

# Memorandum

March 15, 2019

TO: Historical Memo

FROM: Carol Nelson, Process Analyst  
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SUBJECT: Brightwater Treatment Plant  
February 2019 Operating Record

All discharge permit requirements were met in February at the Brightwater Treatment Plant (BWTP). All wastewater received MBR secondary treatment. Effluent BOD and TSS averaged <1.0-mg/L and <2.0-mg/L, respectively, and removals were both  $\geq 99\%$ . All Fecal Coliform results were 0-cfu/100-mL. Effluent pH was maintained between 6.5 and 7.0. Continuous dosing of 25% caustic soda (NaOH) was required to assure permit compliance for pH.

Effluent flow to Puget Sound averaged 17.0-MGD. Influent flow averaged 17.2-MGD. Less than 0.2-MGD effluent was recycled to the influent pump station (IPS) or North Creek Pump Station. 3.5-MGD influent was redirected to South Plant to accommodate constraints on the operating range of the raw sewage pumps (RSPs) and accommodate the decline in membrane capacity. No influent flow was directed to West Point this month.

February weather was unusually cold and snowy. Local rain gauges recorded 3.3-inches total precipitation. Precipitation recorded for SeaTac Airport totaled 4.6-inches, which is 1.1-inches above normal. Total snowfall reported at Seatac was 20.1 inches; snowfall in Woodinville was notably more. Most precipitation in the Woodinville area fell on Feb. 1 and Feb. 12-16. Local area temperatures were 8°F below normal this month. As a result of the cold weather, wastewater effluent temperatures dropped from 61.8°F to 58°F.

All permit-required samples were collected and analyzed. Fecal coliform results for Feb, 27 were rejected because of a non-zero count on the blank.

**Influent Pumping:** One influent RSP was operated for most flows this month; one RSP has a capacity of 19-21 mgd. Two RSPs were rarely operated because of the RSP's increased minimum speeds and the membrane capacity. The membrane capacity would have needed to be at least 26-29 mgd to run two RSPs. Instead, the membrane capacity varied from 21 to 25 mgd this month. Flows to BWTP were controlled using the North Creek Connector gate and the Hollywood Diversion gate. Flows through Hollywood were capped at 7.5-mgd this month, with excess flow going directly to the York Pump Station.

**Primary Treatment:** Three of five primary clarifiers (PC) were in service all month. Solids return flows were directed to PC-2 this month. Regular cleaning of the primary screens continued. All primary effluent was processed through Secondary Treatment.

**Secondary Treatment:** Three aeration basins (AB's) were in service this month. The MLSS averaged 8940-mg/L and ranged from 8,500 to 9,530 mg/L. The solids retention time (SRT) averaged 35-days, with much less variation than in January. Cooler wastewater and the current aeration capacity allowed the AB's DO setpoints to be easily achieved and maintained. With the

ability to maintain DO concentrations, the MLSS and SRT increased to improve mixed liquor filterability. Surface wasting was the primary method to maintain the MLSS and SRT.

Total-N removal averaged 23%. Full nitrification was achieved throughout the month. Effluent NH<sub>3</sub>-N averaged <0.1 mg/L for the month. Denitrification was incomplete; effluent nitrite/nitrate (NO<sub>2</sub>+NO<sub>3</sub>) averaged 37.1-mg/L as N. Influent TKN averaged 50-mg/L, which is typical for a Brightwater wet weather influent.

Caustic soda was continually dosed to the secondary process to ensure minimum effluent pH limits were met, and to achieve complete nitrification. The dose averaged 4539-gpd of 25% NaOH solution or 267 gallons/MG of influent, slightly higher than the dose applied in January. The aeration optimization project should reduce the caustic dose by diminishing the nitrogen load to secondary process and/or improving denitrification in the secondary process.

Membrane effluent turbidity averaged 0.04-0.08 NTU. Membrane Trains 1-7 were primarily in “backpulse” mode. Train 8 operated in relax mode, with a backpulse after every second or third production cycle. Air scour was usually 10s-on/10s-off because of poor filterability. 7 of 20 cassettes in Train 8 were out of service early in February for repairs (based on the high turbidity and bubble test results); 3 cassettes were repaired this month. Approximately 5474-gallons of 12.5% sodium hypochlorite (NaOCl) were used for maintenance cleans. The recovery clean performed on Train 1 on Feb. 1 required an additional 685-gallons of sodium hypochlorite.

In February, service reps from Suez (the membrane vendor) were on-site. They adjusted the back-pulse programming to avoid missed cycles and improve bypass-valve timing. In addition, plans were discussed to 1) upgrade to the LEAP scour aeration mode this summer, 2) finish replacing membrane train backpulse valves and actuators, and 3) install a permanent air bleed system; air accumulation occurs in the membrane effluent header.

Membrane capacity declined from 24-mgd to 21-mgd during the first half of the month. The decline may be related to the colder wastewater temperature. During the last week, membrane capacity improved to over 25-mgd, possibly the result of a longer SRT and thus, a higher (and stable) MLSS concentration. The soluble COD of the mixed liquor and solids return continued to correlate well with filterability. The maximum hourly flux during peak flow tests was between 8 and 12.0-gpd per ft<sup>2</sup> of membrane surface this month.

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 upwards or downwards depending on the “before-BP” TMP. The initial flow for the peak tests was 3500-gpm this month.

<b>Parameter</b>	<b>2/4</b>	<b>2/11</b>	<b>2/18</b>	<b>2/25</b>
TMP before backpulse, average psi <sup>2</sup>	-4.3	-6.6	-8.0	-7.3
TMP before backpulse, peak flow test, psi	-8.5	-8.6	-8.6	-8.5
Permeability temperature-corrected <sup>1</sup> , gfd/psi	1.4	1.3	1.3	1.4
Flow target for peak flow test, gpm	3500	3500	3500	3500
Flow hourly average during peak flow test, gpm	2440	2265	2155	2310
MB Effluent temperature, degrees F	61.0	59.9	58.2	57.6
SRT, days	53	35	36	31
MLSS, mg/L	9270	9200	9080	8830

1 Temperature-corrected Permeability based on Peak Flow Test.

2 TMPs during the moderate flow period of the day

**Odor Control:** The Odor Control (OC) facilities performed well this month. Repairs to the chemical supply systems continued. There were some cold weather issues related to high or low differential pressure. One of the 3 OC trains for the aeration and membrane facilities was occasionally shut down (4 hours per day per four days a week) to participate in an energy peak shaving program. There were no adverse impact to odor control as a result of this activity.

**Disinfection:** Approximately 18,410 gallons of 12.5% NaOCl were used in February for final effluent disinfection, reclaimed water, and process water at IPS. Hypochlorite effluent disinfection was equal to an average dose of 5.5-mg/L as Cl<sub>2</sub>. Hypochlorite was applied through the diffuser. Effluent Cl<sub>2</sub> residual at the outfall (aka Point Wells) met both the monthly and max-weekly permit limits. The monthly average and maximum weekly residuals were 0.23-mg/L and 0.25-mg/L Cl<sub>2</sub>, respectively.

**Thickening:** All three gravity belt thickeners (GBTs) were rotated in service this month. The GBTs thickened feed sludge from an average of 1.4% total solids (TS) to 6.1% TS, with an average solids capture of 93.1%. Thickened sludge production totaled 560 dry tons. The polymer dose for thickening averaged 8.7 pounds active polymer per dry tons solids processed.

**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 February. In the active digesters, the solids retention time averaged 27 days, temperature averaged 99°F, and volatile solids (VS) destruction averaged 63.9%. The total solids concentration in the active digesters averaged 2.5%, with a VS fraction of 80.6% VS/TS. The average digester VS load was 0.13 lbs-VS/cu-ft./d with two digesters in service. Monthly gas production is estimated to be 10.8 million ft<sup>3</sup> (based on flow meters and VS destruction). Digester 1 remains out of service for mixer repairs.

**Dewatering/Biosolids:** 818 wet tons (179 dry tons at 21.9% TS) of biosolids were produced and 864 wet tons (189 dry tons) were hauled in February. Solids recovery in the dewatering process averaged 94.1%. Polymer dosage averaged 49.5 lbs-active per dry ton processed. Dewatering operated 27 days in February using both centrifuges (No. 1 and No.3). Centrifuge feed averaged 2.4% TS at 79.6% VS/TS. Biosolids product averaged 22.2% TS at 81.4% VS/TS for centrifuge 1 and 21.5% TS at 82.4% VS/TS for centrifuge 3.