TORONTO Water

HIGHLAND CREEK TREATMENT PLANT

2022 Annual Report

March 31, 2023

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 533,000. The Highland Creek Treatment Plant discharges into Lake Ontario and operated under Amended Environmental Compliance Approval (ECA) Sewage No. 9597-BWXNPX, issued on March 30, 2021.

The average daily flow rate in 2022 was 174.8 ML/day. Influent concentrations of Biochemical Oxygen Demand (BOD_5), Total Phosphorus (TP) and Total Suspended Solids (TSS) averaged 243.5 mg/L, 5.8 mg/L and 321.8 mg/L, respectively.

Highland Creek Treatment Plant achieved the following effluent quality and loading rates in 2022 in comparison to ECA limits:

Parameter	ECA[1]	2022 Final Effluent
Total Suspended Solids (TSS)	25.0 mg/L	19.3
Carbonaceous Biological Oxygen Demand (CBOD5)	25.0 mg/L	9.2
Total Phosphorus (TP)	1.0 mg/L	0.83
Escherichia Coli (E. Coli)[2]	200 CFU/100mL	42
pH	6.0-9.5	6.4
Total Chlorine Residual (TRC) (Dechlorination)	0.02 mg/L	0.007
TSS Loading Rate	5,475 kg/day	3,378
CBOD5 Loading Rate	5,475 kg/day	1,600
TP Loading Rate	219 kg/day	146

[1] Referenced from Amended ECA No. 9597-BWXNPX, issued on March 30, 2021.

[2] Arithmetic mean of monthly geometric mean data.

The Highland Creek Treatment Plant exceeded the monthly average concentration limit for TSS in May 2022. This exceedance event was due to the plant's intermittent reduced capacity that occurred as a result of capital upgrade currently under construction. 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.

During 2022, the sludge feed flow to the dewatering centrifuges averaged 1,869 m^3/day which resulted in 25.56 dry tonnes of dewatered solids being generated per day.

Ferric sulphate/ferrous chloride consumption for phosphorus removal totalled 624 tonnes as Fe. Polymer consumption in 2022 for waste activated sludge (WAS) thickening and sludge

dewatering totalled 9 and 230 tonnes, respectively. Total sodium hypochlorite (12% w/v) consumption for disinfection totalled 2883 m^3. Sodium Bisulphite (SBS) (38% w/w) consumption for effluent dechlorination totalled 418.7 tonnes.

There were no bypass occurrences at Highland Creek Treatment Plant in 2022. The plant continued with various capital projects. Notable projects included: Liquid Train Upgrades (Contract 1), Disinfection Electrical Upgrades, and Fluidized Bed Incineration. A variety of scheduled, preventative, predictive and reactive maintenance was completed, including the calibration of influent and effluent monitoring equipment.

Total annual consumption of potable water, hydro, and natural gas was 143,672 m^3, 33M kWh, and 7.76 M scm, respectively. Direct operating costs for 2022 totalled $20.2M. In 2022, the Highland Creek Treatment Plant had a staffing complement of 69 employees. As of December 31, 2022, there were 10 health and safety incidents and a total of 84 lost time days in 2022 due to work related injuries

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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: A bypass is defined as a diversion of sewage around one or more unit processes within the plant with the diverted sewage flows being returned to the plant treatment train upstream of the final effluent sampling location, and discharging to the environment through the plant outfall.

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 533,000. 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) Sewage No. 9597-BWXNPX, issued on March 30, 2021.

This report is a summary of plant operations and performance in 2022. 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.

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[1].

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. Ferric sulphate/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

[1] *https://www.toronto.ca/services-payments/water-environment/managing-sewage-in-toronto/wastewater-treatment-plants-and-reports/*

Tanks. RAS contains micro-organisms that naturally occur in wastewater and facilitate its degradation. 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 five 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 five 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 2022, 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	Max
January	11	23	0.93	0.019	39	6.3	7.6
February	9	18	0.66	0.020	53	6.3	6.8
March	10	23	0.71	0.020	75	6.4	7.1
April	10	21	0.86	0.013	42	6.3	7.1
May	11	27	0.95	0.020	46	6.2	6.9
June	11	23	0.77	0.020	60	6.3	6.7
July	7	13	0.79	0.016	12	6.3	6.7
August	8	17	1.0	0.018	32	6.1	6.7
September	10	21	0.94	0.019	64	6.1	7.3
October	8	15	0.70	0.020	34	6.1	6.6
November	8	15	0.71	0.018	37	6.0	6.7
December	7	17	0.94	0.020	14	6.3	6.9
Annual Average	9	19	0.83	0.007	43	6.4	
Loading (kg/d)[2]	1,600	3,378	146	N/A	N/A	N/A	
Removal Efficiency[3] (%)	95%	94%	86%	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.
[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. 9597-BWXNPX
[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	2022	2021	2020
Influent Parameters				
Flow [1]	ML/day	174.8	163.3	173.1
Total Annual Flow [1]	ML	63,801	59,611	63,348
Total Suspended Solids (TSS)	mg/L	321.8	389.9	361.6
Biological Oxygen Demand (BOD)	mg/L	243.5	246.7	242.9
Total Phosphorus (TP)	mg/L	5.8	5.7	5.5
Preliminary Treatment				
Grit and Screenings	Tonnes/day	4.4	4.5	4.2
Primary Treatment				
TSS	mg/l	89.3	84.7	91.9
cBOD5	mg/L	126.2	133.1	143.9
Secondary Treatment				
Aeration Loading	kg $CBOD^5/m^3$·day	0.42	0.41	0.47
Mixed Liquor Suspended Solids	mg/L	2,026	2,036	2,435
Solids Handling				
Primary Sludge Treated	m3/day	561	758	684
Primary Sludge TS[2]	%	2.5	3.4	3.4
Primary Sludge TVS[2]	%	85	85	82
WAS to Thickening	m3/day	3,031.2	3,018.7	3,720.5
WAS SS	mg/L	5,284	4,888	5,188
TWAS Treated	m3/day	516	433	663
TWAS TS	%	2.8	2.8	2.4
TWAS TVS	%	81	80	77
Volume to Digestion	m3/day	1,077	1,191	-
Digesters Hydraulic Detention Time	days	21	18	-
Organic Loading to Digesters	TVS / m3/day	1.1	1.5	-
Digester Gas Volume	m3/day	14,932	17,276	-
Dewatering Centrifuge Feed Flow	m3/day	1,868.9	1,829.2	1,795.8
Dewatering Centrifuge Feed TS	%	1	1	2
Dewatered Biosolids TS	%	28.2	27.3	26.4
Centrate Quality	mg/L	370	402	750
Solids Capture Rate	%	97	97	96
Dewatered Biosolids Disposed	Dry tonnes/day	26	26	27
Dewatered Biosolids Hauled 3	Dry tonnes/day	0	0	0
Dewatered Biosolids Incinerated	Dry tonnes/day	26	26	27
Ash Removed	tonnes	3,564.0	4,519.3	3,293.3

[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 7.1% in 2022. Influent strength of BOD, and TSS decreased by 1.3% and 17.5%, respectively. Influent TP increased by 2.2%.

Influent loadings were concurrently influenced and saw a resultant 13.1% decrease in TSS, and 5.4%, and 8.2% increase for BOD and TP respectively in 2022.

Final effluent annual average concentration for cBOD, TSS, and TP was 9mg/L, 19mg/L, and 0.83mg/L, respectively. The final effluent annual average for e. Coli monthly geometric mean density in 2022 was 42 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 2022. Furthermore, final effluent pH remained between the range of 6.0 – 9.5 throughout the course of 2022.

The HCTP exceeded the monthly average concentration limit for TSS in May 2022. This exceedance event was due to the plant's intermittent reduced capacity that occurred as a result of a major capital upgrade project which is currently under construction. 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 2022. 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, scheduling of the planned outages for 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 2022. In addition, all of 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 2022, the daily average inflow to the Highland Creek Treatment Plant was 174.8 ML/day. The flow projections for 2022 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 2022.

During 2022, the sludge feed flow to the dewatering centrifuges averaged 1,869 m^3/day which resulted in 26 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		2022	2021	2020
Phosphorus Removal	Ferric Sulphate/ Ferrous Chloride as Fe	Dosage as Fe (mg/L)	9.8	11.1	11.4
		Consumption (tonnes as Fe)	624.2	658.7	716.2
		Cost ($)	$1,552,416	$1,736,829	$1,203,102
Disinfection	Sodium Hypochlorite (12% w/v)	Dosage as Cl (mg/L)	5.4	5.1	5.3
		Consumption (m3)	2883	2510	2805
		Cost ($)	$582,638	$409,604	$464,998
Dechlorination	Sodium Bisulfite (38% w/w)	Dosage (mg/L)	2.5	2.5	2.6
		Consumption (tonnes)	418.7	386.1	431.7
		Cost ($)	$102,794	$79,541	$90,589
Thickening	Polymer	Consumption (tonne)	9.0	7.6	10.7
		Cost ($)	$67,772	$32,685	$37,916
Dewatering	Polymer	Consumption (tonne)	230.0	234.8	184.2
		Cost ($)	$1,094,062	$1,004,920	$768,321

3.4 Bypasses, Overflows, Spills, and Abnormal Discharge Events

3.4.1 Bypasses

The Highland Creek Treatment Plant historically does not need to bypass during wet weather events and did not bypass in 2022. A bypass is defined as a diversion of sewage around one or more unit processes within the plant with the diverted sewage flows being returned to the plant treatment train upstream of the final effluent sampling location, and discharging to the environment through the plant outfall. 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. Total precipitation in the Toronto area[2] was 729 mm in 2022, a 3% decrease from 2021.

3.4.2 Overflows

There were no overflow events at the Highland Creek Treatment Plant in 2022. 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 two (2) liquid spills and five (5) spills to air reported to the MECP in 2022; they are summarized in Table 4 below.

Table 4: Spills Summary[1]

Date	Duration (mins)	Nature of event	Description
01-Apr-22	1	Stub Stack Emergency Pressure Relief	Brief Power Interruption
16-Apr-22	75	Stub Stack Emergency Pressure Relief	Equipment Failure
06-May-22	80	Stub Stack Emergency Pressure Relief	Power Interruption
19-May-22	30	Discharge of ash slurry in catch basins	Broken ash slurry pipe
23-Jun-22	60	Digested sludge spill	Equipment Failure
24-Jun-22	20	Stub Stack Emergency Pressure Relief	Power Interruption
06-Jul-22	20	Stub Stack Emergency Pressure Relief	Power Interruption

[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 2022.

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

3.5 Complaints

The Highland Creek Treatment Plant received 6 complaints related to odour or noise in 2022. Refer to Section 7.6 - MECP Correspondence, for additional information.

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, and maintain the high quality of the effluent and biosolids. An Integrated Quality Management System emphasizing environmental, and health and safety objectives is also in the early implementation stages across Toronto Water and is expected to further standardize facility operations and improve facility performance.

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 2022

Table 5: Capital Projects

Project Name	Project Description	Project Stage (Dec 31, 2022)	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 South East 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	2024
Fluidized Bed Incinerator and South Facility Upgrades	New fluidized bed incineration building and upgrades to the south plant facility.	Construction	2029
Firm Capacity, Liquid Train Upgrades and Process Roadmap	Contract 2-Undertake various process upgrades to maintain firm capacity, including installation of 110 MLD process train (NE Plant) and efficiency improvements to secondary treatment (NW/SW) and blower replacement. Process roadmap to assess future requirements and technologies.	Design	2029
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	2025
Emergency Power Study	Conceptual design of an improved emergency power system to allow the plant to maintain process capabilities during prolonged power outages.	Study	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 2022 and found to be within acceptable limits. A summary of effluent monitoring equipment calibration and maintenance performed in 2022 is included in Table 6.

Table 6: Summary of Regulated Monitoring Equipment Calibration and Maintenance

Calibration and/or Maintenance Record	Completion Date
Primary Influent Flow Meter SW Calibration	Feb. 12. Jun. 18
Primary Influent Flow Meter NW Calibration	Feb. 22, Jun. 25
Primary Influent Flow Meter SE 1-4 Calibration	Feb.5, Jun. 11, Dec. 11
Primary Influent Flow Meter SE 5-8 Calibration	Feb. 5, Jun. 11, Dec. 11
Final Effluent pH and Temperature Meter Calibration	Weekly
HACH DR3900 Spectrophotometer Calibration	Oct. 19
Influent Auto Sampler Calibration and Preventative Maintenance	Feb. 25, May. 13, Jul. 14, Oct. 20
Final Effluent Auto Sampler Calibration and Preventative Maintenance	Apr. 1, Aug.1, Dec. 1

In 2022, there was a total of 6,013 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 2022.

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 unit cost for water, hydro, and natural gas. Total annual consumption of potable water, hydro, and natural gas was 143,672 m^3, 32.8M kWh, and 7.76M scm, respectively.

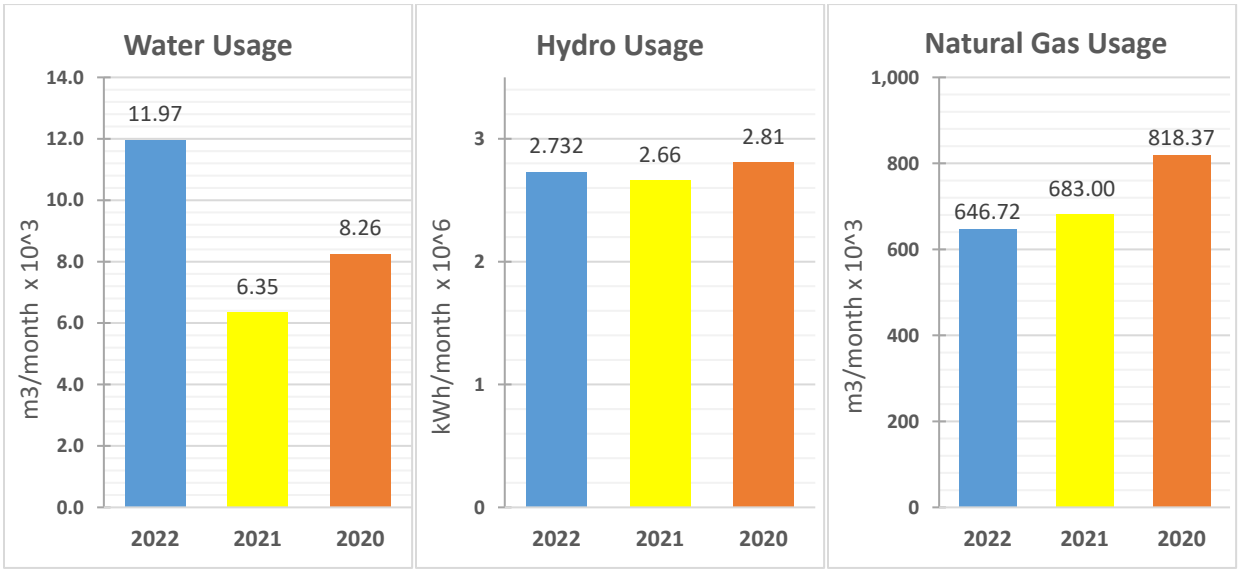


Figure 1: Annual Utility Consumption (Water, Hydro, Gas)

Table 7: Average Unit and Total Utility Cost

Utility	2022	2021	2020
Water Unit Cost ($/$m^3$)	$4.48	$4.35	$4.25
Water Total Cost ($/year)	$644,043.22	$331,870.73	0.4M
Hydro Unit Cost ($/kWh)	$0.10	$0.10	$0.11
Hydro Total Cost ($/year)	$3,315,496.12	$3,326,069.17	3.6M
Natural Gas Unit Cost ($/$m^3$)	$0.31	$0.23	$0.21
Natural Gas Total Cost ($/year)	$2,438,683.74	$1,923,465.21	$2,097,909.40

7 ADMINISTRATION

7.1 Operations and Maintenance Costs

The 2022 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 increased by 5.9% from 2021.

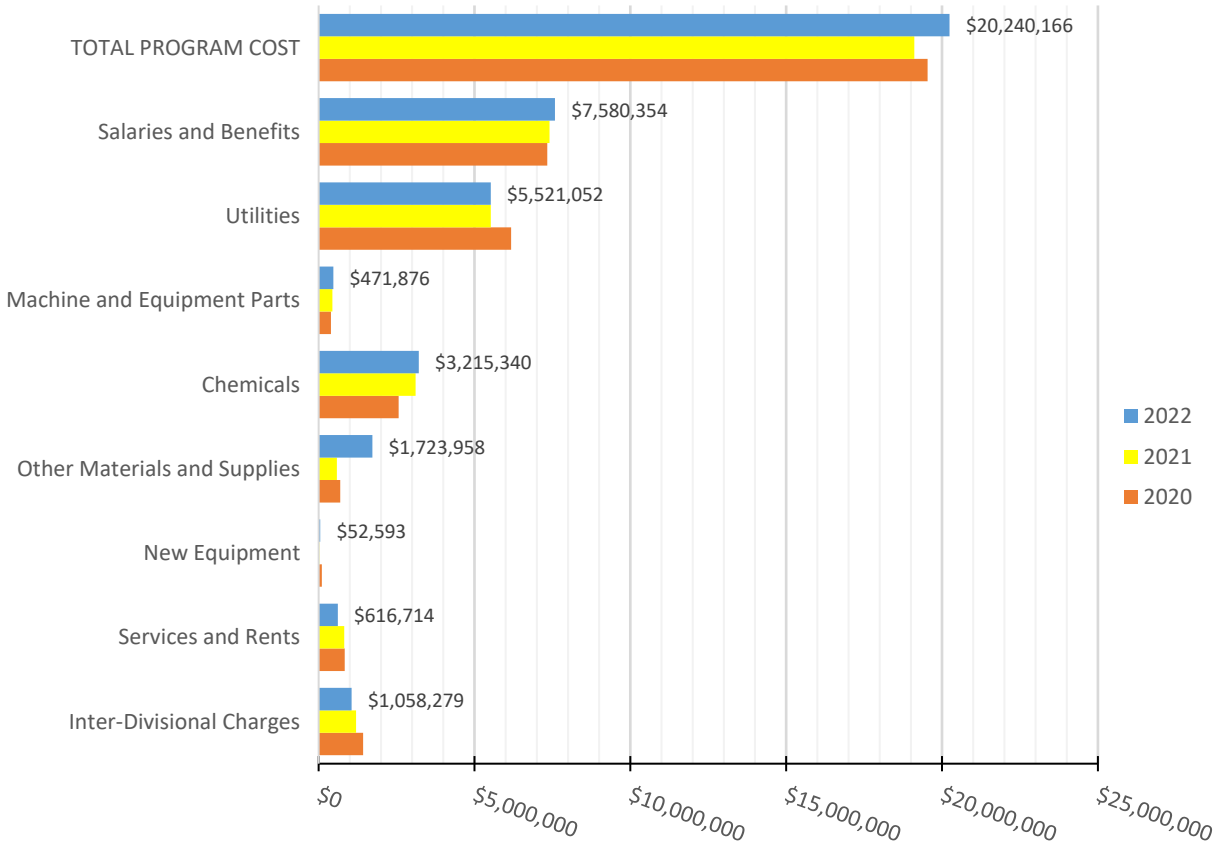


Figure 2: Operations and Maintenance Cost Breakdown

7.2 Human Resources

Plant Staffing at the Highland Creek Treatment Plant in 2022 is shown in Table 8.

Table 8: Plant Staffing

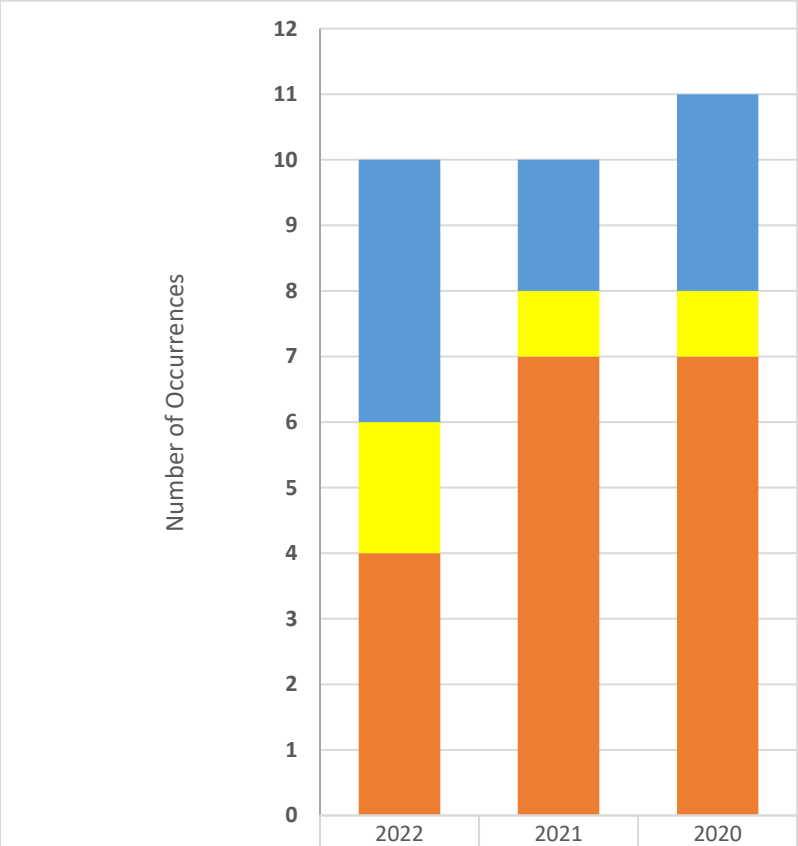
Position	Number of FTE[1]
Plant Manager	1
Senior Engineer	2
Engineer	2
Area Supervisor	4
Electrical & Instrumentation Specialist	1
Electrician	1
Plant Technician	26
Industrial Millwright	16
Electrical Instrumentation Control Technician	7
Wastewater Treatment Plant Worker	6
Support/Materials Management 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, 2022, there were 10 health and safety incidents and a total of 84 lost time days in 2022 due to work related injuries.



	2022	2021	2020
Lost Time	4	2	3
Medical Aid	2	1	1
Non Reportable Injuries	4	7	7

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

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 2022 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

[3] *The previously reported values for 2021 and 2020 have been changed to reflect the status of those WSIB claims as of December 31st, 2022.*

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 in order 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 2022.

Table 9: Wastewater Treatment Certificates

Class Level	Number of Licenses
Class IV	25
Class III	0
Class II	1
Class I	18
O.I.T.	7
Total	**51**

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.

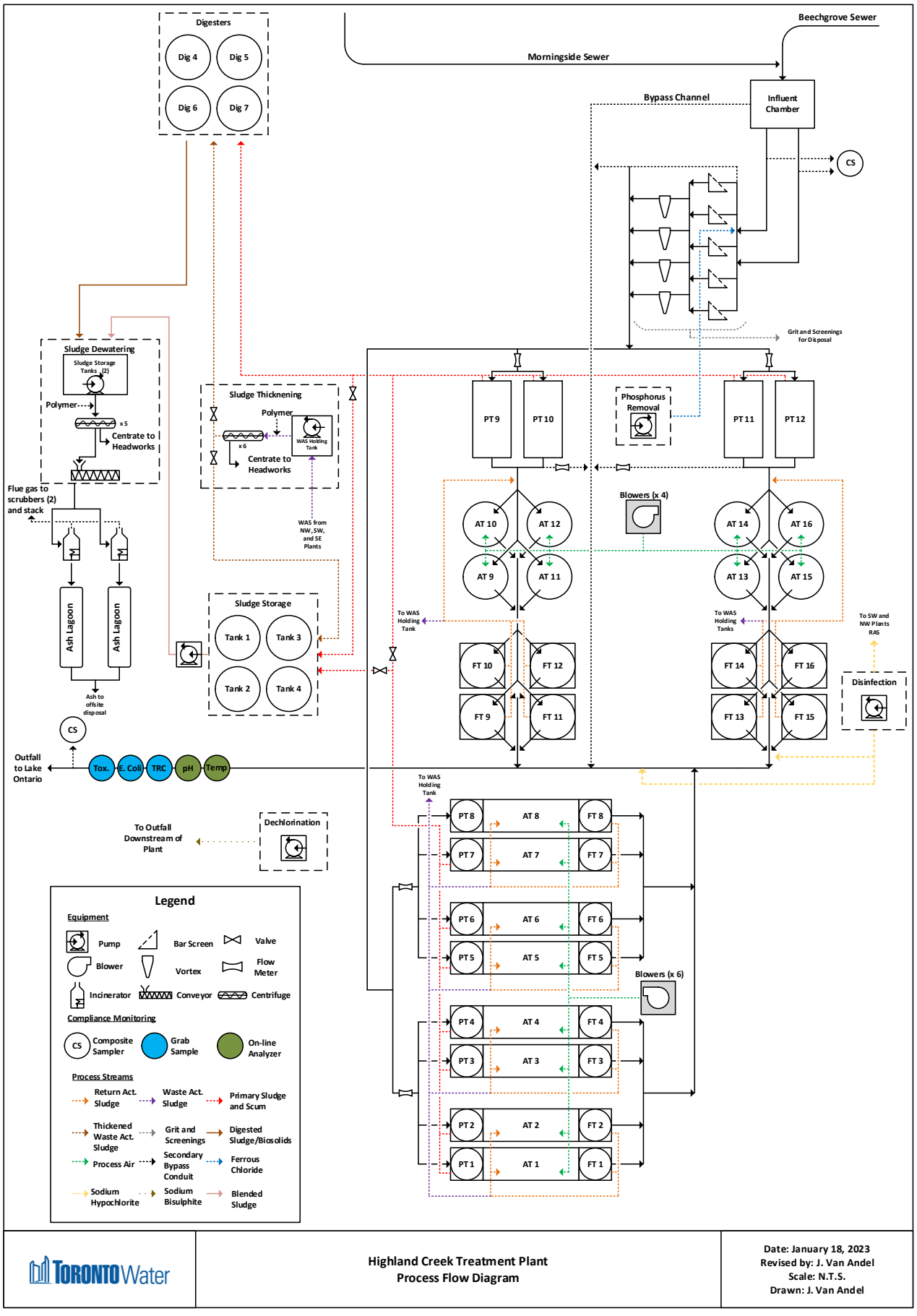
Table 10: Correspondence submitted to the MECP

Event Date	Type	Description	Resolution	Resolution Date
Complaints				
09-Apr-22	Noise	A noise complaint with investigation revealed that the headhouse Biofilter fan was operating within normal range and sound output level.	Temporarily adjust the speed of fan to reduce sound output. Keep minimum fan speed to maintain required draft and air flow requirement for foul air removal and treatment.	12-Apr-22
11-May-22	Odour	An odour complaint with investigation revealed that the possible source was from a primary clarifier that was out of service for capital upgrades and from the final clarifiers.	Rinsing, skimming, repairs and process adjustments.	19-May-22
20-Jul-22	Noise	A noise complaint with investigation revealed that the possible source was the Plant paging system	Turned down speakers.	21-Jul-22
16-Sep-22	Noise	A noise complaint with investigation revealed it as due to a vacuum truck.	Vacuum truck completed work on-site shortly after.	16-Sep-22
24-Oct-22	Odour	An odour complaint with investigation revealed that the possible source was from a secondary clarifier that was out of service for capital upgrades.	Cleaning	25-Oct-22
29-Dec-22	Noise	Status of plant operations was checked and found to be normal; no potential source of the noise was identified.	N/A	29-Dec-22

Consent Letters				
27-Jul-22	Request for Consent	Planned releases of digester gas to safely take damaged Digester #4 out of service for inspection and full damage assessment.	Consent was granted	05-Aug-22
Notice of Modification to Sewage Works				
07-Dec-22	Notice of Modification to Sewage Works	Due to COVID-19 related supply chain shortages, a temporary change to an alternate iron-salt chemical for phosphorus removal was required (Ferric Sulphate instead of Ferrous Chloride) in April of 2020. On December 7, 2022 the plant switched back to Ferrous Chloride.	N/A	N/A
Correspondence Submitted to MECP				
06-Jun-22	Exceedance of Monthly Compliance Limit	Final effluent exceeded TSS monthly compliance limit in May due to ongoing capital projects which reduced the plant's treatment capacity	Notified the MECP and SAC	Jun-22
Notice of Start-up				
N/A				
MECP Inspection				
No inspection conducted				

APPENDIX A – Plant Schematic

APPENDIX A – Plant Schematic



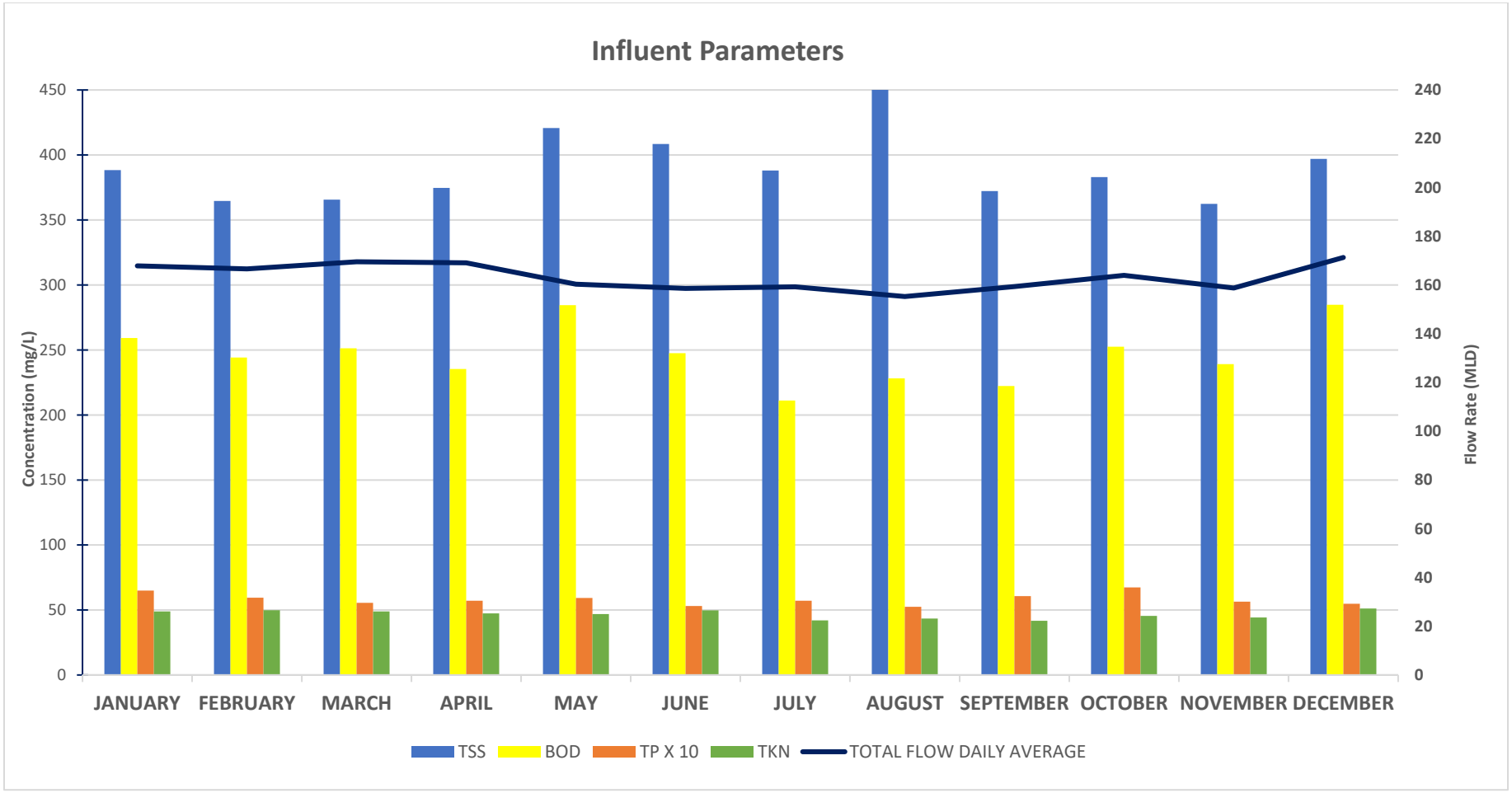
TORONTO Water

Highland Creek Treatment Plant
Process Flow Diagram

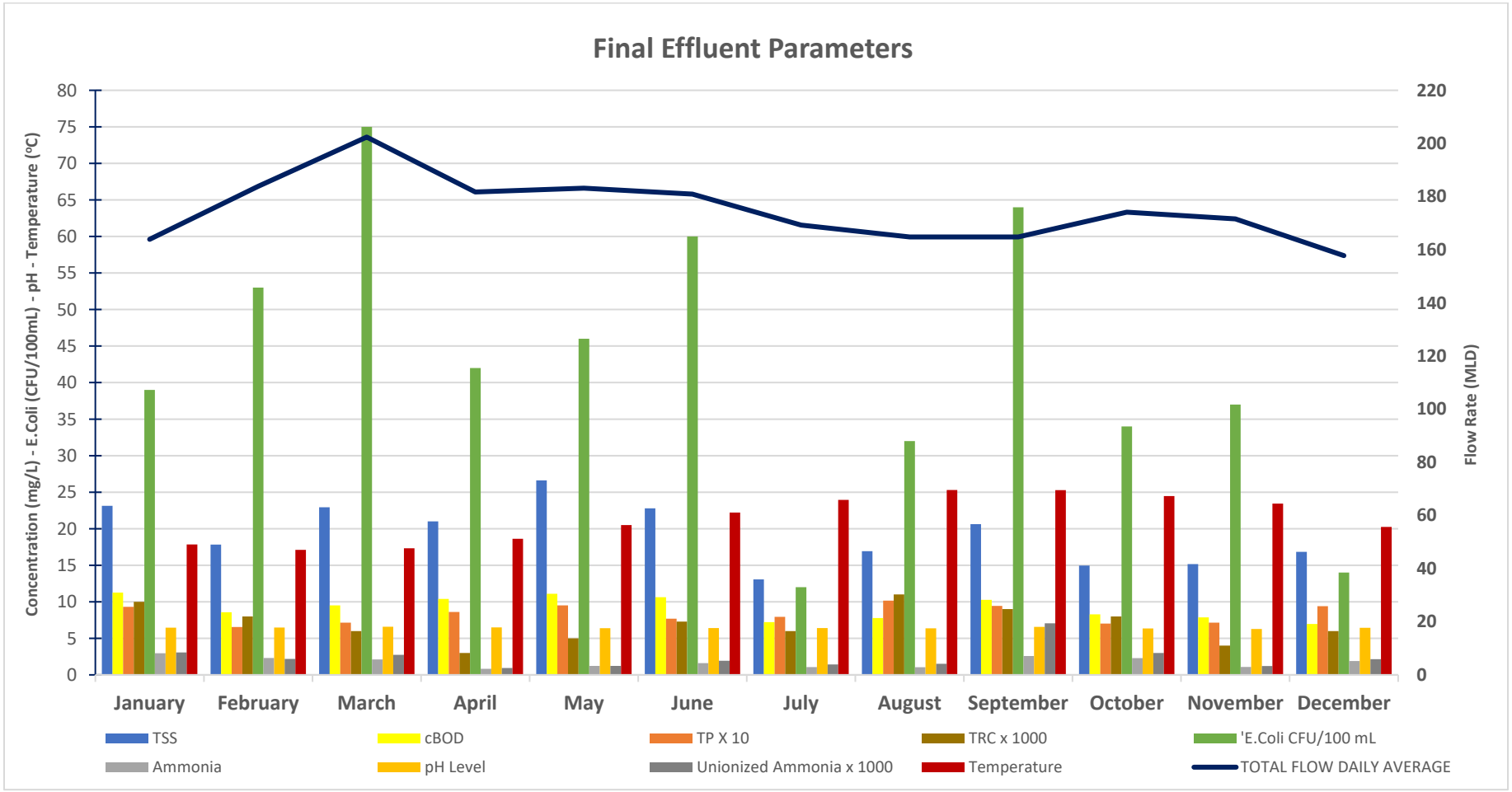
Date: January 18, 2023
Revised by: J. Van Andel
Scale: N.T.S.
Drawn: J. Van Andel

APPENDIX B – Influent and Effluent 2022 Performance Charts

APPENDIX B – Influent and Effluent 2022 Performance Charts



APPENDIX B – Influent and Effluent 2022 Performance Charts



APPENDIX C – Historical Performance Data

APPENDIX C – Historical Performance Data

	Units	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
Influent Parameters												
Flow	ML/day	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	63801	59611	63348	63964	62670	62388	59200	60208	62242	61804	62453
Total Suspended Solids (TSS)	mg/L	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	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	5.8	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	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	4.4	4.5	4.2	4.8	1.8	2	2.4	1.9	2.3	-	-
Primary Treatment												
TSS	mg/L	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	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	0.42	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	2026	2036	2435	2704.6	2619.5	2723	2736	3243	3296	2380	1577
Final Effluent												
TSS	mg/L	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	3378	3537	2967	2578	2736	2406	2368	2877	3440	3868	3598
cBOD5	mg/L	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	1600	1510	1382	1212.0	1245.1	1233	1077	1025	1008	1506	1553
TP	mg/L	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	146	133	132	131.6	120.9	219	117	115	100	104	116
Escherichia Coli (E. Coli)	CFU/100 mL	42.3	11.6	11.3	11.3	21.0	16.0	53.2	40.2	10.4	34.9	15.5
pH	-	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	0.007	0.008	0.006	0.003	0.004	0.004	0.007	0.006	SBS (P)	SBS (P)	SBS (P)
Total Kjeldahl Nitrogen (TKN)	mg/L	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	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	21.4	21.5	21.6	21.1	21.8	21.5	22.2	-	-	-	-
Solids Handling												

APPENDIX C – Historical Performance Data

	Units	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
Primary Sludge Treated	m3/day	561	758	684	463	770	910	1090	1525	2150	2900	2944
Primary Sludge Total Solids (TS)	%	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	82.0	55.4	93.6	81.8	81.9	81.6	77.9	73.5	78.9
WAS to Thickening	m3/day	3,031	3,019	3,720	4,159	4,315	3716	3519	3110	2254	-	-
Thickened WAS (TWAS) TS	%	2.8	2.8	2.4	3.1	3.2	4.1	3.8	5.3	5.7	-	-
TWAS Treated	m3/day	516	433	663	687	665		474	323	1236	-	-
WAS to Co-settling	m3/day	-	-	-	-	-	-	-	-	-	6600	6875
WAS SS	mg/L	5,284	4,888	5,188	5,886	5,768	6732	6126	7358	7300	4500	3262
Dewatering Centrifuge Feed Flow	m3/day	1,869	1,829	1,796	2,478	2,494	1849	1924	2143	2065	1966	1906
Dewatering Centrifuge Feed TS	%	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	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	%	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	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	0.144	1.09	0.00539	0.094	0.000406	0.0025	0.146
February	0.005	0.002	0.002	0.002	0.113	1.03	0.0025	0.074	0.00005	0.0025	0.121
March	0.005	0.002	0.002	0.002	0.118	0.959	0.0025	0.068	0.00005	0.0025	0.12
April	0.005	0.002	0.005	0.002	0.122	1.09	0.0025	0.068	0.00018	0.0025	0.128
May	0.005	0.002	0.006	0.002	0.109	1.53	0.0025	0.075	0.00005	0.0055	0.147
June	0.005	0.002	0.002	0.002	0.123	1.11	0.0025	0.062	0.00005	0.0025	0.116
July	0.005	0.002	0.002	0.002	0.109	0.934	0.0025	0.064	0.00005	0.0025	0.125
August	0.005	0.002	0.002	0.002	0.136	0.697	0.0025	0.062	0.000123	0.0025	0.12
September	0.005	0.002	0.002	0.002	0.132	0.778	0.0025	0.061	0.00005	0.0056	0.12
October	0.005	0.002	0.004	0.002	0.136	1.12	0.0025	0.061	0.00012	0.0025	0.146
November	0.005	0.002	0.002	0.002	0.125	0.872	0.0025	0.060	0.00010	0.0025	0.126
December	0.005	0.002	0.002	0.002	0.146	0.668	0.0025	0.056	0.00005	0.0025	0.113
Annual Average	**0.005**	**0.002**	**0.003**	**0.002**	**0.126**	**0.99**	**0.0027**	**0.067**	**0.00011**	**0.0030**	**0.127**

Values in red are half the MDL

APPENDIX D – Influent and Effluent Metal Concentrations

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

Parameter	Arsenic	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Zinc
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January	0.005	0.002	0.002	0.002	0.023	1.03	0.0025	0.041	0.00005	0.0025	0.032
February	0.005	0.002	0.002	0.002	0.021	0.844	0.0025	0.035	0.00005	0.0025	0.027
March	0.005	0.002	0.002	0.002	0.021	0.962	0.0025	0.040	0.00005	0.0025	0.030
April	0.005	0.002	0.002	0.002	0.022	0.884	0.0025	0.042	0.00005	0.0025	0.029
May	0.005	0.002	0.002	0.002	0.023	1.28	0.0025	0.042	0.00005	0.0025	0.037
June	0.005	0.002	0.002	0.002	0.022	1.14	0.0025	0.045	0.00005	0.0025	0.035
July	0.005	0.002	0.002	0.002	0.020	0.606	0.0025	0.041	0.00005	0.0061	0.037
August	0.005	0.002	0.002	0.002	0.019	0.689	0.0025	0.044	0.00005	0.0025	0.030
September	0.005	0.002	0.002	0.002	0.021	0.893	0.0025	0.039	0.00005	0.0025	0.029
October	0.005	0.002	0.002	0.002	0.019	0.841	0.0025	0.042	0.00005	0.0025	0.036
November	0.005	0.002	0.002	0.002	0.020	0.975	0.0025	0.041	0.00005	0.0025	0.035
December	0.005	0.002	0.0618	0.002	0.024	1.15	0.0025	0.064	0.00005	0.0473	0.030
Annual Average	**0.005**	**0.002**	**0.006983**	**0.002**	**0.0213**	**0.941**	**0.0025**	**0.0430**	**0.00005**	**0.00653**	**0.0322**

Values in red 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											
February											
March	2.5	0.3	2.9	22.2	475.5	0.15	6.5	12.8	11.7	0.6	431.6
April											
May	1.4	0.3	2.7	15.2	442.9	0.3	5.9	11.8	12.5	1.5	426.4
June											
July											
August											
September	0.7	0.3	3.5	15.6	470.8	0.2	7.1	15.6	11.9	1.6	432.1
October											
November	0.8	0.3	3.8	14.8	570.3	0.3	8.5	13.9	13.4	0.8	468.0
December											
Annual Average	**1.4**	**0.3**	**3.2**	**17.0**	**489.9**	**0.2**	**7.0**	**13.5**	**12.4**	**1.1**	**439.5**

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

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

Values in red are half of the less than values converted from mg/l

APPENDIX F – Maintenance Activities

APPENDIX F – Maintenance Activities

Solids Handling (Work Area 1)

Work Area 1 includes sludge storage and dewatering centrifuges, incineration and ash handling, and anaerobic digesters. A total of 841 work orders were closed in this work area in 2022. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 1 in 2022:

- Sludge dewatering centrifuges:
    - Centrifuge preventative maintenance.
    - Overhaul of centrifuges as required
- Ash slurry pumps preventative maintenance
- Repaired Ash slurry hoppers and level controllers and isolation valves
- Incinerator #1 and Incinerator #2 quencher/scrubber maintenance
- Replaced/rebuild sludge grinder
- Replaced sections of ash slurry piping and check valves
- Removed Incinerator #2 clinkers and broken refractory
- Removed refractory from Incinerator #2 broken rabble arms
- Tuned burners on Incinerator #1 and Incinerator #2
- Continuous SCADA upgrades for incinerators, sludge feed, and polymer mixing system
- Regular maintenance of polymer feed pump and polymer neat pump
- Testing and calibration of all WA-1 back-flow preventers (with documentation)

Liquids (Work Area 2)

Work Area 2 encompasses the liquid treatment portion of the plant including grit and screening removal, primary clarification, aeration and secondary clarification, TWAS, phosphorous removal, effluent disinfection and dechlorination. A total of 2126 work orders were closed in this work area in 2022. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 2 in 2022:

- Headworks:
    - Bar screens regular preventative maintenance.
    - Screw Conveyers, replacement of wear liners.
    - Vortex gear boxes lubricated and inspected.
    - Grit pumps, grit valves, tanks and conveyer system maintained.
- Primary Tanks:
    - Primary bridge drive lubricated and alignment checked. Wear parts replaced.
    - Scum and sludge pumps lubricated and inspected.
    - Valves and piping inspected.
- Mechanical repairs to Primary tank collectors
- Mechanical repairs to Final tank collectors
- Various primary and final tank sludge and scum collector repairs
- Repairs to process air blowers
- Rebuild of Ferrous Chloride pumps and Sodium Hypochlorite pumps
- Raw sludge, Return Activated Sludge and scum pump repairs

APPENDIX F – Maintenance Activities

- Thickening Centrifuges overhauled
- Rebuild of TWAS transfer pumps and polymer dosing pumps
- Sump pump preventative maintenance.
- Testing and calibration of all WA-2 back-flow preventers (with documentation). Repair and rebuild as required.
- Repair and rebuild of backflow preventers.

Plant Services 1 (Work Area 3)

Work Area 3 encompasses various plant support services such as effluent water pumping, instrument air system, buildings and grounds maintenance, security and building HVAC systems. A total of 2,041 work orders were closed in this work area in 2022. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 3 in 2022:

- Inspection, maintenance and corrective repairs of the following safety instrumentation:
    - Gas detectors.
    - Waste gas burner instrumentation.
- Inspection, maintenance and corrective repairs of the following services:
    - Electrical and power equipment
    - HVAC systems
- Plant roadway lighting upgrades
- Forklifts, Scissor lift and Overhead Cranes annual inspections
- Maintained and repaired unlicensed vehicles (personnel vehicles for plant use only)
- Disposed of environmental wastes, fluorescent bulbs and batteries
- Repaired various potholes on all plant roadways
- Continuous improvement of tunnel and outside building lighting
- Replaced sump pumps in various locations
- Inspection and repairs, as required, for all Back Flow Preventers
- Preventative maintenance on Emergency generators (Headhouse and Solids Disposal Building)
- Repaired and replaced heating valves and piping in various location
- Repaired and replaced heating booster pumps in various locations
- Replaced corroded effluent water piping and valves in various locations
- Repaired and replaced heating coils
- Maintained monthly inspections on fire extinguishers
- Maintained monthly inspections on elevators
- Preventive maintenance and repairs on plant HVAC systems
- Coordinate all landscaping, grounds keeping and snow removal
- Coordinate with Toronto Security all repairs, replacement and upgrades to cameras, doors, gates and locks
- Coordinate maintenance and repairs on licensed vehicles

APPENDIX F – Maintenance Activities

Plant Services 2 (Work Area 4)

Work Area 4 encompasses various plant support services such as the digester gas system, boilers, process ventilation, odour control systems and fire protection systems. A total of 1,005 work orders were closed in this work area in 2022. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 4 in 2022:

- Lubricated all mechanical components.
- Serviced boilers and inspected all control systems
- Optimized operations of 4 boiler hot water feed pumps
- Monthly testing and service of all plant gas monitoring systems
- Tested and serviced all plant fire hydrants as needed
- Replaced hot water pumps in the plant
- Rebuilt or serviced 6 hot water pumps
- Overhauled primary tanks
- Overhauled final tanks
- Serviced and maintained 2 biofilters
- Serviced heating system piping, coils and glycol system
- Various plant upgrade projects
- Installed new scum collector on primary clarifier.
- Testing and calibration of all WA-4 back-flow preventers (with documentation).

APPENDIX G – Staff Training Courses

Training attended by Highland Creek Treatment Plant operations and skilled trade staff in 2022 includes the list of courses below.

Technical and Health and Safety Training:

- Air Purifying Respirators
- Arc Flash for Non-Qualified Persons
- Backflow Prevention Awareness
- Basic Pumps and Pumping Hydraulics
- Confined Space Awareness and Rescue
- COVID Response Protocols
- Fire Safety and Extinguisher Use
- Fundamentals of Ladder Safety Awareness
- HCTP Construction Awareness Training
- HCTP Disinfection Interruption Contingency Plan
- HCTP Spill Contingency Plan: An Overview
- Health and Safety Competency for Front-Line Supervisors
- Hot Work Permit System Awareness
- Industrial Maintenance Technician (IMT) E & M Certification
- Lock out, Tag out & Test Awareness
- OTJ Highland Creek WWTP Chemical Systems Major Components
- OTJ Highland Creek WWTP Chemical Systems Overview
- OTJ Highland Creek WWTP Odour Control and Biofilter Bed Process
- OTJ Highland Creek WWTP Preliminary Process Major Components
- OTJ Highland Creek WWTP Preliminary Process Overview
- OTJ Highland Creek WWTP Sludge Thickening Process Major Component
- Rigging Safety Awareness
- Scaffold Safety Awareness
- Standard First Aid/CPR/AED
- WHMIS Global Harmonized System (GHS)
- Worker Health and Safety Awareness in 4 Steps

Other Training:

- Accessibility 101 – AODA & OHRC
- Active Listening Skills for Professionals
- Coaching Skills
- Ergonomics

- Human Rights 101 - Human Rights and Anti-harassment legislation
- Incident Reporting
- Logbook Entry
- Physical and Cyber Security
- Practical Leadership Skills
- Protecting Privacy on the Job
- Toronto Public Service By-law
- Vehicle Idling
- Workplace Violence