Region of Peel
working with you

2022

Clarkson Wastewater Treatment Plant
Annual Report

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The Regional Municipality of Peel (the Region) is committed to providing a high level of service in the collection, treatment, and management of wastewater. The Region diligently monitors itssewer network and operates its treatment processes effectively to meet or surpass discharge quality criteria, in order to protect the environment now and into the future.

Our Commitment:

- **Protecting and preserving the environment, including the prevention of pollution, through effective operation and management of the Wastewater Systems that incorporates quality assurance and control practices**
- **Acting promptly and responsibly in addressing incidents or conditions that pose a risk to the public or environment**
- **Complying with applicable legislation and regulatory requirements**
- **Collaborating with internal and external stakeholders to ensure our services consider their environmental and quality concerns**

If you have any questions about this report, please contact the Wastewater Compliance team at 905-791-7800 ext. 4685 or email.

Executive Summary

The Clarkson Wastewater Treatment Plant (WWTP) is located at 2307 Lakeshore Road West in Mississauga, on the shore of Lake Ontario. The plant is designed to treat an average flow of 350 MLD (million liters per day). The Clarkson WWTP is classified as a Class IV wastewater treatment facility under Ontario Regulation 129/04. This WWTP is operated under Environmental Compliance Approval (Approval) # 0729-9KBNNY.

This report summarizes the monitoring results for the Clarkson WWTP required by the Approval and describes the operational performance to ensure production of quality effluent.

In 2022, the Region met all the capacity and effluent limits prescribed in the Approval. The annual average daily flow to the plant was **207 million liters**, which is **59%** of the rated capacity specified in the Approval.

Throughout 2022, the Clarkson WWTP met the effluent concentration limits for Total Suspended Solids (TSS), Carbonaceous Biochemical Oxygen Demand ($CBOD_5$), Total Phosphorous (TP), Total Ammonia Nitrogen (TAN), and *E. coli*, and maintained pH within the range of 6.0 – 9.5, as prescribed in the Approval. The requirements and results are detailed in Section 4.2 of this report.

There was no overflow event at the Clarkson WWTP during the reporting period. There were four spills and one bypass event, described in Section 4.11.

In 2022, the Clarkson WWTP generated **8,151** dry tonnes of sludge cake; **2,742** dry tonnes were sent to nearby G.E. Booth WWTP for incineration and **5,274** dry tonnes were sent for beneficial use.

REGION OF PEEL

Provide water and wastewater services to 1.5 million residents and over 175,000 businesses in Brampton, Caledon and Mississauga

2022 SUMMARY

Clarkson Wastewater Treatment Plant

3,751 km
of sewage pipes throughout the Region delivering wastewater to the treatment facilities

3,340
samples analyzed

100%
of approval effluent limits met

1.9 GJ*
energy used per ML** wastewater treated

$29
of chemicals used per ML** wastewater treated

32%
of the Region's total wastewater treated at Clarkson;

75 billion litres
treated in 2022; equivalent to volume of

83
Olympic pools each day

100%
of wastewater underwent complete treatment

*GJ: Gigajoules
**ML: Million Litres

Glossary of Terms and Abbreviations

Activated Sludge: Sludge containing aerobic microorganism that help to break down organic compounds

Final Effluent: The treated wastewater that has undergone all treatment steps, including disinfection, when prescribed

Influent: The untreated wastewater or raw sewage coming into the sewage treatment plant from the collection system

Limit: Value prescribed in Approval for key parameters that the plant must meet in order to stay in compliance. Limits are generally higher than objectives

MLD: megaliters (ML) per day. 1 ML = 1 million liters. 1 MLD is 1000 m^3

Objective: Value prescribed in Approval for key parameters that the plant is designed to meet. Consistently not meeting objectives means that the plant is not being effective and long-term remedial actions are needed. Sampling results that are over objective but under limit are considered in compliance

Parameter: Chemical substances (such as phosphorus or oxygen), microbiological indicators (such as *E. coli*) or physical characteristics (such as pH or temperature) that are measured or sampled and analyzed in order to assess the performance of a plant. Some parameters have limits in the Approval

Rated Capacity: Average annual daily influent flow that the plant is designed to handle

Residual: Remaining amount of a substance after treatment processes are completed

Twinning: Constructing a parallel pipe to provide additional capacity and to allow for condition assessment and rehabilitation of the existing pipe to extend its useful life

Wastewater: Water that has been used and discharged by homes, businesses and industries. Everything we flush down a toilet or pour down a drain, collectively

WWTP: Wastewater Treatment Plant

1. Water Management in the Region of Peel

The Region owns and operates the water and wastewater systems that serve its population. This includes water treatment, storage and distribution, and wastewater collection, pumping and treatment. Figure 1, on the next page shows how these systems interact.

The Region has two drinking water sources: Lake Ontario and groundwater wells in Caledon. The Region retains services of the Ontario Clean Water Agency (OCWA) under a contract to operate, maintain and manage the lake-based drinking water treatment facilities and its water storage and pumping system. The Region operates the groundwater-based water treatment systems and distribution watermain networks. Similarly, on the wastewater side, OCWA is contracted to operate the large wastewater treatment plants on the shore of Lake Ontario, while the Region operates the wastewater collection system, pumping stations, and the treatment facility in the community of Inglewood, in the Town of Caledon.

This water cycle starts when source water is pumped into our water treatment plants and undergoes treatment to meet the Ontario Drinking Water Standards. Treated drinking water is distributed through a network of pipes, storage facilities and pumping stations to homes and businesses. Used water goes down the drains into the wastewater collection system, where a series of pipes collect and convey wastewater to the treatment plants. Although a predominantly gravity-based network, pumping stations are needed to move wastewater from low lying areas. Wastewater undergoes multi-stage treatment to comply with the strict provincial and federal standards before release to the environment. The Region is committed to high standards of treated wastewater quality since it gets discharged into Lake Ontario, which is the source of drinking water for the Region and many neighboring municipalities.

More information about the water treatment process can be found within the Annual Water Quality Reports, which are available online.

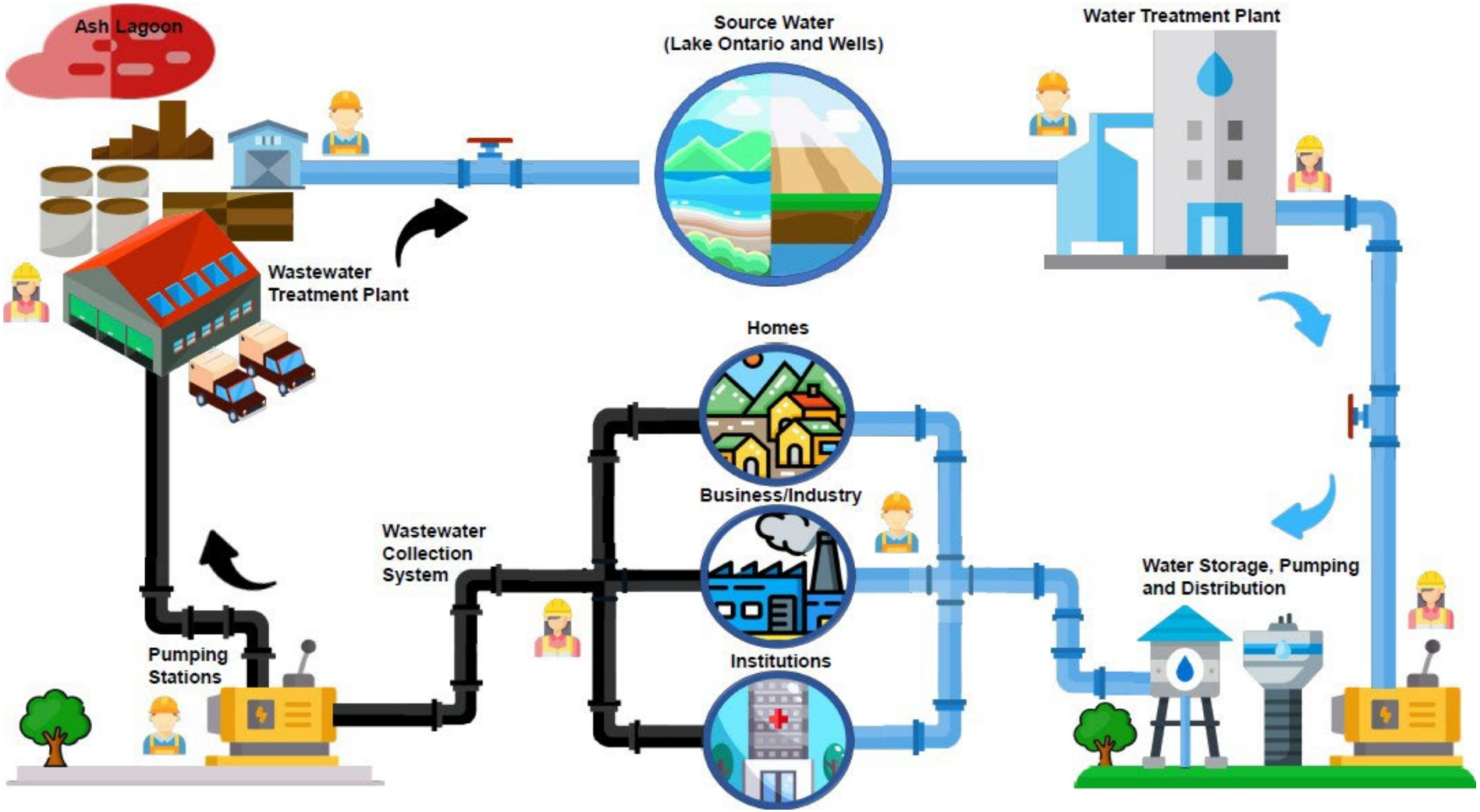


Figure 1 – Water and Wastewater Cycle

2. Introduction

Wastewater systems in Ontario are governed by the Ministry of the Environment, Conservation and Parks (the Ministry) and are also subject to federal legislation.

The purpose of a wastewater treatment system is to remove solids and nutrients to minimize impact from the effluent on the receiving waterbody. The Environmental Compliance Approval (Approval), issued under the *Environmental Protection Act*, is a system-specific document through which the Ministry sets discharge quality limits for that facility based on the sensitivity of the receiving waters. To comply with the Approval, the Region of Peel (the Region) prepares an annual report covering the operation and overall performance of the wastewater system.

This report provides a performance summary for the period from January 1 to December 31, 2022, for the Clarkson Wastewater Treatment Plant (WWTP), to fulfill the annual performance reporting requirements set out in the Approval # 0729-9KBNNY.

The Clarkson WWTP, a Class IV wastewater treatment facility under Ontario Regulation 129/04, is located at 2307 Lakeshore Road West in Mississauga and operated on behalf of the Region by the Ontario Clean Water Agency (OCWA). Today, along with the G.E. Booth WWTP, Clarkson WWTP provides wastewater treatment for a population base of over 1.5 million customers. The Clarkson WWTP consists of conventional and biosolids treatment processes and is designed to treat (referred to as rated capacity) an average flow of 350 MLD (million liters per day).

2.1 Compliance

The Approval is a facility-specific document and it is the legal instrument that sets requirements for municipal system owners and operating agencies with regards to operation and management, level of treatment, monitoring and recording, routine and event reporting, and effluent quality notification. In accordance with the Approval, major changes to treatment process or equipment are communicated to the Ministry.

The Region ensures that the final effluent produced, and activities associated with wastewater treatment comply with the Approval and related legislation. The Region follows best practices in resource planning, process documentation and emergency preparedness.

The Ministry performs periodic inspections on all wastewater systems, comprised of facility visits and review of information and data for the inspection period. Inspection scope generally covers procedural documentation review, staff competency, process operation and monitoring, and corrective actions to operational events. The Region is committed to ensuring environmental protection and compliance with legislative requirements. We maintain transparency with all findings of potential non- compliance incidents and outcomes of internal assessment being reported to the Ministry District (local) office.

2.2 Monitoring

The Region monitors the effluent quality to ensure it meets limits prescribed in the Approval. The Region has an extensive sampling and monitoring program to assess the influent wastewater, ensure effective treatment processes, and assess the quality of treated wastewater being discharged to protect Lake Ontario. Sampling for various microbiological, chemical, and physical parameters is performed by Ministry-licensed wastewater operators at various sampling sites throughout the process and submitted to an accredited laboratory for analysis.

Clarkson WWTP is controlled through a computerized Supervisory Control and Data Acquisition (SCADA) system that is monitored 24 hours per day, 7 days a week. Online analyzers continuously monitor the wastewater quality prior to release. Any significant process upset generates an alarm so staffcan investigate and take appropriate actions to restore normal operational conditions. The plant is equipped with stand-by power generators to ensure critical equipment can continue to operate in the event of a power failure.

2.3 Water and Wastewater Operations during COVID-19

In 2022, the Region remained flexible in planning for return to normal operation for wastewater programs that had been altered in response to the COVID-19 pandemic. Operations continued to experience indirect effects of the pandemic in the form of delays to delivery of equipment and parts due to global supply chain issues and increased costs. 2022 saw an increased pace of work as the Region attempted to get back on track with previously planned long term capital projects.

To understand COVID-19 virus prevalence in our communities, the Region's Water and Wastewater Division has been working with Peel Public Health and participating in a provincial program since April 2020 that tests the levels of COVID-19 in wastewater. Sampling has detected genetic material of COVID-19 in wastewater at both the G.E. Booth and Clarkson Wastewater Treatment Plants. When

Public Health was testing at a clinical level, the virus detected in wastewater matched the trend of reported COVID-19 cases in Peel. At this time, wastewater testing is an important tool to monitor the prevalence of COVID-19 in our community in the absence of clinical testing.

3. Plant Process Overview

Wastewater is collected from homes and industry through a system of underground sewer pipes known as the **collection system**. The vast majority of wastewater collected in the Region flows by gravity to oneof the two WWTPs on the shore of Lake Ontario, Clarkson and G.E. Booth WWTPs. The Clarkson WWTP also receives hauled liquid sewage, which is pumped into the inlet chamber upstream of the raw sewage screens.

When untreated wastewater (influent) enters the treatment process, it goes through **preliminary treatment**, where **screens** remove large objects like wipes and personal hygiene products and a vortex removes small grit particles. Figure 2 illustrates the wastewater treatment process.

The wastewater then enters **primary treatment** tanks (clarifiers), where it flows slowly, allowing heavier suspended solid particles to settle at the bottom and lighter material (such as grease and scum) to float to the top. Treatment aids such as phosphorus removal chemical may be added at this stage. The floating material and settled sludge are skimmed by large moving collectors and then pumped to the digesters for treatment. The remaining water flows to aeration tanks for secondary treatment.

Secondary treatment occurs in two stages to convert organic solids that remain floating to settleable material. The first stage happens in large **aeration tanks** where air is bubbled up via diffusers to provide oxygen so that the microorganisms in the wastewater will break down the nutrients and organic matter. The second stage happens in **secondary clarifiers**, where the microorganisms settle to the bottom. The sludge from the bottom is collected and pumped to the **solids handling** process for treatment and a portion of the sludge is returned to the aeration tanks to supplement the microorganism population.

Treated wastewater (effluent) is **disinfected** seasonally (from June 1 to September 30) using liquid chlorine (sodium hypochlorite) to reduce pathogen content to acceptable levels. Chlorine needs time to exert its disinfection action. This contact time occurs while the effluent travels through the 2.2 km long outfall pipe. Any trace chlorine remaining in the effluent is removed using a dechlorination agent (sodium bisulphite) added near the end of the outfall pipe, prior to release of the final effluent (disinfected effluent)to Lake Ontario. Final effluent quality is tested to confirm compliance with the limits set out in the Approval.

Sludge collected from the secondary treatment process is sent to the **solids handling** process where it isthickened, digested (together with sludge from the primary treatment process) and dewatered. To aid in thickening and dewatering, a chemical compound called polymer is added. Stabilization occurs through anaerobic (in the absence of oxygen) digestion, followed by dewatering. Digestion reduces the total solids, destroys pathogens, and makes the sludge easier to dewater. Gas generated from the anaerobic sludge digestion process is collected and used as a fuel for the hot water boilers and co-generation unitto generate power for use within the Clarkson WWTP.

Once stabilized, the sludge material (called sludge cake) generated at the Clarkson WWTP is hauled

offsite for final disposal. Sludge cake is hauled to one of several receivers: the nearby G.E. Booth WWTP for incineration, a landfill, or directed for beneficial use application. The Region is moving towards maximizing the beneficial use of its biosolids.

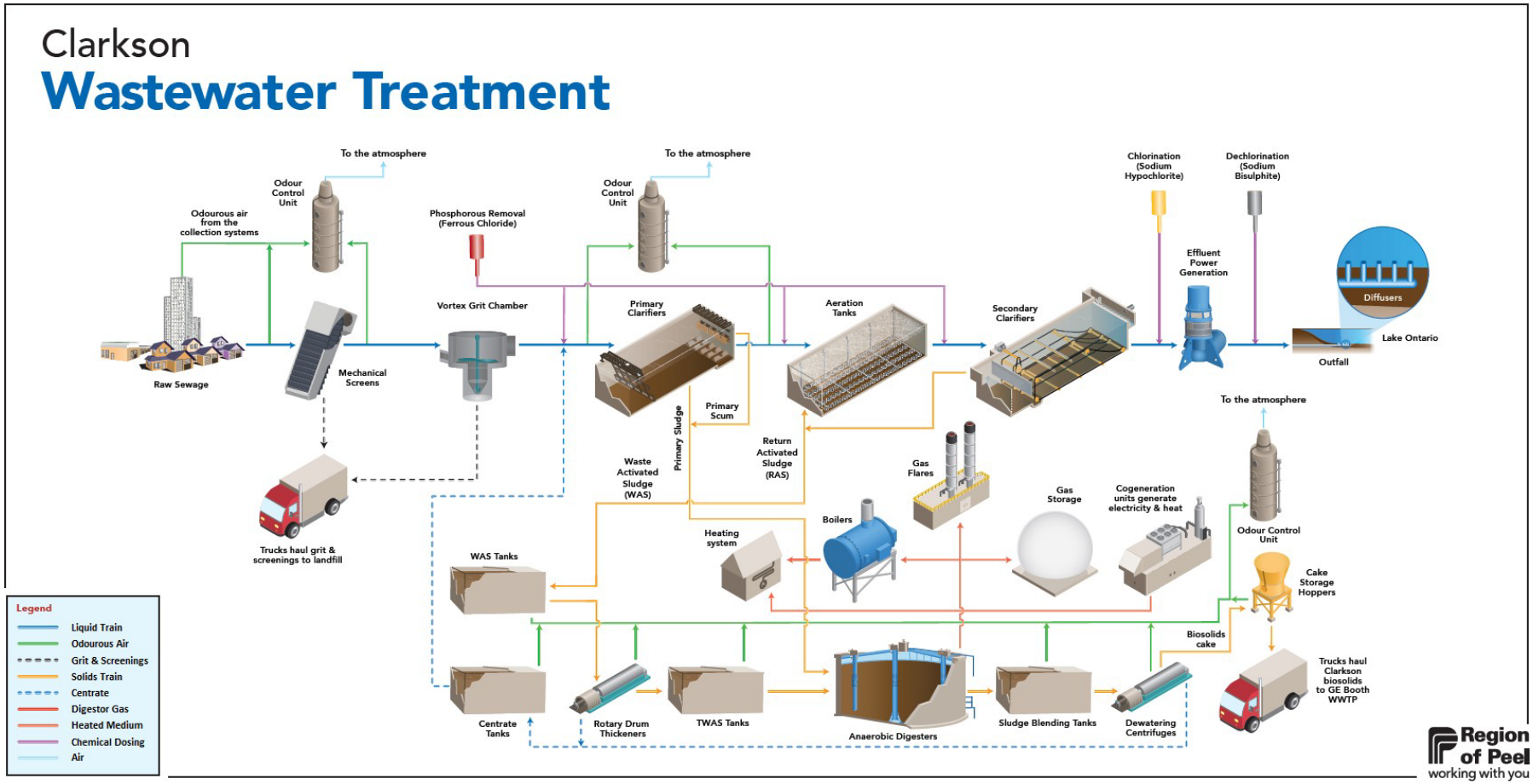


Figure 2 – Clarkson Wastewater Treatment Process

4. Operational Performance

4.1 Summary of Influent Monitoring Data

This section summarizes the influent characteristics for Clarkson WWTP. Table 1 summarizes monthly influent volumes and monthly average concentrations of analytical parameters for 2022. Figure 3 illustrates historical flow trends for 2018 to 2022. For a description of what each test parameter means, see Appendix A.

Table 1 – Influent Flow and Monthly Average Sampling Results

Month	Maximum Daily Flow (MLD) *	Average Flow (MLD)	BOD_5 (mg/L)	$CBOD_5$ (mg/L)	TKN (mg/L)	TP (mg/L)	TSS (mg/L)
January	320.5	175.4	292	281	37	6.2	273
February	489.0	199.8	280	264	35	5.2	237
March	394.8	212.6	242	211	31	4.4	202
April	315.4	194.3	239	218	34	4.8	186
May	360.9	200.5	211	203	32	5.4	195
June	429.7	194.5	247	227	34	6.0	230
July	321.9	203.3	266	242	36	4.8	259
August	374.7	220.6	311	270	35	4.8	289
September	355.6	224.8	316	279	36	5.0	295
October	315.8	214.6	281	287	36	5.6	335
November	343.3	210.4	318	292	38	5.5	338
December	431.1	227.7	316	273	36	5.0	284
Annual Average	489.0	206.5	277	254	35	5.2	260

* Highest daily average of the month

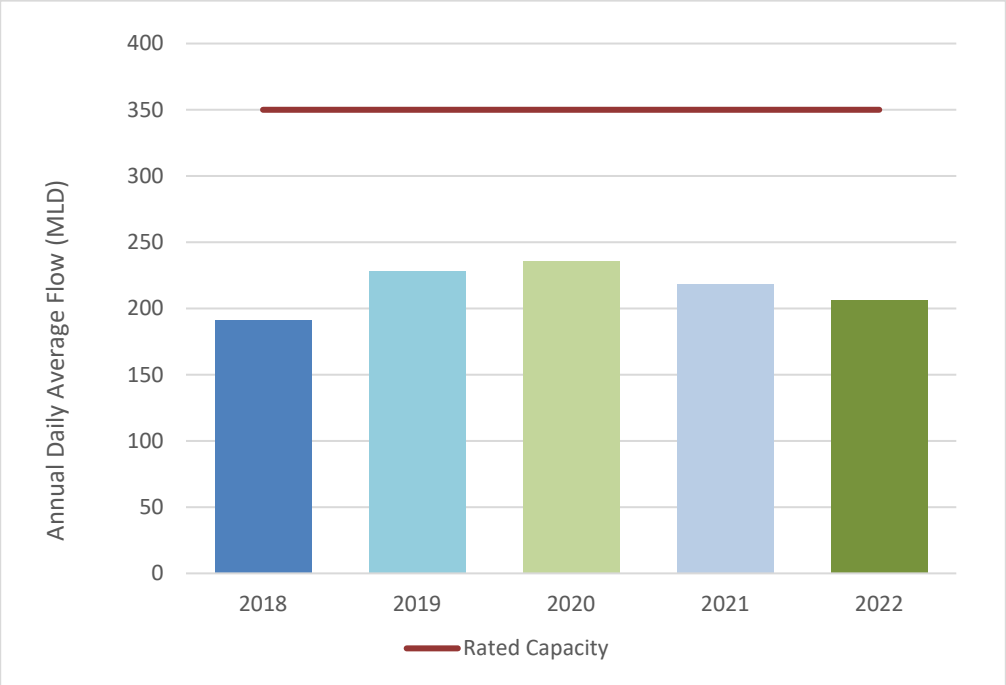
Table 1 – Historical Annual Average Influent Flow and Sampling Results

Year	Flow (MLD)	BOD_5 (mg/L)	$CBOD_5$ (mg/L)	TKN (mg/L)	TP (mg/L)	TSS (mg/L)
2018	191.2	200	177	30	4.3	293
2019	227.9	227	198	30	4.6	271
2020	235.7	218	201	33	4.8	242
2021	218.2	239	216	33	5.0	230
2022	206.6	277	254	35	5.2	260

In 2022, the annual average flow was 207 MLD, representing 59% of the annual rated capacity. This is a 5% reduction from the previous year and an increase of 8% from five years ago.

With a decrease in flow, there was a significant increase in contaminant loading. The concentration of BOD5, CBOD5 and TSS increased between 13% and 18% since the previous year alone. Table 2 provides a summary of the past five years.

Figure 3 – Annual Average Flow 2018 to 2022



4.2 Summary of Final Effluent Monitoring Data

During the year 2022, the final effluent met all the Approval limits (either monthly or annual, as prescribed). A summary of final effluent test results and the Approval objectives (targets) and limits (requirements) are shown in Table 3 and Figure 4. $CBOD_5$, TSS, TP, TAN, and *E. coli* monthly mean values were significantly under the limits throughout the year (or during limit period, for *E. coli*). For a description of test parameters, see Appendix A.

The Approval requires disinfection from June 1 to September 30. During that time, chlorine residual and bisulphite residual are tested at sampling points representative of final effluent.

Table 3 – Final Effluent Monthly Average Flow and Sampling Results

Month	Daily Flow (MLD)	$CBOD_5$ (mg/L)	Total Suspended Solids (mg/L)	Total Phosphorus (mg/L)	Total Phosphorus Loading (kg/day)	Total Ammonia Nitrogen (mg/L)	pH (pH units)	*E. coli* (CFU/100 mL) [1]	Bisulphite Residual [2] (mg/L)
Objective	N/A	15	15	0.8	N/A	8.0 (May 01 – Oct 31) 16.0 (Nov 01 – Apr 30)	6.5 – 9.0	NA	Detectable
Limit	350	25	25	1	350	16.0 (May 01 – Jun 15) 16.0 (Sep 16 – Oct 31) 12.8 (Jun 16 – Sep 15) 30.0 (Nov 01 – Apr 30)	6.0 – 9.5	200 (Jun 1-Sep 30 only)	Detectable
Compliance Assessment Basis [3]	Annual Average	Annual Average	Annual Average	Monthly Average	Annual Average	Monthly	Single Sample	Monthly Geometric Mean Density	Single Sample
January	175.4	2.8	5.5	0.5	81	0.9	6.7	4122 [4]	- [4]
February	199.8	3.7	5.8	0.4	85	4.9	6.7	4747 [4]	- [4]
March	212.6	3.6	5.5	0.4	94	3.6	6.8	5223 [4]	- [4]
April	194.3	2.8	4.0	0.5	99	1.6	6.7	4196 [4]	- [4]
May	200.5	2.6	3.8	0.6	129	1.8	6.7	172 [4]	1.76
June	194.5	2.9	3.8	0.5	93	1.4	6.6	2	1.88
July	203.3	3.3	3.9	0.5	103	0.6	6.7	9	1.69
August	220.6	2.6	4.0	0.5	112	0.8	6.7	40	1.47
September	224.8	2.1	3.2	0.6	139	0.5	6.7	31	2.00
October	214.6	2.5	3.6	0.5	113	0.3	6.7	3628 [4]	- [4]
November	210.4	3.2	4.8	0.6	118	1.6	6.7	8137 [4]	- [4]
December	227.7	4.0	5.8	0.6	146	1.2	6.6	7520 [4]	- [4]
Annual Average	206.5	3.0	4.5	0.5	109	1.6	6.7	N/A	1.76

[1] CFU = Colony forming units.

[2] Approval includes Total Residual Chlorine objective of non-detectable and limit of 0.02 mg/L. If bisulphite residual is used as a surrogate to Total Residual Chlorine, then detected levels of bisulphite residual in the sample shall be deemed to confirm absence or equivalent to 0.0 mg/L concentration level of Total Residual Chlorine.

[3] For different parameters, compliance is assessed based on different time periods. TP and TAN are deemed in compliance if monthly average meets limit; $CBOD_5$, TSS and flow are in compliance if annual average meets limit; bisulphite residual and pH are assessed on daily results. *E. coli* is assessed on a monthly basis using a geometric average.

[4] Disinfection not required, as per the Approval.

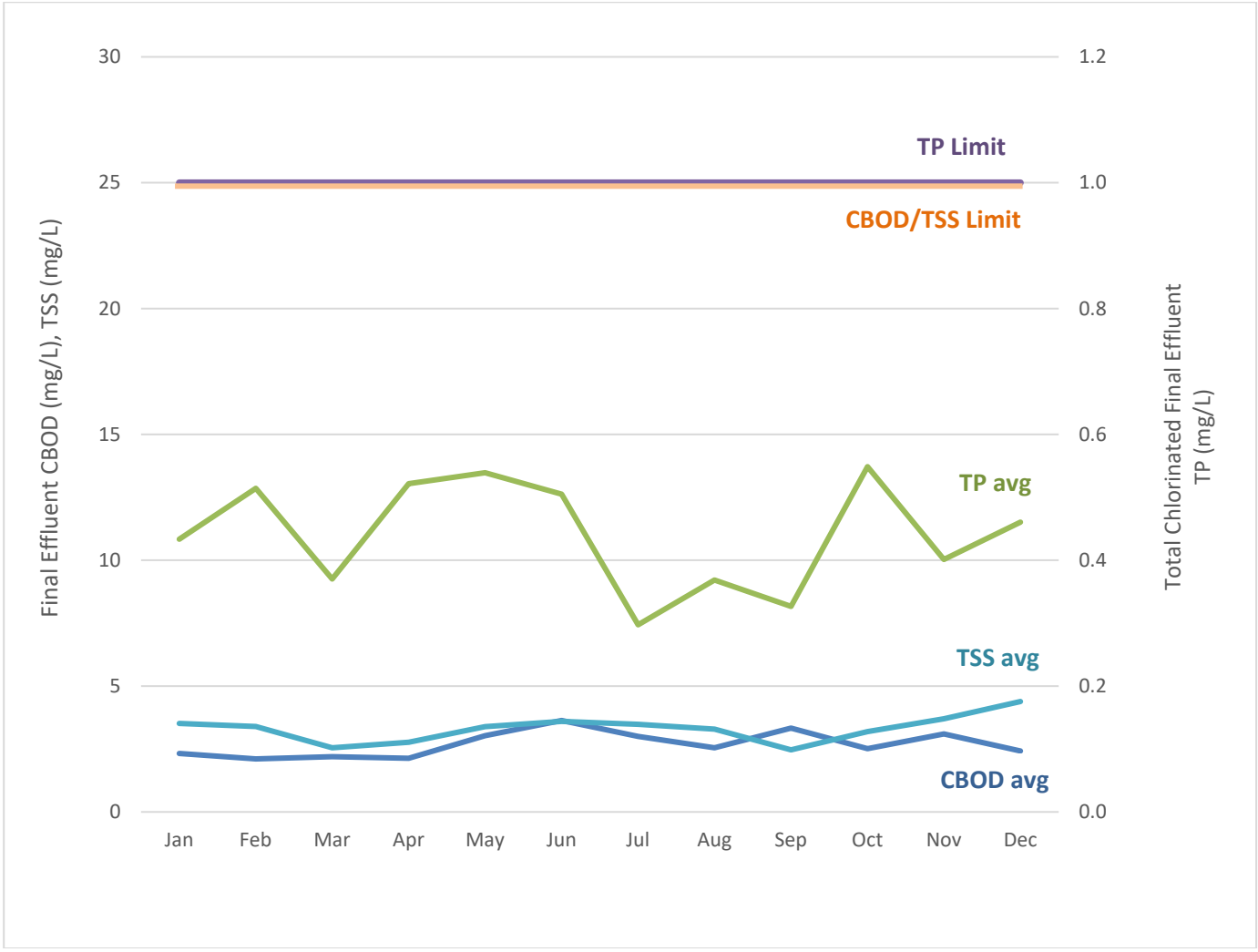


Figure 1 – Final Effluent Monthly Average Sampling Results Compared to Approval Limits

4.3 Deviations from Monitoring Schedule and the Next Reporting Year Schedule

The wastewater influent and effluent must be sampled and tested in accordance with the requirements of the Approval. Each year, a sampling schedule is prepared to ensure all requirements are met. Table 4 shows the sampling schedules for 2022 and 2023. The sampling schedule remains unchanged for 2022.

Table 4 – Sampling Schedules for 2022 and 2023

	Required Monitoring Program			Scheduled Sampling Program 2022 & 2023
	Parameters	**Sample Type**	**Minimum Frequency**	**Frequency**
Influent	**BOD_5**	**24-hour composite**	**Weekly**	Twice Per Week
	TSS	**24-hour composite**	**Weekly**	Daily
	Total Phosphorus	**24-hour composite**	**Weekly**	Daily
	TKN	**24-hour composite**	**Weekly**	Daily
Final Effluent	**$CBOD_5$**	**24-hour composite**	**Weekly**	Daily
	TSS	**24-hour composite**	**Weekly**	Daily
	Total Phosphorus	**24-hour composite**	**Weekly**	Daily
	TAN	**24-hour composite**	**Weekly**	Twice Per Week
	TKN	**24-hour composite**	**Weekly**	Twice Per Week
	Nitrate as Nitrogen	**24-hour composite**	**Weekly**	Twice Per Week
	Nitrite as Nitrogen	**24-hour composite**	**Weekly**	Twice Per Week
	E. coli	**Grab**	**Weekly**	Twice Per Week
	Total Residual Chlorine/	**Grab/Analyzer**	**Daily**	Daily
	Bisulphite Residual			
	pH[1]	**Grab/Probe/Analyzer**	**Weekly**	Daily
	Temperature[1]	**Grab/Probe/Analyzer**	**Weekly**	Daily
	Unionized Ammonia[2]	**As Calculated**	**Weekly**	Twice Per Week

[1] pH and temperature of the final effluent shall be determined in the field at the time of sampling for Total Ammonia Nitrogen.

[2] The concentration of un-ionized ammonia is calculated using the total ammonia concentration, pH and temperature

4.4 Operating Issues and Corrective Actions

The Clarkson WWTP operates year-round, 24 hours a day. Occasional operating issues are encountered. Table 5 summarizes operating issues that temporarily affected the process or effluent quality during the reporting year and lists the corrective actions taken. This information is reported to the Ministry Inspector monthly.

Table 5 – Summary of Operating Issues and Actions Taken

Issue	Date	Causes	Corrective Actions
Effluent pH lower than objective range	Jun 24 Dec 11, 14	Digester dewatering for maintenance added low pH digester decant solution into the treatment process, which caused a reduction of the buffering capacity of alkalinity and increased sludge depth in primary tanks	1) Closely monitored effluent pH and alkalinity; 2) Decreased the volume from digester pumped into the process; 3) Caustic soda supply was set up to dose high pH solution when necessary to increase alkalinity buffering capacity
Effluent TP elevated	May 18-20 Sep 10, 21-25 Oct 6-8 Nov 25, 26, 30 Dec 8, 9, 31	1) Insufficient dosage of phosphorus removal chemical; 2) Decant solution from digesters being added to the treatment process during digester dewatering for maintenance, which caused an increase in phosphorus loading; 3) High raw sewage TP; 4) High sludge levels in primary tanks; 5) Phosphorus removal chemical supply shortage in December leading to a decrease in chemical dosing	1) Decreased the volume from digester pumped into the process; 2) Adjusted phosphorus removal chemical dosing rate; 3) Adjusted plant process and reduced sludge depth in primary tanks

4.5 Maintenance Activities

4.5.1 Repair and Maintenance

To keep the Clarkson WWTP in good operating order, major plant components must be inspected and maintained on a regular basis. Table 6 provides a summary of planned and emergency repairs and maintenance activities carried out during the reporting period.

Table 6 – Summary of Repairs and Maintenance Activities

Plant Process	Maintenance Activity
Preliminary Treatment	Repaired grit pumps, valves, actuators, and conveyor system
	Overhauled a fine screen at headworks
	Replaced inlet gate actuator for a screen at headworks
	Overhauled scrubber at headworks
Primary Treatment	Overhauled two bridges and one primary clarifier
	Overhauled compressor and rebuilt motor for a channel air blower
	Overhauled two aeration blowers
Secondary Treatment	Replaced two hypochlorite pumps
	Repaired/upgraded return activated sludge pipeline for the older part of the plant
	Rebuilt mixers in aeration tank anoxic zones
	Replaced a secondary bypass gate
	Replaced phosphorus removal chemical pump metering valve, actuator, flow meter, and electrical panel
	Overhauled two rotary drum thickeners, a feed pump and thickened waste activated sludge pump
Solids Handling	Overhauled a cake pump and replaced components of cake system
	Overhauled one centrifuge
	Rebuilt one polymer pump and repaired electrical components
	Overhauled one biosolids scrubber
	Redesigned and installed one centrifuge feed pump variable frequency drive
	Upgraded two centrifuge starters
	Cleaned out and inspected two digesters
	Repaired/Replaced aging heating, ventilation, and air conditioning units around plant
Other Works	Overhauled boilers and associated heating piping and pumps
	Overhauled one pump unit at Avonhead pumping station
	Rebuilt one high effluent pressure water pump and overhauled strainers

4.5.2 Operating Resources

The Approval requires the Region to ensure that the plant and all equipment used to achieve compliance are properly operated and maintained. This includes providing adequate funding. The Region funds operational activities and process chemicals to maintain daily operation, as well as capital activities to ensure future system performance.

In 2022, $2.2 million was spent on process chemicals at Clarkson WWTP, such as sodium hypochlorite, polymer, bisulphite and phosphorus removal chemical (see Introduction and Appendix A for description of use of each of these), with an overall cost of $29 per million liters of wastewater treated. This is a 64% increase over the previous year. The increase is due in small part to an increase in volume of some chemicals used and in larger part due to cost increases.

Water and wastewater treatment are among the highest energy users in the Region. In 2022, 1.85 gigajoules of energy were used per million liters treated. Energy use varies slightly from year to year; however, the 2022 usage was 24% higher than the past five years' average of 1.49 gigajoules per million liters.

To reduce the greenhouse gas footprint, two energy generating systems are used at Clarkson WWTP. A micro-hydro turbine is installed in the effluent outfall shaft that is powered by effluent flow. In 2022, 210 MWh of electricity was generated by the turbine, representing a 47% decrease over the past 5 years' average. This decrease was due to the turbine being out of service for maintenance for a significant period in 2022. A cogeneration unit generates electricity for plant processes and heating the facility from biogas generated from the plant's anaerobic digesters. In 2022, a total of 7,167 MWh was generated from the cogeneration unit. Together, 25% of the electricity used at the plant was generated on site.

Energy usage and performance of energy intensive equipment is monitored, and the Region continues to research ways to optimize and reduce energy usage, such as identifying energy-saving opportunities during design of capital improvement and construction projects.

4.5.3 Capital Expenditure Information

Region staff determine capital expenditure priorities to eliminate unnecessary spending while maintaining infrastructure. Table 7 shows a summary of the major capital expenditures at Clarkson WWTP in the previous year.

Table 7 – Summary of Capital Costs

Activity	2022 Expenditures
Condition Assessment and Studies	$856,001
Equipment Repair & Replacement, Conventional Plant	$4,154,765
Equipment Repair & Replacement, Biosolids Processes	$1,413,533
Total	**$6,424,300**

4.6 Effluent Quality Assurance and Control Measures

Quality Assurance & Control Measures

Sampling Data

Licensed operators perform **in-house testing** of multiple parameters for process control

Primary treatment efficiency **sampling program**

Samples are analyzed by an **accredited laboratory**

All **process data** is captured electronically

SCADA real-time data capture & monitoring, data historian, and reporting tools for the collection and analysis of data

Operational Control

Operational facility sheets capture data that can be used to determine trend and diagnose problems

Dissolved oxygen profiling to ensure completion of CBOD removal and complete nitrification

Calibration of critical equipment is performed with required frequency

Equipment redundancy to increase equipment availability and effective response to failures and unplanned emergencies

Multiple **SCADA** stations throughout the facility ensures operators have ready access to real-time conditions and control of plant equipment

Internal **Standard Operating Procedures** complement Operations and Maintenance Manuals

Document control system for proper and effective record-keeping

Wastewater Contingency Plan to address emergency situations in the interest of meeting final effluent limits and prevent impacts to the environment

Preventive Maintenance

Reliability Centered Maintenance program reduces emergency repairs, shifting toward proactive control

Inventory of equipment is captured in a **Computerized Maintenance Management System**, improving the ability to manage assets

A major **maintenance program** focuses on replacing or refurbishing aging assets

Competent Staff

Operator licences (issued under O. Reg. 129/04) are verified monthly

Comprehensive operator training includes classroom, online and hands on training

Overall Responsible Operator readily available to provide direction during operational challenges and emergency situations

Compliance and Process staff for system oversight

Process and Energy Optimization staff for managing cost efficiency, energy savings and environmental stewardship

Management Oversight

Regular process and compliance meetings between the owner and the operating authority

Monthly operations staff meetings provide training and discussion on topics including health and safety, compliance, and operational and maintenance activities

4.7 Monitoring Equipment Calibration and Maintenance

Equipment used to monitor wastewater influent and effluent flows must be checked and maintained to ensure it is reading accurately. This is achieved through annual calibration and maintenance of flow meters, completed by a third-party vendor. For 2022, all effluent flow meters were found to be within acceptable limits.

4.8 Efforts Made to Achieve Design Capacity and Objectives

The flows to Clarkson WWTP are consistently well below rated capacity (as demonstrated in Section 4.1); therefore, no additional measures are required to achieve design capacity.

Throughout 2022, the effluent consistently met the Approval objectives (targets) for $CBOD_5$, TSS, TP, TAN and *E. coli* (when prescribed). For a description of test parameters, see Appendix A. The only parameter for which the objective was not met at times was pH. There were three days when the pH was outside the objective range of 6.5-9.0 pH units. On those days, the pH limit (requirement) was still met. The causes and how the process was managed are detailed in Section 4.4. Figure 5 demonstrates the proportion of time the pH objective was met.

Section 4.6 describes the many programs and measures in place to ensure that objectives are consistently achieved, and environmental impacts are minimized.

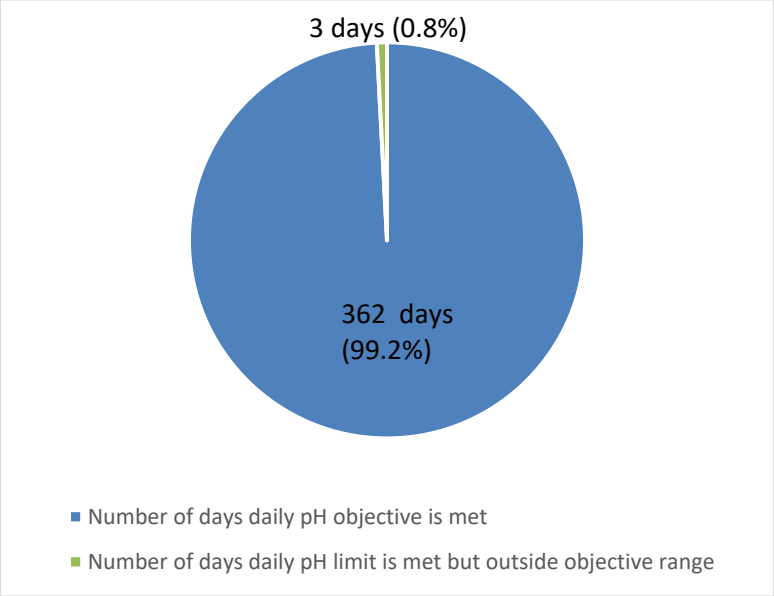


Figure 5 – Proportion of Time pH Met Daily Objective Range

In 2022, the Region of Peel continued to progress on an Environmental Assessment (EA) for the wastewater treatment facilities to provide additional treatment capacity to meet Master Plan flow projections to 2041. The EA is near completion, and an Environmental Study Report will be submitted for final public review in spring 2023.

The Region has undertaken proactive long-term actions in the collection system to meet future needs.

The Region's strategy for offsetting wastewater flows from the east side of Mississauga and Brampton includes several major collection system initiatives, with an overall budget of approximately $420 million. Twinning of the East Brampton and West sanitary trunk sewer is now complete and operational and will provide additional capacity and allow for condition assessment and rehabilitation of the existing trunk sewer to extend its useful life. The Region recently completed a condition assessment of the existing East Brampton sanitary trunk sewer and is in the process of retaining an engineering consultant to support detailed design and construction of planned rehabilitation work. Several significant wastewater condition assessment and rehabilitation initiatives were initiated or continued in 2022, including condition assessments of portions of the West Trunk Sewer, portions of the East Brampton Trunk Sewer, the Sawmill Creek and Levi Creek Trunk Sewers, the Upper Cooksville Trunk Sewer, and the Erin Mills Trunk Sewer.

The goal of these projects is to assess and rehabilitate sanitary infrastructure to meet target levels of service, which in turn improves system resiliency and longevity, and reduces site-specific infiltration, such as leaking pipe joints. The East Trunk Sewer and Energy Dissipation Chamber Rehabilitation Class EA and Detailed Design were completed in 2022, and the project is currently in the early stages of construction. This project was also awarded combined federal and provincial funding.

The Region is also proposing additional collection system initiatives to facilitate diversion and storage to alleviate extraneous flows related to inflow and infiltration. More details can be found in the Wastewater Collection System annual report at https://www.peelregion.ca/wastewater/#reports.

The Region also protects the wastewater collection system (and thus WWTPs) from industry impacts. The Region's Wastewater Bylaw (53-2010) sets concentration limits for discharges to the sanitary sewer, which subsequently protects the WWTPs from industry impacts, and provides information on agreements and spills to the environment. The bylaw applies to the Industrial, Commercial, and Institutional (ICI) sectors as well as residences and establishes penalties for offences of up to $100,000 for businesses.

All ICI facilities are inspected by Region staff at a minimum once every 2 years, resulting in over 5,000 inspections being completed annually. The inspections are used to assess the discharges from the facility and its compliance with the bylaw as well as the effect on the wastewater collection and treatment systems

Upon discovery of a spill into the sanitary sewer, or notification from an industry of a release, WWTPs are notified so staff can implement protective actions.

4.9 Sludge Generation and Disposal

The treatment process removes solids from the wastewater stream in the form of sludge, which is processed on site, as described in Section 3. Table 8 shows the total monthly and annual sludge volumes generated at the Clarkson WWTP.

In 2022, a total of 8,151 dry tonnes of sludge cake was generated. This represents a 5% increase in sludge production compared to the previous year. All sludge is sent offsite for disposal -- 2,742 dry tonnes were incinerated at G.E. Booth WWTP and 134 dry tonnes were shipped to landfill. The remaining 5,274 dry tonnes (65%) of the sludge generated, were sent for beneficial use such as land application, land reclamation, or conversion into soil amendment products.

Anaerobic digestion reduces pathogens and stabilizes the sludge. To recover this valuable resource, a change in the sludge disposal strategy was made in 2022 with the intention of sending about 50% of the sludge produced at Clarkson WWTP to beneficial use. This resulted in much less sludge being delivered to G. E. Booth WWTP than in prior years.

It is difficult to predict the change in sludge production for the following year as there has not been a clear trend in the last several years. Based on a predicted population increase of 1%, and no significant expected changes to flows or processing, no significant changes in sludge generation are expected for the next year.

Table 8 – Summary of Sludge Volume Generated in Different Processes and its Disposal

Month	Sludge Cake Produced (dry tonnes)[1]	Sludge Cake Sent to Landfill (dry tonnes)	Sludge Cake Sent for Beneficial Use (dry tonnes	Sludge Cake Sent to G.E. Booth for Incineration (dry tonnes)
January	526	0	145	381
February	443	0	327	117
March	785	0	205	580
April	673	0	199	473
May	557	0	511	47
June	908	0	832	76
July	720	0	453	267
August	813	0	402	411
September	712	0	712	0
October	636	0	526	110
November	687	0	580	107
December	690	134	382	174
Annual Daily Average	**22**	**0**	**14**	**8**
Annual Total[2]	**8,151**	**134**	**5,274**	**2,742**

[1] Mass as determined based on weight of sludge transported
[2] Total of unrounded values

4.10 Summary of Complaints

The Approval requires that the Region log, investigate and resolve all resident complaints. The Region makes every effort to contact customers and satisfactorily address their concerns and enquiries. A database is used to record details including information collected from the customer on the nature of the enquiry and action taken by the Region. There was one odour complaint received on June 11 about the Clarkson WWTP; however, investigation suggested that the odour was not related to the operation of the plant, but its likely source was the nearby petrochemical plants.

4.11 Bypasses, Overflows, Spills and Abnormal Discharge Events

Occasional weather events such as heavy rainfall and spring snow melt can result in flow rates that are higher than those for which the plant was designed and burden the treatment process. These challenges, as well as the need for planned maintenance and construction activities, may result in a discharge to the environment of a portion of wastewater that has not undergone all treatment processes, outside of normal operating conditions, in what is referred to as a bypass event.

4.11.1 Bypasses

A **bypass** is an intentional diversion of excess wastewater around one or more wastewater treatment process(es). The bypassed portion of wastewater undergoes part of the treatment process followed by disinfection and gets re-combined with the fully treated flow prior to release into Lake Ontario at the approved discharge location and sampling point. Final effluent is sampled and tested during bypass events to assess its quality.

Occasionally, a planned bypass is necessary in order to repair an essential part of the treatment process or during construction. In those cases, Peel submits a request to the federal and provincial governments to perform the bypass, including a plan to minimize its impact.

While not desirable, emergency bypasses may be necessary during high flow events to prevent spills and flooding at the WWTP and backups within the sewer system that can cause basement flooding and spills to the environment. Bypasses are also essential to protect the plant core biological treatment process (microorganisms that treat the sewage) from being washed out, which would prevent the plant from functioning properly and potentially causing long-term treatment impacts until the biological community is re-established.

Most bypasses in Peel are *secondary bypasses*, whereby the diverted wastewater receives primary treatment, bypasses secondary treatment, and receives a high degree of disinfection.

There was one secondary bypass during the reporting period**.** See Table 9.

Table 9 – Summary of Bypasses

Date	Location	Type	Duration (hours)	Volume (L)	Disinfected	Reason
23-Jun	Plant 1	Secondary	0.25	40	Yes	Bypass occurred when bypass gate testing was performed

4.11.2 Overflows

An **overflow** is a controlled discharge of wastewater to the environment from a designed location at the plant other than the approved final effluent outfall. **There were no overflow events** during the reporting period.

4.11.3 Spills

A **spill** is an unplanned discharge of wastewater to the environment from any location that is not specifically designed for this purpose. **There were four spill events** during the reporting period**.** See Table 10.

Table 10 – Summary of Spill Events

Date	SAC Reference Number	Description	Action Taken in Response
11-Apr	1-1R5OSA	Fugitive emissions of natural gas (spill to air) via a failed pressure relief valve	Pressure relief valve was replaced
27-Apr	1-1S4EWF	Overtopping of partially treated sewage during pumping between tanks for a maintenance activity	Standing liquid was pumped to back to process tanks. The floats on the pumps were adjusted to better match pumping requirements.
19-Jul	1-1XKF56	Enbridge discovered a small natural gas leak on underground pipe during routine inspection	Line was isolated and bypassed while it was repaired. The repair has been completed.
29-Dec	1-2FQI25	10 L of ferrous chloride (treatment chemical) spilled during delivery due to valve failure on delivery truck	The spill was cleaned up

4.12 Notice of Modifications to Sewage Works

The Approval allows for certain pre-authorized modifications to be made to the facility. The Ministry is notified of each modification via submission of a *Notice of Modification to Sewage Works* form.

There were no *Notice of Modification to Sewage Works* documented during the reporting period.

Repair and maintenance activities are exempt from the documentation requirements and may be performed as needed to maintain the WWTP in good working condition. These are summarized in Section 4.5.

4.13 Status of the Proposed Works

The Region undertakes construction projects to upgrade or enhance the WWTP to meet demands related to industrial and commercial growth in the Region that may alter incoming wastewater volume or loading, and to integrate new technologies. Future construction plans proposed by the Region are submitted to the Ministry for engineering review. Approved installations and modifications are listed in the Proposed Works section of the Approval # 0729-9KBNNY. All the works have been completed.

5. Performance Management Programs

5.1 Ministry Inspections

Wastewater System inspections are performed periodically by the Ministry to ensure systems are operating as required and complying with the terms and conditions of their Approvals. Performance data is reviewed against the compliance objectives and limits. The inspections also verify that the Region meets sampling, testing and treatment standards and staff competency requirements. Additional inspections can be triggered through a variety of factors such as frequency of events or inconsistent system performance (e.g., increased number of spills or reportable incidents), in response to a complaint or concern, or as part of a follow-up from prior non-compliances.

There was no Ministry inspection of the Clarkson WWTP in 2022.

Appendix A – Summary of Tested Wastewater Parameter Information

Parameter	Parameter Information
Dissolved Oxygen (DO)	Amount of oxygen dissolved in water. It is essential for the survival of aquatic plants and animals. In the wastewater treatment process, DO is required by the microorganisms to break down the organic material present. A lower DO value suggests a greater amount of organic matter present in the sample.
Total Biochemical Oxygen Demand (BOD_5)	Amount of DO used by microorganisms to break down organic material present in a wastewater sample, measured as DO decrease over a 5-day period. A higher BOD_5 value means greater amount of organic matter present in the sample, which can cause deplete DO in receiving waters.
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	Amount of DO needed by microorganisms to break down carbonaceous (carbon rich) organic material present in a wastewater sample over a 5-day period.
Alkalinity	Water's resistance to the effect of acids added to water.
Total Phosphorous (TP)	An essential nutrient used by microorganisms for growth. TP comes from a variety of sources including fertilizers, detergents, domestic wastewater, and wastewater from industrial processes. Excess phosphorus in waterbodies can promote algae blooms.
Total Suspended Solids (TSS)	Suspended particles (organic and inorganic material) present in the water sample. TSS can include sediment, sand, silt, plankton, and algae. High concentration of TSS can interfere with the disinfection process and can also lower the quality of the receiving waterbody.
Total Kjeldahl Nitrogen (TKN)	Sum of ammonia nitrogen and the amount of nitrogen present in organic form. High TKN can be toxic to aquatic life.
Total Ammonia Nitrogen (TAN)	The amount of ammonia in wastewater. Sources of ammonia include domestic, industrial or agricultural pollution, primarily from fertilizers, animal and plant decomposition, and animal waste.
Nitrite, Nitrate	An intermediate nitrogen species in the cycle of nitrogen removal from wastewater.
pH	A measure of the alkalinity or acidity in wastewater, which can indicate chemical or industrial pollution.
Temperature	Temperature of the wastewater sample measured at the time of collection. Higher wastewater temperatures allow for more efficient treatment at biological treatment plants.
Sodium Hypochlorite	Liquid chlorine used for disinfection of treated wastewater. To minimize chlorine effects on the receiving waters, the effluent is dechlorinated before being released into Lake Ontario.
Sodium Bisulphite	Used to neutralize the chlorine present in final effluent after disinfection. This is done to minimize chlorine effects on the receiving waters.
E. coli	An indicator of fecal contamination in effluent. Most species of this bacteria are harmless to humans; however, some strains can be pathogenic (cause disease).

Appendix B – Frequently Asked Questions

1. Where does water go after it is used?

After you use water to wash dishes and clothes, brush your teeth, shower, or flush the toilet, the used water (wastewater) that goes down your drains flows through a series of underground sewer pipes to the wastewater treatment plants.

The wastewater is treated to remove contaminants and kill disease-causing microorganisms before being discharged into the environment. The Region of Peel operates three wastewater treatment plants (WWTP): G.E. Booth WWTP and Clarkson WWTP, both discharging into Lake Ontario, and the Inglewood WWTP, discharging into the Credit River. These three plants serve the cities of Mississauga and Brampton and the Town of Caledon.

Click here for more information on how wastewater is treated.

2. Why am I experiencing a sewage odour outside my house?

The sewage odor outside your house could be from a variety of sources. It could be that the sewer is backed up close to your property. If your property is located close to a lake, algal blooms also cause odours. Other sources of odour might include scheduled treatment plant maintenance coupled with prevailing winds, nearby farming activities, or odours from waste management facilities or industries.

If you are noticing odours near your property, please call the Region of Peel at 905-791-7800.

3. Why am I experiencing a sewage odour inside my house?

If you notice an odour of sewage coming from a drain in your house, it is recommended to pour a capful of bleach into the drain, let it sit for 10-15 minutes and then rinse it down with plenty of water. If this does not resolve the odour problem, please call the Region of Peel at 905-791-7800 for further investigation.

4. What is the difference between a storm sewer and sanitary sewer?

Wastewater that goes down drains inside homes and buildings enters the sanitary sewer system, which sends it to a wastewater treatment facility for treatment before it is released to the environment. Sanitary sewer systems in Mississauga, Brampton and Caledon are maintained by the Region of Peel.

Rainwater and melting snow are called storm water. Stormwater enters storm grates on the road and enters the storm sewer pipes that run beneath the roadways. These pipes discharge the storm water to local waterways, like streams, creeks, and lakes. The majority of storm sewer is maintained by the local municipality – the cities of Brampton and Mississauga and the town of Caledon. The Region of Peel maintains storm sewers on Regional roads.

Click here for more information about wastewater and storm water.

5. What happens to industrial wastewater?

Some companies treat their own wastewater and release it directly into the environment or into to Region of Peel sanitary sewer (wastewater collection system). Wastewater released into the sanitary sewer joins all other wastewater collected (from households and building drains) and flows to one of the wastewater treatment plants. Industrial wastewater can be hazardous or contain substances that may damage sewer infrastructure or upset the treatment process. Therefore, all wastewater released and all businesses that release it into Region of Peel sewers must comply with the Region of Peel's Sewer Use Bylaw (Wastewater Bylaw). To ensure compliance, industrial facilities are examined by inspectors from the Region's Environmental Control department. Approximately 6,000 inspections are completed each year.

6. What must not be disposed down the toilet or poured down the drain?

It is important to understand that what goes down the drain or the toilet may have negative impacts on the wastewater system and the environment. Fats, oils, and grease should never be poured down the drain because these materials are known to cling to pipe walls. Over time, their accumulation can build up to such high levels that the sewer can become blocked. Another reason to avoid disposing fats, oils, and grease into drains or toilets is that it is not effectively broken down during the wastewater treatment process. Instead, the Region of Peel recommends that edible household fats, oils and grease should be collected and properly disposed as per the **FOG disposal at home** instructions on this page. Click here to learn more about Peel's Community Recycling Centres.

It is also important not to dispose items down the toilet that could get stuck in or damage the sewer systems. Sticks, rags, paper towels, personal hygiene products, diapers, disposable wipes, household hazardous waste and pharmaceuticals should not be disposed by simply flushing down the toilet. Any unused or expired pharmaceuticals can be returned to your local pharmacy. For more information on how to properly dispose of items that damage the wastewater refer https://idontflush.ca/

7. What causes a sanitary sewer backup?

Most sewer backups occur when sewer pipes get blocked. Sewer pipes can become clogged with excess fats, oils, greases, food wastes, coffee grounds, hair, toilet paper, soap residue or inappropriate materials being flushed down the toilet or drain. This includes sanitary wipes which are labelled "flushable", will in fact clog pipes, sewers and screens at the treatment plants. To help reduce sanitary sewer blockages and prevent backups, it is recommended to properly dispose of these items and other materials that can harden or settle within the sewer pipes.

Sanitary sewer backups can also occur when tree roots grow into or through sewer lines. These roots may be from trees that are outside your property boundaries. The only solution to this problem is to cut away the roots and then replace the pipeline.

If you notice a sewer backup in your home, call the Region of Peel at 905-791-7800 ext. 4409, or 1-888-919-7800 for residents in Caledon. If the problem area is determined to be on private property, there is a flat fee for the service call. Click here for more information.

8. How safe is the treated wastewater that is released into Lake Ontario?

To meet environmental compliance criteria in Ontario, all wastewater must be treated before being returned to the environment. The Region of Peel operates and maintains three wastewater treatment facilities, G.E. Booth, Clarkson, and Inglewood, under strict regulations and the effluent discharged intothe environment must meet location-specific, provincial, and federal standards.

9. Which pipes are mine and which are the Region's responsibility?

Click here for more information about homeowner and regional responsibilities of wastewater infrastructure.

10. What is optional water/sewer line insurance program?

The pipes on the private side of the property line belong to the property owner. Sometimes these pipes may get damaged or blocked, which can result in costly plumbing bills. The Region of Peel endorses a voluntary pipe insurance program. Read more here:

Click here for more information on the water/sewer line insurance program.

Other sources from which you can get more information about wastewater and related issues:

Region of Peel working with you **Wastewater-related questions:** **Region of Peel** 10 Peel Centre Drive Brampton ON L6T 4B9 Phone: 905-791-7800 Ext. 4685 Website: https://peelregion.ca/wastewater/ E-mail: Publicworkscustserv@peelregion.ca	Region of Peel working with you **Water and Sanitary Sewer/Septic Protection Plans:** https://www.peelregion.ca/pw/water/SLWCfaqs.htm **Peel Wastewater Bylaw:** https://www.peelregion.ca/council/bylaws/2010s/2010/by-53-2010.htm
Ontario **Ministry of the Environment, Conservation & Parks** Public Information Centre Phone: 416-325-4000 Toll-Free: 1-800-565-4923 Web site: www.ontario.ca/environment	Canada **Environment and Climate Change Canada** Inquiry Centre Phone: 819-997-2800 Toll-Free:1-800-668-6767 Web Site: http://www.ec.gc.ca