TORONTO Water

HIGHLAND CREEK TREATMENT PLANT

2024 Annual Report

March 31, 2025

EXECUTIVE SUMMARY

The Highland Creek Treatment Plant (HCTP) is one of four wastewater treatment facilities operated by the City of Toronto. This facility, located at 51 Beechgrove Drive, has a rated capacity of 219,000 m^3/day, or 219 ML/day, and serves an equivalent population of approximately 489,000. The Highland Creek Treatment Plant discharges into Lake Ontario and operated under Amended Environmental Compliance Approval (ECA) Air No. 6101-CUBKC2, issued on November 6, 2023 and Amended Environmental Compliance Approval (ECA) Sewage No. 8001-CQBNPG, issued on December 6, 2023.

The influent parameters at Highland Creek Treatment Plant is summarized in the table below.

Parameter	2024 Influent
Average Daily Flow Rate	184.8 ML/day
Biochemical Oxygen Demand (BOD_5)	219.4 mg/L
Total Phosphorus (TP)	5.5 mg/L
Total Suspended Solids (TSS)	283.5 mg/L

Highland Creek Treatment Plant achieved the following effluent quality and loading rates in 2024 in comparison to ECA limits:

Parameter	ECA[1]	2024 Final Effluent
Total Suspended Solids (TSS)	25.0 mg/L	14.0 mg/L
Carbonaceous Biological Oxygen Demand ($CBOD_5$)	25.0 mg/L	6.6 mg/L
Total Phosphorus (TP)	1.0 mg/L	0.7 mg/L
Escherichia Coli (E. Coli)[2]	200 CFU/100mL	32 CFU/100mL
pH	6.0-9.5	6.6
Total Chlorine Residual (TRC) (Dechlorination)	0.02 mg/L	0.008 mg/L
TSS Loading Rate	5,475 kg/day	2,584 kg/day
$CBOD_5$ Loading Rate	5,475 kg/day	1,218 kg/day
TP Loading Rate	219 kg/day	126 kg/day

[1] Referenced from Amended ECA No. 8001-CQBNPG, issued on December 6, 2023.

[2] Arithmetic mean of monthly geometric mean data.

Summary of 2024 solids handling:

- Sludge feed flow to dewatering centrifuges averaged 1,595 m^3/day
- 27.78 dry tonnes of dewatered solids generated per day

Summary of 2024 chemical consumption:

- 717 tonnes of ferrous chloride for phosphorus removal
- Polymer for waste activated sludge (WAS) thickening and sludge dewatering totalled to 18 and 301 tonnes, respectively
- 2441 m^3 of sodium hypochlorite (12% w/v) for disinfection
- 433 tonnes of sodium bisulphite (SBS) (38 % w/w) for effluent dechlorination

Bypasses and overflows:

There was 1 bypass occurrence due to historically high rainfall (87 mm) at Highland Creek Treatment Plant in 2024.

Capital Projects:

The plant continued with various capital projects. Notable projects include the following:

- Liquid Train Upgrades (Contract 1)
- Disinfection Electrical Upgrades and Fluidized Bed Incineration
- Sludge Storage Tank (SST) Cleaning & Biofilter/TWAS pumping Upgrades
- Variety of scheduled repentative, predictive, and reactive maintenance

Highland Creek Treatment Plant O&M costs, staffing, and health and safety incidents in 2024 is summarized below:

- $22.2M in direct operating costs
- Staffing complement of 69 employees
- 8 health and safety incidents and 1 lost time days due to work related injuries
- Annual consumption of potable water, hydro, and natural gas: 200,937 m^3, 33.2M kWh and 7.2M m^3

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GLOSSARY OF ABREVIATIONS AND DEFINITIONS

BOD5	Five-Day Biochemical Oxygen Demand
CBOD5	Five-Day Carbonaceous Biochemical Oxygen Demand
CEU	Continuing Education Units
CFU	Colony Forming Units
E. Coli	Escherichia Coli
ECA	Environmental Compliance Approval
Fe	Iron
HRT	Hydraulic Retention Time
kg	kilogram
kWh	Kilowatt-hour
MAC	Monthly Average Concentration
MGMD	Monthly Geometric Mean Density
m^3	Cubic metre
m^3/day	Cubic metre per day
mg/L	Milligrams per litre
mL	Millilitre
mm	Millimetre
ML	Megalitre (million Litres)
MECP	Ministry of the Environment, Conservation and Parks
Q	Flow Rate
RAS	Return Activated Sludge
RMDL	Regulatory Method Detection Limit
SBS	Sodium Bisulphite
SBS (P)	Sodium Bisulphite Presence
scm	Standard Cubic Metre
SS	Suspended Solids
TRC	Total Residual Chlorine
TP	Total Phosphorus
TS	Total Solids
TSS	Total Suspended Solids
TVS	Total Volatile Solids
TWAS	Thickened Waste Activated Sludge
µg/L	Micrograms per litre
WAS	Waste Activated Sludge
% w/v	Percent concentration of components of a solution expressed as weight by volume
% w/w	Percent concentration of components of a solution expressed as weight by weight

Definitions

Bypass: The diversion of sewage around one or more treatment processes, excluding Preliminary Treatment System, within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final Effluent sampling point(s) and discharged via the approved effluent disposal facilities.

Overflow: An overflow is defined as a discharge to the environment from the plant at a location other than the plant outfall downstream of the final effluent sampling station.

Spill: A spill is defined within the meaning of Part X of the Environmental Protection Act. "Spill", when used in reference to a pollutant, means a discharge,

a) into the natural environment,
b) from or out of a structure, vehicle or other container, and
c) that is abnormal in quality or quantity in light of the discharge.

Abnormal Discharge: A discharge of a pollutant designated by the regulations at a location designated by the regulations shall be deemed to be in a quantity or with a quality abnormal at the location. R.S.O. 1990, c. E.19, s. 91 (2).

$$Loading\left(\frac{kg}{day}\right) = Concentration\left(\frac{mg}{L}\right) \times Flow\left(\frac{ML}{day}\right)$$

$$Percent\ Removal\ (\%) = 1 - \frac{Concentration\ (Final)}{Concentration\ (Initial)}$$

$$Aeration\ Loading = \left(\frac{kg\ cBOD}{m^3\ aeration\ capacity}\right) = \frac{(Q_{Primary\ Effluent} + Q_{RAS}) \times [cBOD_{5\ primary\ effluent}]}{V_{aeration\ Tanks}}$$

$$Solids\ Capture\ (\%) = \frac{Centrifuge\ Feed\ TS - Centrate\ TSS}{Centrifuge\ Feed\ TS} \times 100$$

1 INTRODUCTION

The Highland Creek Treatment Plant (HCTP) is one of four wastewater treatment facilities operated by the City of Toronto under the responsibility of the Wastewater Treatment section of Toronto Water. The facility is located at 51 Beechgrove Drive, south of Lawrence Avenue East and services an area bounded by Steeles Avenue on the north, Victoria Park Avenue on the west, the Rouge River on the east and Lake Ontario on the south. This area contains an estimated connected population of 489,000[1]. The Highland Creek Treatment Plant has a rated capacity of 219,000 m^3/day, or 219 ML/day.

Major treatment processes include preliminary treatment, primary treatment, secondary treatment, phosphorus removal with ferric sulphate/ferrous chloride, final effluent disinfection using sodium hypochlorite, and final effluent dechlorination using sodium bisulphite. Treated effluent is discharged to Lake Ontario. Solids handling processes include Waste Activated Sludge Thickening, sludge stabilization by anaerobic digestion followed by dewatering using high speed centrifuges. Two multiple hearth incinerators are used for the disposal of the dewatered biosolids. Numerous auxiliary systems are required for the proper operation of plant processes and include potable water, process water, HVAC, SCADA, odour control, electrical power distribution, natural gas, digester gas and instrument air.

The Ministry of the Environment, Conservation and Parks (MECP) has classified the Highland Creek Treatment Plant as a Class IV wastewater treatment facility under Regulation 129/04. The Highland Creek Treatment Plant discharges into Lake Ontario and operated under Amended Environmental Compliance Approval (ECA) Air No. 6101-CUBKC2 November 6, 2023 and Amended Environmental Compliance Approval (ECA) Sewage No. 958001-CQBNPG, issued on December 6, 2023.

This report is a summary of plant operations and performance in 2024. Highlights of the report include a discussion of effluent quality and summaries of plant operations and maintenance, chemical and utility consumption, capital projects, operational costs and human resources.

[1] Population estimated by sewershed delineation and 2021 census data

2 PLANT PROCESS OVERVIEW

A description of the plant process is included below and a schematic flow diagram is available in Appendix A. Additional information regarding the plant process can be found on the City of Toronto website.

2.1 Influent

Wastewater from the Morningside Sanitary Trunk Sewer and Highland Creek Sanitary Trunk Sewer flows to the plant via a common sewer.

2.2 Preliminary Treatment

Raw wastewater enters the Headworks for screenings and grit removal. Perforated plate screens (6 mm) and washer-compactors are used to capture, wash and remove rags, sticks and large pieces of debris. Vortex grit chambers, grit pumps and hydrocyclones are used to remove, wash and dewater sand, gravel and other heavy inorganics. Ferrous chloride is applied to the raw wastewater upstream of the screens for phosphorous removal. The removed grit and screenings are hauled to a municipal landfill site.

2.3 Primary Treatment

Primary Treatment occurs in the Primary Clarification Tanks, where the flow velocity of the wastewater is reduced to allow heavier solids to settle to the bottom and lighter solids float to the top. There are 12 Primary Clarification Tanks. Sludge collectors in the tanks convey the settled sludge, called primary or raw sludge, into sludge hoppers. The primary sludge and scum is then pumped out for further treatment and the wastewater, called primary effluent, continues onto secondary treatment.

2.4 Secondary Treatment

The primary effluent receives secondary treatment through a conventional, suspended biomass activated sludge process in the Aeration Tanks. The mixed liquor consists of primary effluent mixed with return activated sludge (RAS), which is sludge removed from the Final Clarification Tanks. RAS contains micro-organisms that naturally occur in wastewater and facilitate the degradation of the organic pollutants. In the presence of oxygen, these micro-organisms break down organic material in the wastewater. Air is supplied to the Aeration Tanks through electrically driven blowers. There are a total of 16 Aeration Tanks each equipped with fine bubble dome diffusers.

The mixed liquor from the Aeration Tanks flows to 16 Final Clarification Tanks, where the Activated Sludge is allowed to settle. A controlled quantity of this sludge is returned to the Aeration Tanks as RAS in order to maintain a sufficient biomass concentration. The excess sludge is removed as waste activated sludge (WAS) and thickened using centrifuges.

2.5 Final Effluent

Sodium Hypochlorite is used to disinfect and kill pathogens in the final effluent. Sodium Bisulphite (SBS) is added after disinfection to remove excess chlorine (i.e. dechlorinate) from the wastewater, helping to protect the aquatic environment. The final effluent is discharged to Lake Ontario through an outfall pipe extending approximately 1,000 m into the lake. The plant uses measurement of Total Residual Chlorine (TRC), in the final dechlorinated effluent for monitoring and compliance.

2.6 Solids Handling

All primary sludge, thickened WAS (TWAS), and scum from the Primary and Secondary Clarification Tanks, collectively called sludge, is treated, handled and disposed of in a similar manner, consisting of anaerobic digestion, intermediate blending and storage, dewatering and then incineration.

Primary sludge, from the Primary Clarification Tanks, is first fed into primary anaerobic digesters. Secondary sludge (WAS), from the Secondary Clarification Tanks, is first thickened through centrifugation and then it is also fed into primary digesters. Centrifugation reduces the volume of sludge by separating solids from liquid. The Thickening process consists of six centrifuges.

Anaerobic digestion is the biological degradation (stabilization) of organic materials (sludge) in the absence of oxygen – it reduces the volume of solids, destroys pathogens and mitigates sludge odour. The process produces digester gas, made up predominantly of methane. This gas can be used as a supplementary fuel for plant needs, including process and space heating, thereby reducing the plant's operating costs and carbon footprint. The digesters are operated in the mesophilic temperature range (34 – 38^{o}C). The target operating temperature for the digesters is 36^{o}C. The digestion process consists of a digester control building and four primary digesters.

Digested biosolids are conditioned with a polymer and dewatered by centrifugation. Centrifugation reduces the volume of sludge by separating solids from liquid. The Dewatering process consists of six centrifuges. It is not essential that sludge be digested at Highland Creek Treatment Plant – undigested sludge may be fed directly to the dewatering process and then incinerated.

2.7 Solids Management

The dewatered biosolids are incinerated in one of the two multiple-hearth incinerators. This thermal reduction process produces an ash that is mixed with effluent water from the scrubbers and pumped to one of two ash lagoons. When a lagoon is full, ash is removed and hauled to a landfill site for final disposal.

In extreme situations when the incinerators are out of service for an extended period of time due to unforeseen equipment failure, dewatered biosolids may be hauled off-site for third-party processing and disposal.

3 PROCESS SUMMARY

3.1 Process Parameters

In 2024, the Highland Creek Treatment Plant continued to produce a high-quality effluent. A summary of key final effluent parameters and their corresponding ECA objectives and limits are shown in Table 1. Regulated parameters are highlighted. Influent and effluent performance charts are available in Appendix B. Historical performance data is included in Appendix C.

Table 1: Final Effluent Parameters

Parameter	cBOD5 (mg/L)	TSS (mg/L)	TP (mg/L)	TRC[1] (mg/L)	E-Coli (count/ 100mL)	pH Min	pH Max
January	13	23	0.84	0.019	24	6.5	6.9
February	11	25	0.87	0.018	52	6.4	6.9
March	6	11	0.50	0.019	36	6.4	6.9
April	7	16	0.52	0.015	90	6.4	6.9
May	4	8	0.53	0.014	15	6.4	6.9
June	4	9	0.73	0.014	8	6.3	6.9
July	5	10	0.69	0.014	16	6.3	6.9
August	5	10	0.70	0.019	29	6.3	6.9
September	6	14	0.80	0.018	11	6.1	6.9
October	8	20	0.85	0.017	21	6.3	6.9
November	5	12	0.62	0.017	27	6.2	6.9
December	6	11	0.58	0.019	51	6.1	6.9
Annual Average	7	14	0.69	0.017	32	6.6	
Loading (kg/d)[2]	1,218	2,584	126	N/A	N/A	N/A	
Removal Efficiency[3] (%)	96%	95%	88%	N/A	N/A	N/A	
ECA Requirements[4,5]							
Effluent Objective	MAC: 15.0 mg/L	MAC: 15.0 mg/L	MAC: 0.9 mg/L	MAC: non-detect	MGMD: 150 CFU/100 mL	6.5 - 8.5	
Effluent Limit	MAC: 25.0 mg/L	MAC: 25.0 mg/L	MAC: 1.0 mg/L	MAC: 0.02 mg/L	MGMD: 200 CFU/100 mL	6.0 - 9.5	
Effluent Loading Limit	AAL: 5,475 kg/d	AAL: 5,475 kg/d	AAL: 219 kg/d	N/A	N/A	N/A	

[1] TRC – Total Residual Chlorine. Reported figure is the monthly maximum for the month. Annual Average is the average of all sample results. Lower detetion limit for TRC is 0.002 mg/L

[2] Loading is calculated based on the flow rates as provided in Table 2.

[3] cBOD = 0.8 * BOD assumed for removal efficiency calculatons

[4] Referenced from Amended ECA No. 8001-CQBNPG

[5] MAC refers to Monthly Average Concentration, MGMD refers to Montly Geometric Mean Density, and AAL refers to Annual Average Daily Loading.

Influent and Final effluent concentrations of eleven select heavy metals have been included in Appendix D. Any discharge into City sewers must meet the Sewers Bylaw limits. Final effluent concentrations are presented to assess the treatment plant's removal capacity.

A summary of the annual average of process parameters over the past three years is shown in Table 2.

Table 2: Process Summary

Parameter	Units	2024	2023	2022
Influent Parameters				
Flow [1]	ML/day	184.4	178.4	174.8
Total Annual Flow [1]	ML	67,478	65,119	63,801
Total Suspended Solids (TSS)	mg/L	283.5	320.5	321.8
Biological Oxygen Demand (BOD)	mg/L	219.3	225.6	243.5
Total Phosphorus (TP)	mg/L	5.5	5.5	5.8
Preliminary Treatment				
Grit and Screenings	Tonnes/day	4.3	4.4	4.4
Primary Treatment				
TSS	mg/l	153.3	161.5	89.3
cBOD5	mg/L	174.8	178.1	126.2
Secondary Treatment				
Aeration Loading	kg CBOD5/m3.day	0.61	0.60	0.42
Mixed Liquor Suspended Solids	mg/L	2,271	2,134	2,026
Solids Handling				
Primary Sludge Treated	m3/day	1,034	836	561
Primary Sludge TS [2]	%	1.8	1.4	2.5
Primary Sludge TVS [2]	%	85	85	85
WAS to Thickening	m3/day	3,792.0	3,994.4	3,031.2
WAS SS	mg/L	6,467	6,219	5,284
TWAS Treated	m3/day	596	657	516
TWAS TS	%	3.4	3.1	2.8
TWAS TVS	%	76	77	81
Volume to Digestion	m3/day	1,631	1,494	1,077
Digesters Hydraulic Detention Time	days	22	25	21
Organic Loading to Digesters	TVS / m3/day	0.7	1.2	1.1
Digester Gas Volume	m3/day	14,064	15,273	14,932
Dewatering Centrifuge Feed Flow	m3/day	1,594.5	1,716.6	1,868.9
Dewatering Centrifuge Feed TS	%	1.78	1.89	1.40
Dewatered Biosolids TS	%	26.9	27.6	28.2
Centrate Quality	mg/L	443	1,818	370
Solids Capture Rate	%	97	92	97
Dewatered Biosolids Disposed	Dry tonnes/day	28	29	26
Dewatered Biosolids Hauled[3]	Dry tonnes/day	0	0	0
Dewatered Biosolids Incinerated	Dry tonnes/day	28	29	26
Ash Removed	tonnes	6,427.5	4,335.6	3,564.0

[1] Flow monitoring is provided by influent flow meters. There are no effluent flow meters due to infrastructure limitations.
[2] Grab samples of raw sludge were replaced with TS% readings from online density analyser in 2019. TVS lab testing was halted, typical range of TVS is 80-90%
[3] Dewatered Solids hauled for processing to the Lystek facility in Dundalk, Ontario, when required as a contingency measure.

Influent flow to the Highland Creek Treatment Plant increased by 3.6% in 2024. This brings the daily average flow rate to 84% of the plants rated capacity. This flow increase is manageable within the current works and is attributed to annual variability and the switch to new influent flow meters as part of a capital project. Influent strength of BOD, TSS, and TP decreased by 2.8%, decreased by 11.6%, and increased by 0.6% respectively.

Final effluent annual average concentration for cBOD, TSS, and TP was 7mg/L, 14.0mg/L, and 0.69mg/L, respectively. The final effluent annual average for E. Coli monthly geometric mean density in 2024 was 32 CFU/100 mL and met the Schedule C compliance limit for each month. Final effluent total residual chlorine analysis did not exceed 0.02 mg/L in 2024. Furthermore, final effluent pH remained between the range of 6.1 – 7.2 throughout the course of 2024.

Although the HCTP consistently met the compliance limit for pH, the plant did not meet the objective for pH for more than half of the year. This was due to a major capital upgrade project which necessitated process units being taken out of service. A significant part of this multi-year project requires various primary and secondary clarifiers and aeration tanks to be taken off-line to accommodate the restoration of the plant's aging infrastructure. This resulted in prolonged process disruptions in the primary and secondary treatment processes throughout 2024. The capital project improvements that are underway are intended to significantly raise the plant's state of good repair and its ability to achieve the environmental compliance limits.

Due to the complexity and duration of the established HCTP Capital Program, and the need to schedule tanks and processes being taken offline to accommodate the current construction as well as for other major projects that will be tendered over the course of the next several years, the plant will continue to undergo significant onsite challenges, but will exercise best efforts to manage the impacts on its operations.

There were no deviations from the monitoring schedule in 2024. In addition, all the parameters highlighted in the sampling program specified in Schedule D of the plants ECA exceed the sampling frequency of 3 times/week specified by Condition 9(1)(b), negating the requirement for future sampling forecasts and scheduling.

3.2 Biosolids Management

In 2024, the daily average inflow to the Highland Creek Treatment Plant was 184.8 ML/day. The flow projections for 2025 do not exceed the plant rated capacity of 219 ML/day and are expected to generate a sludge volume that will be +/- 5% of the given volume for 2024.

During 2024, the sludge feed flow to the dewatering centrifuges averaged 1,595 m^3/day which resulted in 28 dry tonnes of dewatered solids being generated per day.

3.3 Chemical Usage

Several chemicals are used during the treatment process at the plant. Table 3 outlines the chemical consumption for the current and previous years. Costs listed exclude applicable taxes.

Table 3: Chemical Usage Summary

Process	Chemical		2024	2023	2022
Phosphorus Removal	Ferrous Chloride as Fe	Dosage as Fe (mg/L)	10.7	10.5	9.8
		Consumption (tonnes as Fe)	716.6	682.9	624.2
		Cost ($)	889,634	833,176	1,552,416
Disinfection	Sodium Hypochlorite (12% w/v)	Dosage as Cl (mg/L)	4.4	3.9	5.4
		Consumption (m^3)	2441	2,126	2,883
		Cost ($)	1,413,113	2,076,970	582,638
Dechlorination	Sodium Bisulfite (38% w/w)	Dosage (mg/L)	2.4	2.3	2.5
		Consumption (tonnes)	433.3	390.3	418.7
		Cost ($)	179,595	158,063	102,794
Thickening	Polymer	Consumption (tonne)	18	27.0	9.0
		Cost ($)	58,980	95,980	67,772
Dewatering	Polymer	Consumption (tonne)	301.0	418.0	230.0
		Cost ($)	1,056,970	1,528,647	1,094,062

3.4 Bypasses, Overflows, Spills, and Abnormal Discharge Events

3.4.1 Bypasses

Bypass flow bypasses secondary treatment (i.e. the Aeration Tanks) but receives preliminary, primary treatment, nutrient removal, as well as disinfection and dechlorination before the final effluent sampling point. Secondary bypasses result from high wet weather flows that exceed the plant's secondary treatment capacity. Highland Creek Treatment Plant experienced a bypass on July 16, 2024 for total volume of 9,538 m^3. On this day, Toronto experienced historical level rainfall with 87 mm of precipitation according to Environment and Climate Change Canada. The total precipitation in the Toronto area[2] was 863.4 mm in 2024, a 15.7% increase from 2023

[2] *Adapted from http://climate.weather.gc.ca/historical_data/search_historic_data_e.html, Toronto City Station*

3.4.2 Overflows

There were no overflow events at the Highland Creek Treatment Plant in 2024. An overflow is defined as a discharge to the environment from the plant at a location other than the plant outfall downstream of the final effluent sampling station.

3.4.3 Spills

There were four (2) liquid spills reported to the MECP in 2024; they are summarized in Table 4 below.

Table 4: Spills Summary[1]

Date	Duration (mins)	Nature of event	Description
04-Jan-24	1440	Discharge of un-chlorinated final effluent in construction pit.	Water was discovered seeping into an excavated pit close by final clarifier #8 on Nov 29, 2023. It took thorough investigation and multiple laboratory testing to confirm the source and nature of the leak on January 4, 2024. SAC was updated as required.
27-Aug-24	6	Stub Stack Emergency Pressure Relief	Power interruptions

[1] Under Certificate of Approval No. 3-1044-75-877, use of the stub stacks is limited to emergency situations including power failure, mechnical or electrical failure with the incineration system, and shut down of the incinerator for unanticipated reasons. A notification to the District Officer was issued for every stub stack emergency pressure relief event.

3.4.4 Abnormal Discharge Events

There were no abnormal discharge events at the Highland Creek Treatment plant in 2024.

3.5 Complaints

The Highland Creek Treatment Plant received 0 complaints related to odour or noise in 2024.

3.6 MECP Procedure F-5-1

Condition 12 (4)(m) of the ECA describes requirements to summarize efforts to achieve conformance with MECP Procedure F-5-1 – Determination of Treatment Requirements for Municipal and Private Sewage. The plant utilizes the activated sludge treatment process to meet secondary or equivalent treatment and achieves effluent quality at or beyond the compliance limits outlined in the ECA.

3.7 Effluent Quality Assurance and Control Measures

Analytical tests to monitor required parameters are performed by the Toronto Water Laboratory which is accredited to ISO/IEC 17025 by Canadian Association for Laboratory Accreditation Inc. Plant operations and performance are monitored by licensed operators as well as by the facility management team. Standard Operating Procedures, emergency plans, equipment preventative and predictive maintenance, and a network of support staff, help ensure a rapid and effective response to issues. This ultimately maintains the high quality of the effluent and ensures proper treatment of biosolids. A hybrid Quality and Environmental Management System is also in development and will be reported on in future Annual Reports.

4 CAPITAL PROJECTS

Under Toronto Water's capital program, the Highland Creek Treatment Plant commenced or continued with the capital works projects and studies listed in Table 5 in 2024.

Table 5: Capital Projects

Project Name	Project Description	Project Stage (Dec 31, 2024)	Estimated Completion
Liquid Train Upgrades – Contract 1 and RAS Pumping, Aeration and Phosphorus Removal	Various liquid train upgrades of existing process (primary and secondary treatment) to maintain state of good repair. New chemical dosing facility for phosphorous removal and aeration upgrades to Southeast plant.	Construction	2025
Disinfection and Electrical Upgrades	Upgrades to disinfection and dechlorination chemical dosing systems and various electrical upgrades. Improvements to overall state of good repair.	Construction	2025
Fluidized Bed Incinerator and South Facility Upgrades	New fluidized bed incineration building and upgrades to the south plant facility.	Construction	2029
Firm Capacity Upgrades	Undertake various process upgrades to maintain firm capacity, including installation of 110 MLD process train (NE Plant). Project scope is being reviewed to fit budgetary constraints.	Design	2033
Sludge Storage Tank (SST) Cleaning, Biofilter and TWAS pumping Upgrades	Detailed design for upgrades to the biofilters and TWAS pumping, as well as regular SST cleaning.	Design	2029
Security and Communication Study	Conceptual design for physical security upgrades, and update to communication study cost estimates. Includes developing communication, security and wayfinding design standards. Detailed Design and Construction project based on the study is anticipated to tender in 2025.	Complete	2024

5 MAINTENANCE

Staff from the Highland Creek Treatment Plant performed a variety of scheduled, preventative, predictive and reactive maintenance activities on a diverse spectrum of equipment. Equipment availability and reliability ensures regulatory compliance is achieved.

The annual calibration and maintenance records of flow meters and on-line analysers for regulated parameters was completed in 2024 and found to be within acceptable limits. A summary of effluent monitoring equipment calibration and maintenance performed in 2024 is included in Table 6.

Table 6: Summary of Regulated Monitoring Equipment Calibration and Maintenance

Calibration and/or Maintenance Record	Completion Date
Headworks Influent Chambers	January 16, 2024
Final Effluent pH and Temperature Meter Calibration	Weekly
Final Effluent HACH DR3900 Spectrophotometer Calibration	September 23, 2024
Influent Auto Sampler Calibration and Preventative Maintenance	Jan 9, March 20, April 23, Aug 21, Nov 12, Dec 26, 2024
Final Effluent Auto Sampler Calibration and Preventative Maintenance	Jan 18, April 23, Nov 12, Dec 26, 2024

In 2024, there was a total of 6,242 work orders completed; refer to Appendix F for a summary of maintenance activities as per Conditions 12(4)(e) of the ECA. None of the maintenance activities undertaken at the plant fell under Limited Operational Flexibility; as a result, no Notices of Modifications were submitted to the Water Supervisor as per Condition 12(4)(l) of the ECA. Regular safety inspections and preventative maintenance were performed on life safety systems at the plant in 2024.

6 UTILITIES

A summary of monthly utility consumption for the previous three years at Highland Creek Treatment Plant is provided in Figure 1. Table 7 below summarizes the total cost and average monthly unit cost for water, hydro, and natural gas. Total annual consumption of potable water, hydro, and natural gas was 200,937 m^3, 33.2M kWh, and 7.2M m^3, respectively.

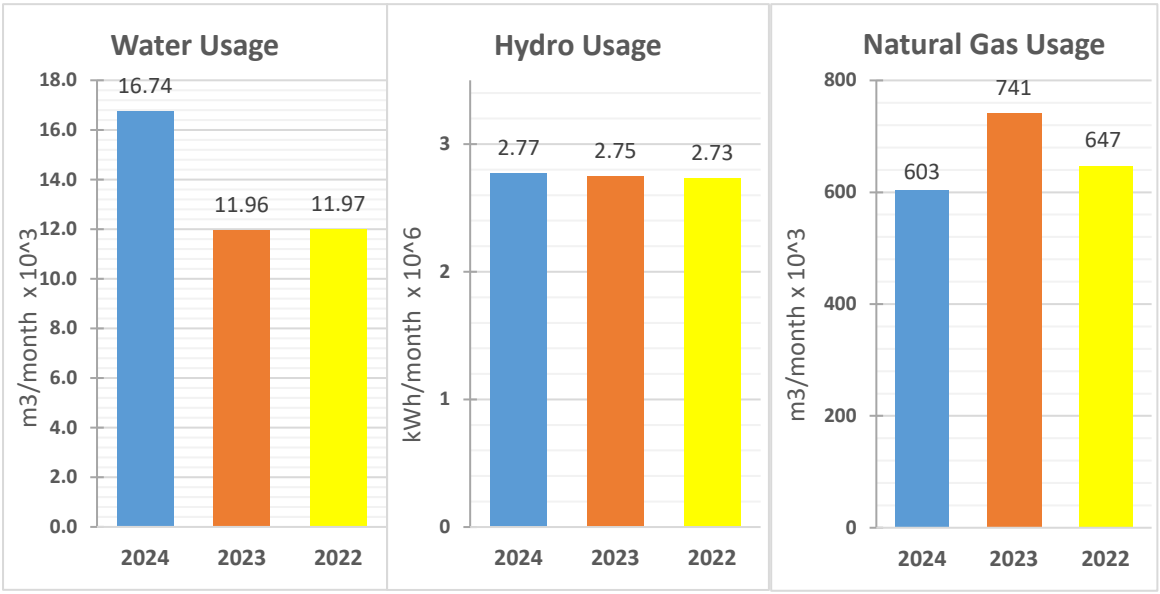


Figure 1: Annual Utility Consumption (Water, Hydro, Gas)

Table 7: Average Unit and Total Utility Cost

Utility	2024	2023	2022
Water Unit Cost ($/$m^3$)	$4.76	$4.62	$4.48
Water Total Cost ($/year)	$720,120.46	$662,633.41	$644,043.22
Hydro Unit Cost ($/kWh)	$0.10	$0.10	$0.10
Hydro Total Cost ($/year)	$3,441,663.20	$3,198,254.30	$3,315,496.12
Natural Gas Unit Cost ($/$m^3$)	$0.38	$0.35	$0.31
Natural Gas Total Cost ($/year)	$2,729,135.96	$3,092,312.10	$2,438,683.74

7 ADMINISTRATION

7.1 Operations and Maintenance Costs

The 2024 plant direct operational costs are broken down into five categories: Salaries and Benefits, Materials and Supplies, New Equipment, Services and Rents, and Inter-Divisional Charges. Materials and Supplies is further segregated into Utilities, Machine and Equipment Parts, Chemicals and Other Materials and Supplies. A breakdown of annual operations and maintenance costs for the past three years is illustrated in Figure 2. Overall, operational costs decreased by 4.2% from 2023. All categories had a decreased cost except for Service & Rents and Inter-Divisional Charges.

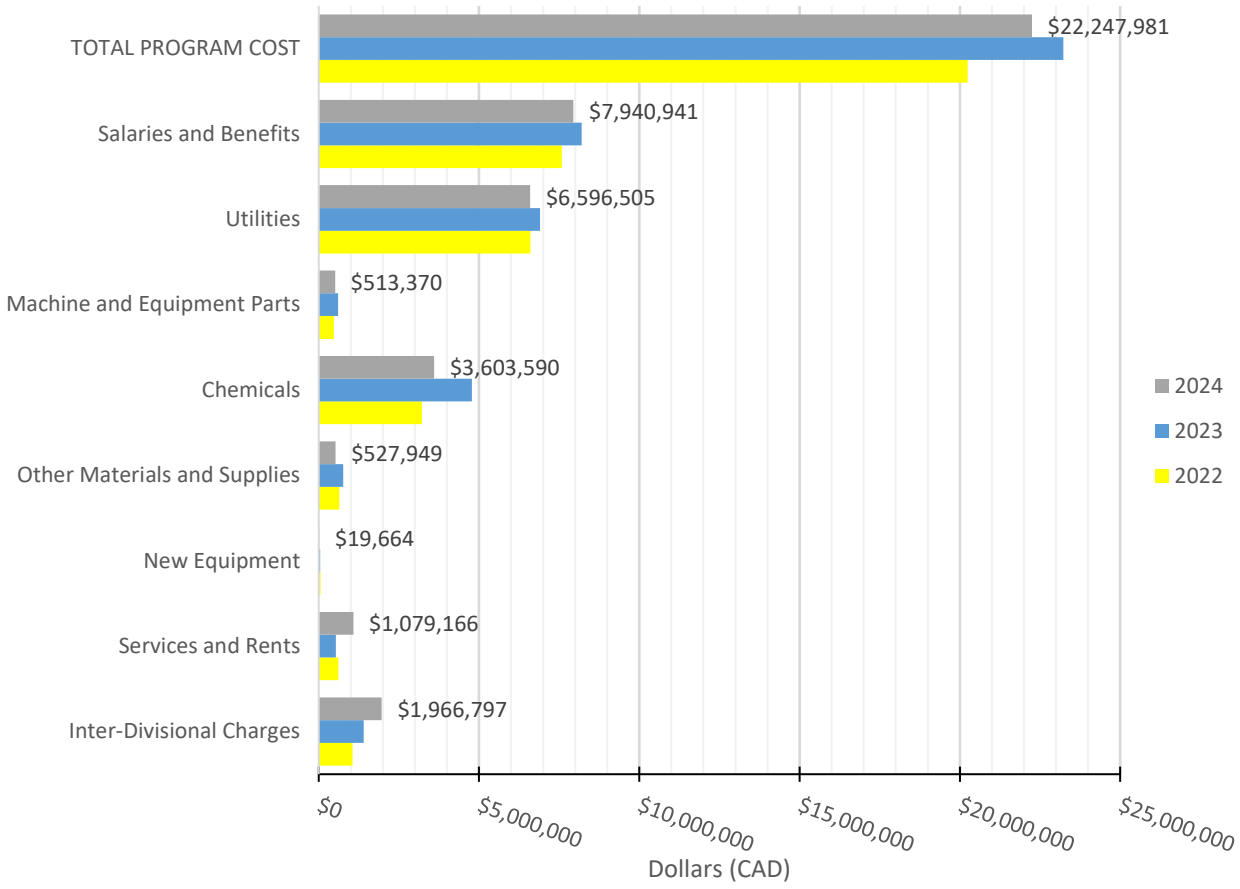


Figure 2: Operations and Maintenance Cost Breakdown

7.2 Human Resources

Plant Staffing at the Highland Creek Treatment Plant in 2024 is shown in Table 8.

Table 8: Plant Staffing

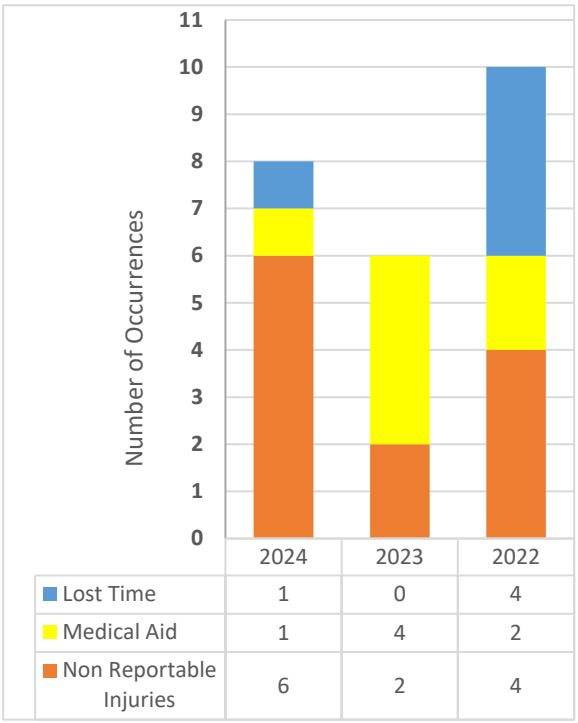
Position	Number of FTE[1]
Plant Manager	1
Senior Engineer	2
Engineer	2
Area Supervisor	4
Electrical & Instrumentation Specialist	1
Electricians	1
Plant Technician	26
Industrial Millwright	16
Electrical Instrumentation Control Technician	7
Wastewater Treatment Plant Worker	6
Support/Materials Management Assistant	2
Engineering Technologist	1
Total FTE Positions	69

[1] FTE refers to Full Time Equivalent staff. Seasonal staff are considered 0.5 FTE staff.

7.3 Occupational Health and Safety

Continuous efforts are made to ensure a safe working environment at the Highland Creek Treatment Plant. The Joint Health and Safety Committee (JHSC) assists management in resolving issues through regular meetings and monthly workplace inspections. Plant Health and Safety statistics for the Highland Creek Treatment Plant are included in Figure 3.

As of December 31, 2024, there were 12 health and safety incidents and a total of 1 lost time days in 2024 due to work related injuries.



	2024	2023	2022
Lost Time	1	0	4
Medical Aid	1	4	2
Non Reportable Injuries	6	2	4

Figure 3: Highland Creek Treatment Plant Health and Safety Injury Summary

7.4 Staff Training and Development

The Strategic Planning and Workforce Development unit of Toronto Water facilitates a comprehensive training program for all staff.

Training attended by Highland Creek Treatment Plant operations and skilled trades staff in 2024 includes the list of courses shown in Appendix G. Some of these courses were eligible for Continuing Education Units (CEU's) as specified by the Ontario Water Wastewater Certification Office (OWWCO). Additional training related to the start-up and commissioning of new equipment/systems installed as part of the capital program was provided as required.

7.5 Utility Operator Certification

Toronto Water trains and provides the required resources to ensure all operators achieve and maintain Class IV certifications. In addition, all skilled trade positions are required to achieve and maintain a Class I operator's license. As part of this initiative, general operational/process training was delivered to prepare staff for any certification examination that they need to write. Table 9 summarizes the status of operator certification at the Highland Creek Treatment Plant in 2024.

Table 9: Wastewater Treatment Certificates

Class Level	Number of Licenses
Class IV	25
Class III	2
Class II	5
Class I	13
O.I.T.	10
Total	55

7.6 MECP Correspondence

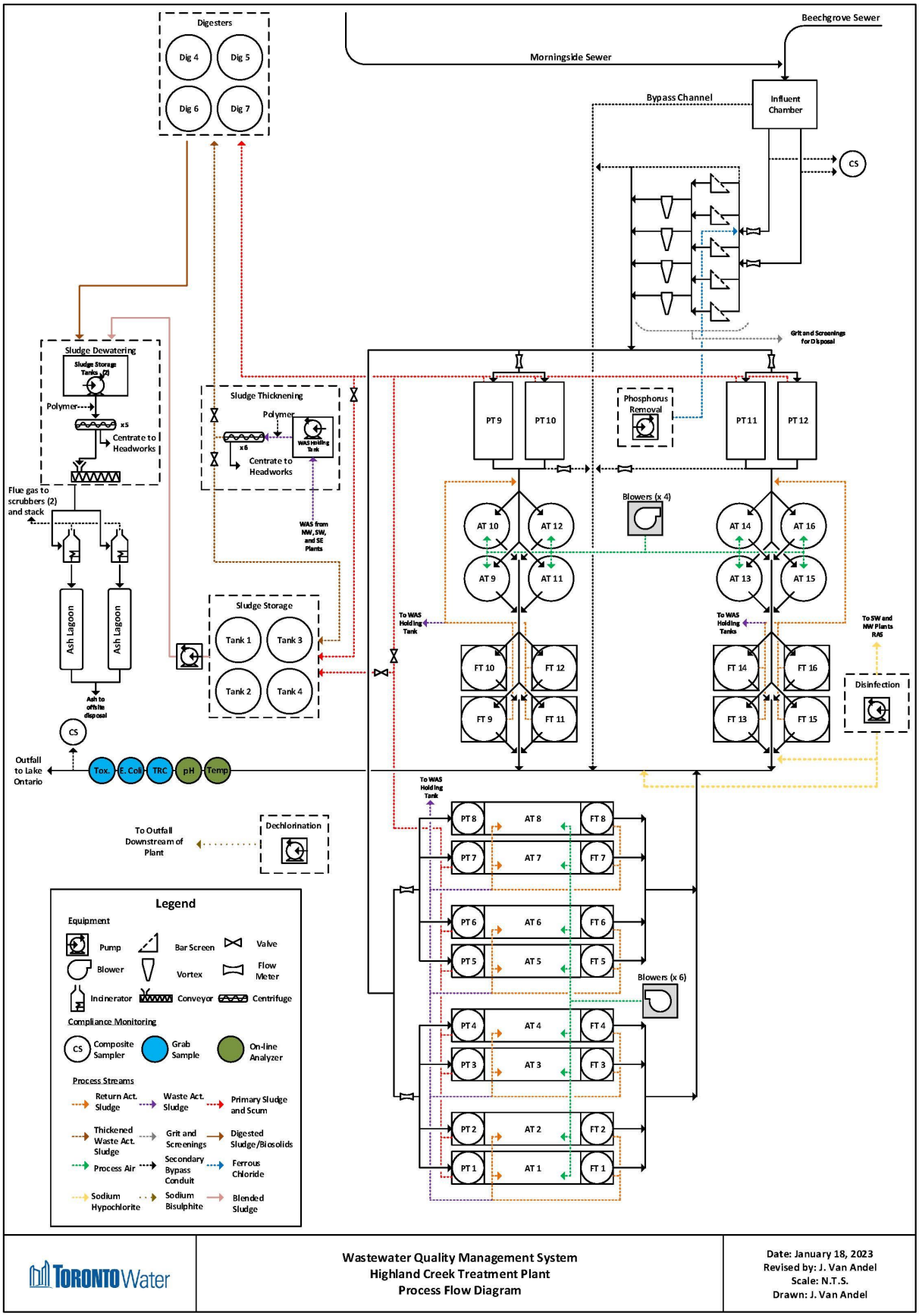
There were no orders issued by the Ministry of the Environment, Conservation and Parks (MECP). Table 10 summarizes the correspondence submitted to the MECP for the Highland Creek Treatment Plant. Correspondence related to spills can be referenced in Section 3.4.3.

Table 10: Correspondence submitted to the MECP

Event Date	Type	Description	Resolution	Resolution Date
Complaints				
Consent Letters				
Notice of Modification to Sewage Works				
Notification on Construction of Proposed Works				
Correspondence Submitted to MECP				
07-Jun-24	MECP Notification – Verification Plan of the New Chlorination Simulation System	The Validation/Verification Plan of the new chlorination simulation system was submitted to the MECP for review and concurrence in accordance with condition 10.2(b) of the ECA.	Resolved	20-Nov-24
Notice of Start-up				
MECP Inspection				

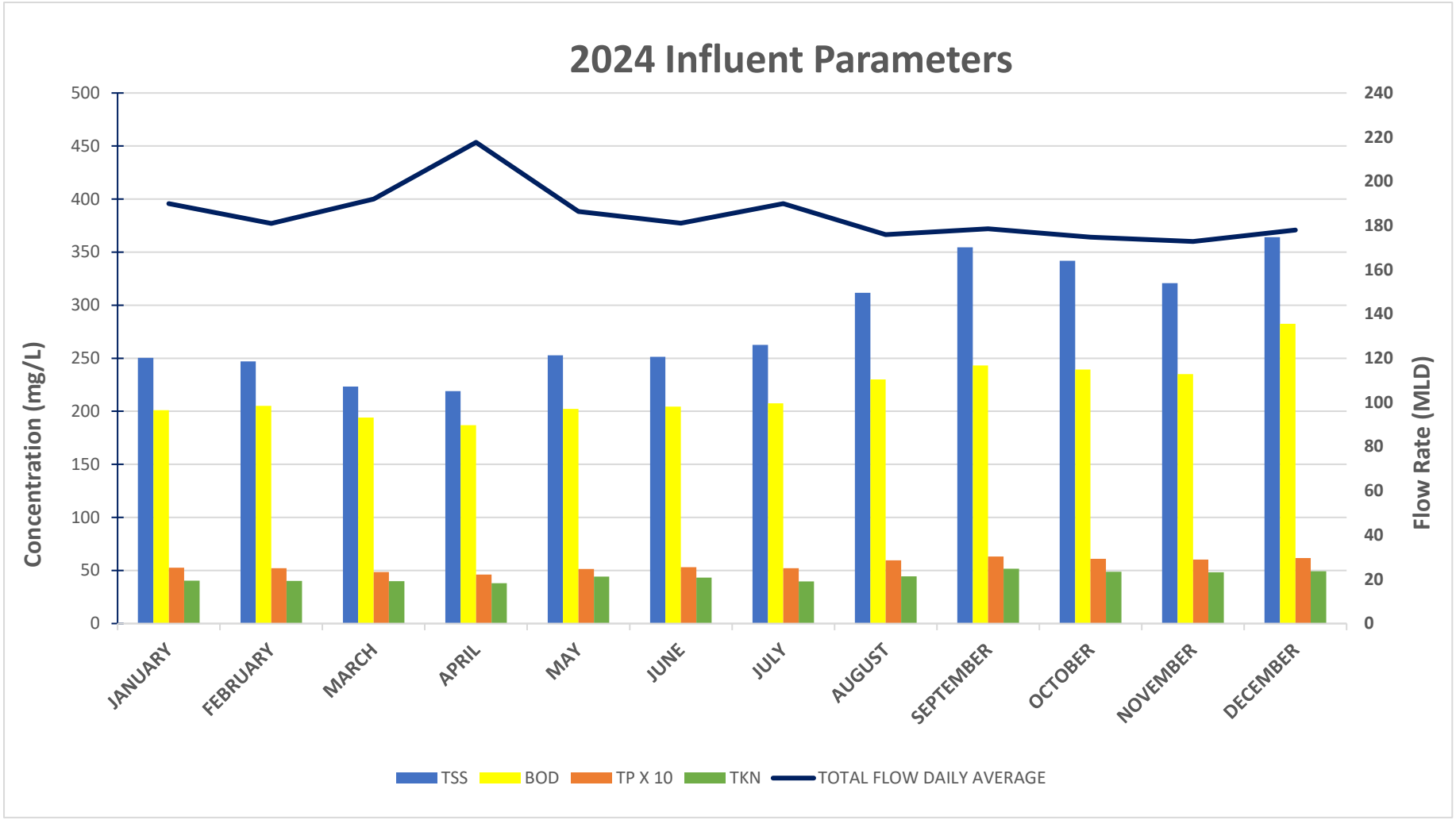
APPENDIX A – Plant Schematic

APPENDIX A – Plant Schematic

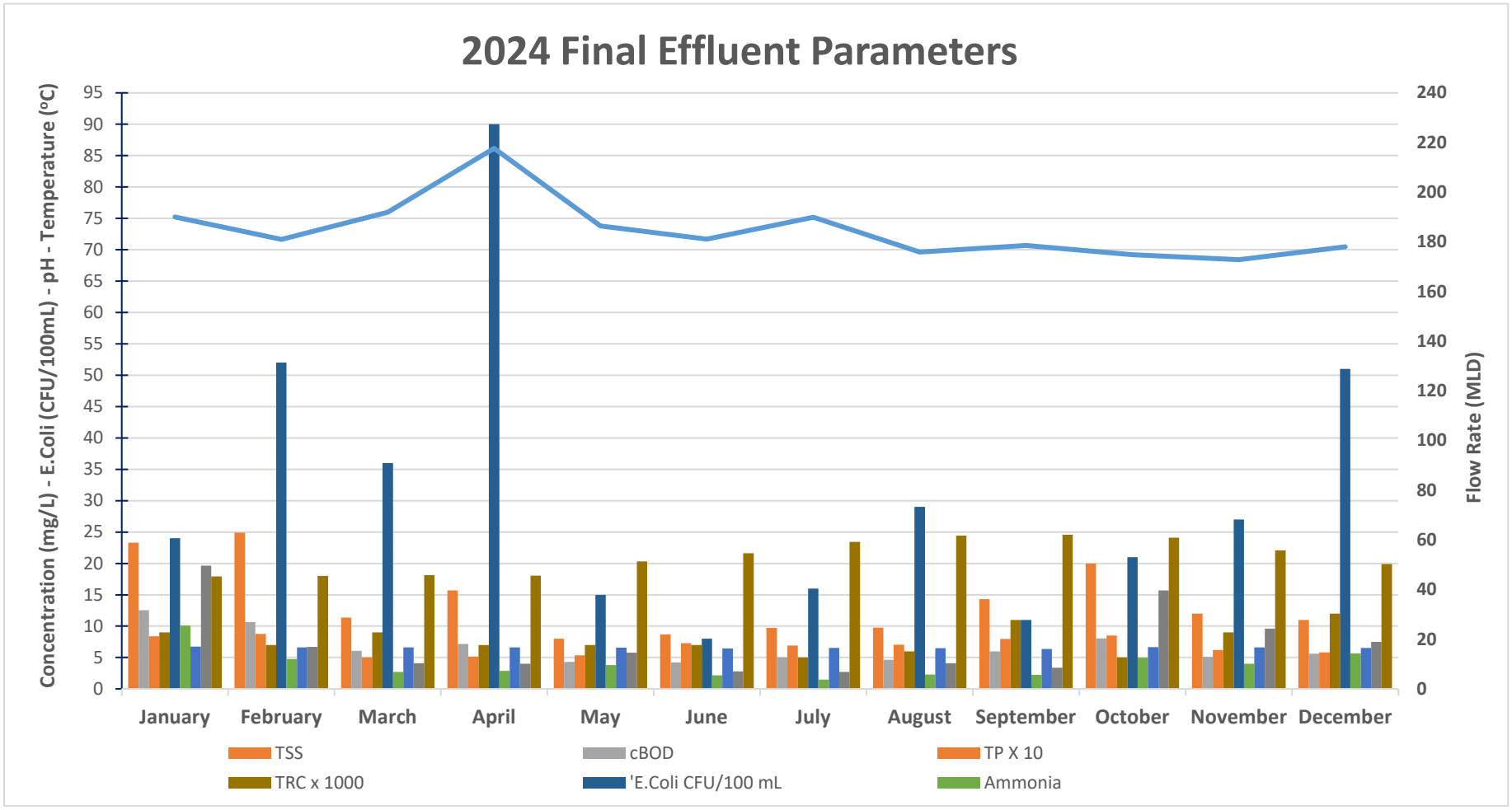


APPENDIX B – Influent and Effluent 2024 Performance Charts

APPENDIX B – Influent and Effluent 2024 Performance Charts



APPENDIX B – Influent and Effluent 2024 Performance Charts



APPENDIX C – Historical Performance Data

APPENDIX C – Historical Performance Data

	Units	2024	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
Influent Parameters														
Flow	ML/day	184.4	178.4	174.8	163.3	173.1	175.2	171.7	170.9	161.8	164.9	170.6	169.3	171.1
Total Annual Flow	ML	67,478	65,119	63,801	59,611	63,348	63,964	62,670	62,388	59,200	60,208	62,242	61,804	62,453
Total Suspended Solids (TSS)	mg/L	283.5	320.5	321.8	389.9	361.6	305.3	288.7	246.7	244.8	212.1	247.6	232.3	268.1
Biochemical Oxygen Demand (BOD_5)	mg/L	219.4	225.6	243.5	246.7	242.9	232.5	255.9	221.4	242.2	234	232.1	205.9	206.7
Total Phosphorus (TP)	mg/L	5.5	5.5	5.8	5.7	5.5	5.2	5.7	5.2	5.2	5	4.9	4.4	4.8
Total Kjeldahl Nitrogen (TKN)	mg/L	44.0	43.2	47.5	46.6	45.7	48.1	48.3	44.0	46.1	39.6	44.3	48.7	52.3
Preliminary Treatment														
Grit and Screenings	tonnes/day	4.3	4.4	4.4	4.5	4.2	4.8	1.8	2	2.4	1.9	2.3	-	-
Primary Treatment														
TSS	mg/L	153.3	161.5	89.3	84.7	91.9	124.6	121.5	134.7	151	171	339	232.1	332.6
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	mg/L	174.8	178.1	126.2	133.1	143.9	173.6	169.3	183.9	178	170	180	129.8	155
Secondary Treatment														
Aeration Loading	kg $CBOD_5$/ m^3.day	0.61	0.60	0.42	0.41	0.47	0.6	0.5	0.59	0.54	0.53	0.58	0.65	0.66
Mixed Liquor Suspended Solids	mg/L	2,271	2134	2026	2036	2435	2704.6	2619.5	2723	2736	3243	3296	2380	1577
Final Effluent														
TSS	mg/L	14.0	15.6	19.3	21.7	17.1	14.7	15.9	14.1	14.6	17.4	20.2	22.8	21
TSS Loading Rate	kg/day	2,584	2,787	3,378	3,537	2,967	2,578	2,736	2,406	2,368	2,877	3,440	3,868	3,598
cBOD5	mg/L	6.6	7.7	9.2	9.2	8.0	6.9	7.3	7.2	6.7	6.2	5.9	8.8	9.1
cBOD5 Loading Rate	kg/day	1,218	1,365	1,600	1,510	1,382	1,212.0	1,245.1	1,233	1,077	1,025	1,008	1,506	1,553
TP	mg/L	0.7	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.7
TP Loading Rate	kg/day	126	150	146	133	132	131.6	120.9	219	117	115	100	104	116
Escherichia Coli (E. Coli)	CFU/100 mL	31.5	45.0	42.3	11.6	11.3	11.3	21.0	16.0	53.2	40.2	10.4	34.9	15.5
pH	-	6.6	6.5	6.4	6.6	6.5	6.6	6.7	6.7	6.5	6.5	6.5	6.2	6.4
Total Residual Chlorine	mg/L	0.0008	0.008	0.007	0.008	0.006	0.003	0.004	0.004	0.007	0.006	SBS (P)	SBS (P)	SBS (P)

APPENDIX C – Historical Performance Data

	Units	2024	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
Total Kjeldahl Nitrogen (TKN)	mg/L	5.4	4.2	3.4	5.4	4.4	3.6	3.8	3.4	2.8	3.5	4.6	5.0	10.2
Total Ammonia Nitrogen	mg/L	3.9	3.0	1.8	4.0	3.2	2.1	2.0	1.5	1.1	1.4	2.9	3.4	7.7
Temperature	degrees Celsius	21.1	21.0	21.4	21.5	21.6	21.1	21.8	21.5	22.2	-	-	-	-
Solids Handling														
Primary Sludge Treated	m3/day	1034	836	561	758	684	463	770	910	1090	1525	2150	2900	2944
Primary Sludge Total Solids (TS)	%	1.82	1.44	2.46	3.41	3.39	1.67	2.85	2.55	2.40	2.80	2.60	2.20	2.20
Primary Sludge TVS	%	85.0	85.0	85.0	85.0	82.0	55.4	93.6	81.8	81.9	81.6	77.9	73.5	78.9
WAS to Thickening	m3/day	3,792	3,994	3,031	3,019	3,720	4,159	4,315	3716	3519	3110	2254	-	-
Thickened WAS (TWAS) TS	%	3.4	2.8	2.8	2.8	2.4	3.1	3.2	4.1	3.8	5.3	5.7	-	-
TWAS Treated	m3/day	596	657	516	433	663	687	665	-	474	323	1236	-	-
WAS to Co-settling	m3/day	-	-	-	-	-	-	-	-	-	-	-	6600	6875
WAS SS	mg/L	6,467	6,219	5,284	4,888	5,188	5,886	5,768	6732	6126	7358	7300	4500	3262
Dewatering Centrifuge Feed Flow	m3/day	1,594	1,717	1,869	1,829	1,796	2,478	2,494	1849	1924	2143	2065	1966	1906
Dewatering Centrifuge Feed TS	%	1.8	1.9	1.4	1.4	1.6	1.8	2.1	2.5	2.3	3.0	2.0	1.7	1.5
Dewatered Biosolids incinerated	Dry tonnes/day	27.8	29.5	25.6	25.7	26.7	41.6	45.4	31.1	45.1	57.4	38.5	29.2	23.1
Dewatered Biosolids TS	%	26.9	27.6	28.2	27.3	26.4	25.7	28.0	26.2	26.6	22.8	25.0	25.8	26.5
Ash Removed	tonnes	6,428	4336	3564	4519	3293	5502	2969	1815	3775	6141	3300	2100	-

APPENDIX D – Influent and Effluent Metal Concentrations

APPENDIX D – Influent and Effluent Metal Concentrations

Influent (Daily Composite tested once/month for metals)

Parameter Units	Arsenic mg/L	Cadmium mg/L	Chromium mg/L	Cobalt mg/L	Copper mg/L	Iron mg/L	Lead mg/L	Manganese mg/L	Mercury mg/L	Nickel mg/L	Zinc mg/L
January	*0.005	*0.002	*0.002	*0.002	0.0883	0.706	*0.0025	0.0581	*0.00005	*0.003	0.104
February	*0.005	*0.002	*0.002	*0.002	0.08	0.503	*0.0025	0.0536	*0.00005	*0.003	0.094
March	*0.005	*0.002	0.00655	*0.002	0.0931	0.682	*0.0025	0.0667	*0.00005	0.009	0.091
April	*0.005	*0.002	*0.002	*0.002	0.0908	0.694	*0.0025	0.0652	*0.00005	*0.003	0.107
May	*0.005	*0.002	*0.002	*0.002	0.0908	0.741	*0.0025	0.0608	*0.00005	*0.003	0.103
June	*0.005	*0.002	*0.002	*0.002	0.0989	0.745	*0.0025	0.0593	*0.00005	*0.003	0.11
July	*0.005	*0.002	*0.002	*0.002	0.0996	0.880	*0.0025	0.0682	0.00016	*0.003	0.121
August	*0.005	*0.002	*0.002	*0.002	0.121	0.811	*0.0025	0.0701	0.00015	0.005	0.136
September	*0.005	*0.002	*0.002	*0.002	0.149	1.090	*0.0025	0.07	*0.00005	0.005	0.149
October	*0.005	*0.002	*0.002	*0.002	0.108	0.891	*0.0025	0.0655	*0.00005	0.005	0.124
November	*0.005	*0.002	*0.002	*0.002	0.109	0.690	*0.0025	0.0669	0.00011	*0.003	0.143
December	*0.005	*0.002	*0.002	*0.002	0.149	0.771	*0.0025	0.0614	*0.00005	*0.003	0.132
Annual Average	**0.005**	**0.002**	**0.002**	**0.002**	**0.106**	**0.767**	**0.0025**	**0.064**	**0.00007**	**0.0037**	**0.118**

Values in red with an asterisk prefix are half the MDL

APPENDIX D – Influent and Effluent Metal Concentrations

Final Effluent (Daily Composite tested once/month for metals)

Parameter Units	Arsenic mg/L	Cadmium mg/L	Chromium mg/L	Cobalt mg/L	Copper mg/L	Iron mg/L	Lead mg/L	Manganese mg/L	Mercury mg/L	Nickel mg/L	Zinc mg/L
January	*0.005	*0.002	*0.002	*0.002	0.0212	1.65	*0.0025	0.0779	*0.00005	*0.0052	0.03
February	*0.005	*0.002	*0.002	*0.002	0.0139	1.23	*0.0025	0.0698	*0.00005	*0.0025	0.03
March	*0.005	*0.002	*0.002	*0.002	0.0128	0.77	*0.0025	0.0887	*0.00005	*0.0025	0.026
April	*0.005	*0.002	*0.002	*0.002	0.0135	1.02	*0.0025	0.0800	*0.00005	*0.0025	0.025
May	*0.005	*0.002	*0.002	*0.002	0.0103	0.45	*0.0025	0.0577	*0.00005	*0.0025	0.022
June	*0.005	*0.002	*0.002	*0.002	0.0106	0.51	*0.0025	0.0484	*0.00005	*0.0025	0.026
July	*0.005	*0.002	*0.002	*0.002	0.0098	0.57	*0.0025	0.0626	*0.00005	*0.0025	0.022
August	*0.005	*0.002	*0.002	*0.002	0.0099	0.60	*0.0025	0.0696	0.00011	*0.0025	0.025
September	*0.005	*0.002	*0.002	*0.002	0.0108	0.79	*0.0025	0.0779	*0.00005	*0.0025	0.023
October	*0.005	*0.002	*0.002	*0.002	0.0109	1.25	*0.0025	0.0758	*0.00005	*0.0025	0.02
November	*0.005	*0.002	*0.002	*0.002	0.0116	0.94	*0.0025	0.0773	*0.00005	*0.0025	0.027
December	*0.005	*0.002	*0.002	*0.002	0.0121	0.76	*0.0025	0.0688	*0.00005	*0.0025	0.023
Annual Average	**0.005**	**0.002**	**0.002**	**0.002**	**0.0123**	**0.879**	**0.0025**	**0.071**	**0.000055**	**0.0027**	**0.025**

Values in red with an asterisk prefix are half the MDL

APPENDIX E – Centrifuge Feed Sludge Analysis

APPENDIX E – Centrifuge Feed Sludge Analysis

	Arsenic	Cadmium	Cobalt	Chromium	Copper	Mercury	Molybdenum	Nickel	Lead	Selenium	Zinc
Limit [(1)]	*170*	*34*	*340*	*2800*	*1700*	*11*	*94*	*420*	*1100*	*34*	*4200*
January	2.29	0.25	5.99	54.3	517	0.19	8.075	20.6	16.8	0.62	421
February											
March											
April	2.51	0.22	4.74	44.0	468	0.14	6.811	17.1	16.1	0.54	398
May	2.45	0.91	4.11	44.7	732	1.00	6.798	19.2	78.1	3.11	434
June											
July	2.78	0.244	4.26	39.9	502	0.190	7.68	17.7	10.5	0.610	457
August											
September											
October											
November											
December											
Annual Average	**2.51**	**0.40**	**4.77**	**45.70**	**555.00**	**0.38**	**7.34**	**18.6**	**30.4**	**1.22**	**427**

All values are expressed in terms of mg metal / kg sludge dry weight.

(1) As per MECP regulations for sludge utilization on agricultural lands.

APPENDIX F – Maintenance Activities

APPENDIX F – Maintenance Activities

Solids Maintenance

Solids maintenance encompasses the solids handling aspects of the plant, including sludge storage and dewatering centrifuges, incineration and ash handling, anaerobic digesters, as well as supporting services such as the digester gas system, boilers, process ventilation, odor control systems, and plant safety instrumentation. In 2024, 2054 work orders were closed in this area.

The following maintenance on major structures, equipment, apparatus, mechanism, or thing forming the Works was completed by Solids Maintenance in 2024:

- Sludge Dewatering Centrifuges:
  - Preventative maintenance and inspections.
  - Overhaul as required.
- Ash Handling:
  - Preventative maintenance on ash slurry pumps.
  - Maintenance of Incinerators #1 and #2 (temperature transmitter calibration, cleaning quenchers, alarms)
- Sludge Storage Tanks:
  - Routine inspection and maintenance of pumps, sludge recirculation, and tanks
- Back-flow Preventers:
  - Maintenance and repair of valves to meet specifications
- Boilers & Hot Water Systems:
  - Servicing and inspection of boilers and control systems.
  - Replacement and repairs of inlet/outlet piping and installation of new motorized valve for outlet
- Digester Gas System & Odor Control:
  - Maintenance of the digester gas system and odor control systems.
- Mechanical Components:
  - Lubrication and oil change of mechanical components
- Plant Upgrades:
  - Completion of various plant upgrade projects.
  - Installation of fans, screens, electrical upgrades
- Safety Instrumentation:
  - Inspection, maintenance, and corrective repairs of gas detectors, waste gas burner instrumentation, and electrical equipment.
- Forklifts & Heavy Equipment:
  - Annual inspections of forklifts, scissor lifts, and overhead cranes.
- Fire Safety:
  - Monthly inspections and maintenance of fire extinguishers and elevators.
- HVAC Systems:
  - Preventive maintenance and repairs on plant HVAC systems.

Liquids Maintenance

APPENDIX F – Maintenance Activities

Liquids Maintenance focuses on liquid treatment, including grit removal, screening, primary and secondary clarification, aeration, phosphorous removal, and effluent disinfection. In 2024, 4,188 work orders were closed in this area.

The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Liquids Maintenance in 2024:

- Headworks:
  - Annual odour control inspection and cleaning tasks.
  - Cleaning, water inspection, and testing tasks.
  - Maintenance on HVAC system, blowers, and conveyors.
- Primary Tanks:
  - Primary clarifier lubrication, oil level check, and alignment.
  - Scum and sludge pump maintenance (lubrication and inspection).
  - Valve and piping inspections.
- Sump Pumps:
  - Inspection and preventative maintenance.
- Tank Overhauls
  - Overhaul of secondary tanks.
- Back-flow Preventers:
  - Testing and calibration of all back-flow preventers, repair and rebuild as needed.
- Landscaping & Groundskeeping:
  - Coordination of landscaping, building maintenance, and snow removal.
- Vehicle Maintenance:
  - Maintenance and repair of vehicles used for plant purposes.
- Security Systems:
  - Conducted monthly duress test, tested control room “PANIC” button and alarm systems.

APPENDIX G – Staff Training Courses

Training attended by Highland Creek Treatment Plant operations and skilled trade staff in 2024 includes the list of courses below.

Technical and Health and Safety Training:

- Wastewater Digester Operation & Control
- Standard First Aid Level C, CPR & AED
- Emergency Equipment (First aid kit, Eye wash, Fire extinguisher)
- Sewage Works and Surface Water Spill Response
- Arc Flash for Non-Qualified Persons (CEU)
- Fire Safety at Work
- Fall Protection in an Industrial Work Setting (CEU)
- Laboratory Procedures for Wastewater Operators
- Troubleshooting Wastewater Treatment Plant
- Condensed OHS Competency for Frontline Supervisors
- Spill Contingency Plan Training
- Respirators: Selection, Fit, Use, and Maintenance
- Hazardous Noise In The Workplace
- Confined Space entry and Rescue (CEU)
- PPE – Hard Hats
- WHMIS eLearning Module
- Chlorine Safety / B Kit (CEU)
- MMR – Self-Contained Breathing Apparatus (CEU)
- Worker Health and Safety Awareness in 4 Steps

Other Training:

- Unconscious Bias for People Leaders
- Achieving a Strategic Perspective
- Avoid Email Mistakes
- MTLD - Employee Relations
- Accessibility 101
- Human Rights 101
- Cybersecurity Training
- Lock Out, Tag Out & Test Awareness (CEU)
- The Toronto Public Service By-law eLearning