TORONTO Water

HIGHLAND CREEK TREATMENT PLANT

2021 Annual Report

March 31, 2022

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. 7622-B96S2G, issued on May 14, 2019, at which point it was replaced by Amended ECA No. 9597-BWXNPX, issued on March 30, 2021.

The average daily flow rate in 2021 was 163.3 ML/day. Influent concentrations of Biochemical Oxygen Demand (BOD_5), Total Phosphorus (TP) and Total Suspended Solids (TSS) averaged 246.7 mg/L, 5.7 mg/L and 389.9 mg/L, respectively.

Highland Creek Treatment Plant achieved the following effluent quality and loading rates in 2021 in comparison to ECA limits:

Parameter	ECA[1]	2021 Final Effluent
Total Suspended Solids (TSS)	25.0 mg/L	21.7
Carbonaceous Biological Oxygen Demand (CBOD5)	25.0 mg/L	9.2
Total Phosphorus (TP)	1.0 mg/L	0.8
Escherichia Coli (E. Coli)[2]	200 CFU/100mL	12
pH	6.0-9.5	6.6
Total Chlorine Residual (TRC) (Dechlorination)	0.02 mg/L	0.008
TSS Loading Rate	5,475 kg/day	3537
CBOD5 Loading Rate	5,475 kg/day	1510
TP Loading Rate	219 kg/day	133

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

[2] Arithmetic mean of monthly geometric mean data.

During 2021, the sludge feed flow to the dewatering centrifuges averaged 1,829 m^3/day which resulted in 25.69 dry tonnes of dewatered solids being generated per day.

Ferric sulphate consumption for phosphorus removal totalled 659 tonnes as Fe. Polymer consumption in 2021 for waste activated sludge (WAS) thickening and sludge dewatering totalled 7.6 and 234.8 tonnes, respectively. Total sodium hypochlorite (12% w/v) consumption for disinfection totalled 2510 m^3. Sodium Bisulphite (SBS) (38% w/w) consumption for effluent dechlorination totalled 386.1 tonnes.

There were no bypass occurrences at Highland Creek Treatment Plant in 2021. The plant continued with various capital projects. Notable projects included: Liquid Train Upgrades (Contract 1), and the Beechgrove Influent Sewer. 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 76,256 m^3, 31.9M kWh, and 8.20M scm, respectively. Direct operating costs for 2021 totalled $19.1M. In 2021, the Highland Creek Treatment Plant had a staffing complement of 68 employees. As of December 31, 2021, there were 10 health and safety incidents and a total of 12 lost time days in 2021 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, 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. 7622-B96S2G, issued on May 14, 2019, from January 1 to March 30, 2021 at which point it was replaced by Amended ECA No. 9597-BWXNPX, issued on March 30, 2021, for the remainder of the year.

This report is a summary of plant operations and performance in 2021. 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 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 sweep 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 direct 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 2021, 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	10.3	24.9	0.7	0.004	15.0	6.3	6.6
February	10.3	26.4	0.6	0.005	6.0	6.3	6.7
March	9.5	19.2	0.7	0.013	12.0	6.7	7.0
April	8.3	16.8	0.9	0.003	8.0	6.6	7.0
May	9.7	23.3	0.9	0.008	8.0	6.4	6.8
June	8.7	20.1	0.8	0.003	7.0	6.3	6.5
July	7.6	16.7	0.8	0.008	9.0	6.3	6.5
August	7.2	18.8	0.8	0.010	9.0	6.2	6.5
September	9.3	28.8	1.0	0.011	12.0	6.3	6.6
October	9.4	21.9	0.7	0.013	7.0	6.4	6.7
November	9.4	18.8	0.9	0.009	25.0	6.5	6.7
December	11.2	24.2	0.8	0.006	21.0	6.5	6.7
Annual Average	9.2	21.7	0.8	0.008	11.6	6.6	
Loading (kg/d)[2]	1,510	3,537	133	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	2021	2020	2019
Influent Parameters				
Flow [1]	ML/day	163.3	173.1	175.2
Total Annual Flow [1]	ML	59,611	63,348	63,964
Total Suspended Solids (TSS)	mg/L	389.9	361.6	305.3
Biological Oxygen Demand (BOD)	mg/L	246.7	242.9	232.5
Total Phosphorus (TP)	mg/L	5.7	5.5	5.2
Preliminary Treatment				
Grit and Screenings	Tonnes/day	4.5	4.2	4.8
Primary Treatment				
TSS	mg/l	84.7	91.9	124.6
cBOD5	mg/L	133.1	143.9	173.6
Secondary Treatment				
Aeration Loading	kg $CBOD^5/m^3$·day	0.41	0.47	0.57
Mixed Liquor Suspended Solids	mg/L	2,036	2,435	2,705
Solids Handling				
Primary Sludge Treated	m3/day	758	684	463
Primary Sludge TS[2]	%	3.4	3.4	1.7
Primary Sludge TVS[2]	%	85	82	55
WAS to Thickening	m3/day	3,018.7	3,720.5	4,158.6
WAS SS	mg/L	4,888	5,188	5,886
TWAS Treated	m3/day	433	663	687
TWAS TS	%	2.8	2.4	3.1
TWAS TVS	%	80	77	77
Volume to Digestion	m3/day	1,191	1,347	-
Digesters Hydraulic Detention Time	days	18	16	-
Organic Loading to Digesters	TVS / m3/day	1.5	1.4	-
Digester Gas Volume	m3/day	17,276	14,206	-
Dewatering Centrifuge Feed Flow	m3/day	1,829.2	1,795.8	2,478.3
Dewatering Centrifuge Feed TS	%	1	2	2
Dewatered Biosolids TS	%	27.3	26.4	25.7
Centrate Quality	mg/L	402	750	853
Solids Capture Rate	%	97	96	95
Dewatered Biosolids Disposed	Dry tonnes/day	26	27	42
Dewatered Biosolids Hauled 3	Dry tonnes/day	0	0	0
Dewatered Biosolids Incinerated	Dry tonnes/day	26	27	42
Ash Removed	tonnes	4,519.3	3,293.3	5,501.5

[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 decreased by 5.7% in 2021. Influent strength of BOD, TSS, and TP increased by 1.5%, 7.8%, and 3.6% respectively. Influent loadings were concurrently influenced and saw a resultant 4.2% increase in TSS and 1.7%, and 2.2% decrease for BOD and TP respectively in 2021.

Final effluent annual average concentration for cBOD, TSS, and TP was 9.2mg/L, 21.7mg/L, and 0.8mg/L, respectively. The final effluent annual average for e. Coli monthly geometric mean density in 2021 was 11.6 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 2021. Furthermore, final effluent pH remained between the range of 6.0 – 9.5 throughout the course of 2021.

The HCTP exceeded the monthly average concentration limit for TSS in February and September, as well as the TSS objective for the other months of 2021. These exceedance events were 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 2021. 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 2021. 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 2021, the daily average inflow to the Highland Creek Treatment Plant was 163.3 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 2021.

During 2021, the sludge feed flow to the dewatering centrifuges averaged 1,829 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		2021	2020	2019
Phosphorus Removal	Ferric Sulphate as Fe	Dosage as Fe (mg/L)	11.1	11.4	9.9
		Consumption (tonnes as Fe)	658.7	716.2	629.5
		Cost ($)	$1,736,829	$1,203,102	$ 522 374
Disinfection	Sodium Hypochlorite (12% w/v)	Dosage as Cl (mg/L)	5.1	5.3	4.9
		Consumption (m3)	2510	2805	2597
		Cost ($)	$409,604	$464,998	$ 451 213
Dechlorination	Sodium Bisulfite (38% w/w)	Dosage (mg/L)	2.5	2.6	3.7
		Consumption (tonnes)	431.7	431.7	633.6
		Cost ($)	$79,541	$90,589	$ 136 696
Thickening	Polymer	Consumption (tonne)	7.6	10.7	30.2
		Cost ($)	$32,685	$37,916	$ 72 091
Dewatering	Polymer	Consumption (tonne)	234.8	184.2	392.4
		Cost ($)	$1,004,920	$768,321	$ 937 937

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 2021. 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 752 mm in 2021, an 8% decrease from 2020.

3.4.2 Overflows

There were no overflow events at the Highland Creek Treatment Plant in 2021. 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 no liquid spills reported to the MECP in 2021. There were 9 spills to air reported to the MECP in 2021; they are summarized in Table 4 below.

Table 4: Spills Summary[1]

Date	Duration (mins)	Nature of event	Description
19-Mar-21	10	Stub Stack Emergency Pressure Relief	Brief Power Interruption
25-Jul-21	5	Stub Stack Emergency Pressure Relief	Brief Power Interruption
26-Jul-21	31	Stub Stack Emergency Pressure Relief	Brief Power Interruption
10-Sep-21	10	Stub Stack Emergency Pressure Relief	Brief Power Interruption
22-Sep-21	35	Stub Stack Emergency Pressure Relief	Brief Power Interruption
23-Sep-21	1	Stub Stack Emergency Pressure Relief	Brief Power Interruption

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

Date	Duration (mins)	Nature of event	Description
30-Oct-21	35	Stub Stack Emergency Pressure Relief	Brief Power Interruption
23-Dec-21	180	Stub Stack Emergency Pressure Relief	Equipment Failure
25-Dec-21	5	Stub Stack Emergency Pressure Relief	Brief 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 2021.

3.5 Complaints

The Highland Creek Treatment Plant received 7 complaints related to odour or noise in 2021.

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. 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 2021

Table 5: Capital Projects

Project Name	Project Description	Project Stage (Dec 31, 2021)	Estimated Completion
Beechgrove Influent Sewer	New Beechgrove Sewer influent chamber and twin influent channels to Headworks Building. Anticipating Substantial Completion Q1 2022	Construction	2022
Liquid Train Upgrades – Contract 1 and RAS Pumping, Aeration and Phosphorus Removal	Various liquid train upgrades of existing process and 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.	Construction	2024
Fluidized Bed Incinerator and South Facility Upgrades	New fluidized bed incineration building and upgrades to the south plant facility. Anticipating Order to Commence in Q4 2022.	Design	2029
Firm Capacity, Liquid Train Upgrades and Process Roadmap	Contract 2-Undertake various process upgrades to maintain firm capacity and process roadmap to assess future requirements and technologies.	Design	2029
Sludge Storage Tank Cleaning, Biofilter and TWAS pumping Upgrades	Detailed design for upgrades to the biofilters and TWAS pumping, as well as regular SST cleaning.	Design	2025

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 2021, and found to be within acceptable limits. A summary of effluent monitoring equipment calibration and maintenance performed in 2021 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 Phase 1 Calibration	March 10, August 25
Primary Influent Flow Meter Phase 4 Calibration	April 20, April 21, August 28
Primary Influent Flow Meter Old 1-4 Calibration	June 2, December 30
Primary Influent Flow Meter Old 5-8 Calibration	June 3
Final Effluent pH and Temperature Meter Calibration	Weekly
HACH DR3900 Spectrophotometer Calibration	December 8
Influent Auto Sampler Calibration and Preventative Maintenance	April 8, June 11, 29, October 13 December 21, 23
Final Effluent Auto Sampler Calibration and Preventative Maintenance	April 19, December 21

In 2021, there was a total of 7,368 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 2021.

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 76,256 m^3, 31.9M kWh, and 8.20M scm, respectively.

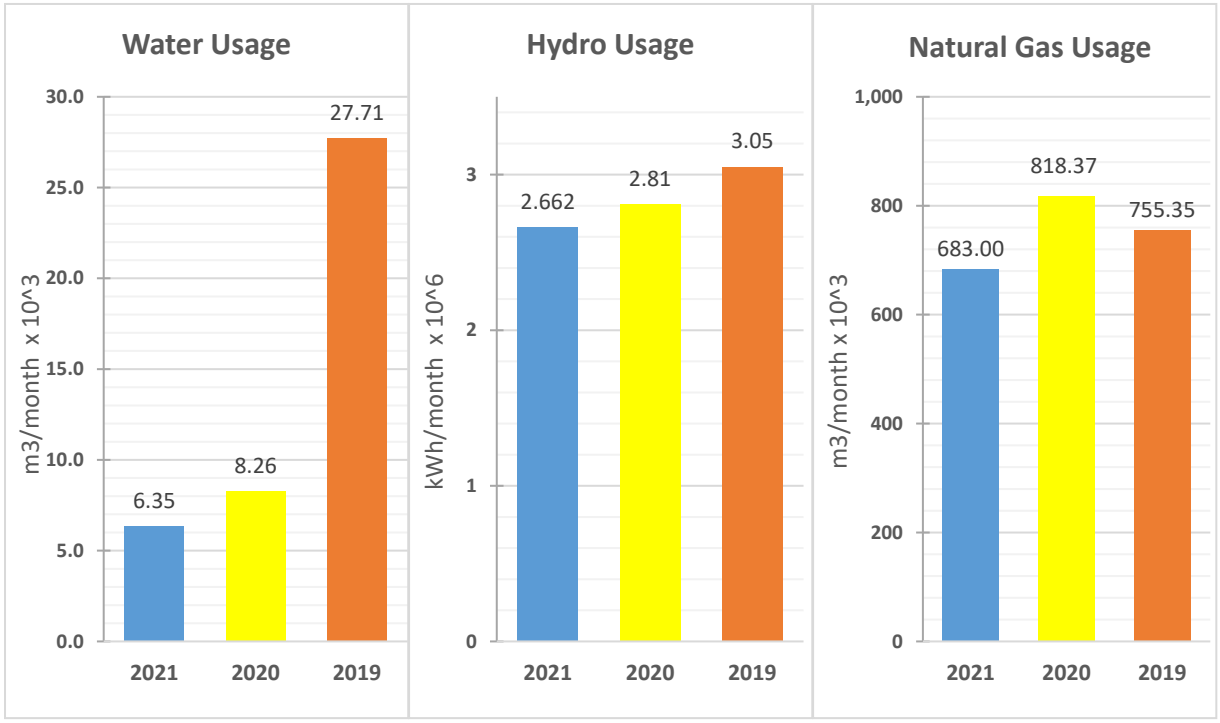


Figure 1: Annual Utility Consumption (Water, Hydro, Gas)

Table 7: Average Unit and Total Utility Cost

Utility	2021	2020	2019
Water Unit Cost ($/$m^3$)	$4.35	$4.25	$4.07
Water Total Cost ($/year)	0.33M	0.40M	1.35M
Hydro Unit Cost ($/kWh)	$0.10	$0.11	$0.10
Hydro Total Cost ($/year)	3.3M	3.6M	3.50M
Natural Gas Unit Cost ($/$m^3$)	$0.23	$0.21	$0.18
Natural Gas Total Cost ($/year)	1.9M	2.1M	1.60M

In 2019, the Highland Creek Treatment Plant had its automated water meters commissioned. Water consumption was previously not accurately metered.

7 ADMINISTRATION

7.1 Operations and Maintenance Costs

The 2021 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 2.2% from 2020.

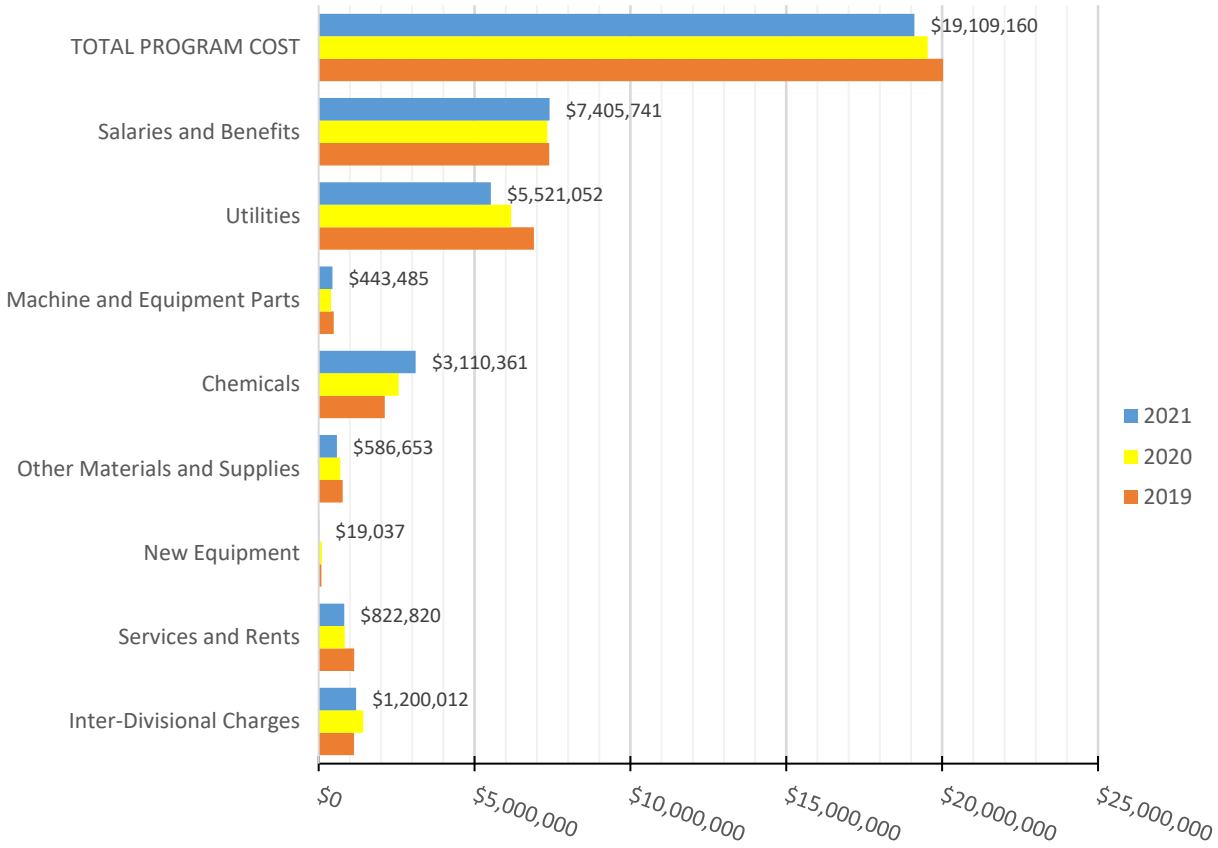


Figure 2: Operations and Maintenance Cost Breakdown

7.2 Human Resources

Plant Staffing at the Highland Creek Treatment Plant in 2021 is shown in Table 8.

Table 8: Plant Staffing

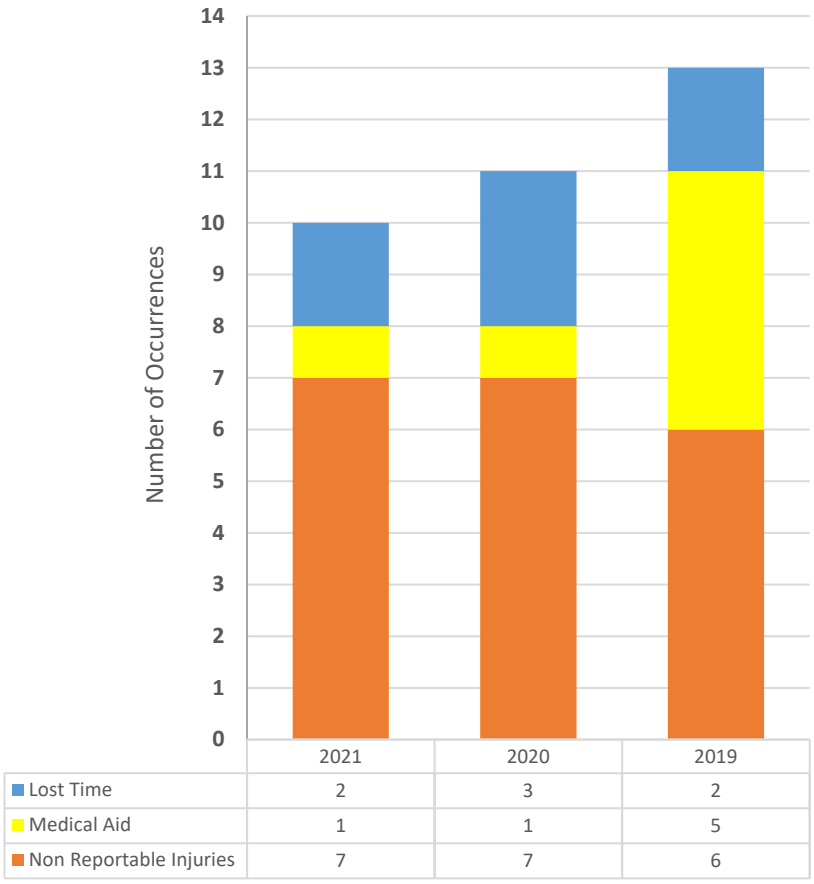
Position	Number of FTE[1]
Plant Manager	1
Senior Engineer	2
Engineer	1
Area Supervisors	4
Electrical & Instrumentation Specialist	1
Electricians	1
Plant Technicians	26
Industrial Millwrights	16
Electrical Instrumentation Control Technicians	7
Wastewater Treatment Plant Workers	6
Support/Materials Management Assistants	2
Engineering Technologist	1
Seasonal Labourer	0
Total FTE Positions	68

[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, 2021, there were 10 health and safety incidents and a total of 12 lost time days in 2021 due to work related injuries.



	2021	2020	2019
Lost Time	2	3	2
Medical Aid	1	1	5
Non Reportable Injuries	7	7	6

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 2021 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 2019 and 2020 have been changed to reflect the status of those WSIB claims as of December 31st, 2021.*

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 2021.

Table 9: Wastewater Treatment Certificates

Class Level	Number of Licenses
Class IV	21
Class III	0
Class II	2
Class I	14
O.I.T.	6
Total	43

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.

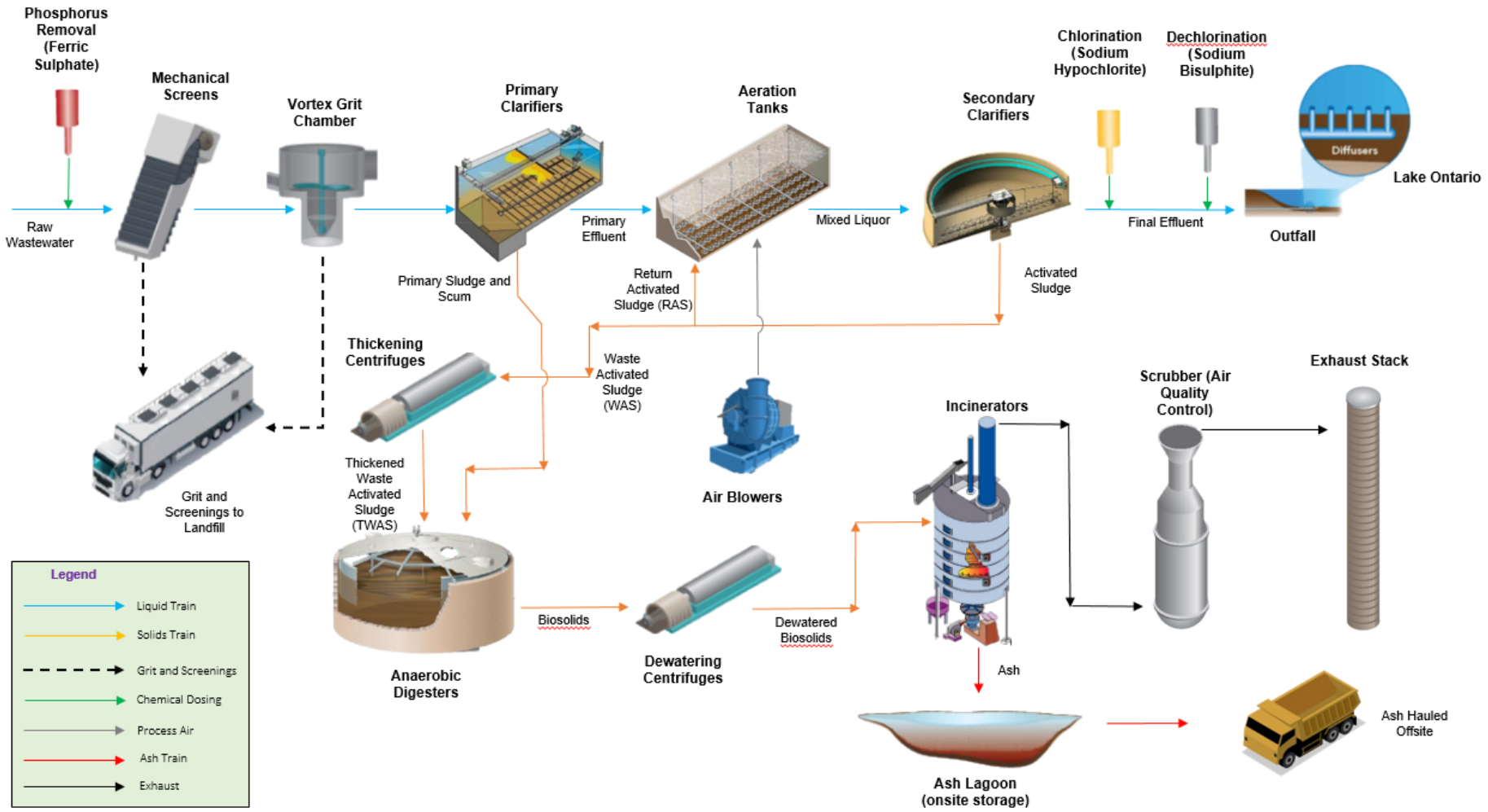
Table 10: Correspondence submitted to the MECP

Event Date	Type	Description	Resolution	Resolution Date
Complaints				
May 23, 2021	Odour	An odour complaint with investigation revealed that the possible source was from the primary tanks on the west side of the property	Tanks and sludge hoppers were cleaned and put back into service	May 26, 2021
May 25, 2021	Odour	An odour complaint with investigation revealed that the possible source was from the primary tanks on the west side of the property	Tanks and sludge hoppers were cleaned and put back into service	May 26, 2021
May 25, 2021	Odour	An odour complaint with investigation revealed that the possible source was from the primary tanks on the west side of the property	Tanks and sludge hoppers were cleaned and put back into service	May 26, 2021
June 2, 2021	Odour	An odour complaint with investigation revealed that the possible source was from the primary tanks on the west side of the property	Warranty repairs on tanks	June 3 – 4, 2021
June 23, 2021	Noise	A noise complaint with investigation revealed that it was due to contractor work	Provided instructions to ensure no construction prep occurs outside regular working hours	June 24, 2021
July 7, 2021	Noise	A noise complain with investigation revealed it as due to a vacuum truck	Provided instructions to ensure no construction prep occurs outside regular working hours	July 8, 2021
July 8, 2021	Noise	A noise complain with investigation revealed it as due to a vacuum truck	Provided instructions to ensure no construction prep occurs outside regular working hours	July 8, 2021

Consent Letters				
N/A				
Notice of Modification to Sewage Works				
March 30, 2021	N/A	Demolition of Heat Treatment Building for replacement with proposed Fluidized Bed Incinerator Building	N/A	N/A
Correspondence Submitted to MECP				
March 8, 2021	Exceedance of Monthly Compliance Limit	Final effluent exceeded TSS monthly compliance limit due to ongoing capital projects which reduced the plant's treatment capacity	Notified the MECP and SAC	N/A
May 8, 2021	Shutdown of southwest plant	Necessary repairs of mechanical isolating gate valves	Notified the MECP	May 18, 2021
October 11, 2021	Exceedance of Monthly Compliance Limit	Final effluent exceeded TSS monthly compliance limit due to ongoing capital projects which reduced the plant's treatment capacity	Notified the MECP and SAC	N/A
Notice of Start-up				
N/A				
MECP Inspection				
No inspection conducted				

APPENDIX A – Plant Schematic

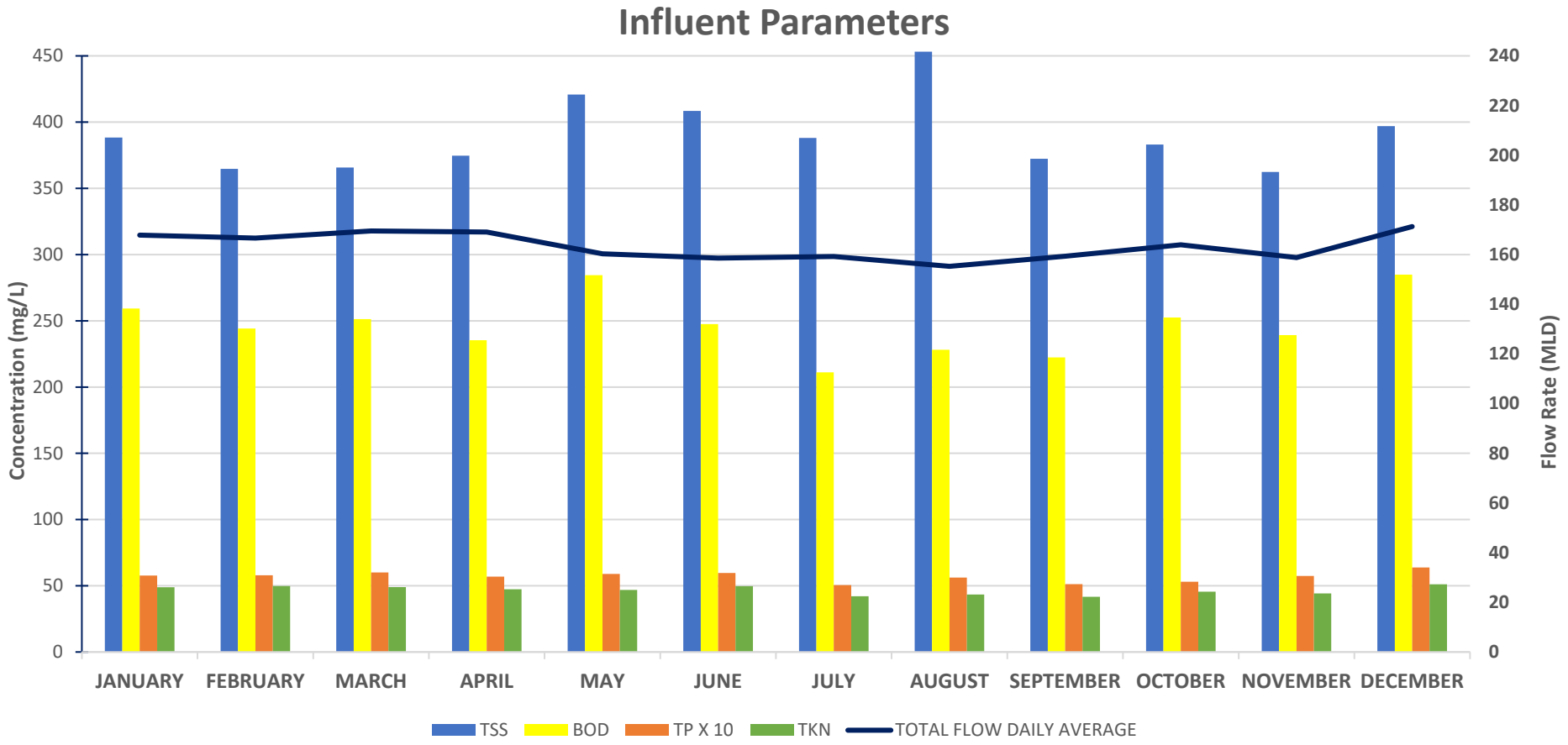
APPENDIX A – Plant Schematic (Normal Operation)



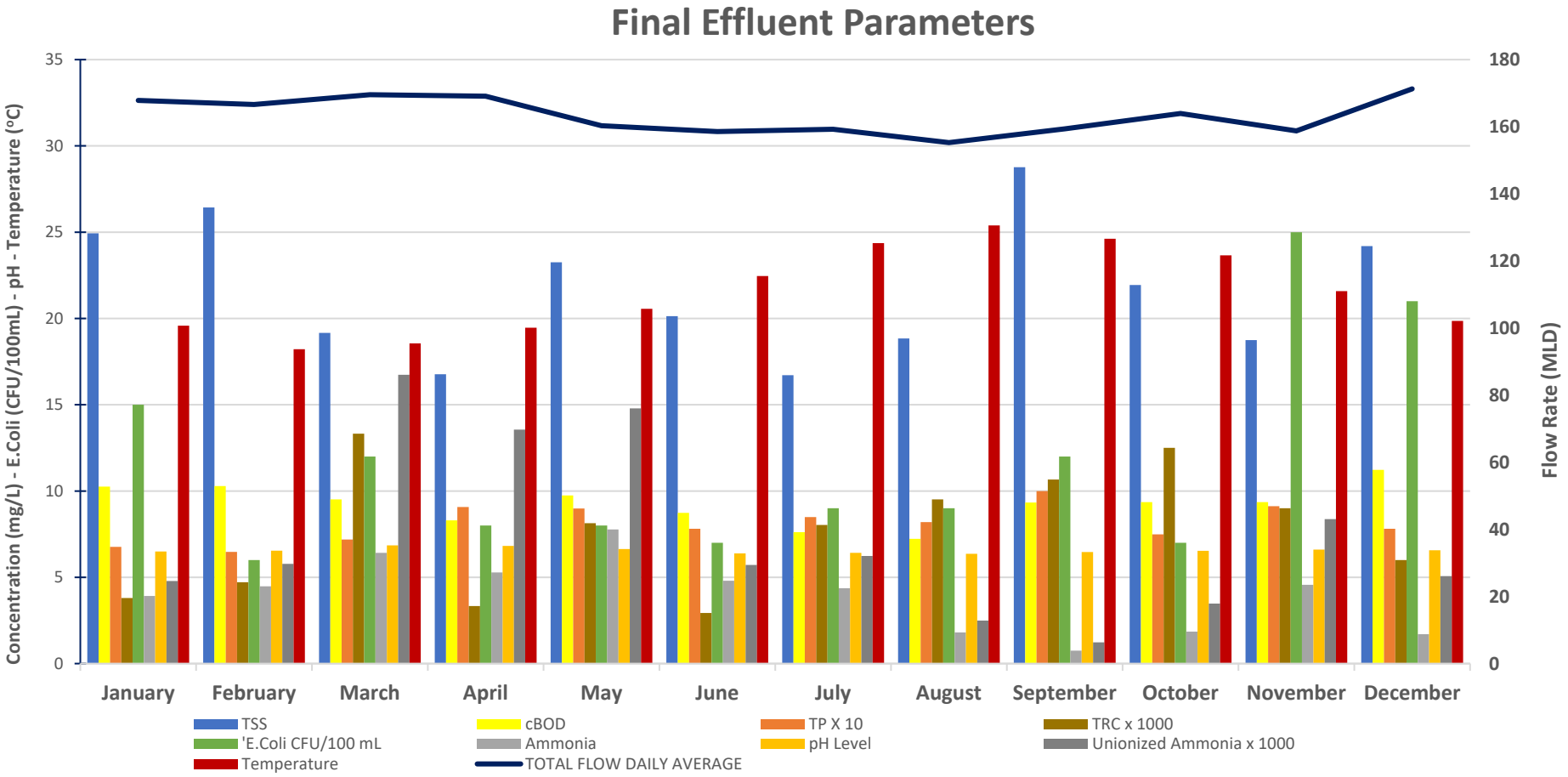
Process Flow Diagram for the Highland Creek Treatment Plant

APPENDIX B – Influent and Effluent 2021 Performance Charts

APPENDIX B – Influent and Effluent 2021 Performance Charts



APPENDIX B – Influent and Effluent 2021 Performance Charts



APPENDIX C – Historical Performance Data

APPENDIX C – Historical Performance Data

	Units	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
Influent Parameters												
Flow	ML/day	163.3	173.1	175.2	171.7	170.9	161.8	164.9	170.6	169.3	171.1	171.9
Total Annual Flow	ML	59611	63348	63964	62670	62388	59200	60208	62242	61804	62453	62753
Total Suspended Solids (TSS)	mg/L	389.9	361.6	305.3	288.7	246.7	244.8	212.1	247.6	232.3	268.1	238
Biochemical Oxygen Demand (BOD_5)	mg/L	246.7	242.9	232.5	255.9	221.4	242.2	234	232.1	205.9	206.7	185.3
Total Phosphorus (TP)	mg/L	5.7	5.5	5.2	5.7	5.2	5.2	5	4.9	4.4	4.8	4.7
Total Kjeldahl Nitrogen (TKN)	mg/L	46.6	45.7	48.1	48.3	44.0	46.1	39.6	44.3	48.7	52.3	45.0
Preliminary Treatment												
Grit and Screenings	tonnes/day	4.5	4.2	4.8	1.8	2	2.4	1.9	2.3	-	-	-
Primary Treatment												
TSS	mg/L	84.7	91.9	124.6	121.5	134.7	151	171	339	232.1	332.6	244.4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	mg/L	133.1	143.9	173.6	169.3	183.9	178	170	180	129.8	155	143.5
Secondary Treatment												
Aeration Loading	kg $CBOD_5$/ m^3.day	0.41	0.47	0.6	0.5	0.59	0.54	0.53	0.58	0.65	0.66	0.46
Mixed Liquor Suspended Solids	mg/L	2036	2435	2704.6	2619.5	2723	2736	3243	3296	2380	1577	2747
Final Effluent												
TSS	mg/L	21.7	17.1	14.7	15.9	14.1	14.6	17.4	20.2	22.8	21	14.6
TSS Loading Rate	kg/day	3537	2967	2578	2736	2406	2368	2877	3440	3868	3598	2492
cBOD5	mg/L	9.2	8.0	6.9	7.3	7.2	6.7	6.2	5.9	8.8	9.1	6.4
cBOD5 Loading Rate	kg/day	1510	1382	1212.0	1245.1	1233	1077	1025	1008	1506	1553	1091
TP	mg/L	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.7	0.5
TP Loading Rate	kg/day	133	132	131.6	120.9	219	117	115	100	104	116	83.5
Escherichia Coli (E. Coli)	CFU/100 mL	11.6	11.3	11.3	21.0	16.0	53.2	40.2	10.4	34.9	15.5	6.4
pH	-	6.6	6.5	6.6	6.7	6.7	6.5	6.5	6.5	6.2	6.4	6.9

APPENDIX C – Historical Performance Data

	Units	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
Total Residual Chlorine	mg/L	0.008	0.006	0.003	0.004	0.004	0.007	0.006	SBS (P)	SBS (P)	SBS (P)	SBS (P)
Total Kjeldahl Nitrogen (TKN)	mg/L	5.4	4.4	3.6	3.8	3.4	2.8	3.5	4.6	5.0	10.2	9.7
Total Ammonia Nitrogen	mg/L	4.0	3.2	2.1	2.0	1.5	1.1	1.4	2.9	3.4	7.7	8.1
Temperature	degrees Celsius	21.5	21.6	21.1	21.8	21.5	22.2	-	-	-	-	-
Solids Handling												
Primary Sludge Treated	m3/day	758	684	463	770	910	1090	1525	2150	2900	2944	4100
Primary Sludge Total Solids (TS)	%	3.41	3.39	1.67	2.85	2.55	2.40	2.80	2.60	2.20	2.20	3.20
Primary Sludge TVS	%	85.0	82.0	55.4	93.6	81.8	81.9	81.6	77.9	73.5	78.9	60.8
WAS to Thickening	m3/day	3,019	3,720	4,159	4,315	3716	3519	3110	2254	-	-	-
Thickened WAS (TWAS) TS	%	2.8	2.4	3.1	3.2	4.1	3.8	5.3	5.7	-	-	-
TWAS Treated	m3/day	433	663	687	665		474	323	1236	-	-	-
WAS to Co-settling	m3/day	-	-	-	-	-	-	-	-	6600	6875	5893
WAS SS	mg/L	4,888	5,188	5,886	5,768	6732	6126	7358	7300	4500	3262	4148
Dewatering Centrifuge Feed Flow	m3/day	1,829	1,796	2,478	2,494	1849	1924	2143	2065	1966	1906	1873
Dewatering Centrifuge Feed TS	%	1.4	1.6	1.8	2.1	2.5	2.3	3.0	2.0	1.7	1.5	1.6
Dewatered Biosolids incinerated	Dry tonnes/day	25.7	26.7	41.6	45.4	31.1	45.1	57.4	38.5	29.2	23.1	28.1
Dewatered Biosolids TS	%	27.3	26.4	25.7	28.0	26.2	26.6	22.8	25.0	25.8	26.5	26.4
Ash Removed	tonnes	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	0.0214	1.5	0.0025	0.0512	0.00005	0.0053	0.0289
February	0.005	0.002	0.002	0.002	0.0203	1.66	0.0025	0.0492	0.00005	0.0053	0.0342
March	0.005	0.002	0.002	0.002	0.0191	0.695	0.0025	0.0429	0.00005	0.0025	0.0283
April	0.005	0.002	0.002	0.002	0.0175	0.676	0.0025	0.0391	0.00005	0.0025	0.0275
May	0.005	0.002	0.002	0.002	0.0189	1.05	0.0025	0.041	0.00005	0.0056	0.033
June	0.005	0.002	0.002	0.002	0.021	1	0.0025	0.0399	0.00005	0.005	0.0303
July	0.005	0.002	0.002	0.002	0.0192	0.735	0.0025	0.0404	0.00005	0.0025	0.0271
August	0.005	0.002	0.002	0.002	0.0193	0.952	0.0025	0.0407	0.00005	0.0075	0.0302
September	0.005	0.002	0.002	0.002	0.0214	1.58	0.0025	0.0451	0.00005	0.0025	0.0302
October	0.005	0.002	0.002	0.002	0.0164	1.24	0.0025	0.0387	0.00005	0.0025	0.0253
November	0.005	0.002	0.002	0.002	0.0165	0.846	0.0025	0.0397	0.00005	0.0025	0.0242
December	0.005	0.002	0.002	0.002	0.0225	1.07	0.0025	0.0445	0.00005	0.0025	0.03
Annual Average	**0.005**	**0.002**	**0.002**	**0.002**	**0.0195**	**1.0837**	**0.0025**	**0.0427**	**0.00005**	**0.0039**	**0.0291**

Values in red 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	0.101	23	0.0025	0.0709	0.00013	0.0085	0.113
February	0.005	0.002	0.00405	0.002	0.114	21.9	0.0025	0.0686	0.00005	0.0094	0.124
March	0.005	0.002	0.002	0.002	0.127	17.5	0.0025	0.0767	0.00005	0.008	0.121
April	0.005	0.002	0.002	0.002	0.114	11.5	0.0025	0.0706	0.00005	0.0062	0.116
May	0.005	0.002	0.002	0.002	0.143	14.2	0.0025	0.0689	0.00005	0.0075	0.134
June	0.005	0.002	0.00573	0.002	0.129	15.2	0.0025	0.0734	0.00005	0.0089	0.149
July	0.005	0.002	0.00407	0.002	0.133	9.09	0.0025	0.0682	0.00005	0.0062	0.127
August	0.005	0.002	0.00431	0.002	0.127	9.33	0.0025	0.0669	0.00005	0.0076	0.154
September	0.005	0.002	0.002	0.002	0.111	9.56	0.0025	0.0725	0.00005	0.0072	0.113
October	0.005	0.002	0.00442	0.002	0.101	12.6	0.0025	0.0658	0.00005	0.007	0.115
November	0.005	0.002	0.002	0.002	0.117	11.6	0.0025	0.0704	0.00005	0.0067	0.121
December	0.005	0.002	0.00521	0.002	0.15	1.31	0.0025	0.0993	0.00005	0.0059	0.147
Annual Average	**0.005**	**0.002**	**0.00332**	**0.002**	**0.1223**	**13.066**	**0.0025**	**0.072683**	**0.000057**	**0.0074**	**0.1278**

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	0.034	0.0097	0.0555	0.573	8.34	0.0030	0.0954	0.298	0.275	0.01	6.87
February											
March											
April	0.0236	0.004	0.0824	0.68	9.44	0.0020	0.111	0.384	0.626	0.021	7.85
May											
June											
July	0.043	0.004	0.117	4.59	13.1	0.0103	0.197	3.05	0.738	0.027	13.5
August											
September											
October	0.0784	0.014	0.162	1.58	15.5	0.0051	0.229	0.869	0.593	0.069	15.8
November											
December											
Annual Average	0.04	0.01	0.10	1.9	12	0.01	0.16	1.2	0.6	0.03	11

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 1,255 work orders were closed in this work area in 2021. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 1 in 2021:

- 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 2040 work orders were closed in this work area in 2021. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 2 in 2021:

- 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 2,418 work orders were closed in this work area in 2021. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 3 in 2021:

- 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 1,499 work orders were closed in this work area in 2021. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 4 in 2021:

- 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 2021 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