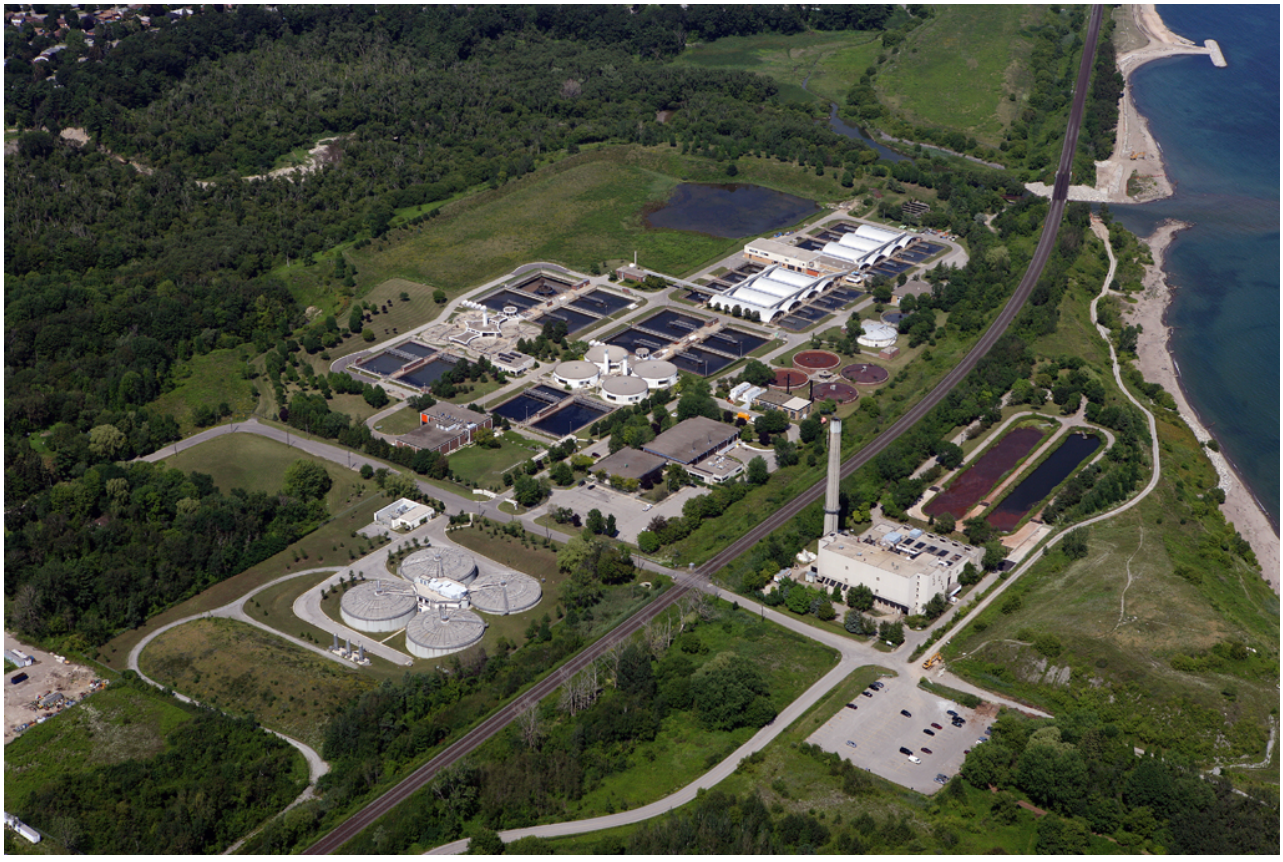
TORONTO Water

HIGHLAND CREEK TREATMENT PLANT

2018 Annual Report



March 28, 2019

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. 8261-99EP4S from January 1 to December 17, 2018, at which point it was replaced by Amended ECA No. 3448-B2UK8W, issued on December 17, 2018.

The average daily flow rate in 2018 was 171.7 ML/day. Influent concentrations of Biochemical Oxygen Demand (BOD_5), Total Phosphorus (TP) and Total Suspended Solids (TSS) averaged 255.9 mg/L, 5.7 mg/L and 288.7 mg/L, respectively.

Highland Creek Treatment Plant achieved the following effluent quality and loading rates in 2018 in comparison to ECA limits:

	ECA[1]	2018 Final Effluent
Total Suspended Solids (TSS)	25.0 mg/L	15.9 mg/L
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	25.0 mg/L	7.3 mg/L
Total Phosphorus (TP)	1.0 mg/L	0.7 mg/L
Escherichia coli (E. Coli)[2]	200 CFU/100mL	21 CFU/100mL
pH	6.0 - 9.5	6.7
Total Residual Chlorine (TRC) (i.e. Dechlorination)	0.02 mg/L	0.004 mg/L
TSS Loading Rate	5,475 kg/day	2,736 kg/day
$CBOD_5$ Loading Rate	5,475 kg/day	1,245 kg/day
TP Loading Rate	219 kg/day	121 kg/day

[1] Referenced from Amended ECA No. 8261-99EP4S, issued on October 28, 2015.

[2] Arithmetic mean of monthly geometric mean data.

During 2018, the sludge feed flow to the dewatering centrifuges averaged 2494 m^3/day which resulted in 49.1 dry tonnes of dewatered solids being generated per day.

Ferrous chloride consumption for phosphorus removal was 10.37 tonnes as iron (Fe) per 1000ML wastewater treated. Polymer consumption in 2018 for waste activated sludge (WAS) thickening and sludge dewatering totalled 7.90 tonnes per 1000 ML treated. Total sodium hypochlorite (12% w/v) consumption for disinfection totalled 48.72 m^3 per 1000 ML. Sodium Bisulphite (SBS) (38% w/w) consumption for effluent dechlorination totalled 13.66 m^3 per 1000 ML.

There were no bypass occurrences at Highland Creek Treatment Plant in 2018. The plant continued with various capital projects. Notable projects included: Digester Cleaning and Rehabilitation, the Headworks and Odour Control Upgrades, and the Liquid Train Upgrades and Process Roadmap Project. A variety of scheduled, preventative, predictive and reactive maintenance was completed, including the calibration of effluent monitoring equipment.

Total annual consumption of potable water, hydro, and natural gas was 2,093 m^3, 36.6M kWh, and 11.3M scm, respectively. Plant direct operating costs for 2018 totalled $18.7M. In 2018, the Highland Creek Treatment Plant had a staffing complement of 67 employees. As of December 31, 2018, there were four health and safety incidents and a total of 17 lost time days in 2018 due to work related injuries.

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GLOSSARY OF ABREVIATIONS AND DEFINITIONS

AAC	Annual Average Concentration
BOD5	Five-Day Biochemical Oxygen Demand
CBOD5	Five-Day Carbonaceous Biochemical Oxygen Demand
CEU	Continuing Education Units
CFU	Colony Forming Units
DAF	Dissolved Air Flotation
E. Coli	Escherichia Coli
ECA	Environmental Compliance Approval
Fe	Iron
HTP	Humber Treatment Plant
HP	Horsepower
HRT	Hydraulic Retention Time
kg	kilogram
kWh	Kilowatt-hour
MAC	Monthly Average Concentration
MGMD	Monthly Geometric Mean Concentration
MWh	Megawatt-hour
m3	Cubic metre
m3 /day	Cubic metre per day
mA	Milliamps
mg/L	Milligrams per litre
mL	Millilitre
ML	Million Litres
MECP	Ministry of the Environment, Conservation and Parks
Q	Flow Rate
RAS	Return Activated Sludge
SBS	Sodium Bisulphite
SBS (P)	Sodium Bisulphite Presence
scm	Standard Cubic Metre
SS	Suspended Solids
TCR	Total Chlorine Residual
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

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 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, 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 facility operated under Environmental Compliance Approval (ECA) Sewage No. 8261-99EP4S from January 1 to December 17, 2018, at which point it was superseded with ECA No. 3448-B2UK8W, issued on December 17, 2018, for the duration of the year. For reporting purposes, conditions listed in this annual report reference ECA Sewage No. 8261-99EP4S since it was in effect for the majority of the operating year.

This report is a summary of plant operations and performance in 2018. 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. A Plant process flow diagram is available in Appendix A. Additional information on the plant's 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 grit and screenings removal. Aerated grit channels, cyclones and classifiers are used to remove and dewater grit; climber-type bar screens remove rags and large pieces of debris. Ferrous chloride is applied at the head of the aerated grit channels for phosphorous removal. The removed grit and screenings are hauled to a sanitary 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

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

Clarification Tanks and 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 ceramic fine bubble dome diffusers[2].

The mixed liquor from the Aeration Tanks flows to 16 large quiescent 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 1000 m into the lake from the shore. 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 and ash handling.

Primary sludge and scum, 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.

[2] *With exception of the first two sections of Aeration Tank 8.*

Anaerobic digestion is the biological degradation (stabilization) of organic materials (sludge and scum) in the absence of oxygen – it reduces volume of solids, destroys pathogens and mitigates sludge odour. The process produces digester gas, made up predominantly of methane. This gas is 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.

To facilitate cleaning and rehabilitation of the digesters, anaerobic digestion of primary sludge, TWAS, and scum was not performed in 2018. The digesters have been offline since September 2015 and are expected to be back in service in 2019.

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.

On occasion, when the incinerators are down due to unforeseen equipment failure, dewatered biosolids may be hauled off-site for further processing

3 PROCESS SUMMARY

3.1 Process Parameters

In 2018, the Highland Creek Treatment Plant continued to produce a high quality effluent. A summary of key final effluent parameters against the 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	$cBOD_5$ (mg/L)	TSS (mg/L)	TP (mg/L)	TRC (mg/L)	E-Coli (count/ 100mL)
January	9.0	13.1	0.6	0.005	15
February	7.4	15.3	0.7	0.006	5
March	10.0	22.7	0.8	0.001	9
April	10.7	24.0	0.8	0.001	12
May	7.9	19.9	0.8	0.002	3
June	5.7	14.8	0.7	0.003	13
July	5.6	14.7	0.8	0.006	5
August	6.7	14.1	0.7	0.006	15
September	4.7	12.0	0.6	0.009	33
October	5.8	13.6	0.7	0.004	13
November	8.8	14.0	0.6	0.001	21
December	7.1	13.1	0.5	0.005	71
Annual Average	7.3	15.9	0.7	0.004	21
Loading (kg/d)[1]	1,245	2,736	120.9	N/A	N/A
Removal Efficiency[2] (%)	96%	94%	87%	N/A	N/A
ECA Requirements[3, 4, 5]					
Effluent Objective	AAC: 15.0 mg/L	AAC: 15.0 mg/L	MAC: 0.9 mg/L	MAC: non-detect	MGMD: 150 CFU/ 100 mL
Effluent Limit	AAC: 25.0 mg/L	AAC: 25.0 mg/L	MAC: 1.0 mg/L	MAC: 0.02 mg/L	MGMD: 200 CFU/ 100 mL
Effluent Loading Limit	AAL: 5475 kg/d	AAL: 5475 kg/d	AAL: 219 kg/d	N/A	N/A

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

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

[3] The ECA effluent objective and limit for pH is 6.5 to 8.5 and 6.0 to 9.5 respectively, inclusive, at all times. Effluent pH in 2018 was within the required objective and limit.

[4] Referenced from Amended ECA No. 8261-99EP4S, issued on October 28, 2015.

[5] AAC refers to Annual Average Concentration, MAC refers to Monthly Average Concentration, MGMD revers 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 sewer use By-law limits. Final effluent concentrations are presented to assess the treatment plant's removal capacity.

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

Table 2: Process Summary

Parameter	Units	2018	2017	2016
Influent Parameters				
Flow [1]	ML/day	171.7	170.9	161.8
Total Annual Flow [1]	ML	62,671	62,388	59,200
Total Suspended Solids (TSS)	mg/L	288.7	246.7	244.8
Biological Oxygen Demand (BOD)	mg/L	255.9	221.4	242.2
Total Phosphorus (TP)	mg/L	5.7	5.2	5.5
Preliminary Treatment				
Grit and Screenings	Tonnes/day	1.8	2.0	2.4
Primary Treatment				
TSS	mg/l	121.5	134.7	151.3
cBOD5	mg/L	169.3	183.9	178.4
Secondary Treatment				
Aeration Loading	kg $CBOD^5/m^3 \cdot day$	0.55	0.59	0.54
Mixed Liquor Suspended Solids	mg/L	2,619	2,723	2,736
Solids Handling				
Primary Sludge Treated	m3/day	770	910	1,090
Primary Sludge TS	%	2.8	2.6	2.4
Primary Sludge TVS	%	94	82	82
WAS to Thickening	m3/day	4,315.0	3,716.4	3,519.2
WAS SS	mg/L	5,768	6,732	6,126.0
TWAS TS	%	3.2	4.1	3.8
TWAS TVS	%	76	77	-
TWAS Treated m3/day	m3/day	665	560	474
Dewatering Centrifuge Feed Flow	m3/day	2,494.4	1,848.9	1,924.0
Dewatering Centrifuge Feed TS	%	2	2	2
Dewatered Biosolids TS	%	28.0	26.2	26.6
Centrate Quality	mg/L	996	1,516	1,014
Solids Capture Rate	%	95	94	96

Parameter	Units	2018	2017	2016
Dewatered Biosolids Total	Dry tonnes/day	49.1	43.3	43.1
Dewatered Biosolids Hauled[2]	Dry tonnes/day	3.8	12.2	12.4
Dewatered Biosolids Incinerated	Dry tonnes/day	45.4	31.1	30.7
Ash Removed	tonnes	2,968.6	1,815.0	3,775.0

[1] Flow monitoring is provided by influent flow meters. There are no effluent flow meters due to infrastructure limitations.
[2] Dewatered Solids hauled for processing to the Lystek facility in Dundalk, Ontario, when required as a contingency measure.

In 2018, the total annual influent flow increased by 0.5% as compared to 2017. Over the past five years, sewage flow to Highland Creek Treatment Plant has remained relatively constant. The sewershed is comprised of separated sewers so the plant does not typically see wet weather flow variations; on rare occasions, high peak flows may be experienced. TSS, BOD, and TP loading to the plant increased by 17%, 16%, and 9% respectively, compared to 2017.

The objective for TRC is given as non-detect under Condition 6 of the ECA. The MECP gives a regulatory method detection limit (RMDL) of 0.01 mg/L for the recommended amperometric method. The Highland Creek Treatment Plant uses an alternate approved method (i.e. colourimetric) for which the MECP does not give a RMDL but which has a lower measurement range, as specified by the manufacturer, of 0.002 mg/L. This allows for more significant figures to be reported. Considering the RMDL of 0.01 mg/L, the Highland Creek Treatment Plant met the objective for TRC for all of 2018.

The Highland Creek Treatment Plant encountered operating issues in the months of March, April and May in 2018. In March the plant experienced a filamentous bulking event, which was corrected with RAS chlorination. In April, the plant experienced a washout of biomass from the secondary process due to extreme high flows caused by a rapid ice storm and snow melt cycle over a short time period. Finally in May, the plant began to recover from the biomass loss but also experienced settling issues due to intermittent filamentous bulking. For the remaining seven months of the year, the plant continued to produce a high quality effluent which surpassed requirements of the effluent objectives as described in Condition 6 of the plant's ECA. This was achieved through continuous improvement in operations and maintenance of treatment processes, and infrastructure delivery. The plant also at all times met Federal Government WSER requirements for un-ionized ammonia and acute toxicity.

3.2 Biosolids Management

In 2018, the daily average inflow to the Highland Creek Treatment Plant was 171.7 ML/day. The flow projections for 2019 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 2019.

During 2018, the sludge feed flow to the dewatering centrifuges averaged 2,494 m^3/day which resulted in 49.1 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 year based on 1000 ML of water treated in the facility for the past three years. Costs listed are plus applicable taxes.

Table 3: Chemical Usage Summary per 1000 ML Treated

Process	Chemical	2018 Usage	2018 Cost	2017 Usage	2017 Cost	2016 Usage	2016 Cost
Phosphorus Removal	Ferrous Chloride as Fe	10.34 tonnes	$826/ tonne Fe	9.54 tonnes	$800/ tonne Fe	11.30 tonnes	$800/ tonne Fe
Disinfection	Sodium Hypochlorite (12% w/v)	48.72 m^3	$151/ m^3	52.14 m^3	$157/ m^3	37.47 m^3	$129/ m^3
Dechlorination	Sodium Bisulphite (32% w/w)	13.66 m^3	$282/ m^3	15.79 m^3	$282/ m^3	7.31 m^3	$303/ m^3
Biosolids Dewatering and WAS Thickening	Polymer	7.90 tonnes	$2660/ tonne	7.93 tonnes	$2390/ tonne	6.83 tonnes	$2390/ tonne

3.4 Bypasses, Overflows, Spills, and Abnormal Discharge Events

3.4.1 Bypasses

The Highland Creek Treatment Plant historically does not have to bypass during wet weather events, and did not bypass in 2018. 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, and exits the plant through the plant outfall before the final effluent sampling point. Secondary bypasses occur due to high wet weather flows that exceed the plant's secondary treatment capacity. Total precipitation in the Toronto area[3] was 921 mm in 2018, a 17% increase from 2017.

3.4.2 Overflows

There were no overflow events at the Highland Creek Treatment Plant in 2018. 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 2018. There were 18 spills to air reported to the MECP in 2018; they are summarized in Table 4 below.

Table 4: Spills Summary[1]

Date	Duration (mins)	Nature of event	Description
January 29, 2018	1	Stub stack emergency pressure relief	ID fan unexpected stoppage
February 20, 2018	42	Stub stack emergency pressure relief	RPU shut down of effluent water and overheating of scrubber
March 8, 2018	5	Stub stack emergency pressure relief	Main Power feeder interruption
April 4, 2018	45	Stub stack emergency pressure relief	Main Power feeder interruption, twice
April 14, 2018	145	Stub stack emergency pressure relief	Main Power feeder interruption
May 18, 2018	4	Stub stack emergency pressure relief	Brief power interruption
May 24, 2018	15	Stub stack emergency pressure relief	Plant wide power interruption
May 26, 2018	120	Stub stack emergency pressure relief	Scrubber water return line failure forced ID fan stoppage

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

Date	Duration (mins)	Nature of event	Description
June 10, 2018	27	Stub stack emergency pressure relief	Main power feeder interruption
June 12, 2018	8	Stub stack emergency pressure relief	Plant wide power interruption
June 12, 2018	3	Stub stack emergency pressure relief	Brief power interruption
July 4, 2018	7	Stub stack emergency pressure relief	ID fan unexpected stoppage
July 24, 2018	105	Stub stack emergency pressure relief	Main power feeder interruption
August 5, 2018	1	Stub stack emergency pressure relief	Brief power interruption severe weather and fallen tree
August 7, 2018	2	Stub stack emergency pressure relief	ID fan unexpected stoppage
August 30, 2018	120	Stub stack emergency pressure relief	ID fan unexpected stoppage
November 18, 2018	15	Stub stack emergency pressure relief	Main power feeder interruption
December 3, 2018	1	Stub stack emergency pressure relief	Main power feeder interruption

[1] Stub stack emergency relief has not historically been reported in the Annual Reports. 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 two abnormal discharge events at the Highland Creek Treatment Plant in 2018. Both events were related to brief final effluent disinfection interruptions. A table of correspondence with the MECP, including abnormal discharge events can be found in Section 7.6.

3.5 Complaints

The Highland Creek Treatment Plant received one complaint related to odour and two related to noise. All complaints were recorded, investigated by Toronto Water Staff, reported to the MECP, and when possible, followed up with the complainant. After investigation, only the odour complaint was determined to be plant related, which was promptly rectified.

A table of correspondence with the MECP, including complaints can be found in Section 7.6.

3.6 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 operation and performance is monitored by licensed operators as well as by the facility management team. Standard Operation 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 2018.

Table 5: Capital Projects

Project Name	Project Description	Project Stage (Dec 31, 2018)
Biosolids Treatment Upgrades Project	New dewatering centrifuges and refurbishment of multiple hearth furnaces.	Complete
Headworks and Odour Control	New Headworks building with screening and grit removal. New odour control for liquids treatment process.	Construction
Process Control Building	Extension to administration building with office and meeting space and upgrades to existing.	Construction
RAS Pumping, Aeration and Phosphorus Removal	New chemical dosing facility for phosphorous removal and aeration upgrades to South East plant.	Construction Tender
Electrical Condition Assessment Project #6	Electrical upgrades including new MCC and RPUs to the North/South West plant.	Commissioning
PLC Platform Migration	Site wide upgrades to various Programmable Logic Controllers.	Construction
Firm Capacity, Liquid Train Upgrades and Process Roadmap	Undertake various process upgrades to maintain firm capacity and process roadmap to assess future requirements and technologies.	Design
Digester Cleaning and Rehabilitation	Rehabilitation of four digesters, including new waste gas burners.	Construction
Disinfection and Electrical Upgrades	Upgrades to disinfection and dechlorination chemical dosing systems and various electrical upgrades.	Design
Fluidized Bed Incinerator	New fluidized bed incineration facility.	Design
Communication System Upgrade	Upgrades to site wide communication system.	Study

5 MAINTENANCE

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

The annual calibration and maintenance records of flow meters and on-line analysers for regulated parameters was completed in 2018, and found to be within acceptable limits. A summary of effluent monitoring equipment calibration and maintenance performed in 2018 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	Jan 30, Mar 24, Oct 24, 2018
Primary Influent Flow Meter Phase 4 Calibration	Jan 30, Jul 20, 2018
Primary Influent Flow Meter Old 1-4 Calibration	Aug 24, Oct 26, 2018
Primary Influent Flow Meter Old 5-8 Calibration	Aug 10, Oct 26, 2018
Final Effluent pH and Temperature Meter Calibration	Weekly
HACH DR3900 Spectrophotometer Calibration	June 7, 2018
Influent Auto Sampler Calibration and Preventative Maintenance	Mar 22, Jun 15, Sept 11, Sept 24, Nov 30, 2018
Final Effluent Auto Sampler Calibration and Preventative Maintenance	Apr 13, Jun 29, Sept 11, Sept 24, Dec 14, 2018

The Highland Creek Treatment Plant work areas include all major and auxiliary processes. In 2018, there was a total of 5889 work orders completed; refer to Appendix F for a summary of maintenance activities as per Conditions 10(6)(c) 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 10(6)(j) of the ECA.

Regular safety inspections and preventative maintenance were performed on life safety systems at the plant in 2018.

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 2,093 m^3, 36.6M kWh, and 11.3M scm, respectively.

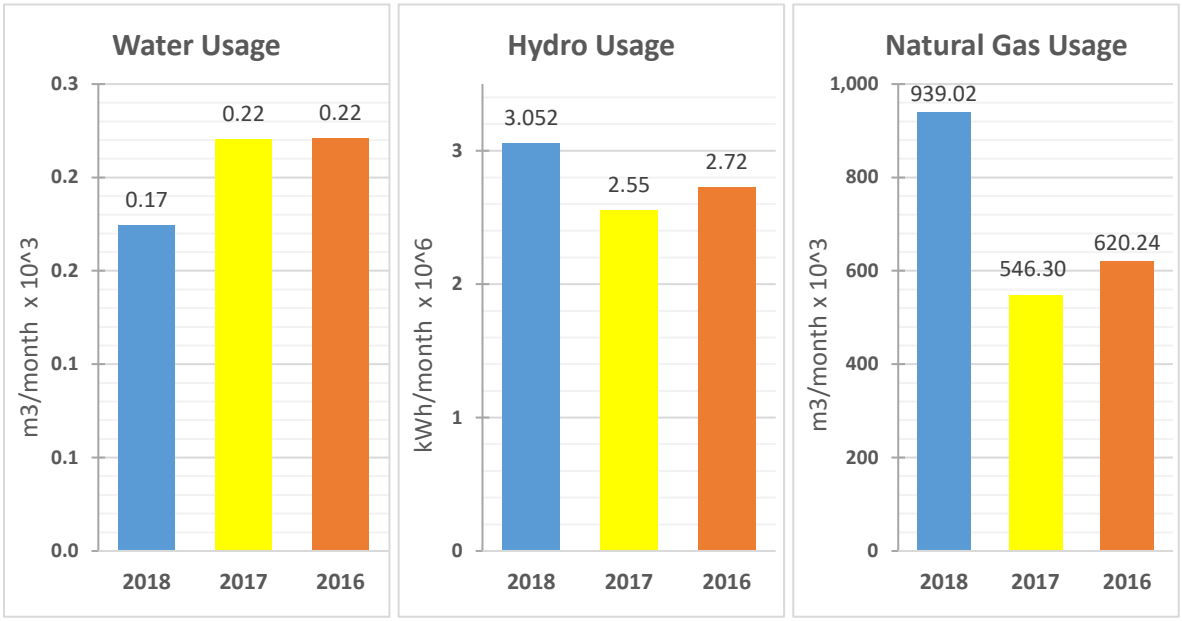


Figure 1: Annual Utility Consumption (Water, Hydro, Gas)

Table 7: Average Unit and Total Utility Cost

Utility	2018	2017	2016
Water Unit Cost ($/m3)	4.92	3.81	3.63
Water Total Cost ($/year)	13,046	10,074	6,991
Hydro Unit Cost ($/kWh)	0.09	0.12	0.14
Hydro Total Cost ($/year)	3.26M	3.69M	4.66M
Natural Gas Unit Cost ($/m3)	0.16	0.22	0.21
Natural Gas Total Cost ($/year)	1.79M	1.42M	1.53M

There was a 51% increase in natural gas consumption in 2018. This was due to increased processing of solids by the on-site multiple hearth incinerators and less off-site disposal after the completion of the Biosolids Treatment Upgrades capital project.

7 ADMINISTRATION

7.1 Operations and Maintenance Costs

The 2018 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 7.3% from 2017.

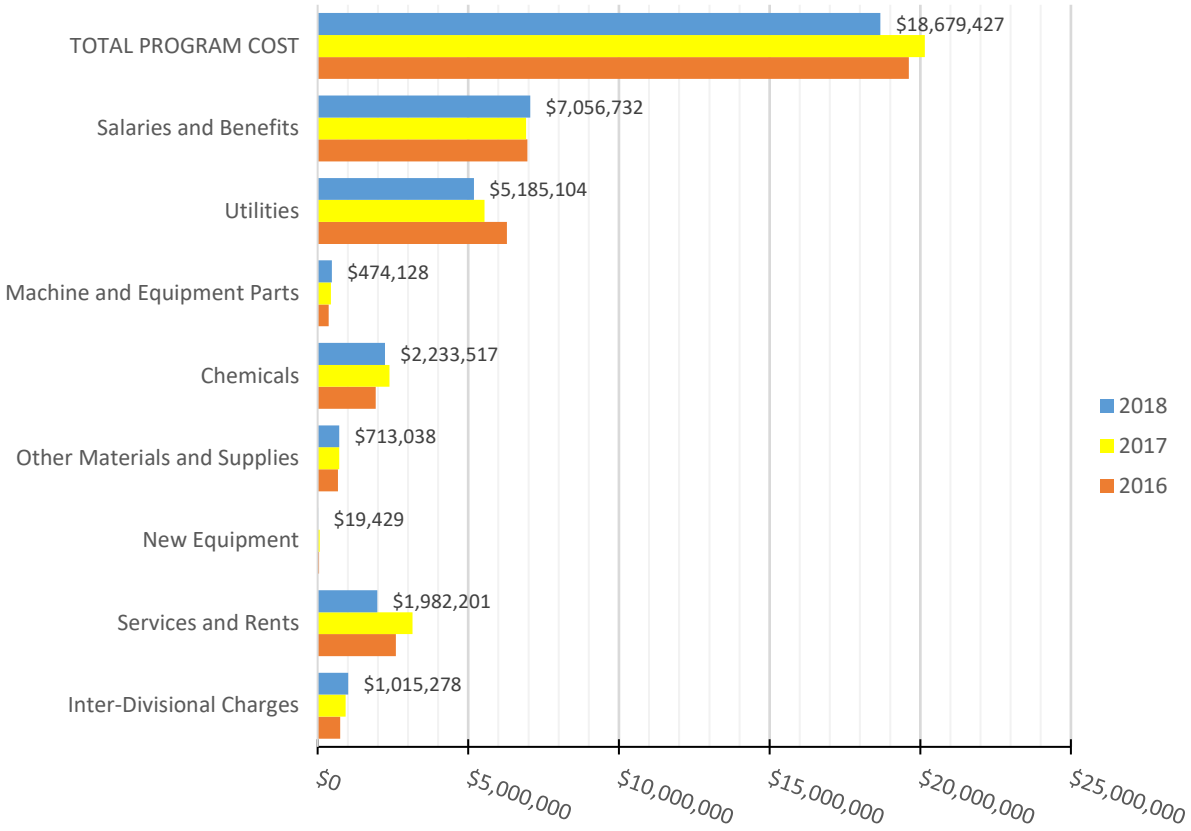


Figure 2: Operations and Maintenance Cost Breakdown

7.2 Human Resources

Plant Staffing at the Highland Creek Treatment Plant in 2018 is shown in Table 8.

Table 8: Plant Staffing

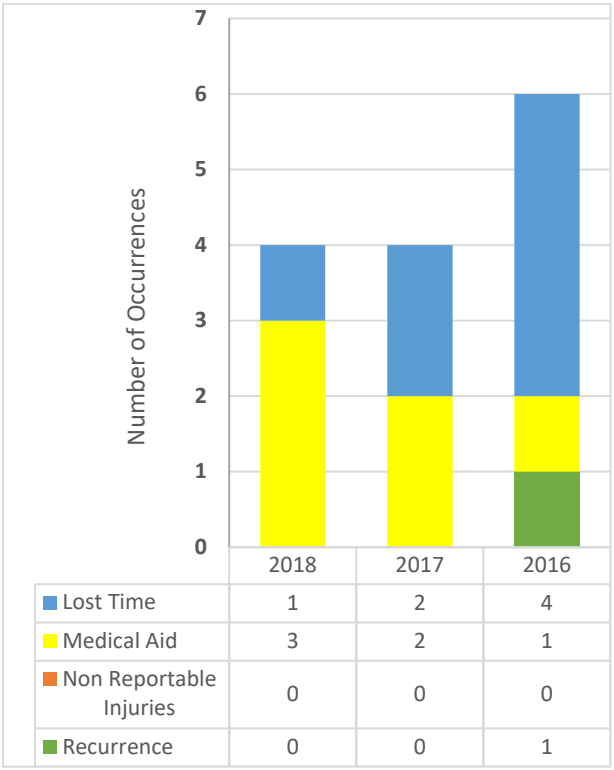
Position	Number of FTE[1]
Plant Manager	1
Senior Engineer	1
Engineer	1
Area Supervisors	4
Electrical and Instrumentation Specialist	1
Electricians	1
Plant Technicians	26
Industrial Millwrights	16
Electrical Instrumentation Control Technicians	7
Wastewater Treatment Plant Workers	6
Support/Materials Management Assistants	2
Engineering Technologist	1
Total FTE Positions	**67**

[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, 2018, there were four health and safety incidents and a total of 17 lost time days in 2018 due to work related injuries.



	2018	2017	2016
Lost Time	1	2	4
Medical Aid	3	2	1
Non Reportable Injuries	0	0	0
Recurrence	0	0	1

Figure 3: Highland Creek Treatment Plant Health and Safety Injury Summary[4]

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 2018 includes the list of courses shown in Appendix G. Some of these courses were eligible for Continuing Education Units (CEU's) from the Ontario Environmental Training Consortium (OETC). Additional training related to the start-up and commissioning of new equipment/systems installed as part of the capital program was provided as required.

[4] *The previously reported values for 2017 and 2016 have been changed to reflect the status of those WSIB claims as of December 31st, 2018.*

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 2018.

Table 9: Wastewater Treatment Certificates

Class Level	Number of Licenses
Class IV	21
Class III	3
Class II	6
Class I	10
O.I.T.	13
Total	**53**

7.6 MECP/MOL Correspondence

There were no orders issued by the Ministry of the Environment, Conservation and Parks (MECP) or from the Ministry of Labour (MOL).

Reports were submitted to the MECP for the one odour and two noise complaints received at the plant in 2018.

Table 10 summarizes the correspondence submitted to the MECP and MOL for the Highland Creek Treatment Plant. Correspondence related to spills can be referenced in Section 3.4.3.

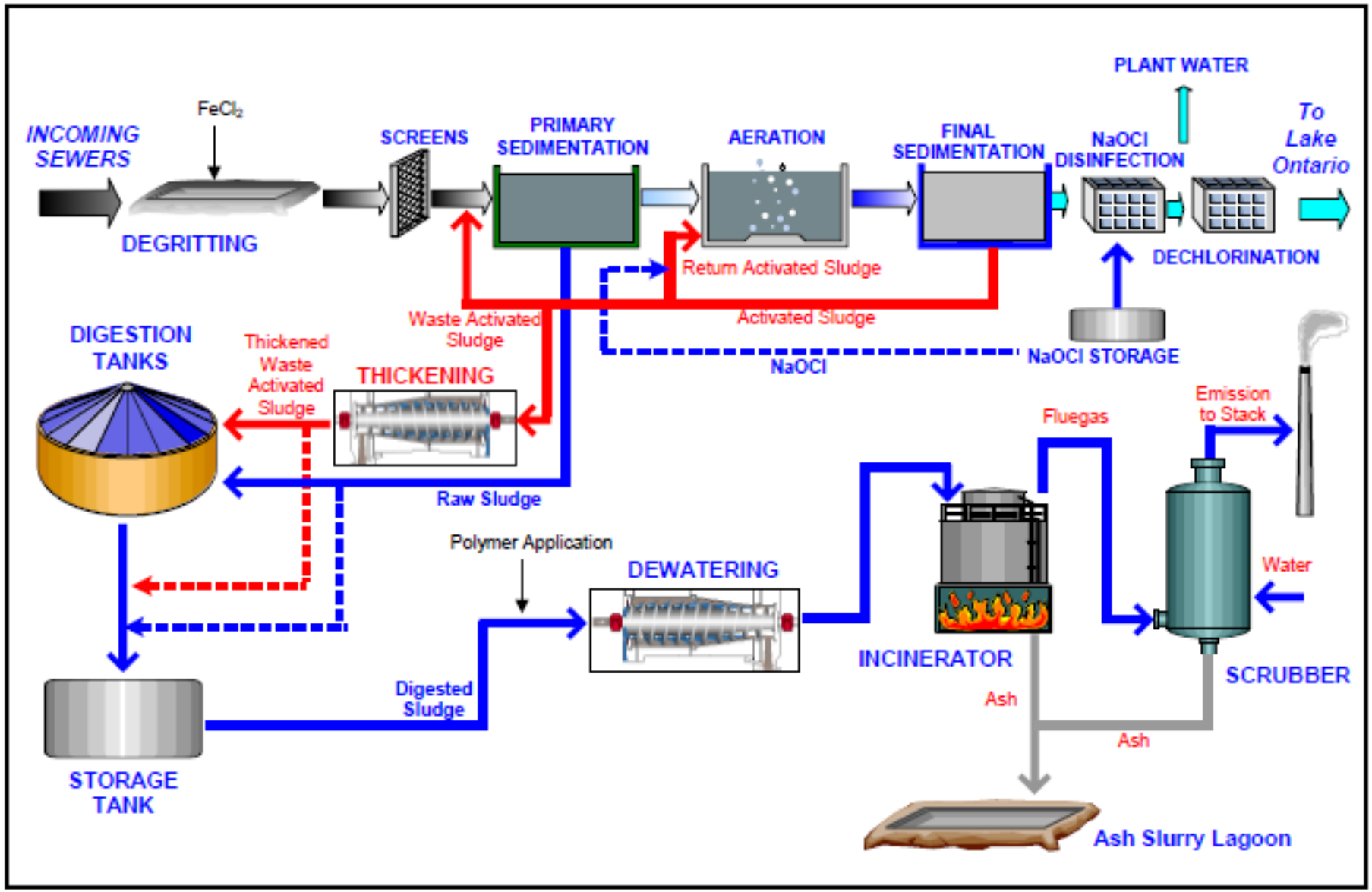
Table 10: Correspondence submitted to the MECP and MOL

Event Date	Type	Description	Resolution	Resolution Date
March 23, 2018	Communication regarding Effluent Suspended Solids Compliance Action Plan	Communicated with Tessa Villeneuve, MECP Supervisor for the final update about Effluent Suspended Solids Compliance Action Plan as both short term and long term actions were completed.	No further action required. Item is completed	N/A
April 10, 2018	Communication regarding an noise complaint	Communicated with Tessa Villeneuve, MECP Supervisor. A noise complaint was received on April 6th. An investigation revealed that the noise did not originate from the plant and all plant equipment and systems were operating normally.	No further action required. Item is completed	April 10, 2018
April 25, 2018	10 Day Report as per Amended ECA	Written report communicated to Tessa Villeneuve, MECP Supervisor and Inspector Shannon Boland regarding the disinfection interruption to final effluent on April 14th. Duration of interruption was 8 minutes and root cause was power failure during storm.	No further action required. Item is completed	N/A
June 25, 2018	10 Day Report as per Amended ECA	Written report communicated to Tessa Villeneuve, MECP Supervisor and Inspector Shannon Boland regarding the disinfection interruption to final effluent on June 12th. Duration of interruption was 14 minutes and caused by faulty motor breaker.	No further action required. Breaker was replaced.	N/A
September 5, 2018	Communication regarding an noise complaint	Communicated with Tessa Villeneuve, MECP Supervisor. A noise complaint was received on September 2nd. An investigation revealed that the noise did not originate from the plant and all plant equipment and systems were operating normally.	No further action required.	N/A

Event Date	Type	Description	Resolution	Resolution Date
September 17, 2018	Communication regarding an odour complaint	Communicated with Tessa Villeneuve, MECP Supervisor. An odour complaint was received on September 17th complaining about a stagnant sour sewage smell felt around 6:30 to 7 AM on the same date. Possible source of the odour might be the final tank # 7 partially drained.	Plant staff immediately contacted maintenance staff to begin to pump the tank down completely.	September 17, 2018
April and May, 2018	MECP Inspector site visit	Communicated with MECP Inspector Catherine Eby regarding her possible site visit to incinerator building.	Tour was conducted of Incineration area.	May 9, 2018
July and August, 2018	MECP Inspector site visit follow up	Communicated with MECP Inspector Catherine Eby regarding the stub stack test and spill history as a follow up to her site visit.	Information regarding previous stub stack testing provided to MECP Inspector as requested.	N/A
Consent Letters				
N/A				
Notice of Start-up Notice of Start-up				
N/A				
MECP Inspection				
No inspection conducted				

APPENDIX A – Plant Schematic

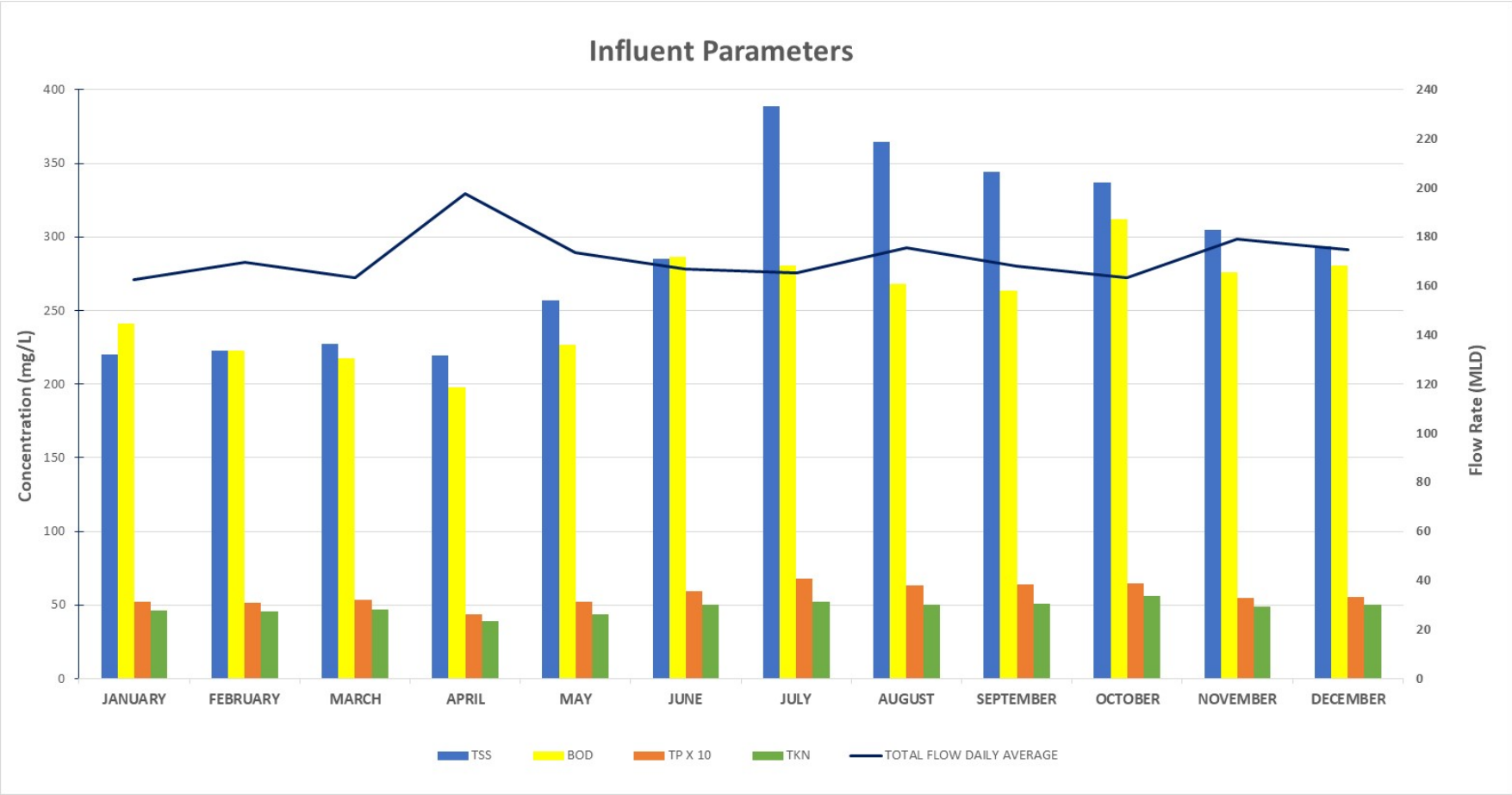
APPENDIX A – Plant Schematic



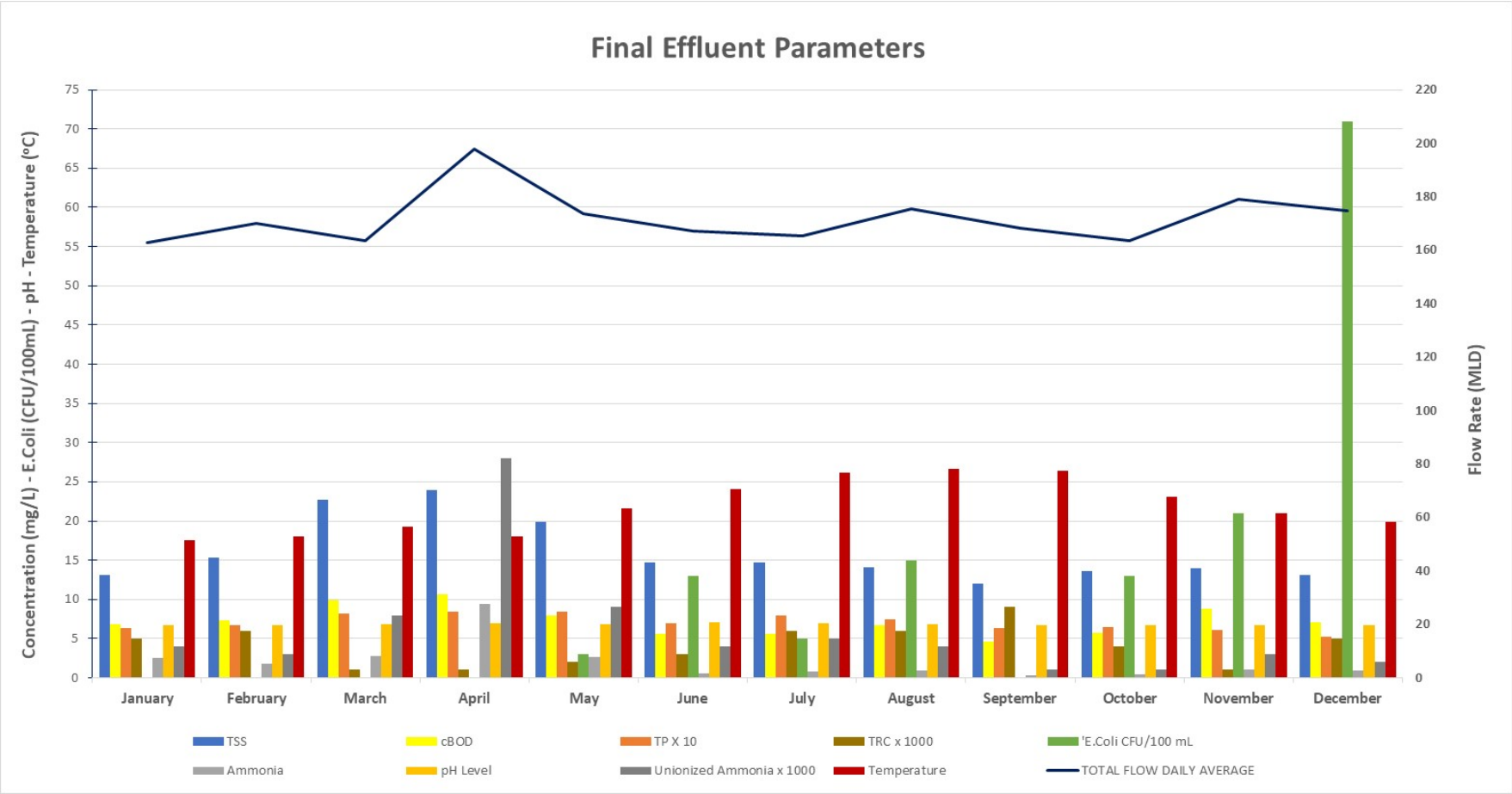
Process Flow Diagram for Highland Creek Wastewater Treatment Plant

APPENDIX B – Influent and Effluent 2018 Performance Charts

APPENDIX B – Influent and Effluent 2018 Performance Charts



APPENDIX B – Influent and Effluent 2018 Performance Charts



APPENDIX C – Historical Performance Data

APPENDIX C – Historical Performance Data

	Units	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Influent Parameters												
Flow	ML/day	171.7	170.9	161.8	164.9	170.6	169.3	171.1	171.9	166.4	184.7	181.2
Total Annual Flow	ML	62671	62388	59200	60208	62242	61804	62453	62753	60720	67398	66328
Total Suspended Solids (TSS)	mg/L	288.7	246.7	244.8	212.1	247.6	232.3	268.1	238	312.8	295.3	265
Biochemical Oxygen Demand (BOD_5)	mg/L	255.9	221.4	242.2	234	232.1	205.9	206.7	185.3	246.1	205.6	140.1
Total Phosphorus (TP)	mg/L	5.7	5.2	5.2	5	4.9	4.4	4.8	4.7	5.6	5.4	5.6
Total Kjeldahl Nitrogen (TKN)	mg/L	48.3	44.0	46.1	39.6	44.3	48.7	52.3	45.0	51.6	45.4	47.5
Preliminary Treatment												
Grit and Screenings	tonnes/day	1.8	2.0	2.4	1.9	2.3	-	-	-	-	2.8	3.2
Primary Treatment												
TSS	mg/L	121.5	134.7	151	171	339	232.1	332.6	244.4	209.3	175.7	271.6
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	mg/L	169.3	183.9	178	170	180	129.8	155	143.5	124	87.4	101.5
Secondary Treatment												
Aeration Loading	kg $CBOD_5$/ m^3.day	0.55	0.59	0.54	0.53	0.58	0.65	0.66	0.46	0.3	0.3	0.35
Mixed Liquor Suspended Solids	mg/L	2619	2723	2736	3243	3296	2380	1577	2747	2431	2372	2432
Final Effluent												
TSS	mg/L	15.9	14.1	14.6	17.4	20.2	22.8	21	14.6	12.4	15.8	14.7
TSS Loading Rate	kg/day	2736	2406	2368	2877	3440	3868	3598	2492	2056	2901	2683
cBOD5	mg/L	7.3	7.2	6.7	6.2	5.9	8.8	9.1	6.4	5.2	6.3	5.2
cBOD5 Loading Rate	kg/day	1245	1,233	1077	1025	1008	1506	1553	1091	864	1168	949
TP	mg/L	0.7	0.7	0.7	0.7	0.6	0.6	0.7	0.5	0.5	0.6	0.6
TP Loading Rate	kg/day	121	219	117	115	100	104	116	83.5	85	105	110
Escherichia Coli (E. Coli)	CFU/100 mL	21	16	53.2	40.2	10.4	34.9	15.5	6.4	3.9	16.7	7.6
pH	-	6.7	6.7	6.5	6.5	6.5	6.2	6.4	6.9	6.6	6.6	7.1

APPENDIX C – Historical Performance Data

	Units	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Total Residual Chlorine	mg/L	0.004	0.004	0.007	0.006	SBS (P)	SBS (P)	SBS (P)	SBS (P)	SBS (P)	-	-
Total Kjeldahl Nitrogen (TKN)	mg/L	3.8	3.4	2.8	3.5	4.6	5.0	10.2	9.7	10.1	15.2	15.0
Total Ammonia Nitrogen	mg/L	2.0	1.5	1.1	1.4	2.9	3.4	7.7	8.1	9.0	12.4	12.6
Temperature	degrees Celsius	21.8	21.5	22.2	-	-	-	-	-	-	-	-
Solids Handling												
Primary Sludge Treated	m3/day	770	910	1090	1525	2150	2900	2944	4100	3553	3900	5100
Primary Sludge Total Solids (TS)	%	2.85	2.55	2.4	2.8	2.6	2.2	2.2	3.2	2.4	2.4	2.7
Primary Sludge TVS	%	93.56	81.83	81.9	81.6	77.9	73.5	78.9	60.8	66.5	72.5	76
WAS to Thickening	m3/day	4,315	3,716	3519	3110	2254	-	-	-	-	-	-
Thickened WAS (TWAS) TS	%	3	4.12	3.83	5.3	5.7	-	-	-	-	-	-
TWAS Treated	m3/day	665		474	323	1236	-	-	-	-	-	-
WAS to Co-settling	m3/day	-	-	-	-	-	6600	6875	5893	6905	7250	10960
WAS SS	mg/L	5,768	6,732	6126	7358	7300	4500	3262	4148	3491	3700	3780
Dewatering Centrifuge Feed Flow	m3/day	2,494	1,849	1924	2143	2065	1966	1906	1873	1913	1818	2008
Dewatering Centrifuge Feed TS	%	2	2.48	2.3	3	2	1.7	1.5	1.6	1.6	1.6	1.7
Dewatered Biosolids incinerated	Dry tonnes/day	45	31.1	45.1	57.4	38.5	29.2	23.1	28.1	28.9	27.5	33.2
Dewatered Biosolids TS	%	28	26.2	26.6	22.8	25	25.8	26.5	26.4	26.5	27.1	27.3
Ash Removed	tonnes	2,969	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	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*	0.00549	*0.002*	0.108	1.24	*0.0025*	0.0614	*0.00005*	0.0054	0.124
February	*0.005*	*0.002*	0.00587	*0.002*	0.114	1.5	*0.0025*	0.0653	*0.00005*	0.0057	0.126
March	*0.005*	*0.002*	0.00587	*0.002*	0.131	1.1	*0.0025*	0.0683	*0.00005*	0.0078	0.121
April	*0.005*	*0.002*	0.00473	*0.002*	0.116	1	*0.0025*	0.0618	0.00011	0.0058	0.119
May	*0.005*	*0.002*	0.00547	*0.002*	0.113	1.23	*0.0025*	0.0747	0.0001	0.0052	0.119
June	*0.005*	*0.002*	0.00568	*0.002*	0.123	3.33	*0.0025*	0.0842	*0.00005*	0.0066	0.123
July	*0.005*	*0.002*	0.00738	*0.002*	0.178	6.27	0.00544	0.104	*0.00005*	0.0067	0.181
August	*0.005*	*0.002*	0.00537	*0.002*	0.151	4.13	0.00528	0.0944	0.00014	0.0074	0.156
September	*0.005*	*0.002*	0.00484	*0.002*	0.137	4.41	*0.0025*	0.0933	*0.00005*	0.0062	0.134
October	*0.005*	*0.002*	0.00446	*0.002*	0.142	3.99	*0.0025*	0.0935	0.00012	0.0064	0.137
November	*0.005*	*0.002*	0.0055	*0.002*	0.149	4.93	*0.0025*	0.0927	0.0002	0.0052	0.123
December	*0.005*	*0.002*	*<0.004*	*0.002*	0.16	3.67	*0.0025*	0.076	*0.00005*	0.006	0.117
Annual Average	0.005	0.002	0.006	0.002	0.135	3.067	0.00298	0.081	0.00009	0.006	0.132

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*	0.0171	1.02	*0.0025*	0.0761	*0.00005*	0.0056	0.0342
February	*0.005*	*0.002*	*0.002*	*0.002*	0.017	0.939	*0.0025*	0.07	*0.00005*	0.0054	0.0344
March	*0.005*	*0.002*	*0.002*	*0.002*	0.0236	1.57	*0.0025*	0.069	*0.00005*	0.0082	0.0374
April	*0.005*	*0.002*	*0.002*	*0.002*	0.0228	1.33	*0.0025*	0.0582	*0.00005*	*0.0025*	0.0354
May	*0.005*	*0.002*	*0.002*	*0.002*	0.0226	1.86	*0.0025*	0.0793	*0.00005*	0.0053	0.0365
June	*0.005*	*0.002*	*0.002*	*0.002*	0.0303	1.19	*0.0025*	0.0548	*0.00005*	0.0064	0.0396
July	*0.005*	*0.002*	*0.002*	*0.002*	0.019	1.19	*0.0025*	0.0756	*0.00005*	0.0055	0.035
August	*0.005*	*0.002*	*0.002*	*0.002*	0.0181	1.06	*0.0025*	0.0633	*0.00005*	0.0071	0.0354
September	*0.005*	*0.002*	*0.002*	*0.002*	0.0152	0.933	*0.0025*	0.0506	*0.00005*	*0.0025*	0.0282
October	*0.005*	*0.002*	*0.002*	*0.002*	0.0174	1.05	*0.0025*	0.051	*0.00005*	0.0054	0.0266
November	*0.005*	*0.002*	*0.002*	*0.002*	0.0182	1.12	*0.0025*	0.061	*0.00005*	*0.0025*	0.0323
December	*0.005*	*0.002*	*0.002*	*0.002*	0.0183	1.18	*0.0025*	0.0645	*0.00005*	0.0053	0.0312
Annual Average	0.005	0.002	0.002	0.002	0.020	1.204	0.003	0.064	0.00005	0.005	0.034

Data in red italics is half the MDL

APPENDIX E – Dewatered Sludge Analysis

APPENDIX E – Dewatered 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	1.85	0.32	1.50	32.0	398	0.393	5.80	9.9	11.2	1.64	332
February											
March											
April	1.56	0.18	1.06	19.4	289	0.289	4.06	7.6	6.3	1.70	223
May	0.26	0.03	0.19	4.1	51	0.031	0.72	1.3	1.2	0.30	42
June	1.99	0.25	1.85	29.6	349	0.261	5.65	10.3	8.8	2.47	278
July											
August	2.39	0.25	2.72	35.9	508	0.246	7.90	18.4	11.5	3.06	384
September											
October	0.64	0.25	0.83	14.1	168	0.179	2.87	4.8	3.8	0.64	136
November											
December											
Annual Average	**1.4**	**0.21**	**1.36**	**22.5**	**294**	**0.23**	**4.50**	**8.7**	**7.1**	**1.64**	**232**

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

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

APPENDIX F – Maintenance Activities

APPENDIX G – 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 1924 work orders were closed in this work area in 2018. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 1 in 2018:

- Sludge dewatering centrifuges:
    - Centrifuge preventative maintenance.
    - Overhaul of centrifuges as required
- Overhauled Ash slurry pumps
- Repaired Ash slurry hoppers and level controllers and isolation valves
- Overhauled Incinerator #1 and Incinerator #2 quencher/scrubber
- 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
- Repaired centrifuge feed lines
- 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 2745 work orders were closed in this work area in 2018. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 2 in 2018:

- Headworks:
    - Bar screen lubricated. Rake mechanism maintained.
    - Influent channel maintenance, including degritting.
    - Screw Conveyer lubricated. Replacement of wear liners, oil and shaftless screws.
    - Vortex lubricated and classifier 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.
- Structural and mechanical repairs to Primary tank collectors
- Structural and mechanical repairs to Final tank collectors
- Various primary and final tank sludge and scum collector repairs
- Structural and diffuser repairs to Grit Channels
- Repairs to Bar Screen
- Repairs to all process air blowers
- Rebuild of Ferrous Chloride pumps and Sodium Hypochlorite pumps
- Raw sludge, Return Activated Sludge and scum pump repairs
- 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 803 work orders were closed in this work area in 2018. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 3 in 2018:

- 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)

APPENDIX G – Maintenance Activities

- 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
- Install new scum collector on #10 Primary Clarifier
- Coordinate maintenance and repairs on licensed vehicles

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 417 work orders were closed in this work area in 2018. The following maintenance on major structures, equipment, apparatus, mechanism or thing forming the Works was completed by Work Area 4 in 2018:

- Lubricated all mechanical components.
- Serviced 5 boilers and inspected all control systems
- Optimized operations of 4 boiler hot water feed pumps
- Monthly maintenance and servicing of all 7 ozone generators
- Monthly testing and service of all plant gas monitoring systems
- Tested and serviced all plant fire hydrants as needed
- Replaced 2 hot water pumps in the plant
- Rebuilt or serviced 6 hot water pumps
- Overhauled primary tanks
- Overhauled final tanks
- Serviced and maintained 2 biofilters
- Rebuilt 2 RAS pumps in South East plant (complete with new impellers)
- 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 2018 includes the list of courses below.

Technical and Health and Safety Training:

- Activated Sludge
- Air Purifying Respirators
- Air Quality and Your Health (May 2018 Tailgate)
- Arc Flash for Non-Qualified Persons
- Asbestos Awareness
- Basic Vibration Analysis
- Confined Space Rescue - 2 Day
- Critical Pump Maintenance, Packing, and Mechanical Seals
- Cross Connection Specialist Backflow Tester – Certification
- Electrical Safety for District Operations and Maintenance Operators
- ELOG Employer Minimum Content
- Emergency First Aid Level "A" CPR
- Fall Protection Awareness
- Fundamentals of Ladder Safety Awareness
- HCTP Bulk Chemical Receiving And Unloading Training
- HCTP Fire Evacuation Training
- HCTP Shelter In Place Evacuation Training
- Hot Work Permit System Awareness
- Industrial Maintenance Technician (IMT)M Certification
- In-Service Heath and Safet Orientation
- Joint Health and Safety Committees - (JHSC) Certification Training Part I - Basic
- Joint Health and Safety Committees - (JHSC) Certification Training Part II - Workplace Specific Hazard Training
- Lock Out Tag Out Training
- Lock Out, Tag Out and Test Awareness
- Logbook Entry
- Mathematics For Operators: Module 1
- Mathematics For Operators: Module 2
- MMR – Self-Contained Breathing Apparatus
- Preventing Back Injuries (August 2018 Tailgate)
- Quarterly Inspections

- Quatro Safety Incident Reporting
- Rigging Safety Awareness
- Safety on the Road (November 2018 Tailgate)
- Scaffolding Awareness Course
- SCBA Refresher
- Spill Contingency Plan
- Standard First Aid - Level "C" CPR and AED - 2 Day
- Transportation of Dangerous Goods
- Trenching And Excavation Awareness
- Water Valve Training, Selection, Operation, Maintenance
- WMS Avantis Workshop
- WWT-MOECC Exam Prep For Wastewater Treatment Level 3 And 4

Other Training:

- Attendance Management
- Coping with Shift Work
- OneNote 2013 Fundamentals
- Outlook 2013 – Increase your Productivity with Outlook
- Performance Management in a Unionized Environment
- Preparing to Move into Supervision
- Psychological and Mental Health in Our Workplace (Tailgate February 2018)
- Respect in our Workplace
- Violence in the Workplace