



Chapleau Sewage Treatment Lagoon

Annual Performance Report

Prepared by Ontario Clean Water Agency, Northeastern Ontario Hub
January 1, 2019 to December 31, 2019



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ANNUAL SEWAGE PERFORMANCE REPORT

Reporting Period	January 1, 2019 to December 31, 2019
Sewage System Name	Chapleau Sewage Treatment Lagoon
Sewage System Address	300 Strathcona Street, Chapleau, ON P0M 1K0
Sewage System Owner	Corporation of the Township of Chapleau
Sewage System Number	110002149
Environmental Compliance Approval No.	6830-5SQK4C, issued October 30, 2003

FACILITY DESCRIPTION

Capacity of Works	4550 m ³ /day
Service Area	Township of Chapleau, District of Sudbury
Service Population	2300
Effluent Receiver	Nebskwashi River
Major Process	Two Cell Aerated Lagoon

The Chapleau sewage treatment lagoon consists of a grit removal channel where heavier inorganic wastes are settled and manually removed before entering a two cell aerated lagoon. There are two blowers supplying air to a fine bubble tubular aeration system with separate distribution grids located in each cell. Cell 1 is 96 m x 72 m and Cell 2 is 112 m x 65 m, with a combined storage capacity of approximately 28,000 m³/day. The lagoons service the Township of Chapleau and are continuously discharged into the Nebskwashi River. The system is designed to operate at a rated capacity of 4550 m³/day.

The sewage effluent is disinfected on a seasonal basis from May 1 to October 31 with gaseous chlorine. An open channel flow meter to measure the treated chlorinated effluent is located in the chlorine contact chamber.

1.0 MONITORING DATA

1.1 Monitoring Program as Outlined in the Environmental Compliance Approval

BOD ₅ = Five-day biochemical oxygen demand measured in an unfiltered sample
<i>E. coli</i> = <i>Escherichia coli</i>
TSS = Total Suspended Solids
TP = Total Phosphorus
TKN = Total Kjeldahl Nitrogen
TCR = Total Chlorine Residual

1.1.1 Raw Sewage (Influent)

Parameter	Type of Sample	Minimum Frequency
BOD ₅	composite*	monthly
Total Suspended Solids	composite*	monthly
Total Phosphorous	composite*	monthly
TKN	composite*	monthly

*Historically grab samples have been taken, for both influent and effluent testing, as the system is not equipped with a 24hr automatic sampler and therefore not capable of collecting a composite sample as required by the ECA.

1.1.2 Final Effluent

Parameter	Type of Sample	Minimum Frequency
BOD ₅	composite	monthly
Total Suspended Solids	composite	monthly
Total Phosphorous	composite	monthly
<i>E. coli</i>	grab	monthly
pH	grab	weekly
Temperature	grab	weekly

Note: *E. coli* samples are collected May 1 to October 31.

1.2 Data

1.2.1 Influent Flow Data

Month	Average Flow (m ³ /day)	Maximum Flow (m ³ /day)	Total Volume (m ³)
January	2,161	2,835	66,991
February	2,390	2,824	66,928
March	2,637	3,186	81,735
April	4,597	8,569	137,910
May	5,262	6,576	163,110
June	3,518	5,129	105,547
July	2,211	3,239	68,542
August	1,817	2,024	56,315
September	2,432	2,750	72,945
October	2,505	2,694	77,656
November	2,448	2,752	73,445



Month	Average Flow (m ³ /day)	Maximum Flow (m ³ /day)	Total Volume (m ³)
December	1,238	2,444	38,389

1.2.2 Summary of Influent Flow

	Flow (m ³ /day)	Rated Capacity (m ³ /day)	% Capacity	Exceedance
Average	2,768	4,550	61	No
Maximum	8,569	-	-	-

1.2.3 Raw Sewage (Influent)

Parameter (mg/L)	Average	Maximum
Total Phosphorous	2.05	4.54
TKN	16	46.7
BOD ₅	126	300
Total Suspended Solids	195	496

1.2.4 Effluent

Parameter (mg/L)	Annual Average	Range of Results (min – max)	Compliance Limit
Total Phosphorous	0.404	0.151 – 0.759	N/A
BOD ₅	14.8	4.76 – 24.4	Limit - annual average 30 Objective - maximum 25
Total Suspended Solids	17	6.0 – 25	Limit - annual average 40 Objective - maximum 30
<i>E. coli</i> (cfu/100 mL)	19	<5 – 665	monthly geometric mean 200
pH (units)	6.96	6.11 – 7.90	6.0 – 9.5
Temperature (°C)	11.8	1.2 – 24.1	N/A

Note: *E. coli* results are from the disinfection period (May 1 – October 31).
Monthly geometric mean (MGM) is used rather than an arithmetic mean

1.3 Sewage Treatment Program Success and Adequacy

The Performance Summary details results and efficiency of the plant's performance demonstrating pollutant removal rates from raw sewage concentrations through to final effluent for BOD₅, suspended solids and total phosphorus.

1.3.1 Performance Summary

Parameter (mg/L)	Influent	Effluent	% Removal
Total Phosphorous	2.05	0.404	80.3
BOD ₅	126	14.8	88.2
Total Suspended Solids	195	16.7	91.4

Note: calculations are based on the annual averages

1.4 Interpretation of Monitoring and Analytical Data

The Chapleau sewage treatment lagoon operated within its required capacity. Table 1.2.1 *Influent Flow Data* summarizes the flow data for 2019. The average and maximum daily flows are presented for each month. The Environmental Compliance Approval outlines that the owner shall use best effort to operate the works within the rated capacity of 4550 m³/day. Average flows from the plant were measured at 2,768 m³/day, which represents approximately 61 % of the total design capacity of the system.

The effluent quality is based on the biochemical oxygen demand, total suspended solids, *E. coli* and pH levels. The annual averages for all parameters are listed in table 1.2.4 *Effluent*.

Biological Oxygen Demand (BOD₅) is the amount of oxygen used by micro-organisms as they decompose organic matter in the effluent sample for five days. High BOD₅ in effluent means a large quantity of oxygen was needed to break down the organic matter and identifies a large amount of organic matter in the effluent indicating inadequate treatment.

In 2019, the average BOD₅ of 14.8 mg/L complied with the limit of 30 mg/L and the maximum result of 24.4 mg/L was well below the effluent objective of 25 mg/L.

Total Suspended Solids (TSS) in effluent are composed of settleable solids and non-settleable solids depending on the size, shape and weight of the solid particles. Settable solids are large sized particles that tend to settle more rapidly in a given period of time. In 2019, the average TSS of 17 mg/L complied with the limit of 40 mg/L. The effluent objective of 30 mg/L was not exceeded as the maximum result was 25 mg/L.

Escherichia coli (*E. coli*) is a common bacterium that lives in human and animal intestines, where it is present in large numbers. There are hundreds of *E. coli* strains and most are relatively harmless, however a notorious exception is *E. coli* strain 0157:H7, an emerging pathogen that produces a powerful toxin and can cause severe illness. *E. coli* is used as the most widely adopted indicator of faecal pollution in water and wastewater. The compliance limit for *E. coli* is a monthly geometric mean limit of 200 cfu/100 mL during the disinfection period (May 1-October 31). In 2019, the *E. coli* monthly geometric mean was not exceeded.

The pH of a solution is an indication of its acidic and basic properties and measured on a scale ranging between 0 and 14. Very high or very low pH levels can be corrosive to pipes, screening equipment and pumps, can damage biological processes and form undesirable toxic gases or heavy metals. The ECA outlines the compliance criteria for effluent pH to be maintained within the limits of 6.0 and 9.5, inclusive, at all times. In 2019, the pH ranged from 6.11 – 7.90.

Refer to Appendix A for the Monthly Process Data Report, which summarizes the monitoring and sampling analysis conducted at the facility.

2.0 OPERATING PROBLEMS AND CORRECTIVE ACTIONS

There were no significant operating problems or corrective actions during the reporting period. Preventative maintenance was performed on a regular basis to help identify problems before they occur.

3.0 MAINTENANCE PROCEDURES PERFORMED ON THE WORKS

Routine maintenance is done as per OCWA's Work Management System software program. This is a comprehensive maintenance program that is based on a pro-active, preventive approach. This program includes but not limited to running checks weekly, monthly, and annually as required or as recommended by manufacturer's instructions.

Major maintenance and upgrades that took place during 2019 include:

- Installation of a new flow meter
- Pumping stations and grit channel clean out
- Dufferin generator breaker replacement: station repair; new pump
- A new portable pH/dissolved oxygen meter
- Lifting device inspection for all sites
- Lagoon de-chlorination assessment

4.0 EFFLUENT QUALITY ASSURANCE AND CONTROL MEASURES UNDERTAKEN

The facilities mechanical elements are in good repair. Each member of the operational staff possesses a high level of process knowledge and regulatory competence.

Samples are collected as required and analyzed by Testmark Laboratories Limited located in Kirkland Lake, Ontario. Licensed operators conduct in-house tests for monitoring purposes using Standard Methods of Water and Wastewater procedures.

Any bypass or upset events that occur are tested, monitored and reported to the Spills Action Center (SAC).

5.0 CALIBRATION AND MAINTENANCE OF ALL MONITORING EQUIPMENT

The flow-monitoring program, maintained in the Work Management System (WMS) incorporates a calibration of all monitoring devices once a year. This helps ensure their accuracy within plus or minus 15 % of actual rate of flow.

All monitoring equipment is calibrated based on the manufacturer's recommendations and conducted by a qualified Instrumentation Technician. Refer to Table 5.1 for a summary of calibrations conducted in 2019.

5.1 Calibration Summary

Date	Instrument	% Accuracy
November 2019	Influent/Effluent Flow Meter	New installation
November 27, 2019	pH meter	98.5
November 27, 2019	Pocket colorimeter	95.8

6.0 SLUDGE SUMMARY

Sludge was not removed from the lagoon in 2019.

7.0 COMPLAINTS

No complaints were received during the reporting period.

8.0 BYPASS, SPILL, AND ABNORMAL DISCHARGE EVENTS

There were no bypasses, spills nor abnormal discharge events for 2019.

APPENDIX A: MONTHLY PROCESS DATA

Raw Sewage	29-Jan-19	20-Feb-19	13-Mar-19	10-Apr-19	7-May-19	4-Jun-19	3-Jul-19	7-Aug-19	10-Sep-19	22-Oct-19	20-Nov-19	10-Dec-19
Total Phosphorus (mg/L)	4.22	3.33	1.15	1.7	1.11	1.46	1.65	4.54	1.29	1.45	1.61	1.1
TKN (mg/L)	18.0	17.1	14.0	13.4	6.7	10.4	7.9	10.7	8.4	46.7	22.4	12.0
BOD5 (mg/L)	190	259	76.5	115	63.1	45.6	50.1	190	75	300	97	50
Suspended Solids (mg/L)	256	440	68	138	114	82	90	348	115	496	142	52

Effluent	29-Jan-19	20-Feb-19	13-Mar-19	10-Apr-19	7-May-19	4-Jun-19	3-Jul-19	7-Aug-19	10-Sep-19	22-Oct-19	20-Nov-19	10-Dec-19	
Total Phosphorus (mg/L)	0.553	0.616	0.533	0.449	0.759	0.165	0.151	0.278	0.331	0.266	0.329	0.423	
BOD5 (mg/L)	15	24.4	20.5	14.4	11	4.76	11.9	21	17	12	15	11	
cBOD5 (mg/L)	14	21.2	16.1	14.2	10.5	5.1	8.37	16	14	7.5	13	12	
Suspended Solids (mg/L)	19	24.5	19.5	16.0	11.5	6	10	18	24	25	15.5	11.5	
<i>E. coli</i> (cfu/100 mL)	Only required May 1 to Oct 31				88	< 5	125	< 5	< 39	< 5	Monthly Geo Mean - 200		
pH	(6.0) Min	6.78	6.69	6.71	6.83	7.04	7.13	6.50	6.11	6.49	6.35	6.12	6.50
	(9.5) Max	7.28	7.42	7.61	7.29	7.42	7.52	7.36	7.9	7.66	7.56	6.77	7.44
Temperature (C)	January	February	March	April	May	June	July	August	September	October	November	December	
	Min	1.3	1.1	0.2	3.9	6.8	13.2	20.8	17.7	14.3	7.5	1.2	2.6
	Max	4.1	6.6	5.8	8.9	15.4	23.8	24.1	23.6	18.3	14.3	6.4	6.9
Total Chlorine Res. (mg/L)	January	February	March	April	May	June	July	August	September	October	November	December	
	Min					0.1	1.35	2.06	1.78	1.06	1.06		
	Max					3.28	2.5	3.92	3.20	4.06	4.06		