining and dewatering the contents of Digester 1 (via the storage tank) contributed to the ammonia load in the secondary influent.

Continuous dosing of caustic soda to the secondary process was required to ensure minimum effluent pH permit conditions were met, and to achieve complete nitrification. The dose averaged 3846-gpd of 25% NaOH solution, or 243 gallons/MG of influent. This caustic dose, which was nearly the same as August's, is lower than most other times of the year because of less than full nitrification during the entire day. Also, denitrification tends to improve in September, helping to further lower the caustic dose.

Membrane effluent turbidity averaged 0.03 - 0.08 NTU. Membrane Trains 1-7 were primarily in "backpulse" mode and 10s-on/30s-off air scour. Train 8 was operated in relax mode and 10s-on/10s-off air scour because of previous damage to its cassettes. All of Train 8's cassettes are now in service. Approximately 4230-gallons of 12.5% sodium hypochlorite (NaOCl) were used for maintenance cleans.

Membrane capacity was between 28 and 40 MGD this month. Filtering capacity declined noticeably during the month's second half. The drop in filtering capacity is likely associated with operating only two AB's while the biosolids dewatering rate was higher than normal to drain Digester-1. Thus, filterability should improve once AB-1 returns to service and biosolids dewatering rates return to normal. The maximum average flux during the peak flow tests was between 11.8 and 16.7-gfd per ft^2 of membrane surface in September.

Testing of two higher-density cassettes in Train 7 continued this month, (Higher-density modules and LEAP aeration have the potential for reducing membrane energy use while increasing capacity.) Performance of the higher-density cassettes tracked well with the other trains though with more fouling during production cycles - as would be expected. Maintenance cleans for Train 7 were performed three times a week to prevent fouling during the higher flows required for the testing.

The table below shows changes in trans-membrane pressure (TMP), membrane permeability, and MCRT over the month. The rated instantaneous peak hourly flow for one membrane train is 4950-gpm. Peak flow tests were run on two trains per day. Flow setpoints for the peak flow tests were adjusted down on Sept 12-14, 24 and 27 as the trains reached TMP control during the test. The initial flow for the peak tests varied between 4750-gpm and 3500-gpm this month.

Parameter	9/3	9/10	9/17	9/24
TMP before backpulse, average psi	0.5	0.5	0.6	0.7
TMP before backpulse, peak flow test, psi	-5.5	-6.2	-7.8	-7.4
Permeability temperature-corrected ¹ , gfd/psi	2.9	2.7	1.7	1.8
Flow target for peak flow test, gpm	4750	4750	4250	3970
Flow hourly average during peak flow test, gpm	3760	3710	3245	3075
MB Effluent temperature, degrees F	72.1	72.1	71.9	71.4
MCRT, days	13.6	12.4	9.0	11.2
MLSS, mg/L	6700	6710	6270	5870

1 Temperature-corrected Permeability based on Peak Flow Test.

2 TMPs were at 0.3– 0.8 psi during the minimum flow period of the day

Odor Control: The Odor Control facilities performed well this month. The performance or bio-activity of the Headworks and Solids area bioscrubbers continued to improve with the rise in air and effluent temperatures. Maintenance on the chemical pumps and piping for the chemical scrubbers continued this month.

Disinfection: Approximately 7,500 gallons of 12.5% NaOCl were used in September for final effluent disinfection, reclaimed water disinfection, and process water at IPS. Hypochlorite effluent disinfection was equal to an average dose of 2.2-mg/L as Cl₂. Hypochlorite was applied through the diffuser. Effluent Cl₂ residual at the outfall (aka Point Wells) met both the monthly and max-weekly permit limits. The monthly average and maximum weekly residuals were <0.06-mg/L Cl₂ and 0.07-mg/L Cl₂, respectively.

Thickening: All three gravity belt thickeners (GBTs) were rotated in service this month. The GBTs thickened feed sludge from an average of 1.54% total solids (TS) to 6.1% TS, with an average solids capture of 92.3%. Thickened sludge production totaled 755 dry tons. The polymer dose for thickening averaged 7.5 pounds active polymer per dry tons solids processed in September.

Anaerobic Digestion: The digestion process met time and temperature requirements for Class B biosolids production. Digesters 2 and 3 and the blended storage tank were in service in September. Digester 1 was taken out of service for repair. In the active digesters, the solids retention time averaged 23.8 days, temperature averaged 97°F, and volatile solids (VS) destruction averaged 61.2%. The total solids concentration in the active digesters averaged 2.96%, with a volatile solids (VS) fraction of 82.8% VS/TS. The average digester VS load increased to 0.15 lbs-VS/cu-ft./d with two digesters in service. Monthly gas production is estimated to be 13.6 million ft³ (based on biosolids haul data and an estimated 426 tons of VS destroyed).

Dewatering/Biosolids: A total of 1766 wet tons (351 dry tons at 19.9% TS) of biosolids were produced and 1860 wet tons (370 dry tons) were hauled. Taking Digester 1 out of service contributed approximately 88 dry tons. Solids recovery in the dewatering process averaged 92.8%. Polymer dosage averaged 58.4 lbs-active per dry ton processed. Dewatering operated 30 days in September using both centrifuges (No. 1 and No.3). Centrifuge feed TS averaged

2.57% and VS averaged 81.6% VS/TS. Centrifuge cake averaged 19.9% TS at 83.5% VS/TS for centrifuge 1 and 20.0% TS at 83.5% VS/TS for centrifuge 3.