



Lake Simcoe Water Pollution Control Plant 2025 Annual Performance Report





The Regional Municipality of Durham

Lake Simcoe Water Pollution Control Plant 2025 Annual Performance Report

Environmental Compliance Approval (ECA):7423-CJT8GQ

Dated March 7, 2024

Environmental Compliance Approval (Air): 8-3041-95-006

Dated February 5, 1996

The Lake Simcoe Water Pollution Control Plant (WPCP) 2025 Annual Performance Report provides staff, stakeholders and customers an overview of the performance of the Lake Simcoe WPCP.

Further, this report fulfills the annual reporting requirements of the Ontario Ministry of Environment, Conservation and Parks (MECP). This report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

Water Pollution Control Plant Process Description

General

The Lake Simcoe WPCP located in the Community of Beaverton in the Township of Brock and is owned and operated by the Regional Municipality of Durham (Region). The plant is operated according to the terms and conditions of the ECA. This MECP Class 3 wastewater treatment plant utilizes an extended aeration process with tertiary treatment and is designed to treat wastewater at a rated capacity of 4,550 cubic metres per day (m³/d). The Lake Simcoe WPCP has a service population of approximately 4,956 residents.

Lake Simcoe WPCP treats wastewater from the Community of Beaverton service area utilizing the following processes:

- Raw influent pumping
- Preliminary treatment
- Phosphorus removal
- Secondary treatment
- Tertiary treatment
- Disinfection
- Solids management

Raw Influent Pumping

Wastewater is collected through approximately 27.2 kilometres of sanitary sewers in Beaverton and is conveyed to the WPCP by gravity and two sanitary sewage pumping stations (SSPS), Harbour Street and Cedar Beach located in the collection system. Flow from the two SSPS are combined in the raw sewage inlet channel.



Preliminary Treatment

Screening: There are two screen channels in the screen room for the removal of paper products and large material that could harm pumps and process equipment. One channel contains an automatic, mechanically cleaned bar screen and the other is equipped with a bar rack to provide screening on an emergency basis. Screenings are removed in this process and transported to landfill for disposal.

Grit Removal: The vortex grit tank removes sand and small stones (grit) for the protection of mechanical equipment from unnecessary wear and reduce formation of heavy deposits in pipelines, channels and process tanks. The vortex grit tank uses centrifugal force to separate the grit from the wastewater. Grit is collected in the lower portion of the grit tank and is pumped to a grit classifier for dewatering. The dewatered grit is conveyed to the grit/screenings bin for landfill disposal.

Phosphorus Removal

The phosphorus removal system lowers the total phosphorus level in the final effluent by adding a chemical coagulant (aluminum sulphate) as part of the treatment process. Aluminum sulphate is added into the aeration tank.

Secondary Treatment

Aeration Tanks: Preliminary effluent flow is directed to two aeration tanks. Surface mechanical aerators mix air into the wastewater to assist bacteria in removing dissolved and suspended organics and nutrients from the wastewater.

Secondary Clarifier: The effluent from the aeration tanks is directed to two secondary clarifiers where solids settle quickly as activated sludge leaving a clear effluent. A portion of the activated sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tanks and the excess activated sludge is wasted to the aerobic digester.

Tertiary Treatment

Tertiary Clarifier: The secondary effluent is directed to the tertiary clarifier. The helical flow pattern in the clarifier separates the solids from the liquid, the effluent flows over to the tertiary sand filter and the thickened sludge is pumped to the aerobic digester.

Tertiary Sand Filter: Effluent flow from the tertiary clarifier flows into an automatic cleaning sand filter. The automatic backwash is initiated by an increase in head pressure or a programmed timer. The backwash water is returned to the beginning of the plant for further treatment.

Disinfection

Ultraviolet (UV) Irradiation: The effluent flow from the sand filter is then directed to the UV channel for disinfection. The flow passes two banks of UV lamps connected in series before being discharged to Lake Simcoe through the 400mm diameter outfall extending 314 metres into Lake Simcoe.



Solids Management

Aerobic Digester: Activated sludge from the secondary clarifiers is pumped to an aerobic digester for stabilization. A mechanical mixer and a fixed header diffused aeration system provide oxygen for the microorganisms. The mixer and diffusers are turned off to allow solids to settle for removal and the supernatant to be decanted and flow by gravity to the raw sewage pumping station.

Sludge Management: Stabilized biosolids from the digester are transported to Duffin Creek WPCP for further treatment and incineration.

Environmental Compliance Approval (ECA)

Under Condition 11(4) of ECA #7423-CJT8GQ the Region must produce an annual performance report that must contain the following information:

a) A summary and interpretation of all influent and imported sewage monitoring data, and a review of the historical trend of the sewage characteristics and flow rates

The raw wastewater flowing into the plant is analyzed for its chemical and physical composition. Monitoring of the raw wastewater is performed in accordance with the conditions in the ECA. Table 2 and Figures 1-5 summarize the raw wastewater characteristics during the reporting period.

b) Summary and interpretation of all final effluent monitoring data, including concentration, flow rates, loading and a comparison to the design objectives and compliance limits in this Approval, including an overview of the success and adequacy of the works

The plant operated at 40.7% of its rated capacity and received a maximum daily flow of 6,973 cubic metres per day (m³/d) on April 5, 2025. Tables 3-5 provide a tabulation of effluent results.

- The minimum pH limit of 6.5 was exceeded in 1 of 255 samples (0.4%). Alkalinity is monitored twice per week to ensure there is enough buffering capacity to maintain pH within compliance.

c) A summary of all operating issues encountered and corrective actions taken

Higher final effluent total phosphorus results were observed mostly due to ongoing WPCP construction and a prolonged tertiary bypass. Aeration upgrades have led to one aeration tank out of commission. When upgrades are complete, the plant will be able to run both treatment trains and increase plant performance.

d) A summary of all normal and emergency repairs and maintenance activities carried out on any major structure, equipment, apparatus, or mechanism forming part of the Works

Major maintenance items in 2025 included:

- Dewatered aeration tank number 1 for construction



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- Repaired broken rake arm for secondary clarifier number 1

e) Summary of any effluent quality assurance or control measures undertaken

In-house lab test results are compared to the results of the Regional Environmental Laboratory on comparable samples to determine the in-house accuracy. On-line instrumentation is verified by WPCP operators using various field or laboratory test equipment.

f) Summary of the calibration and maintenance carried out on all influent, imported sewage, and final effluent monitoring equipment to ensure that the accuracy is within the tolerance of that equipment as required in this Approval or recommended by the manufacturer

Calibration of the effluent flow meter occurred on June 24, 2025.

Calibration of the laboratory equipment was conducted on November 25, 2025.

Calibration of the pH meter is conducted regularly.

g) A summary of efforts made to achieve the design objectives in this Approval, including an assessment of the issues and recommendations for pro-active actions if any are required under the following situations

a. when any of the design objectives is not achieved more than 50% of the time in a year, or there is an increasing trend in deterioration of Final Effluent quality

The Region continually strives to achieve the best effluent quality at all times and remain below the objectives specified in the ECA:

- The total phosphorus monthly objective of 0.12 mg/L was exceeded in 9 of 12 samples (75%). Total phosphorus results are monitored daily, and coagulant adjustments are made to the process as required. Construction has led to one aeration tank being out of commission for an extended amount of time. Plant performance should recover once construction upgrades are complete.
- The total suspended solids (TSS) objective of 5 mg/L was exceeded in 2 of 12 samples (16.7%). Total suspended solids results are monitored daily, and adjustments are made to the process as required.

b. when the Annual Average Daily Influent Flow reaches 80% of the Rated Capacity

- The annual average daily influent flow did not reach 80 percent of the rated capacity.

h) A tabulation of the volume of sludge generated in the reporting period, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed

The volume of sludge removed from Lake Simcoe WPCP in 2025 was 2,496 m³.

All sludge produced was transported to Duffin Creek WPCP for further treatment and incineration. Even with the increase in population on a year-to-year basis, no significant



changes to flows or processing are anticipated. Therefore, no significant changes in sludge generation are expected for the next year.

i) Summary of any complaints received and any steps taken to address the complaints

All complaints received are administered, investigated and documented using a central database. No complaints were received in 2025.

j) Summary of all Bypasses, Overflows, other situations outside Normal Operating Conditions and spills within the meaning of Part X of EPA and abnormal discharge events

A tertiary bypass occurred between March 16, 2025, and April 16, 2025 due to significant snowmelt. The volume bypassed was 145,279 cubic metres. Ministry of the Environment, Conservation and Parks (MECP) Incident Report # 1-J2H858.

k) a summary of all Notice of Modifications to Sewage Works completed under Paragraph 1.d. of Condition 10, including a report on status of implementation of all modification

No notice of modifications were submitted in 2025.

l) a summary of efforts made to achieve conformance with Procedure F-5-1 including but not limited to projects undertaken and completed in the sanitary sewer system that result in overall Bypass/Overflow elimination including expenditures and proposed projects to eliminate Bypass/Overflows with estimated budget forecast for the year following that for which the report is submitted.

Industrial Wastes

Durham Region's Sewer Use By-Law (55-2013) outlines concentration limits for discharge into land drainage works or the sanitary sewer system. Violations of the by-law can result in fines of up to \$100,000 for personal or corporate offences. Durham Region may establish a Compliance Program that will permit an industrial user to discharge non-complying sewage upon such terms and conditions deemed appropriate by the Durham Region Commissioner of Works. The compliance program allows industry to not be prosecuted for violating the concentration limits outlined in the by-law. The compliance program outlines the length of time necessary to plan, design, construct or install facilities to eliminate the non-compliance. A Sewage Surcharge Agreement is an agreement between Durham Region and a company, that permits the discharge of overstrength sewage to the Region's sanitary sewer collection system. Companies are billed for the overstrength sewage to pay for the additional cost of treatment and collection. The eligible parameters for a sewage Surcharge Agreement are Biochemical Oxygen Demand, Total Suspended Solids, Total Phosphorus, Total Kjeldahl Nitrogen, Animal/Vegetable Oil & Grease, and Sulphates. Sewer use by-law office staff routinely monitor and sample the wastewater collection system to ensure compliance with the by-law.

m) any changes or updates to the schedule for the completion of construction and



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commissioning operation of major process(es) / equipment groups in the Proposed Works.

Contract Number	Project Description	Original Projected Completion Date	Updated Projection Completion Date
D2023-50	Replacing mechanical aerators with fine bubble aerators in aeration tanks and digester New partition for digester New Blower building complete with five new blowers Upgrades to the stormwater pond Relocation of main duct bank New SCADA, communication and security for the new equipment New Odour Control System	June, 2025	September, 2026

n) a summary of any deviation from the monitoring schedule and reasons for the current reporting year and a schedule for the next reporting year

There were no deviations from the monitoring schedule in 2025.

The following table demonstrates the 2025 sample schedule with the following definitions:

- SIM3M - BOD5, suspended solids, TKN, TP, Total Ammonia Nitrogen (TAN), Nitrite (NO2), Nitrite + Nitrate (NO2+NO3), dissolved phosphorous, Aluminum (Al), Arsenic (As), Cadmium (Cd), Cobalt (Co), Chromium (Cr), Copper (Cu), Iron (Fe), Manganese (Mn), Molybdenum (Mo), Nickel (Ni), Lead (Pb), Antimony (Sb), Selenium (Se), Zinc (Zn)
- SIM3 - BOD5, suspended solids, TKN, TP, TAN, NO2, NO2+NO3, dissolved phosphorous
- SIM3MC - CBOD5, suspended solids, TKN, TP, TAN, NO2, NO2+NO3, dissolved phosphorous, Al, As, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Sb, Se, Zn
- SLU2 - Total solids, ashed total solids, volatile total solids, TKN, TP, TAN, NO2+NO3, Mercury (Hg), As, Cd, Co, Cr, Cu, Potassium (K), Mo, Ni, Pb, Se, Zn
- MFEC-WW – E.coli



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Sample Location	Tuesday	Wednesday	Thursday
Raw Influent	SIM3M (Monthly), Alkalinity SIM3, Alkalinity (Weekly)	Not Applicable (N/A)	N/A
Final Effluent	SIM3C, Alkalinity MFEC-WW	N/A	SIM3MC, Alkalinity (Monthly) SIM3C, Alkalinity (Weekly) MFEC-WW
Biosolids	N/A	SLU2 (Monthly)	N/A

Ministry of the Environment, Conservation and Parks (MECP) Inspection

This plant was last inspected by the MECP on March 6, 2019.



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Table 1 Final Effluent Flows

Month	Total Plant Flow* cubic metre (m ³)	Average Day Flow cubic metre per day (m ³ /d)	Maximum Day Flow m ³ /d
January	42,439	1,369	2,136
February	32,165	1,149	1,558
March	105,904	3,416	5,124
April	122,160	4,072	6,973
May	86,442	2,788	3,713
June	74,139	2,471	3,371
July	40,579	1,309	2,512
August	34,425	1,110	1,593
September	30,274	1,009	1,240
October	30,014	968	1,157
November	39,571	1,319	1,977
December	38,427	1,237	2,265
Total	676,539		
Average	56,378	1,854**	
Minimum	30,014		
Maximum	122,160		6,973
ECA Limit		4,550**	
Met Compliance		Yes	Yes

*Metered at the Final Effluent

**Annual Average



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Table 2 Raw Influent Analyses

Month	Biochemical Oxygen Demand (BOD ₅) average (avg.) concentration (conc.) milligrams per litre (mg/L)	Total Suspended Solids (TSS) avg. conc. mg/L	Total Phosphorus (TP) avg. conc. mg/L	Alkalinity as calcium carbonate mg/L
January	132	147	2.5	282
February	149	153	3.6	281
March	45	96	1.2	259
April	73	72	1.9	257
May	88	70	3.3	252
June	121	120	3.2	272
July	135	136	4.5	252
August	113	155	4.6	236
September	107	132	5.8	261
October	113	89	5.0	261
November	102	111	3.4	266
December	102	153	3.9	258
Average	107	119	3.6	261
Minimum	45	70	1.2	236
Maximum	149	155	5.8	282
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes



Table 2 Raw Influent Analyses continued

Month	Total Kjeldahl Nitrogen average concentration milligrams per litre	pH minimum	pH maximum
January	22.64	6.8	7.7
February	31.50	7.1	7.7
March	9.38	7.0	7.8
April	14.63	7.0	7.9
May	27.30	7.1	8.2
June	25.58	5.7	7.9
July	37.08	6.8	7.0
August	38.30	6.8	7.8
September	47.60	6.7	7.5
October	42.76	6.8	8.2
November	31.28	6.3	8.3
December	35.27	6.5	7.3
Average	30.28		
Minimum	9.38	5.7	
Maximum	47.60		8.3
Sampling Frequency Requirement Met	Yes	Yes	Yes



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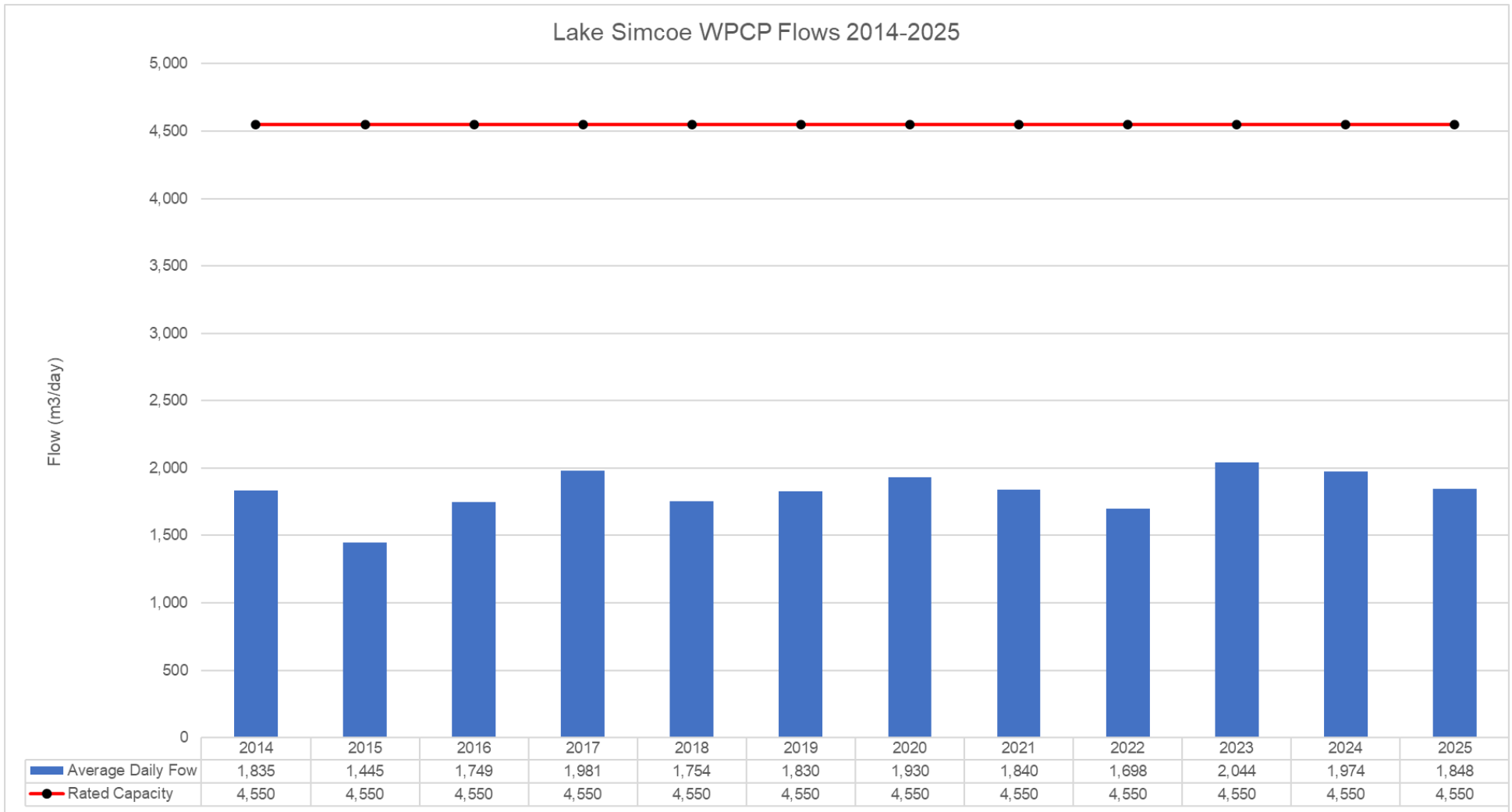


Figure 1 - Annual Average Flow 2014 – 2025

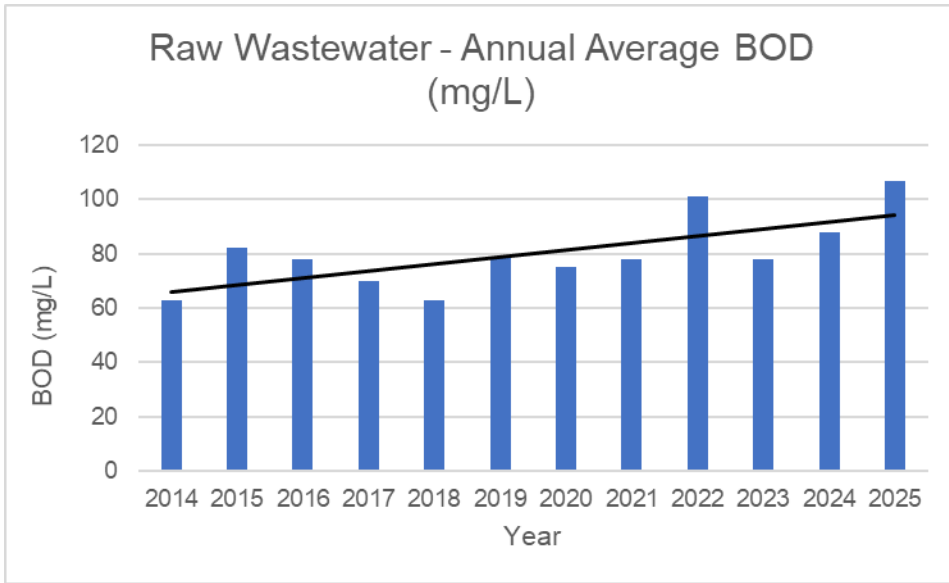


Figure 2 - Raw Influent - Annual Average Biochemical Oxygen Demand (BOD)

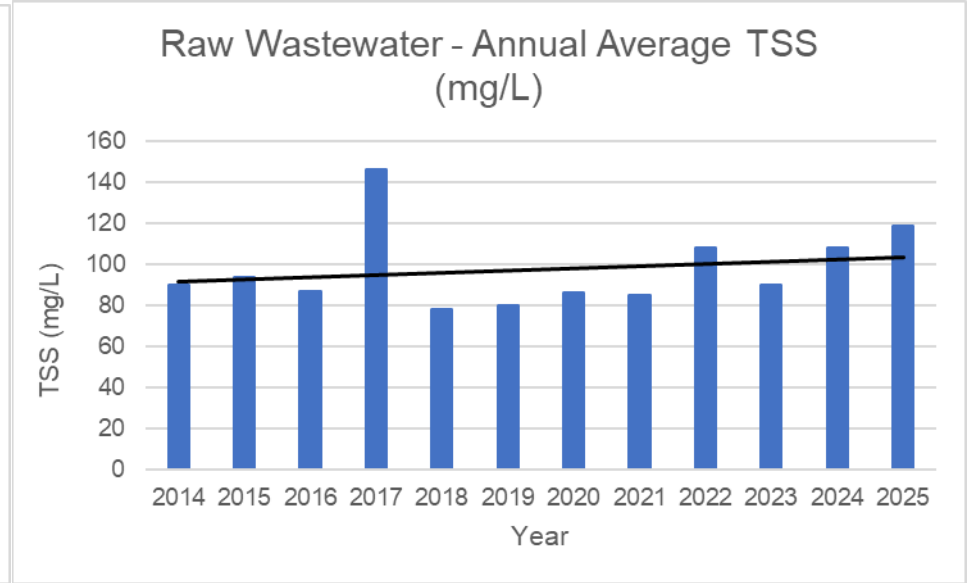


Figure 3 - Raw Influent - Annual Average Total Suspended Solids (TSS)

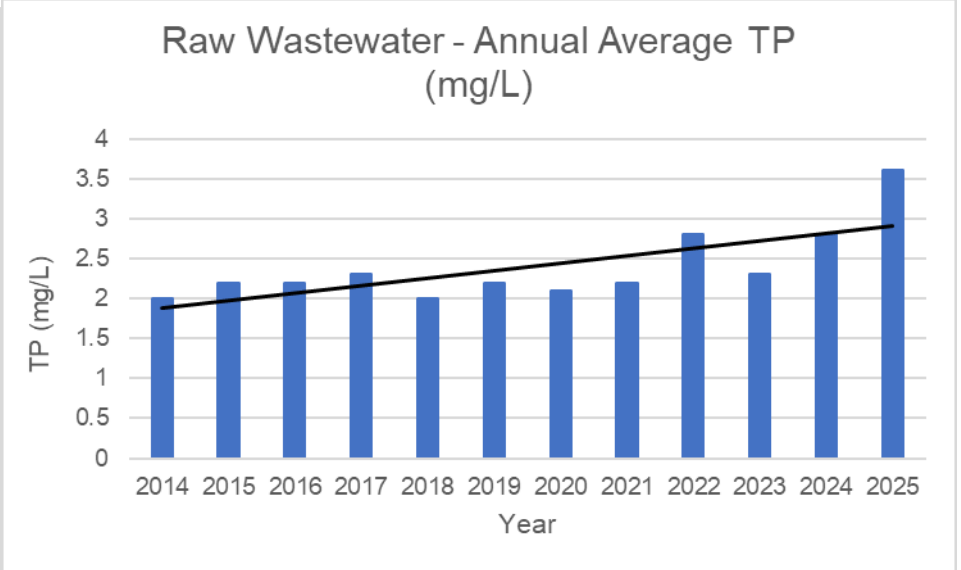
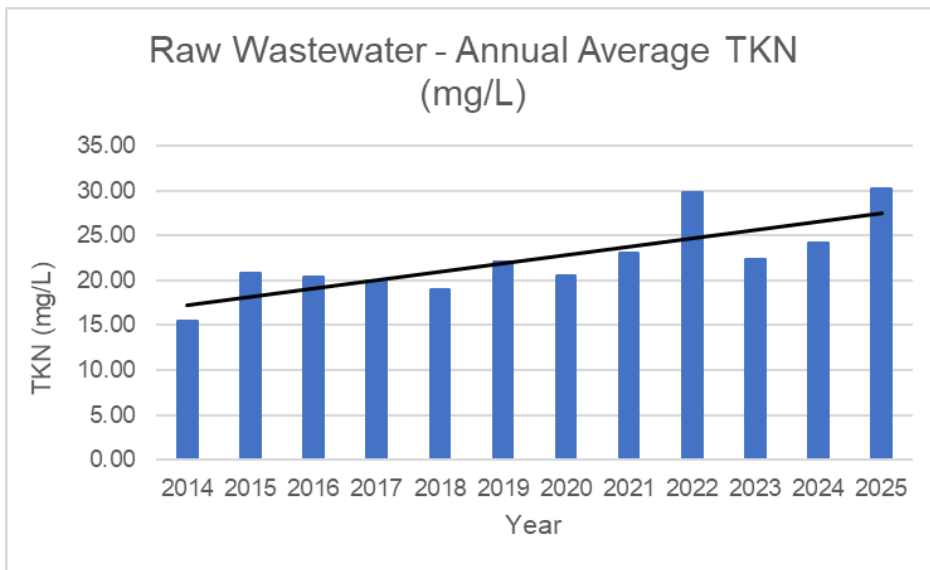


Figure 4 - Raw Influent - Annual Average Total Kjeldahl Nitrogen (TKN)

Figure 5 – Raw Influent – Annual Average Total Phosphorus (TP)



Table 3 Final Effluent Analyses

Month	Carbonaceous Biochemical Oxygen Demand (CBOD ₅) average (avg.) concentration (conc.) milligrams per litre (mg/L)*	Total Suspended Solids (TSS) avg. conc. mg/L*
January	4.6	3.8
February	3.5	3.5
March	2.6	5.4
April	2.5	6.0
May	1.4	2.6
June	1.3	2.0
July	1.2	1.5
August	1.2	2.2
September	1.3	1.3
October	1.7	3.3
November	1.6	3.9
December	1.8	5.7
Average	2.1	3.4
Minimum	1.2	1.3
Maximum	4.6	6.0
ECA Limit	10*	10*
ECA Objective	5	5
Within Compliance	Yes	Yes
Sampling Frequency Requirement Met	Yes	Yes

*Monthly Average Concentration



Table 3 Final Effluent Analyses continued

Month	Total Phosphorus (TP) average (avg.) concentration milligrams per litre	TP avg. loading kilograms per month
January	0.11	5
February	0.12	4
March	0.13	14
April	0.15	18
May	0.09	8
June	0.13	10
July	0.19	8
August	0.13	4
September	0.23	7
October	0.17	5
November	0.27	11
December	0.23	9
Annual Loading		108
Average	0.16	9.2
Minimum	0.09	3.9
Maximum	0.27	18.3
ECA Limit	0.3**	190*
ECA Objective	0.12	190
Lake Simcoe Phosphorus Reduction Strategy	0.15***	190*
Within Compliance	No	Yes
Sampling Frequency Requirement Met	Yes	Yes

*Total Annual Loading, kilograms per year (kg/year)

**Monthly Average Concentration

***Annual Average Concentration



Table 3 Final Effluent Analyses continued

Month	Total Ammonia Nitrogen (TAN) average (avg.) concentration (conc.) milligrams per litre (mg/L) summer	TAN avg. conc. mg/L winter
January		0.08
February		0.06
March		0.22
April		0.35
May		0.07
June	0.13	
July	0.96	
August	2.69	
September		1.29
October		4.72
November		1.21
December		1.46
Average	1.26	1.05
Minimum	0.13	0.06
Maximum	2.69	4.72
ECA Limit	5*	15*
ECA Objective	3	10
Within Compliance	Yes	Yes
Sampling Frequency Requirement Met	Yes	Yes

*Monthly Average Concentration



Table 3 Final Effluent Analyses continued

Month	pH minimum	pH maximum	Temperature Degree Celsius average
January	6.5	7.9	8.8
February	6.8	7.7	9.1
March	7.0	8.0	10.4
April	6.9	8.0	10.5
May	7.1	8.5	15.1
June	5.9	8.2	18.7
July	6.5	7.7	20.7
August	6.8	7.8	20.0
September	6.8	7.9	18.7
October	6.9	8.3	17.2
November	6.5	8.0	14.2
December	6.6	8.2	11.2
Minimum	5.9		8.8
Maximum		8.5	20.7
ECA Objective and Limit	6.5	9.0	
Within Compliance	No	Yes	
Sampling Frequency Requirement Met	Yes	Yes	Yes



Table 4 *Escherichia coli* Sampling

Month	Monthly Geometric Mean Density	Number of Samples
January	67	9
February	3	8
March	75	20
April	122	20
May	1	9
June	4	8
July	4	10
August	2	8
September	3	8
October	7	10
November	2	8
December	1	8
ECA Objective	40 organisms/100mL	
Sampling Frequency Requirement Met		Yes



Table 5 Chemical and Energy Usage

Month	Aluminum Sulphate litres	Hydro kilowatt hours	Natural Gas cubic metres
January	7,457	64,246	17,596
February	5,584	70,593	19,926
March	21,277	47,008	15,896
April	13,557	61,265	12,392
May	10,129	58,898	4,850
June	5,437	60,953	3,845
July	6,609	60,889	497
August	5,600	55,632	0
September	5,114	49,256	1,566
October	5,898	59,501	1,934
November	6,837	66,107	9,166
December	10,614	91,452	16,761
Total	104,114	745,797	104,429



Table 6 Sludge Analysis

Parameter	Concentration (mg/L)
Total Solids	22,486
Total Phosphorus	511
Total Ammonia Nitrogen	40.4
Nitrate as Nitrogen	0.5
Arsenic	0.039
Cadmium	0.015
Cobalt	0.25
Chromium	0.187
Copper	5.71
Lead	0.180
Mercury	0.0017
Molybdenum	0.25
Nickel	0.132
Potassium	57.6
Selenium	0.120
Zinc	9.57