



HIGHLAND CREEK WASTEWATER TREATMENT PLANT

2015 Annual Report



March 31, 2016

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 m³ per day and serves an equivalent population of approximately 509,000. The Highland Creek Treatment Plant discharges into Lake Ontario and operates under Environmental Compliance Approval (Sewage) No. 8261-99EP4S, issued on October 28, 2015.

The average daily influent flow rate in 2015 was 164.9 ML/day. Influent concentrations of Biological Oxygen Demand (BOD), Total Phosphorus (TP) and Suspended Solids (SS) averaged 234 mg/L, 5.0 mg/L and 212.1 mg/L, respectively.

Highland Creek achieved the following effluent quality in 2015:

	ECA ¹	2015 Final Effluent	
Suspended Solids (SS)	25 mg/L	17.4 mg/L	
Carbonaceous Biological Oxygen Demand (CBOD ₅)	25 mg/L	6.2 mg/L	
Total Phosphorus (TP)	1 mg/L	0.7 mg/L	
Escherichia Coli (E. Coli) ²	200 CFU/100mL	40.2 CFU/100mL	
pH	6.0-9.5	6.5	
Total Chlorine Residual (Dechlorination)	0.02 mg/L	Bisulphite Presence Detected ³	0.006 mg/L
SS Loading Rate	5,475 kg/day	2,877 kg/day	
CBOD ₅ Loading Rate	5,475 kg/day	1,025 kg/day	
TP Loading Rate	219 kg/day	115 kg/day	

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

² Geometric Mean

³ The presence of Bisulphite indicates a Total Chlorine Residual of zero. This was the case from January – March 2015. Subsequently, the Total Chlorine Residual was measured directly.

During 2015, the sludge feed flow to the dewatering centrifuges averaged 2,143 m³/day which resulted in 57.4 dry tonnes of dewatered solids being generated per day.

The plant continued with numerous capital projects. Notable projects included: Biosolids Treatment Upgrades, Digester Gas – High Pressure System Upgrades, Mechanical and Electrical Upgrades, WAS Thickening and Sludge Blending process upgrades, and the Headworks and Odour Control Upgrades.

In 2015, polymer consumption for Waste Activated Sludge Thickening and Sludge Dewatering totalled 222 tonnes. Ferrous chloride consumption was 872 tonnes as Fe. Sodium hypochlorite consumption for effluent disinfection totalled 1292 m³. Sodium Bisulphate (SBS) consumption for effluent dechlorination totalled 392 m³. Total annual consumption for potable water, hydro, and natural gas was 3,120 m³, 35.4M kWh, and 10.6M m³, respectively.

The plant operating costs for 2015 totalled \$18.7M. In 2015, the Highland Creek Treatment Plant had 67 employees. There were 29 days lost due to work related injuries.

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1. INTRODUCTION

The Highland Creek Treatment Plant 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 509,000. The Highland Creek Treatment Plant has a rated capacity of 219,000 m³ per day.

Major treatment processes include grit and screening removal, primary treatment, secondary treatment, phosphorus removal with ferrous chloride, final effluent disinfection using sodium hypochlorite, and final effluent dechlorination using sodium bisulphite. Solids handling processes include sludge stabilization by anaerobic digestion followed by dewatering using high speed centrifuges. Two multiple hearth incinerators (normally one duty and one standby) 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, electrical power distribution, natural gas, and instrument air.

The Ministry of the Environment and Climate Change (MOECC) has classified the Highland Creek Treatment Plant as a Class IV wastewater treatment facility under Regulation 129/04. The facility operates under Environmental Compliance Approval (Sewage) No. 8261-99EP4S, issued on October 28, 2015.

This report is a summary of plant operations and performance in 2015. Highlights of the report include a discussion of effluent quality and summaries of process operations, maintenance, chemical and utility consumption, operational costs and human resources.

2. OPERATIONS

2.1 Influent

Wastewater flows to the plant via a common sewer in which the flows from the Morningside Sanitary Trunk Sewer and Highland Creek Sanitary Trunk Sewer systems join. The plant experienced a 3.3% decrease in influent flow from 2014 to 2015.

A summary of annual flow and influent parameter concentrations for the past four years is shown in Table 1. A comparison of monthly influent flow rates and characteristics for 2015 is illustrated in Appendix C.

Table 1: Influent Parameters

Parameter	2015	2014	2013	2012
Influent Flow [ML/day]	164.9	170.6	169.3	171.1
Total Annual Flow [ML]	60,208	62,242	61,804	62,453
Influent SS [mg/L]	212.1	247.6	232.3	268.1
Influent BOD [mg/L]	234.0	232.1	205.9	206.7
Influent TP [mg/L]	5.0	4.9	4.4	4.8

Influent concentrations for eleven (11) select metals have been included in Appendix D and presented against the sewer Bylaw limits for comparison purposes only.

2.2 Preliminary Treatment

Raw wastewater enters the Headworks which provides grit and screenings removal operations. There are five aerated grit channels (18 m x 4.0 m x 4.0 m), each having a Peak Flow Rate of 104,800 m³/day, for the removal of grit and inorganic material from the wastewater flow. There are also five climber-type bar screens with bars spaced 1.25 cm apart to remove rags and large pieces of debris from the wastewater. The grit and screenings are hauled to a sanitary landfill site.

The quantity of grit and screenings removed by the aerated grit channels and mechanical bar screens averaged 1.9 tonnes per day in 2015.

2.3 Primary Treatment

The next step in the treatment process is Primary Settling or Clarification where the flow velocity is reduced through the Primary Clarification Tanks allowing the heavier solids in the wastewater to settle to the bottom. Sludge collectors in the tanks sweep the settled sludge (primary sludge or raw sludge) into sludge hoppers located on the bottom of the tank at one end, from where it is pumped for further treatment. There are 12 Primary Clarification Tanks: four rectangular tanks (48.4 m x 28.4 m x 3.7 m) in the New Section (Phase 1 and 4), each having a Peak Flow Rate of 82,470 m³/day and eight square tanks (18.3 m x 18.3 m x 3.4 m) in the Old Section, each having a Peak Flow Rate of 20,090 m³/day.

Table 2 contains a summary of key primary treatment effluent parameter concentrations and their respective removal efficiencies in 2015 and 2014.

Table 2: Primary Treatment Effluent Parameters

Parameter	2015	Primary Removal Efficiency	2014 ¹	Primary Removal Efficiency ¹
SS [mg/L]	171	19%	177	29%
CBOD ₅ [mg/L]	170	27%	140	40%

¹Quantities incorrectly reported in 2014 and have been corrected as shown.

2.4 Secondary Treatment

In Secondary Treatment, Return Activated Sludge from the final clarification tanks is mixed with primary effluent and treated through a conventional, suspended biomass activated sludge process which occurs in Aeration Tanks. The activated sludge is made up of micro-organisms which are a natural part of wastewater. In the presence of oxygen, these micro-organisms break down organic solids in the wastewater. Air is supplied to the Aeration Tanks through 12 electrically driven blowers. There are a total of 16 Aeration Tanks each equipped with ceramic fine bubble dome diffusers¹: eight rectangular tanks (17.6 m x 36 m x 4.6 m) in the Old Section and eight circular tanks (23 m in diameter and 9.1 m in depth) in the New Section.

The mixed liquor from the Aeration Tanks flows to 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 in order to maintain a sufficient sludge concentration. The excess is removed as Waste Activated Sludge (WAS) which is thickened by high speed centrifuges. There are 16 Final Clarification Tanks: eight square tanks (18.3 m x 18.3 m x 3.4 m) in the Old Section, each having a Peak Flow rate of 16,050 m³/day, and eight square tanks (35.0 m x 35.0 m x 3.7 m) in the New Section, each having a Peak Flow Rate of 61,250 m³/day.

A summary of key aeration basin parameters for 2013 to 2015 are shown in Table 3.

Table 3: Secondary Treatment Process Parameters

Parameter	2015	2014	2013
Aeration Loading [kg CBOD ₅ /m ³ ·d]	0.61	0.58	0.65
Mixed Liquor Suspended Solids [mg/L]	3,243	3,296	2,380

2.5 Final Effluent Quality, Disinfection & Dechlorination

Sodium Hypochlorite is used to disinfect the final effluent and Sodium Bisulphite is used as the dechlorination agent prior to discharging into Lake Ontario. The plant outfall is equipped with a number of diffusers and extends approximately 1000 m into the lake from the shore.

In 2015, the Highland Creek Treatment Plant continued to produce a high quality effluent which surpassed requirements of the plant's Environmental Compliance Approval (Sewage). A summary of key final effluent parameters for 2014 and 2015 is shown in Table 4. Details of the plant's final effluent characteristics are presented in graphical form in Appendix C.

¹ With exception of the first 2 sections of Aeration Tank 8.

Table 4: Annual Average Final Effluent Parameters

Parameter	ECA Limit ¹	2015		Removal Efficiency	2014	Removal Efficiency
SS (mg/L)	25	17.4		92%	22.2	87 %
CBOD ₅ (mg/L)	25	6.2		97%	5.9	97 %
pH	6-9.5	6.5		-	6.5	-
SS Loading Rate (kg/day)	5,475	2877		-	3,440	-
CBOD ₅ Loading Rate (kg/day)	5,475	1025		-	1,008	-
TP Loading Rate (kg/day)	219	115		-	100	-
Total Chlorine Residual (mg/L) (Dechlorination)	0.02	Bisulphite Presence Detected ²	0.006	-	Bisulphite Presence Detected ²	-

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

² The presence of Bisulphite indicates a Total Chlorine Residual of zero. This was the case from January – March 2015. Subsequently, the Total Chlorine Residual was measured directly.

Table 5: Monthly Average Final Effluent Parameters

Parameter	ECA Limit ¹	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
TP [mg/L]	1.0	0.55	0.64	0.61	0.43	0.97	0.81	0.60	0.79	0.62	0.82	0.72	0.84
Escherichia Coli ² [CFU/100mL]	200	15.38	8.41	13.62	25.31	34.96	169.41	107.06	84.42	38.22	52.84	45.37	82.42

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

² Geometric Mean

Table 6: Annual Average Secondary Treatment Effluent Objectives and Parameters

Parameter	C of A Objective ¹	2015	
SS [mg/L]	15	17.4	
CBOD ₅ [mg/L]	15	6.5	
TP [mg/L]	0.9	0.7	
TCR [mg/L]	0.00	Bisulphite Presence Detected ²	0.006
E.Coli [CFU/100 mL]	150	40.2	
pH	6.5-8.5	6.5	

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

² The presence of Bisulphite indicates a Total Chlorine Residual of zero. This was the case from January to March 2015. Subsequently, the Total Chlorine Residual was measured directly.

Final effluent concentrations of eleven (11) select heavy metals have been included in Appendix D.

2.6 Bypasses, Spills and Abnormal Events

There were no bypass events to report in 2015.

There was one spill reported to the MOECC in 2015. On March 10, 2015 two buried 50 mm plastic lines, one containing potable water and one containing chlorinated plant effluent, were ruptured due to construction activities on site. The amount of mixed potable water and chlorinated effluent discharged to Highland Creek was estimated at not more than 10 m³.

An inspection of the Highland Creek final effluent outfall was performed on November 24, 2015 and it was noted that a diffuser inspection hatch had been damaged. This diffuser was repaired on November 29, 2015.

2.7 Solids Handling

Solids handling and disposal at the Highland Creek Treatment Plant treats all primary sludge, thickened waste activated sludge (TWAS) as well as scum from the primary and secondary clarifiers. The treatment is performed in the following process areas: anaerobic digestion, intermediate blending and storage, dewatering, incineration and ash handling.

In 2015, anaerobic digestion of primary sludge and TWAS was not performed to facilitate cleaning and rehabilitation of the digesters. However, the normal process consists of a digester control building and four primary digesters each measuring 33.5 m in diameter and 7.6 m in depth for a volume of 6,500 m³ each. This process also accomplishes the following:

- Generation of methane gas, which can be used by the plant for process and space heating requirements.
- Reduction in solids volume
- Pathogen destruction
- Sludge odour mitigation

On average, 3,110 m³/day of WAS was thickened with high speed centrifuges. The WAS contained an average SS concentration of 7,358 mg/L. The TWAS contained an average TS concentration of 5.3%. An average of 1,525 m³/day of primary sludge was pumped to the sludge storage tanks having an average TS concentration of 2.8% and TVS content of 81.6% of TS.

A summary of the solids handling process from 2013 to 2015 can be seen in Table 7.

Table 7: Solids Handling Process Parameters

Parameter	2015	2014	2013
Primary Sludge Treated [m ³ /day]	1,525	2,150	2,900
Primary Sludge TS [%]	2.8	2.6	2.2
Primary Sludge TVS [%]	81.6	77.9	73.5
WAS to Thickening [m ³ /day]	3,110	2,254	-
TWAS TS (%)	5.3	5.7	-
TWAS Treated [m ³ /day]	323	255 ¹	-
WAS to Co-settling [m ³ /day]	-	-	6,600
WAS SS [mg/L]	7,358	7,300	4,500
Dewatering Centrifuge Feed Flow [m ³ /day]	2,143	2,065	1,966
Dewatering Centrifuge Feed TS [%]	3.0	2.0	1.7
Dewatered Solids TS [%]	22.8	25.0	25.8
Dewatered Solids incinerated [dry tonnes per day]	57.4	38.5	29.2

¹Quantities incorrectly reported in 2014 and have been corrected as shown.

The blend of Primary Sludge and TWAS is conditioned with a polymer and dewatered by centrifugation. Four solid bowl dewatering centrifuges, with an average throughput of approximately 21 L/s each, are used to dewater the blended sludge.

An average of 2,143 m³/day of sludge was dewatered by centrifugation, resulting in an average of 57.4 dry tonnes per day of dewatered solids being produced and incinerated. Average TS of centrifuge feed and dewatered sludge cake were 3.0% and 22.8%, respectively. The 8% decrease in the dewatered sludge cake TS concentration from 2014 was due to poor centrifuge performance

caused by septic sludge. The increase in dewatered solids incinerated was attributed to the digesters being offline since September 2014 to facilitate cleaning and rehabilitation.

Concentrations of eleven metals in the biosolids are compared to metal concentrations regulated by *Ontario Regulation 267/03 under the Nutrient Management Act*, which govern the maximum acceptable metal concentration in biosolids that are applied to land. Although biosolids generated at the Highland Creek Treatment Plant are not applied to land, average metal concentrations met all criteria as designated in O.Reg 267/03. Results are shown in Appendix E.

In 2015 the daily average inflow to the Highland Creek Treatment Plant was 164.9 ML/day. The flow projections for 2016 do not exceed the rated plant capacity of 219 ML/day and are expected to generate a sludge volume that will be +/-5% of the given volume for 2015.

2.8 Solids Management

All solids cake generated on-site by centrifugation is 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. Approximately 6,141 tonnes of ash were removed in 2015.

2.9 Complaints

No complaints were received for the Highland Creek Treatment Plant in 2015.

2.10 Effluent Suspended Solids Compliance – Action Plan Status

The updates to the Action Plan items for the Effluent Suspended Solids Compliance Plan (See Appendix H) are as follows:

2.10.1 Biosolids Master Plan

In May 2011, Toronto's City Council directed that a biosolids Beneficial Use Program with Landfill as a contingency option be implemented for the HCTP which would require the construction of a truck loading facility so that the biosolids generated at the HCTP could be trucked away on a daily basis rather than incinerated on site. Subsequent to Council's consideration of the Biosolids Master Plan (BMP) in May 2011, additional public meetings were held and several local community members expressed their concerns to the City and the Ministry of the Environment (MOE) regarding Council's final decision.

After consulting with the MOE in the summer of 2012, a separate process consistent with Class EA requirements was initiated. As such the BMP was closed and a new Schedule B Class Environmental Assessment specifically for the implementation of the proposed HCTP biosolids management undertakings was recommended to Council.

In early 2014, the City retained Consulting services to undertake the new biosolids Class EA work for the HCTP. The City Project Team for this Class EA included staff from Toronto Public Health (TPH) and the Toronto Energy and Environment Division (EED) in addition to Toronto Water (TW) and Engineering & Construction Services (ECS).

The Schedule B Class EA looked at all viable biosolids management options and included a Health Impact Assessment that was overseen by TPH as well as a Cumulative (Air) Impact Assessment that

was overseen by the EED. The results of the Cumulative Impact Assessment and the Health Impact Assessment were used by the project team to assess all biosolids management options and arrive at a preferred biosolids management strategy for the HCTP.

This project continued throughout 2015 and involved extensive consultation with stakeholders including the public and specifically the surrounding community. A project web site was maintained and kept up to date with relevant project information such as minutes of Public Meetings and technical memorandums. In October 2015, the City's Board of Health adopted the report from the MOH on the Health Impact Assessment of Biosolids Management Plan for HCTP.

This Schedule B Class EA is expected to be finalized in 2016.

2.10.2 Additional Sludge Dewatering Capacity

A capital project for the sludge dewatering centrifuges is in progress. An engineering consultant was selected in 2007 and the design was completed and tendered for construction in late 2013. Construction is ongoing and expected to be completed by 2017.

2.10.3 Biosolids Truck Loading

A conceptual design of a potential future truck loading facility was completed in May 2013. This study is now a reference document for the Class EA for Biosolids Management at the HCTP.

2.10.4 Incineration Operation

In 2007, an engineering consultant was selected to perform the detailed design of the incinerator repairs. A minor repair contract to #1 Incinerator was completed in 2009. The minor repair work for #2 Incinerator is included as part of the Dewatering project noted above in 2.10.2 and is currently ongoing.

3. CAPITAL PROJECTS

Under Toronto Water's capital program, the Highland Creek Treatment Plant commenced or continued with the following projects:

- WAS Thickening and Sludge Blending Upgrades
- Biosolids Treatment Unit Upgrades
- Headworks and Odour Control Upgrades
- Plant Services Improvements
- Miscellaneous Electrical Projects Contract 2
- Digester Gas - High Pressure System Upgrades
- New North Workshop
- Process Control Building Upgrades
- RAS Pumping, Aeration and Phosphorus Removal
- Electrical Condition Assessment Project #1
- Electrical Condition Assessment Project #2
- Electrical Condition Assessment Project #6
- PLC Platform Migration
- Firm Capacity and Liquid Train Upgrades Conceptual Design
- Tunnel Concrete Inspection & Repairs

4. MAINTENANCE

The Highland Creek Treatment Plant maintenance activities in 2015 were distributed between four Work Areas. Staff from these groups performed a variety of scheduled, preventative, predictive and breakdown maintenance on a diverse spectrum of equipment. The main goal of maintenance activities is to ensure equipment availability and reliability to meet plant process operation requirements.

The following is a summary of significant maintenance activities conducted over the past year. These are considered to be maintenance and/or minor modifications as per Conditions 10(6) (c) & (j) and Condition 11 of the ECA.

4.1 Flow Meter Calibration Record

Calibration records for flow meters are attached in Appendix G.

4.2 Solids Handling (Work Area 1)

Work Area 1 encompasses the solids treatment portion of the plant including sludge digestion, dewatering, and incineration. The following major maintenance was completed in 2015 in this Work Area:

- Overhauled 3 Ash slurry pumps
- Refurbished #1 and #2 incinerator quencher/scrubber sprays
- Overhauled 1 sludge grinder
- Overhauled #3 dry polymer feed unit
- Replaced various sections of ash slurry piping
- Removed #2 incinerator clinker and replaced 2 rabble arms
- Replaced #1 incinerator H1 burner box and large section of outer shell
- Ongoing numerous SCADA upgrades for incinerator, centrifuge, sludge feed and mixing system

4.3 Liquids Handling (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. The following major maintenance was completed in 2015 for Work Area 2:

- Structural repairs to Primary Tanks 3, 4, 9 and 10.
- Structural repairs to Final Tank 9, 13, 15 and 16.
- Various primary and final tank sludge and scum collector repairs.
- Structural repairs to Grit Channel 4.
- Structural Repairs to Bar screens 2 and 3
- Repairs to Barscreens 1, 2, 3, 4 and 5
- Instrumentation repairs and overhaul to all Turblex blowers
- Repairs to Old Section Blowers
- Rebuild of Ferrous Chloride pumps and Sodium Hypochlorite pumps
- Rebuild of Scum pumps.

4.4 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 and building HVAC systems. The following maintenance was completed in 2015 for Work Area 3:

- Structural repairs to #3 and #4 primary clarifiers
- Street lighting upgrades on main road and incinerator roads
- Forklifts, Scissor lift and Overhead Cranes annual inspections
- Repaired unlicensed vehicles (personnel vehicles for plant use only)
- Disposed of environmental wastes
- 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 & 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 old section heating coils
- Provide for regular vibration data collection
- Changed all oils in old section clarifier drives
- Maintained monthly inspections on fire extinguishers
- Maintained monthly inspections on elevators

4.5 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 plant fire protection. The following maintenance was completed in 2015 for Work Area 4:

- Serviced 4 boilers and inspected all control systems
- Overhauled 4 boiler hot water feed pumps
- Installed new stainless steel effluent water lines in various locations at the plant
- Serviced all 7 ozone generators
- Tested and serviced all plant gas monitoring systems
- Tested and serviced all plant fire hydrants as needed
- Replaced 6 hot water pumps in the plant
- Installed new signs, barriers, and gas traps on the diesel generators

5. CHEMICALS AND UTILITIES

5.1 Chemicals

Several chemicals are used for a variety of treatment processes at the plant. Major process chemicals are discussed below and include:

- Polymer (Solids Dewatering and WAS Thickening)
- Ferrous Chloride (Nutrient Removal)
- Sodium Hypochlorite (Disinfection)
- Sodium Bisulphite (Dechlorination)

5.1.1 *Polymer for WAS Thickening and Biosolids Dewatering*

Polymer is applied to the sludge feed into the dewatering centrifuges as well as the WAS feed into the thickening centrifuges. Polymer consumption during 2015 was approximately 222,149 kg, a 4% decrease in consumption from 2014.

Polymer was purchased at an average cost of \$4,237 per tonne, plus applicable taxes.

5.1.2 *Ferrous Chloride for Phosphorus Removal*

Ferrous chloride is applied to the distribution conduits upstream of the aerated grit channels. Ferrous chloride consumption during 2015 was approximately 872 tonne as Iron (Fe). The average ferrous chloride dosage rate was 14.48 mg/L as Fe during the year, which is an 8% increase from 2014.

In 2015, ferrous chloride for nutrient removal was purchased at an average cost of \$815 per tonne Fe plus applicable taxes.

5.1.3 *Sodium Hypochlorite for Disinfection*

Sodium hypochlorite is used for final effluent disinfection. Sodium hypochlorite consumption during 2015 was approximately 1,292 m³, a 4% decrease in consumption from 2014.

Sodium hypochlorite for disinfection was purchased at an average cost of \$0.128 per L, plus applicable taxes.

5.1.4 *Sodium Bisulphite*

Sodium Bisulphite is used as the dechlorination agent. The total quantity of sodium bisulphite consumed in 2015 was approximately 392 m³, a 136% increase in consumption from 2014.

In 2015 the method to determine the effectiveness of the dechlorination process was changed from the bisulphite presence / absence test to the ultra-low chlorine Hach method. The new method's increased precision resulted in increasing the sodium bisulphite dosage to more accurately target our total chlorine residual limit.

Sodium Bisulphite was purchased at an average cost of \$225 per tonne, plus applicable taxes.

5.2 Utilities

A summary of monthly utility consumption for the previous two years at Highland Creek Treatment Plant is provided in Table 8.

Table 8: Monthly Utility Consumption for 2013 - 2015

Utility	2015	2014	2013
Water [m ³ / month]	260	343	984
Hydro [kWh/ month]	2,948,442	2,867,574	2,733,156
Gas [m ³ / month]	881,856	665,847	525,165

5.2.1 Water

The measured total potable water consumption decreased by 24% from 2014 to an annual use of 3,120 m³. The total cost for potable water was \$7,734. The average unit cost of water was \$2.50 per cubic meter.

This decrease in the measured potable water consumption is associated with a malfunction of the potable water flowmeter that was detected in September 2015. The malfunctioning flowmeter is scheduled to be replaced in 2016.

5.2.2 Hydro

Total electrical energy consumption increased 2.8% from 2015 to 35.4M kWh. The total cost for hydro was \$4.4M. The average unit cost of power was \$0.13 per kWh.

5.2.3 Natural Gas

Total natural gas consumption increased 32.5% from 2015 to 10.6M m³. Total cost for natural gas was \$2.3M. The average unit cost of natural gas was \$0.21 per m³.

The increase in natural gas consumption aligns with the decreased digester gas production and other process constraints associated with removing the anaerobic digesters from service.

6. OPERATIONAL COSTS

The 2015 plant operational costs are broken down into five (5) categories: Salaries & Benefits, Materials & Supplies, New Equipment, Services & Rents and Inter-Divisional Charges. Materials & Supplies is further segregated into Utilities (power, natural gas and water), Machine & Equipment Parts, Chemicals and Other Materials & Supplies. The total cost of plant operation in 2015 was \$18.7M. Overall, operational costs increased by 7% from 2014. A breakdown of annual operational costs for the previous two years is shown in Table 9. The 2015 operating costs are also illustrated below in Figure 1.

Table 9: Operating Costs, 2013 - 2015

Operating Cost	2015	2014	2013
Salaries & Benefits	\$6,782,684	\$6,838,155	\$5,909,588
Materials & Supplies			
Utilities	\$6,789,922	\$5,855,230	\$4,515,437
Machine & Equipment Parts	\$483,021	\$225,000	\$368,794
Chemicals	\$1,870,827	\$2,491,913	\$1,452,200
Other Materials & Supplies	\$864,655	\$533,218	\$629,469
New Equipment	\$11,117	\$129,715	\$107,342
Services & Rents	\$885,858	\$1,129,524	\$647,778
Inter-Divisional Charges	\$1,025,317	\$513,924	\$384,689
TOTAL PROGRAM COST:	\$18,713,401	\$17,716,679	\$14,015,297

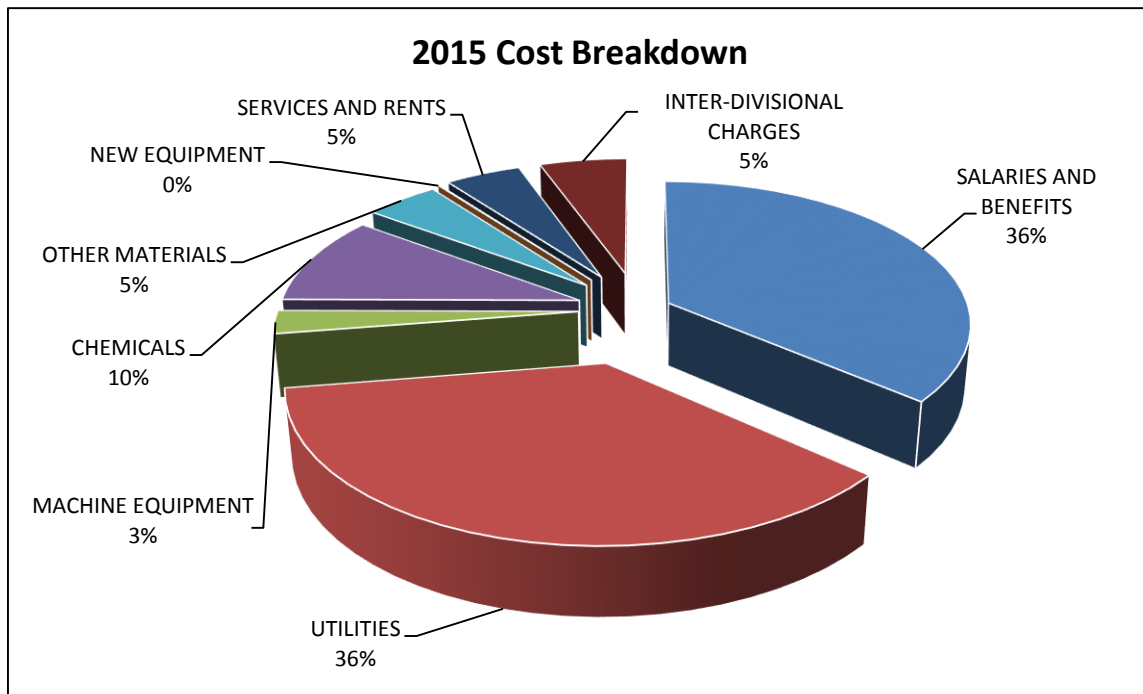


Figure 1: 2015 Highland Creek Treatment Plant Operating Cost Breakdown

7. HUMAN RESOURCES

7.1 Staffing

In 2015, the Highland Creek Treatment Plant had 67 positions on their establishment, several of which were vacant. Plant Staffing excluding vacant positions is shown in Table 10.

Table 10: Plant Staffing

Position Title	Number
Plant Manager	1
Senior Engineer	1
Engineer	1
Area Supervisors	4
Electrical & Instrumentation Specialist	1
Electricians	1
Plant Technicians	27
Industrial Millwrights	16
Electrical Instrumentation Control Technicians	7
Wastewater Treatment Plant Workers	6
Support Assistant	1
Engineering Technologist	1

7.2 Occupational Health & 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 in 2015 were as follows:

Incident	2
First Aid	1
Medical Aid	0
Lost Time	2
Recurrence	0
Total	5

In 2015, total lost days due to work related injuries was 29 days.

7.3 Staff Training & Development

The Strategic Planning and Workforce Development unit of Toronto Water facilitates training programs that expand the abilities of the staff, resulting in better service to the public.

All Highland Creek Treatment Plant operations and maintenance staff attended training which was held at various Toronto Water facilities. Courses were eligible for Continuing Education Units (CEU's) from the Ontario Environmental Training Consortium (OETC).

The Highland Creek Treatment Plant offered its operation and maintenance staff the following training courses in 2015:

- AODA - OHRC
- Basic Presentation Skills: Planning a Presentation
- Being an Effective Team Member
- Business Coaching
- Chainsaw Safety Workshop
- Common Wear Items - Plant Machinery
- Conductors
- Confined Space Entry/Rescue
- Conflict of Interest
- Coping with Shiftwork
- Customer Service
- Developing Strategic Thinking
- Spills Response Program
- Electrical Safety for Maintenance
- Environmental Legislation & Due Diligence
- Fall Protection
- Fraud Prevention and Whistleblower Protection
- Freedom of Information and Privacy Protection
- Health and Safety Competency for Frontline Supervisors
- Hoisting & Rigging Course
- Hot Work Permit System
- Incident / Accident Reporting Course
- Industrial Maintenance Technician
- Health & Safety Orientation
- Joint Health and Safety Committees - Certification Training
- Leadership Essentials
- Lockout, Tagout & Test
- Log Book Entry Workshop
- Managing Project Risk
- Math & Stats - Physical Asset Management (FT)
- Microbiology of Wastewater
- Mission, Values and Ethics
- Self-Contained Breathing Apparatus
- MOL Worker H&S Awareness Program
- MS Office Applications
- Overhead Crane Operator Training
- Project Management
- Safety in a High Voltage Environment
- Sampling & Testing
- Scaffold Safety
- Spills Response Refresher Training
- Standard First Aid Level "C" CPR and AED
- Transportation of Dangerous Goods
- Violence in the Workplace
- Wastewater Treatment Certification Program

- WHMIS Course
- WMS Avantis Multi-site User Training
- Worker Health and Safety Awareness in 4 Steps
- Working with Wastewater
- Writing Technical Reports

7.4 Utility Operator Certification

Toronto Water has incorporated the requirement of a Class I operating licence into the job profiles of the skilled trades in the Water and Wastewater Treatment facilities. As part of this initiative, general operational/process training was delivered in order to prepare staff for the certification examination.

Table 11 summarizes the status of operator certification at the Highland Creek Treatment Plant in 2015.

Table 11: Wastewater Treatment Certificates

Class Level	Licensed
Class IV	25
Class III	1
Class II	3
Class I	10
O. I. T.	19
TOTAL	58

7.5 MOECC/MOL Correspondence

There were no orders issued by the Ministry of the Environment and Climate Change (MOECC) or the Ministry of Labour (MOL). Notable correspondence with the MOECC in 2015 was as follows:

- Follow-up spill reports
- Request for consent to discharge odourous air to facilitate contractor work on biofilter
- Notice of biofilter restart
- Comments on Sewage ECA issued October 2015
- Source testing for CWS: pre-test plan and test report
- Comments on brown plume in Lake Ontario issued November 2015
- Hazardous Waste Manifest correction notice
- Effluent limit exceedance notification
- Incinerator Shutdown notification

Appendix A

Glossary of Abbreviations & Definitions

Glossary of Abbreviations

CBOD ₅	Five-Day Carbonaceous Biological Oxygen Demand
CEU	Continuing Education Units
CFU	Colony Forming Units
CSO	Combined Sewer Overflow (Tank)
DAF	Dissolved Air Flotation
E. Coli	Escheria Coli
HCTP	Highland Creek Treatment Plant
HP	horsepower
HRT	Hydraulic Retention Time
kg	kilogram
kWh	Kilowatt-hour
MWh	Megawatt-hour
m ³	cubic metre
mA	milliamps
mg/L	milligrams per litre
mL	Millilitre
ML	Megalitre
MTI	Mid-Toronto Interceptor Forcemain
SBS	Sodium Bisulphite
SS	Suspended Solids
TCR	Total Chlorine Residual
TP	Total Phosphorus
TS	Total Solids
TVS	Total Volatile Solids
TWAS	Thickened Waste Activated Sludge
µg/L	micrograms per litre
WAS	Waste Activated Sludge

Definitions

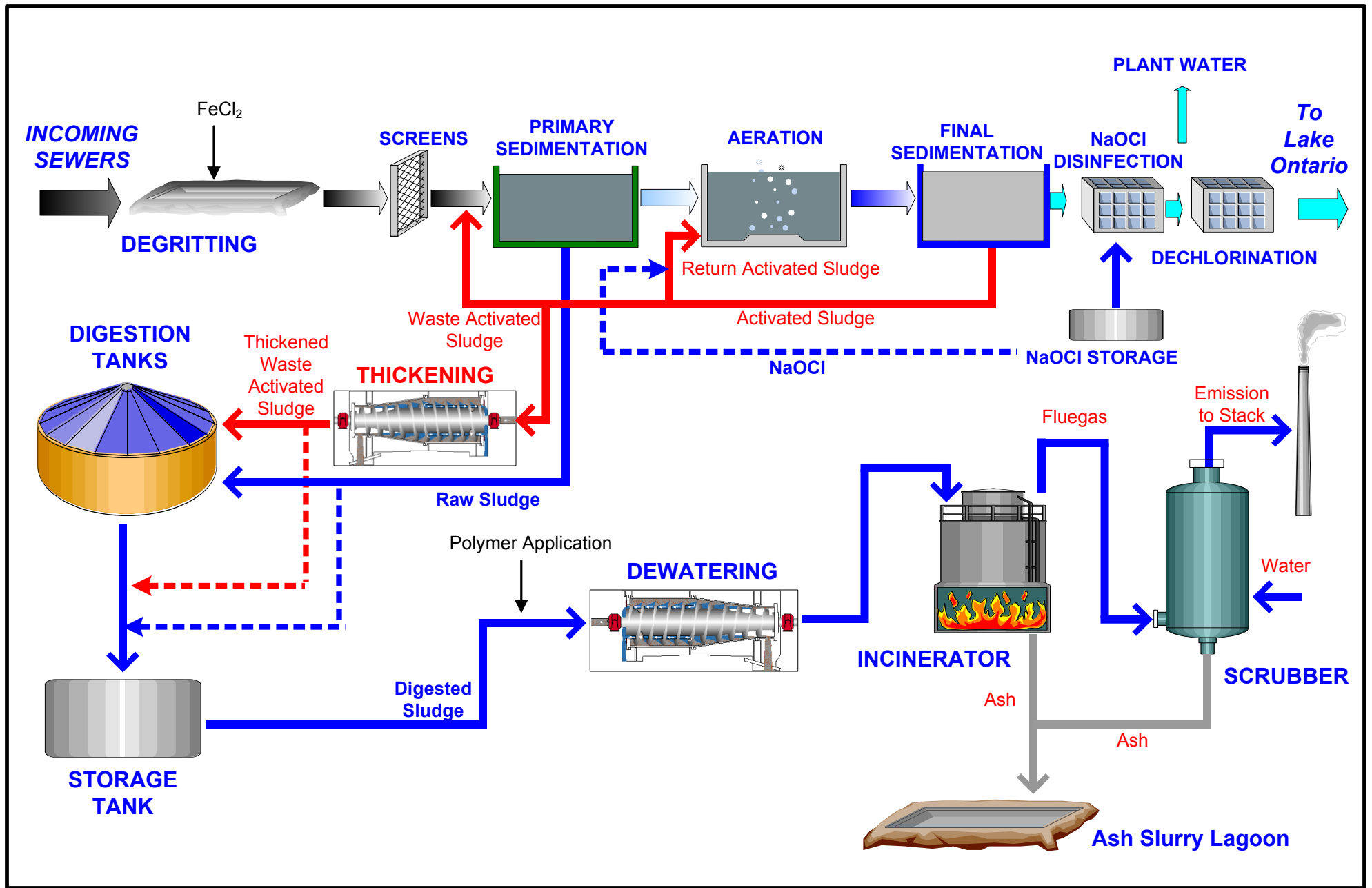
$$\text{Percent Removal (\%)} = 1 - \frac{\text{Concentration (Final)}}{\text{Concentration (Initial)}}$$

$$\text{Aeration Loading (kg CBOD/ m}^3 \text{ Aeration Capacity)} = \frac{\text{Primary CBOD}_5 \times (\text{Secondary Treatment Volume} \times \text{RAS Volume})}{\text{Capacity of Aeration Tanks}}$$

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

Appendix B

Plant Schematic



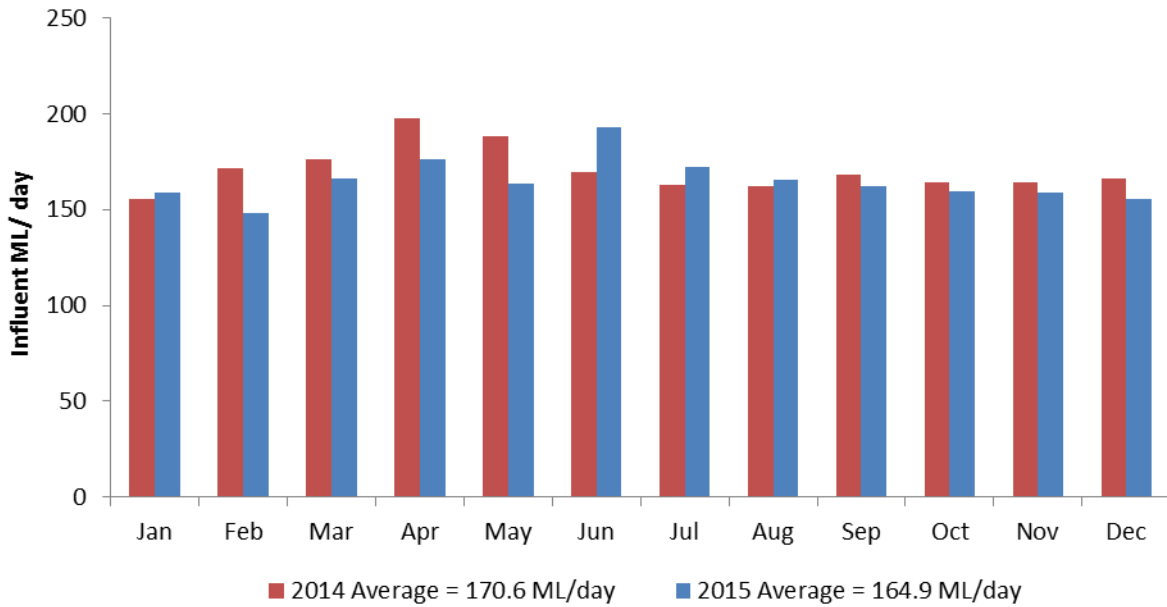
Process Flow Diagram for Highland Creek Wastewater Treatment Plant

Appendix C

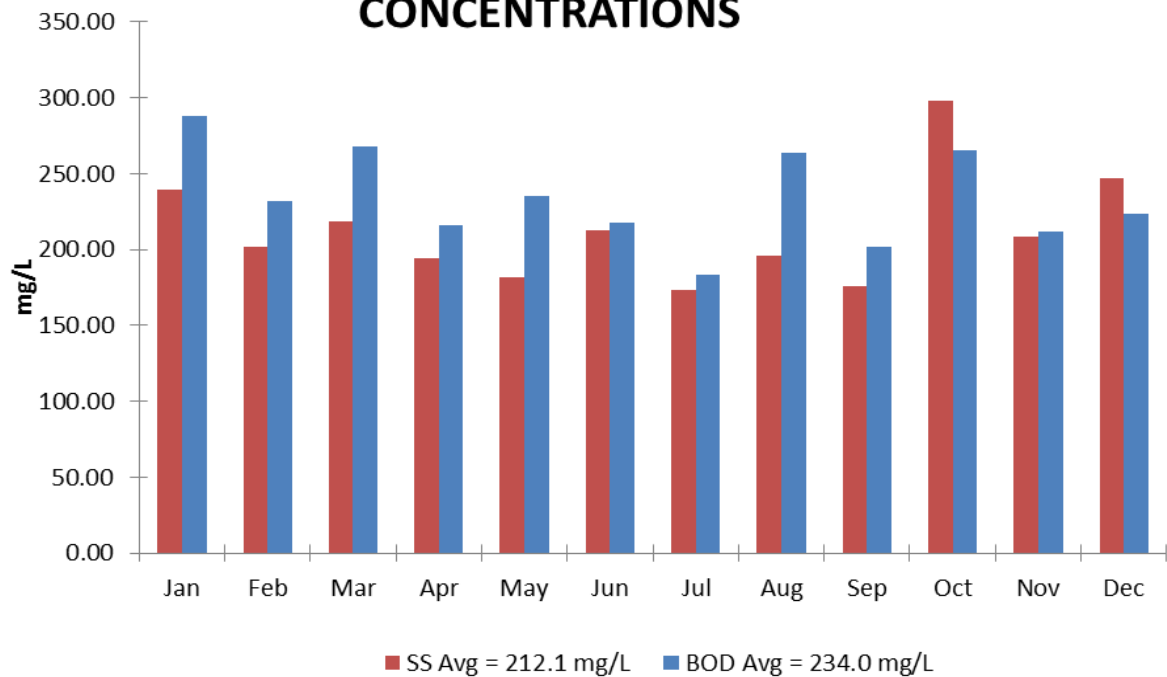
Performance Charts

- **Influent Flows**
- **Influent SS & BOD Concentrations**
- **Influent TKN & Total Phosphorus Concentrations**
- **Effluent SS & CBOD₅ Concentrations**
- **Effluent TKN, Total Phosphorus, & Ammonia Concentrations**

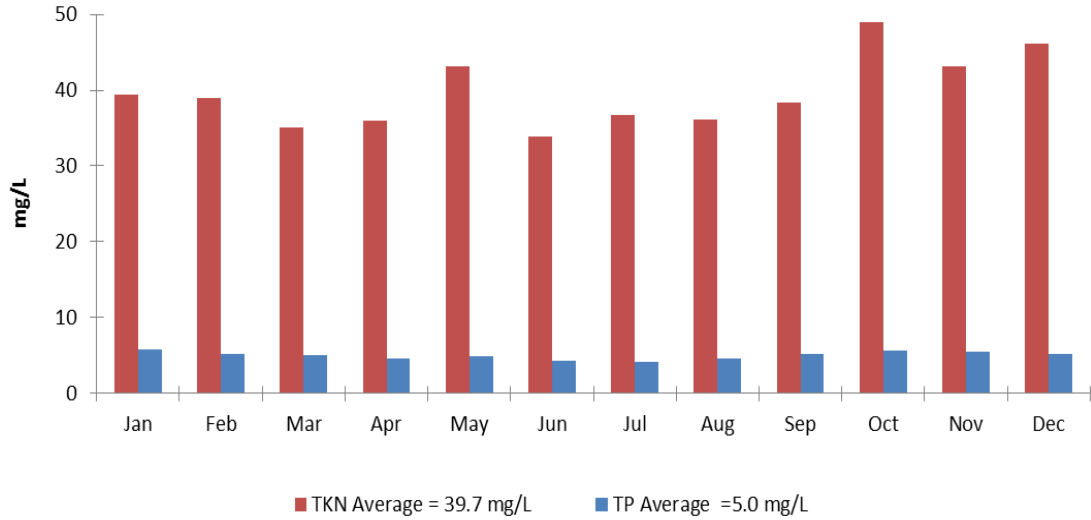
HIGHLAND CREEK TREATMENT PLANT INFLUENT FLOWS 2014-2015



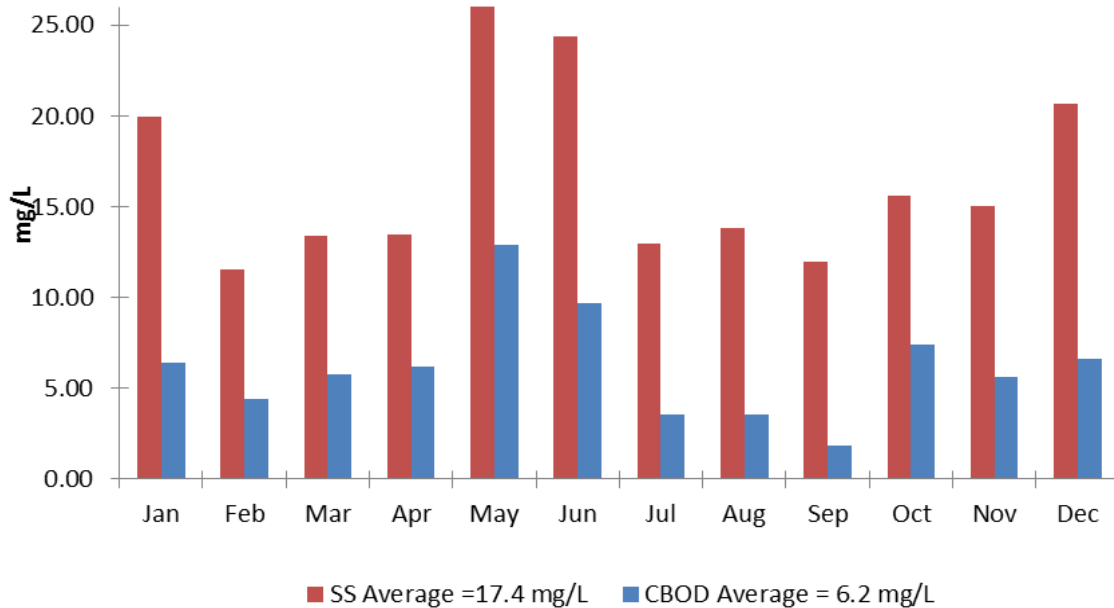
HIGHLAND CREEK TREATMENT PLANT 2015 INFLUENT SS and BOD₅ CONCENTRATIONS



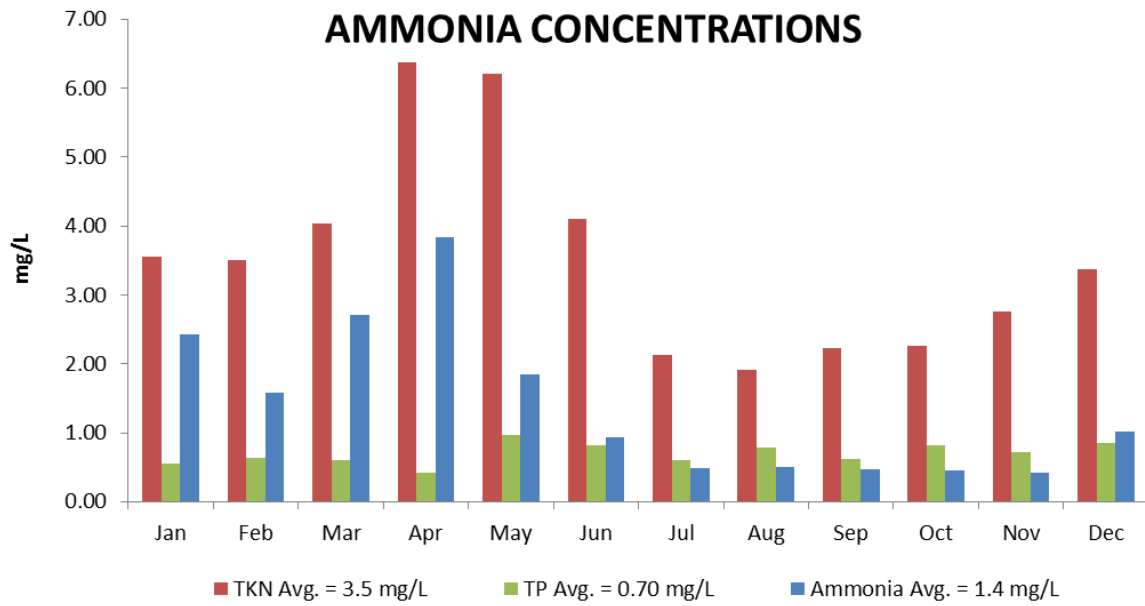
HIGHLAND CREEK TREATMENT PLANT 2015 INFLUENT TKN and TOTAL PHOSPHORUS CONCENTRATIONS



HIGHLAND CREEK TREATMENT PLANT 2015 EFFLUENT SS and CBOD₅ CONCENTRATIONS



HIGHLAND CREEK TREATMENT PLANT 2015 EFFLUENT TKN, TOTAL PHOSPHORUS, and AMMONIA CONCENTRATIONS



Appendix D

Influent & Effluent Metal Concentrations

TORONTO WATER LABORATORY
Treatment Plant Monthly Metal Analysis for: January 2015

Tel: 416-392-2894
 Fax: 416-397-0342

<u>DESCRIPTION</u>	<u>NAME</u>	<u>RESULT</u>	<u>UNITS</u>	<u>LIMITS</u>	<u>NOTES</u>
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dec.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0209	mg/L	0.0400	
	Iron	1.80	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	<u>0.105</u>	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00655	mg/L	0.0800	
	Zinc	<u>0.0444</u>	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dec.					
	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.00820	mg/L	4.0000	
	Copper	0.147	mg/L	2.0000	
	Iron	3.90	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0618	mg/L	5.0000	
	Mercury	0.00006300	mg/L	0.0100	
	Nickel	0.00992	mg/L	2.0000	
	Zinc	0.163	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites.

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits.

Date Report Printed: 19-Feb-2015

TORONTO WATER LABORATORY
Treatment Plant Monthly Metal Analysis for: February 2015

Tel: 416-392-2894
 Fax: 416-397-0342

<u>DESCRIPTION</u>	<u>NAME</u>	<u>RESULT</u>	<u>UNITS</u>	<u>LIMITS</u>	<u>NOTES</u>
Highland Creek Treatment Plant					
FINAL EFFLUENT- Monthly Metals @ Dec	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0221	mg/L	0.0400	
	Iron	1.13	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	<u>0.0971</u>	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00705	mg/L	0.0800	
	Zinc	<u>0.0451</u>	mg/L	0.0400	
INFLUENT- Monthly Metals @ Dec					
	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.0104	mg/L	4.0000	
	Copper	0.164	mg/L	2.0000	
	Iron	1.93	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0653	mg/L	5.0000	
	Mercury	0.00008400	mg/L	0.0100	
	Nickel	0.00665	mg/L	2.0000	
	Zinc	0.153	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites.

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits.

Date Report Printed: 24-Mar-2015

TORONTO WATER LABORATORY
Treatment Plant Monthly Metal Analysis for: March 2015

Tel: 416-392-2894
Fax: 416-397-0342

<u>DESCRIPTION</u>	<u>NAME</u>	<u>RESULT</u>	<u>UNITS</u>	<u>LIMITS</u>	<u>NOTES</u>
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dec.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0187	mg/L	0.0400	
	Iron	1.11	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	<u>0.0977</u>	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00648	mg/L	0.0800	
	Zinc	<u>0.0467</u>	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dec.					
	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.00639	mg/L	4.0000	
	Copper	0.121	mg/L	2.0000	
	Iron	1.81	mg/L		
	Lead	0.00646	mg/L	1.0000	
	Manganese	0.0689	mg/L	5.0000	
	Mercury	0.00008900	mg/L	0.0100	
	Nickel	0.00836	mg/L	2.0000	
	Zinc	0.149	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 30-Apr-2015 /

TORONTO WATER LABORATORY
Treatment Plant Monthly Metal Analysis for: April 2015

Tel: 416-392-2894
Fax: 416-397-0342

<u>DESCRIPTION</u>	<u>NAME</u>	<u>RESULT</u>	<u>UNITS</u>	<u>LIMITS</u>	<u>NOTES</u>
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dec.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0174	mg/L	0.0400	
	Iron	1.02	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	<u>0.0925</u>	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00790	mg/L	0.0800	
	Zinc	<u>0.0413</u>	mg/L	0.0400	
INFLUEN - Monthly Metals @ Dec.					
	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.00488	mg/L	4.0000	
	Copper	0.0978	mg/L	2.0000	
	Iron	1.38	mg/L		
	Lead	0.00575	mg/L	1.0000	
	Manganese	0.0674	mg/L	5.0000	
	Mercury	0.00008700	mg/L	0.0100	
	Nickel	0.00705	mg/L	2.0000	
	Zinc	0.123	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 28-May-2015 /

TORONTO WATER LABORATORY
Treatment Plant Monthly Metal Analysis for: May 2015

Tel: 416-392-2894
Fax: 416-397-0342

<u>DESCRIPTION</u>	<u>NAME</u>	<u>RESULT</u>	<u>UNITS</u>	<u>LIMITS</u>	<u>NOTES</u>
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Metals at Dec.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0256	mg/L	0.0400	
	Iron	3.03	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	<u>0.0934</u>	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00777	mg/L	0.0800	
	Zinc	0.0385	mg/L	0.0400	
INFLUENT- Monthly Metals @ Dec					
	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.00675	mg/L	4.0000	
	Copper	0.131	mg/L	2.0000	
	Iron	0.966	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0667	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00734	mg/L	2.0000	
	Zinc	0.148	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 22-Jun-2015 /

TORONTO WATER LABORATORY
Treatment Plant Monthly Metal Analysis for: June 2015

Tel: 416-392-2894
 Fax: 416-397-0342

<u>DESCRIPTION</u>	<u>NAME</u>	<u>RESULT</u>	<u>UNITS</u>	<u>LIMITS</u>	<u>NOTES</u>
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dec.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0203	mg/L	0.0400	
	Iron	2.35	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	<u>0.0941</u>	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.0124	mg/L	0.0800	
	Zinc	0.0396	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dec.					
	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.0156	mg/L	4.0000	
	Copper	0.0938	mg/L	2.0000	
	Iron	1.06	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0569	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.0143	mg/L	2.0000	
	Zinc	0.136	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 23-Jul-2015 /

TORONTO WATER LABORATORY
Treatment Plant Monthly Metal Analysis for: July 2015

Tel: 416-392-2894
 Fax: 416-397-0342

<u>DESCRIPTION</u>	<u>NAME</u>	<u>RESULT</u>	<u>UNITS</u>	<u>LIMITS</u>	<u>NOTES</u>
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dec.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0199	mg/L	0.0400	
	Iron	1.24	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	<u>0.0671</u>	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00886	mg/L	0.0800	
	Zinc	0.0387	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dec.					
	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.00795	mg/L	4.0000	
	Copper	0.0978	mg/L	2.0000	
	Iron	0.774	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0579	mg/L	5.0000	
	Mercury	0.0002120	mg/L	0.0100	
	Nickel	0.0114	mg/L	2.0000	
	Zinc	0.109	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites. /

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits. /

Date Report Printed: 21-Aug-2015

TORONTO WATER LABORATORY
Treatment Plant Monthly Metal Analysis for: August 2015

Tel: 416-392-2894
Fax: 416-397-0342

<u>DESCRIPTION</u>	<u>NAME</u>	<u>RESULT</u>	<u>UNITS</u>	<u>LIMITS</u>	<u>NOTES</u>
Highland Creek Treatment Plant					
FINAL EFFLUENT- Monthly Metals @ Dec.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0278	mg/L	0.0400	
	Iron	1.61	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	<u>0.0623</u>	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00961	mg/L	0.0800	
	Zinc	<u>0.0408</u>	mg/L	0.0400	
INFLUENT- Monthly Metals @ Dec.					
	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.00722	mg/L	4.0000	
	Copper	0.106	mg/L	2.0000	
	Iron	0.986	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0690	mg/L	5.0000	
	Mercury	0.00006700	mg/L	0.0100	
	Nickel	0.00665	mg/L	2.0000	
	Zinc	0.158	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites.

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits.

Date Report Printed: 25-Sep-2015

TORONTO WATER LABORATORY
Treatment Plant Monthly Metal Analysis for: September 2015 (

Tel: 416-392-2894 #
Fax: 416-397-0342 #

<u>DESCRIPTION</u>	<u>NAME</u>	<u>RESULT</u>	<u>UNITS</u>	<u>LIMITS</u>	<u>NOTES /</u>
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dec.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0143	mg/L	0.0400	
	Iron	0.990	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	<u>0.0656</u>	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00570	mg/L	0.0800	
	Zinc	0.0344	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dec.					
	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00603	mg/L	4.0000	
	Copper	0.0963	mg/L	2.0000	
	Iron	1.21	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0646	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00615	mg/L	2.0000	
	Zinc	0.121	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites.

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits.

Date Report Printed: 27-Oct-2015

TORONTO WATER LABORATORY
Treatment Plant Monthly Metal Analysis for: October 2015

Tel: 416-392-2894
Fax: 416-397-0342

<u>DESCRIPTION</u>	<u>NAME</u>	<u>RESULT</u>	<u>UNITS</u>	<u>LIMITS</u>	<u>NOTES</u>
Highland Creek Treatment Plant					
FINAL EFFLUENT - Biometals @ Dec.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0168	mg/L	0.0400	
	Iron	0.995	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	<u>0.0658</u>	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00623	mg/L	0.0800	
	Zinc	0.0388	mg/L	0.0400	
INFLUENT - Biometals @ Dec.					
	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00723	mg/L	4.0000	
	Copper	0.121	mg/L	2.0000	
	Iron	1.22	mg/L		
	Lead	0.00606	mg/L	1.0000	
	Manganese	0.0756	mg/L	5.0000	
	Mercury	0.00006400	mg/L	0.0100	
	Nickel	0.00767	mg/L	2.0000	
	Zinc	0.157	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites.

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits.

Date Report Printed: 30-Nov-2015

TORONTO WATER LABORATORY
Treatment Plant Monthly Metal Analysis for: November 2015

Tel: 416-392-2894
 Fax: 416-397-0342

<u>DESCRIPTION</u>	<u>NAME</u>	<u>RESULT</u>	<u>UNITS</u>	<u>LIMITS</u>	<u>NOTES</u>
Highland Creek Treatment Plant					
FINAL EFFLUENT - Monthly @ Dec.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0170	mg/L	0.0400	
	Iron	1.25	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	<u>0.0621</u>	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00649	mg/L	0.0800	
	Zinc	0.0391	mg/L	0.0400	
INFLUENT - Monthly @ Dec.					
	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00573	mg/L	4.0000	
	Copper	0.117	mg/L	2.0000	
	Iron	1.03	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0676	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00669	mg/L	2.0000	
	Zinc	0.125	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites.

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits.

Date Report Printed: 29-Dec-2015

TORONTO WATER LABORATORY
Treatment Plant Monthly Metal Analysis for: December 2015

Tel: 416-392-2894
Fax: 416-397-0342

<u>DESCRIPTION</u>	<u>NAME</u>	<u>RESULT</u>	<u>UNITS</u>	<u>LIMITS</u>	<u>NOTES</u>
Highland Creek Treatment Plant					
FINAL EFFLUENT	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0220	mg/L	0.0400	
	Iron	1.98	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	<u>0.110</u>	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00642	mg/L	0.0800	
	Zinc	<u>0.0466</u>	mg/L	0.0400	
INFLUENT					
	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00738	mg/L	4.0000	
	Copper	0.122	mg/L	2.0000	
	Iron	1.08	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0672	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00694	mg/L	2.0000	
	Zinc	0.135	mg/L	2.0000	

Notes: All Results in mg/L. These samples are monthly composites.

Underlined Results have exceeded respective Sanitary or Storm Sewer Bylaw limits of the Sewer Use Bylaw Chapter 681 of the Toronto Municipal Code. limits.

Date Report Printed: 29-Jan-2016

Appendix E

Biosolids Metals Analyses

Highland Creek T.P. - Summary of Digested Sludge Metals Analyses

	Arsenic⁽¹⁾	Cadmium⁽¹⁾	Cobolt⁽¹⁾	Chromium⁽¹⁾	Copper⁽¹⁾	Mercury⁽¹⁾	Molybdenum⁽¹⁾	Nickel⁽¹⁾	Lead⁽¹⁾	Selenium⁽¹⁾	Zinc⁽¹⁾
<i>Limit⁽²⁾</i>	170	34	340	2,800	1,700	11	94	420	1,100	34	4,200
January	1.7	0.4	1.2	44.5	466.0	0.4	7.1	12.7	10.9	2.4	445.5
February	-	-	-	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	-	-
April	2.6	0.1	2.0	39.0	328.6	0.3	3.7	11.0	12.3	1.9	275.9
May	1.4	0.2	1.7	23.9	287.7	0.4	2.0	10.3	12.6	0.2	363.5
June	-	-	-	-	-	-	-	-	-	-	-
July	-	-	-	-	-	-	-	-	-	-	-
August	-	-	-	-	-	-	-	-	-	-	-
September	-	-	-	-	-	-	-	-	-	-	-
October	-	-	-	-	-	-	-	-	-	-	-
November	-	-	-	-	-	-	-	-	-	-	-
December	-	-	-	-	-	-	-	-	-	-	-
Annual Average	1.9	0.2	1.6	35.8	360.8	0.3	4.2	11.3	11.9	1.5	361.6

Notes:

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

(2) As per MOE regulations for sludge utilization on agricultural lands

Appendix E

Analytical Testing Summary

	ALK pH DS COND	Alkalinity	BOD	CBOD	Chlorine	COD	ECOLI	Ferric Chloride	FID	IONS	Mercury	METALS	NH3(as N)	Orthophosphate	P	pH_15	Sulphite	TKN(as N)	Total Phosphorus	Toxicity	TS	TSS	Un-ionized NH3(as N)	VA	Total
AERATION TANK 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	0	0	34
AERATION TANK 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	0	38
AERATION TANK 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	32
AERATION TANK 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	0	0	42
AERATION TANK 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	0	0	42
AERATION TANK 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	0	0	37
AERATION TANK 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0	43
AERATION TANK 1E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	32
AERATION TANK 1W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	32
AERATION TANK 2E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	0	0	34
AERATION TANK 2W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	0	36
AERATION TANK 3E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	0	0	42
AERATION TANK 3W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	40
AERATION TANK 4E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	0	0	37
AERATION TANK 4W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	0	0	37
AERATION TANK 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	0	0	42
AERATION TANK 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	0	0	44
AERATION TANK 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	0	0	42
AERATION TANK 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	0	0	42
AERATION TANK 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	0	0	33
DEWATERING BLENDED SLUDGE FEED	0	0	0	0	0	0	0	0	50	5	50	5	0	0	0	0	0	0	0	0	708	0	0	0	818
DEWATERING CAKE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	4
DEWATERING CAKE # 310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	570	0	0	0	570
DEWATERING CAKE # 311	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	228	0	0	0	228
DEWATERING CAKE # 314	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	312	0	0	0	312
DEWATERING CAKE # 315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	236	0	0	0	236
DEWATERING CAKE # 413	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54	0	0	0	54
DEWATERING CAKE # 414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	0	0	0	34
DEWATERING CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
DEWATERING CENTRATE # 310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	307	0	0	307
DEWATERING CENTRATE # 311	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	131	0	0	133
DEWATERING CENTRATE # 314	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	163	0	0	165
DEWATERING CENTRATE # 315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	116	0	0	116
DEWATERING CENTRATE # 413	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	0	36
DEWATERING CENTRATE # 414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	0	0	27
FINAL EFFLUENT	7	1	0	353	18	1	72	0	0	500	14	126	153	3	361	151	4	50	2	36	0	362	151	1	2,366
HCTP FE SAMPLE	0	0	0	0	0	0	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
INFLUENT	4	0	304	0	0	0	0	2	0	13	117	52	0	365	0	0	52	1	0	0	362	0	0	0	1,272
POLYMER DEWATERING MIXING TANK 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
POLYMER DEWATERING MIXING TANK 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52	0	0	0	52
POLYMER DEWATERING MIXING TANK 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54	0	0	0	54
POLYMER THICKENING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	12
POLYMER THICKENING NEAT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	12
PRIMARY DIGESTED SLUDGE VA TANK 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
PRIMARY DIGESTED SLUDGE VA TANK 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
PRIMARY EFFLUENT 1	9	0	2	12	0	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	44	0	0	73
PRIMARY EFFLUENT 11-12	7	0	4	51	0	3	0	0	0	10	0	0	1	3	4	0	1	0	0	0	0	348	0	0	432
PRIMARY EFFLUENT 1-8	0	0	2	36	0	0	0	0	0	10	0	0	2	0	4	0	2	0	0	0	0	231	0	0	287
PRIMARY EFFLUENT 2	9	0	2	12	0	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	43	0	0	72
PRIMARY EFFLUENT 3	3	0	1	1	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	6	0	0	14
PRIMARY EFFLUENT 4	9	0	2	19	0	3	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	45	0	0	89
PRIMARY EFFLUENT 5	4	0	0	13	0	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	46	0	0	68
PRIMARY EFFLUENT 6	4	0	0	13	0	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	45	0	0	67
PRIMARY EFFLUENT 7	4	0	0	14	0	2	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	43	0	0	69
PRIMARY EFFLUENT 8	4	0	0	16	0	2	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	40	0	0	70
PRIMARY EFFLUENT 9-10	7	0	4	51	0	3	0	0	0	10	0	0	2	3	5	0	2	0	0	0	0	348	0	0	435
RAW SLUDGE 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	2	0	0	36
RAW SLUDGE 11-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	186	0	0	0	186
RAW SLUDGE 1-8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	148	0	0	0	148
RAW SLUDGE 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	0	0	38
RAW SLUDGE 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	6
RAW SLUDGE 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	0	0	36
RAW SLUDGE 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46	0	0	0	46
RAW SLUDGE 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	2	0	0	44
RAW SLUDGE 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	4	0	0	44
RAW SLUDGE 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	0	0	38
RAW SLUDGE 9-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	190	0	0	0	190
RETURN SLUDGE 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	0	0	34
RETURN SLUDGE 13-16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	31
RETURN SLUDGE 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	32
RETURN SLUDGE 3	0	0</																							

TORONTO WATER LABORATORY

Tel: 416-392-2894
Fax: 416-397-0342

Sampling Point: THC01 INFLUENT

Group:	Minimum	Maximum	Average	Units	Reporting Limit
ALK pH DS COND					
Alkalinity	253.00	270.00	261.50	mg/L	<1.6
Conductivity	1,250.00	1,250.00	1,250.00	µS/cm	<0.4
pH	7.40	7.40	7.40	SU	<0.10
Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	47.00	886.00	234.16	mg/L	<2
Group: FID	Minimum	Maximum	Average	Units	Reporting Limit
Fuel Identification					
Group: METALS	Minimum	Maximum	Average	Units	Reporting Limit
Arsenic	0.006000	0.01000	0.00723	mg/L	<0.01
Cadmium	0.001000	0.00400	0.00192	mg/L	<0.004
Chromium	0.004900	0.01560	0.00780	mg/L	<0.004
Copper	0.093800	0.20200	0.12436	mg/L	<0.004
Iron	0.774000	3.90000	1.46123	mg/L	<0.02
Lead	0.005000	0.00650	0.00531	mg/L	<0.005
Manganese	0.056900	0.07560	0.06627	mg/L	<0.004
Nickel	0.006200	0.01430	0.00835	mg/L	<0.005
Zinc	0.109000	0.22100	0.14600	mg/L	<0.02
Group: Mercury	Minimum	Maximum	Average	Units	Reporting Limit
Mercury	0.000100	0.00020	0.00011	mg/L	<0.00003
Group: NH3(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Ammonia(as N)	15.00	39.00	26.46	mg/L	<0.05
Group: P	Minimum	Maximum	Average	Units	Reporting Limit
Dilution	5.00	10.00	7.50		
P_HACH(reading)	1.68	3.16	2.42		
Phosphorus (HACH)	2.60	21.00	4.97	mg/L	<0.08
Group: TKN(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Total Kjeldahl Nitrogen	28.40	63.20	39.56	mg/L	<0.2
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	36.00	1,488.00	211.33	mg/L	<2
Group: Total Phosphorus	Minimum	Maximum	Average	Units	Reporting Limit
Total Phosphorus	7.44	7.44	7.44	mg/L	<0.02

Sampling Point: THC02 PRIMARY EFFLUENT 1-8

Group:	Minimum	Maximum	Average	Units	Reporting Limit
Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	15.00	221.00	118.00	mg/L	<2
Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	3.00	318.00	147.75	mg/L	<2
Group: IONS	Minimum	Maximum	Average	Units	Reporting Limit
Bromide	0.410000	0.41000	0.41000	mg/L	<0.1
Calcium	65.100000	65.10000	65.10000	mg/L	<0.2

Chloride	162.000000	162.000000	162.000000	mg/L	<0.2
Hardness (Calculation)	215.000000	215.000000	215.000000	mg/L	<1
Magnesium	12.700000	12.700000	12.700000	mg/L	<0.1
Nitrate(as N)	11.600000	11.600000	11.600000	mg/L	<0.01
Nitrite(as N)	0.358000	0.358000	0.358000	mg/L	<0.002
Potassium	13.100000	13.100000	13.100000	mg/L	<0.05
Sodium	97.200000	97.200000	97.200000	mg/L	<0.4
Sulfate	51.300000	51.300000	51.300000	mg/L	<0.2
Group: NH3(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Ammonia(as N)	0.90	24.00	12.45	mg/L	<0.05
Group: P	Minimum	Maximum	Average	Units	Reporting Limit
Phosphorus (HACH)	0.28	5.10	2.69	mg/L	<0.08
Group: TKN(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Total Kjeldahl Nitrogen	4.30	41.00	22.65	mg/L	<0.2
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	8.00	25,890.00	355.45	mg/L	<2

Sampling Point: THC03 PRIMARY EFFLUENT 9-10

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	201.00	248.00	227.33	mg/L	<1.6
Conductivity	1,050.00	1,210.00	1,130.00	µS/cm	<0.4
pH	7.20	7.20	7.20	SU	<0.10
Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	20.00	339.00	153.00	mg/L	<2
Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	5.00	532.00	169.39	mg/L	<2
Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	315.00	485.00	418.33	mg/L	<10
Group: IONS	Minimum	Maximum	Average	Units	Reporting Limit
Bromide	0.610000	0.610000	0.610000	mg/L	<0.1
Calcium	67.600000	67.600000	67.600000	mg/L	<0.2
Chloride	165.000000	165.000000	165.000000	mg/L	<0.2
Hardness (Calculation)	222.000000	222.000000	222.000000	mg/L	<1
Magnesium	12.900000	12.900000	12.900000	mg/L	<0.1
Nitrate(as N)	7.980000	7.980000	7.980000	mg/L	<0.01
Nitrite(as N)	0.721000	0.721000	0.721000	mg/L	<0.002
Potassium	12.400000	12.400000	12.400000	mg/L	<0.05
Sodium	99.600000	99.600000	99.600000	mg/L	<0.4
Sulfate	51.700000	51.700000	51.700000	mg/L	<0.2
Group: NH3(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Ammonia(as N)	2.00	23.00	12.50	mg/L	<0.05
Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	3.10	11.00	6.97	mg/L	<0.5
Group: P	Minimum	Maximum	Average	Units	Reporting Limit
Phosphorus (HACH)	0.42	8.60	3.66	mg/L	<0.08
Group: TKN(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Total Kjeldahl Nitrogen	5.41	41.00	23.21	mg/L	<0.2
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	20.00	56,776.00	400.46	mg/L	<2

Sampling Point: THC04

PRIMARY EFFLUENT 11-12

Group:	Minimum	Maximum	Average	Units	Reporting Limit
ALK pH DS COND					
Alkalinity	237.00	279.00	255.33	mg/L	<1.6
Conductivity	1,040.00	1,160.00	1,100.00	µS/cm	<0.4
pH	7.40	7.50	7.45	SU	<0.10
Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	9.00	360.00	186.20	mg/L	<2
Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	5.00	294.00	165.14	mg/L	<2
Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	305.00	545.00	416.67	mg/L	<10
Group: IONS	Minimum	Maximum	Average	Units	Reporting Limit
Bromide	0.600000	0.60000	0.60000	mg/L	<0.1
Calcium	65.600000	65.60000	65.60000	mg/L	<0.2
Chloride	163.000000	163.00000	163.00000	mg/L	<0.2
Hardness (Calculation)	215.000000	215.00000	215.00000	mg/L	<1
Magnesium	12.500000	12.50000	12.50000	mg/L	<0.1
Nitrate(as N)	11.800000	11.80000	11.80000	mg/L	<0.01
Nitrite(as N)	0.227000	0.22700	0.22700	mg/L	<0.002
Potassium	13.100000	13.10000	13.10000	mg/L	<0.05
Sodium	100.000000	100.00000	100.00000	mg/L	<0.4
Sulfate	49.700000	49.70000	49.70000	mg/L	<0.2
Group: NH3(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Ammonia(as N)	0.30	0.30	0.30	mg/L	<0.05
Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	2.00	7.60	4.20	mg/L	<0.5
Group: P	Minimum	Maximum	Average	Units	Reporting Limit
Phosphorus (HACH)	0.50	8.20	3.93	mg/L	<0.08
Group: TKN(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Total Kjeldahl Nitrogen	2.81	2.81	2.81	mg/L	<0.2
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	12.00	5,390.00	249.96	mg/L	<2

Sampling Point: THC05

FINAL EFFLUENT

Group:	Minimum	Maximum	Average	Units	Reporting Limit
ALK pH DS COND					
Alkalinity	70.30	103.00	92.10	mg/L	<1.6
Conductivity	912.00	984.00	948.00	µS/cm	<0.4
pH	7.40	7.70	7.55	SU	<0.10
Group: Alkalinity	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	120.00	120.00	120.00	mg/L	<10
Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	2.00	48.00	6.17	mg/L	<2
Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	50.00	50.00	50.00	mg/L	<10
Group: Chlorine	Minimum	Maximum	Average	Units	Reporting Limit
Total Residual Chlorine	0.01	0.60	0.28	mg/L	<0.01
Group: ECOLI	Minimum	Maximum	Average	Units	Reporting Limit

EColi	0.00	790.00	119.06	CFU/100 mL	
Group: IONS	Minimum	Maximum	Average	Units	Reporting Limit
Bromide	0.200000	2.75000	1.99540	mg/L	<0.1
Calcium	59.300000	104.00000	75.08600	mg/L	<0.2
Chloride	90.200000	207.00000	138.58000	mg/L	<0.2
Hardness (Calculation)	200.000000	329.00000	244.66000	mg/L	<1
Magnesium	12.300000	16.90000	13.87200	mg/L	<0.1
Nitrate(as N)	5.590000	20.40000	12.16360	mg/L	<0.01
Nitrite(as N)	0.068000	2.31000	0.73036	mg/L	<0.002
Potassium	9.510000	14.80000	11.72900	mg/L	<0.05
Sodium	68.800000	147.00000	92.83600	mg/L	<0.4
Sulfate	39.900000	62.50000	50.59000	mg/L	<0.2
Group: METALS	Minimum	Maximum	Average	Units	Reporting Limit
Arsenic	0.006000	0.01000	0.00714	mg/L	<0.01
Cadmium	0.001000	0.00400	0.00186	mg/L	<0.004
Chromium	0.004000	0.00400	0.00400	mg/L	<0.004
Copper	0.014300	0.02980	0.02075	mg/L	<0.004
Iron	0.938000	3.03000	1.52879	mg/L	<0.02
Lead	0.005000	0.00500	0.00500	mg/L	<0.005
Manganese	0.062100	0.11400	0.08694	mg/L	<0.004
Nickel	0.005700	0.01240	0.00749	mg/L	<0.005
Zinc	0.034400	0.06110	0.04262	mg/L	<0.02
Group: Mercury	Minimum	Maximum	Average	Units	Reporting Limit
Mercury	0.000100	0.00010	0.00010	mg/L	<0.00003
Group: NH3(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Ammonia	0.30	0.90	0.60	mg/L	
Ammonia(as N)	0.20	5.60	1.41	mg/L	<0.05
Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	0.88	2.20	1.33	mg/L	<0.5
Group: P	Minimum	Maximum	Average	Units	Reporting Limit
Dilution	1.00	2.00	1.50		
P_HACH(reading)	0.87	1.98	1.43		
Phosphorus (HACH)	0.18	7.60	0.68	mg/L	<0.08
Group: Sulphite	Minimum	Maximum	Average	Units	Reporting Limit
Sulphite_P_A				mg/L	
Group: TKN(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Total Kjeldahl Nitrogen	1.71	8.74	3.51	mg/L	<0.2
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2.00	97.00	17.40	mg/L	<2
Volatile Suspended Solids				%	
Group: Total Phosphorus	Minimum	Maximum	Average	Units	Reporting Limit
Total Phosphorus	0.67	1.12	0.90	mg/L	<0.02
Group: Toxicity	Minimum	Maximum	Average	Units	Reporting Limit
96h_Mortality	0.00	0.00	0.00		
96h_LC50	100.00	100.00	100.00	%	
Un-ionized Ammonia	0.00	0.01	0.00	mg/L	
Group: Un-ionized NH3(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Ammonia(as N)Un-ionized (Calculation)	0.00	0.06	0.01	mg/L	<0.001
Group: pH_15	Minimum	Maximum	Average	Units	Reporting Limit

Sampling Point: THC07 RAW SLUDGE 1-8

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.20	5.50	2.99	%	
Volatile Total Solids	60.00	87.10	81.76	%	

Sampling Point: THC08 RAW SLUDGE 9-10

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.38	5.95	3.17	%	
Volatile Total Solids	70.00	88.30	82.05	%	

Sampling Point: THC09 RAW SLUDGE 11-12

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.40	4.90	2.54	%	
Volatile Total Solids	62.50	87.50	81.25	%	

Sampling Point: THC10 DEWATERING BLENDED SLUDGE FEED

Group: IONS	Minimum	Maximum	Average	Units	Reporting Limit
Bromide	0.550000	2.750000	1.430000	mg/L	<0.1
Calcium	106.000000	206.000000	147.400000	mg/L	<0.2
Chloride	104.000000	204.000000	142.400000	mg/L	<0.2
Hardness (Calculation)	359.000000	704.000000	508.000000	mg/L	<1
Magnesium	22.800000	46.100000	33.980000	mg/L	<0.1
Nitrate(as N)	0.275000	0.790000	0.416000	mg/L	<0.01
Nitrite(as N)	0.452000	7.910000	2.323200	mg/L	<0.002
Potassium	27.100000	70.500000	42.020000	mg/L	<0.05
Sodium	66.900000	134.000000	98.900000	mg/L	<0.4
Sulfate	5.500000	17.300000	9.856000	mg/L	<0.2

Group: METALS	Minimum	Maximum	Average	Units	Reporting Limit
Arsenic	0.034300	0.077400	0.063940	mg/L	<0.01
Cadmium	0.002000	0.011400	0.008460	mg/L	<0.004
Chromium	0.889000	1.520000	1.217800	mg/L	<0.004
Cobalt	0.024700	0.074900	0.058100	mg/L	<0.004
Copper	9.320000	15.700000	12.450000	mg/L	<0.004
Lead	0.218000	0.655000	0.402800	mg/L	<0.005
Molybdenum	0.107000	0.214000	0.168000	mg/L	<0.01
Nickel	0.254000	0.500000	0.407600	mg/L	<0.005
Selenium	0.044000	0.100000	0.059800	mg/L	<0.01
Zinc	8.000000	14.700000	11.562000	mg/L	<0.02

Group: Mercury	Minimum	Maximum	Average	Units	Reporting Limit
Mercury	0.007200	0.012800	0.009660	mg/L	<0.00003

Group: NH3(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Ammonia(as N)	150.00	320.00	206.00	mg/L	<0.05

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.27	4.70	2.96	%	
Volatile Total Solids	67.60	85.10	77.95	%	

Sampling Point: THC100**PRIMARY EFFLUENT 8**

Group:	Minimum	Maximum	Average	Units	Reporting Limit
ALK pH DS COND					
Alkalinity	255.00	293.00	274.00	mg/L	<1.6
Conductivity	1,090.00	1,090.00	1,090.00	μS/cm	<0.4
pH	7.30	7.30	7.30	SU	<0.10
Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	150.00	150.00	150.00	mg/L	
Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	131.00	234.00	169.75	mg/L	<2
Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	450.00	475.00	462.50	mg/L	<10
Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	0.50	12.00	4.24	mg/L	<0.5
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	92.00	228.00	163.78	mg/L	<2

Sampling Point: THC101**RAW SLUDGE 1**

Group:	Minimum	Maximum	Average	Units	Reporting Limit
TS					
Total Solids	1.67	3.72	2.53	%	
Volatile Total Solids	73.80	87.50	80.57	%	
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	9,860.00	9,860.00	9,860.00	mg/L	<2
Volatile Suspended Solids	76.00	76.00	76.00	%	

Sampling Point: THC102**RAW SLUDGE 2**

Group:	Minimum	Maximum	Average	Units	Reporting Limit
TS					
Total Solids	1.75	3.95	2.48	%	
Volatile Total Solids	55.30	88.51	78.72	%	

Sampling Point: THC103**RAW SLUDGE 3**

Group:	Minimum	Maximum	Average	Units	Reporting Limit
TS					
Total Solids	2.30	2.48	2.39	%	
Volatile Total Solids	80.00	84.78	82.39	%	
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	3,700.00	3,700.00	3,700.00	mg/L	<2
Volatile Suspended Solids	75.70	75.70	75.70	%	

Sampling Point: THC104**RAW SLUDGE 4**

Group:	Minimum	Maximum	Average	Units	Reporting Limit
TS					
Total Solids	1.70	5.60	2.49	%	
Volatile Total Solids	78.10	89.40	81.62	%	

Sampling Point: THC105**RAW SLUDGE 5**

Group:	Minimum	Maximum	Average	Units	Reporting Limit
TS					
Total Solids	0.97	4.40	2.22	%	
Volatile Total Solids	66.00	85.70	80.63	%	

Sampling Point: THC106 RAW SLUDGE 6

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.50	4.30	2.40	%	
Volatile Total Solids	60.70	87.50	80.04	%	
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	4,740.00	4,740.00	4,740.00	mg/L	<2
Volatile Suspended Solids	76.80	76.80	76.80	%	

Sampling Point: THC107 RAW SLUDGE 7

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.32	4.60	2.26	%	
Volatile Total Solids	64.30	84.30	79.56	%	
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	5,820.00	6,640.00	6,230.00	mg/L	<2
Volatile Suspended Solids	75.60	75.80	75.70	%	

Sampling Point: THC108 RAW SLUDGE 8

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.99	3.00	2.15	%	
Volatile Total Solids	70.20	86.00	80.52	%	

Sampling Point: THC109 DEWATERING CAKE # 413

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	17.90	29.33	23.70	%	
Volatile Total Solids	73.20	83.84	78.84	%	

Sampling Point: THC11 DEWATERING CAKE

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	20.66	26.56	23.61	%	
Volatile Total Solids	75.74	76.98	76.36	%	

Sampling Point: THC110 DEWATERING CENTRATE # 413

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	390.00	9,700.00	1,836.39	mg/L	<2

Sampling Point: THC111 DEWATERING CAKE # 414

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	18.00	29.60	21.60	%	
Volatile Total Solids	70.30	82.18	77.46	%	

Sampling Point: THC112 DEWATERING CENTRATE # 414

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	340.00	6,710.00	1,687.41	mg/L	<2

Sampling Point: THC12 DEWATERING CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
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Total Suspended Solids	710.00	2,970.00	1,716.67	mg/L	<2
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Sampling Point: THC13 AERATION TANK 1E

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,440.00	5,470.00	3,456.25	mg/L	<2
Volatile Suspended Solids	74.90	83.60	78.97	%	

Sampling Point: THC14 AERATION TANK 1W

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,830.00	5,360.00	3,555.63	mg/L	<2
Volatile Suspended Solids	75.10	88.00	79.33	%	

Sampling Point: THC15 AERATION TANK 2E

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,940.00	5,330.00	3,424.12	mg/L	<2
Volatile Suspended Solids	75.30	81.70	78.46	%	

Sampling Point: THC16 AERATION TANK 2W

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,368.00	5,830.00	3,329.33	mg/L	<2
Volatile Suspended Solids	75.60	81.20	78.60	%	

Sampling Point: THC17 AERATION TANK 3E

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,940.00	3,600.00	2,493.81	mg/L	<2
Volatile Suspended Solids	70.30	80.40	75.77	%	

Sampling Point: THC18 AERATION TANK 3W

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,960.00	3,350.00	2,456.50	mg/L	<2
Volatile Suspended Solids	72.80	79.30	75.93	%	

Sampling Point: THC19 AERATION TANK 4E

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	630.00	2,410.00	1,748.95	mg/L	<2
Volatile Suspended Solids	73.60	80.50	77.46	%	

Sampling Point: THC20 AERATION TANK 4W

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	780.00	3,100.00	2,306.32	mg/L	<2
Volatile Suspended Solids	71.80	80.70	77.03	%	

Sampling Point: THC21 AERATION TANK 5

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,260.00	5,970.00	4,085.71	mg/L	<2
Volatile Suspended Solids	73.40	81.40	77.13	%	

Sampling Point: THC22 AERATION TANK 6

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,810.00	2,980.00	2,315.91	mg/L	<2
Volatile Suspended Solids	75.70	97.80	80.56	%	

Sampling Point: THC23 AERATION TANK 7

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,170.00	4,490.00	2,478.10	mg/L	<2
Volatile Suspended Solids	73.40	83.10	78.45	%	

Sampling Point: THC24 AERATION TANK 8

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,780.00	4,550.00	2,820.48	mg/L	<2
Volatile Suspended Solids	72.40	83.70	77.18	%	

Sampling Point: THC25 AERATION TANK 9

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,200.00	7,500.00	5,020.59	mg/L	<2
Volatile Suspended Solids	72.80	80.50	76.88	%	

Sampling Point: THC26 AERATION TANK 10

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	3,500.00	8,410.00	5,596.47	mg/L	<2
Volatile Suspended Solids	72.70	82.00	76.66	%	

Sampling Point: THC27 AERATION TANK 11

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	3,110.00	7,320.00	4,958.95	mg/L	<2
Volatile Suspended Solids	72.40	80.40	77.02	%	

Sampling Point: THC28 AERATION TANK 12

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	3,480.00	8,550.00	5,548.75	mg/L	<2
Volatile Suspended Solids	72.60	80.10	76.57	%	

Sampling Point: THC29 AERATION TANK 13

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,260.00	6,110.00	4,598.57	mg/L	<2
Volatile Suspended Solids	72.20	80.70	77.88	%	

Sampling Point: THC30 AERATION TANK 14

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	3,850.00	7,480.00	5,263.64	mg/L	<2
Volatile Suspended Solids	75.70	79.70	77.62	%	

Sampling Point: THC31 AERATION TANK 15

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,890.00	5,920.00	3,978.95	mg/L	<2
Volatile Suspended Solids	77.00	81.70	78.73	%	

Sampling Point: THC32 AERATION TANK 16

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	3,480.00	8,720.00	4,939.09	mg/L	<2
Volatile Suspended Solids	74.90	79.40	77.68	%	

Sampling Point: THC38 HCTP FE SAMPLE

Group: Ferric Chloride	Minimum	Maximum	Average	Units	Reporting Limit
Absolute Difference	0.00	0.03	0.01		
Bill of Lading #	82,087,572.00	82,346,315.00	82,223,350.40		
Specific Gravity	1.24	1.38	1.30		
Supplier Specific Gravity	1.24	1.38	1.30		

Sampling Point: THC39 RETURN SLUDGE 1

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	3,140.00	14,210.00	8,050.00	mg/L	<2
Volatile Suspended Solids	73.90	80.20	77.58	%	

Sampling Point: THC40 RETURN SLUDGE 3

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,740.00	6,880.00	4,521.67	mg/L	<2
Volatile Suspended Solids	71.80	79.80	75.27	%	

Sampling Point: THC41 RETURN SLUDGE 5

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	6,540.00	14,600.00	9,401.11	mg/L	<2
Volatile Suspended Solids	73.40	77.70	75.86	%	

Sampling Point: THC42 RETURN SLUDGE 7

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,636.00	7,380.00	5,735.33	mg/L	<2
Volatile Suspended Solids	75.00	80.10	77.43	%	

Sampling Point: THC43 RETURN SLUDGE 9-12

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	7,240.00	16,710.00	12,566.50	mg/L	<2
Volatile Suspended Solids	72.70	78.80	75.82	%	

Sampling Point: THC44 RETURN SLUDGE 13-16

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	5,040.00	26,950.00	12,708.75	mg/L	<2
Volatile Suspended Solids	74.80	79.00	77.22	%	

Sampling Point: THC46 PRIMARY DIGESTED SLUDGE VA TANK 5

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	3.50	3.50	3.50	%	
Volatile Total Solids	79.50	79.50	79.50	%	

Sampling Point: THC48 PRIMARY DIGESTED SLUDGE VA TANK 7

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.20	2.20	2.20	%	
Volatile Total Solids	76.70	76.70	76.70	%	

Sampling Point: THC49 RETURN SLUDGE 2

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	4,930.00	14,030.00	8,776.25	mg/L	<2
Volatile Suspended Solids	74.40	79.20	77.36	%	

Sampling Point: THC50 RETURN SLUDGE 4

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	770.00	7,400.00	3,972.22	mg/L	<2
Volatile Suspended Solids	72.70	82.00	76.90	%	

Sampling Point: THC51 RETURN SLUDGE 6

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	3,460.00	9,990.00	5,570.00	mg/L	<2
Volatile Suspended Solids	73.90	82.70	77.83	%	

Sampling Point: THC52 RETURN SLUDGE 8

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	3,590.00	8,970.00	6,212.35	mg/L	<2
Volatile Suspended Solids	73.50	79.50	76.05	%	

Sampling Point: THC56 POLYMER DEWATERING MIXING TANK 1

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.29	0.29	0.29	%	

Sampling Point: THC57 POLYMER DEWATERING MIXING TANK 2

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.19	0.52	0.34	%	
Volatile Total Solids				%	

Sampling Point: THC58 POLYMER DEWATERING MIXING TANK 3

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.20	0.56	0.34	%	
Volatile Total Solids				%	

Sampling Point: THC60 DEWATERING CAKE # 311

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	18.10	30.50	23.21	%	
Volatile Total Solids	59.20	83.90	78.27	%	

Sampling Point: THC61**DEWATERING CENTRATE # 311**

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	23.56	23.56	23.56	%	
Volatile Total Solids	80.25	80.25	80.25	%	
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	210.00	33,650.00	4,887.62	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC62**DEWATERING CAKE # 314**

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	16.70	29.86	22.88	%	
Volatile Total Solids	66.00	83.00	78.22	%	

Sampling Point: THC63**DEWATERING CENTRATE # 314**

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	21.33	21.33	21.33	%	
Volatile Total Solids	80.61	80.61	80.61	%	
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	200.00	17,510.00	3,389.75	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC64**WAS THICKENING - CENTRIFUGE #1 - FEED**

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,610.00	9,070.00	5,340.00	mg/L	<2
Volatile Suspended Solids	75.30	81.40	78.35	%	

Sampling Point: THC65**WAS THICKENING - CENTRIFUGE #1 - CENTRATE**

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	6.07	6.07	6.07	%	
Volatile Total Solids	73.68	73.68	73.68	%	
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	200.00	8,620.00	1,485.87	mg/L	<2

Sampling Point: THC66**WAS THICKENING - CENTRIFUGE #1 - TWAS**

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.70	7.71	5.18	%	
Volatile Total Solids	43.00	77.70	73.78	%	
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	710.00	710.00	710.00	mg/L	<2

Sampling Point: THC67**WAS THICKENING - CENTRIFUGE #2 - FEED**

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	760.00	9,240.00	5,000.00	mg/L	<2
Volatile Suspended Solids	75.00	77.60	76.30	%	

Sampling Point: THC68**WAS THICKENING - CENTRIFUGE #2 - CENTRATE**

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	80.00	4,610.00	1,592.78	mg/L	<2
Volatile Suspended Solids	81.40	83.00	82.20	%	

Sampling Point: THC69 WAS THICKENING - CENTRIFUGE #2 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	3.70	8.77	5.43	%	
Volatile Total Solids	73.33	75.80	74.48	%	

Sampling Point: THC70 WAS THICKENING - CENTRIFUGE #3 - FEED

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	9,120.00	9,120.00	9,120.00	mg/L	<2
Volatile Suspended Solids	75.60	75.60	75.60	%	

Sampling Point: THC71 WAS THICKENING - CENTRIFUGE #3 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	180.00	4,990.00	1,813.33	mg/L	<2
Volatile Suspended Solids	88.50	88.50	88.50	%	

Sampling Point: THC72 WAS THICKENING - CENTRIFUGE #3 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	5.00	7.20	6.08	%	
Volatile Total Solids	71.40	73.80	72.37	%	

Sampling Point: THC74 WAS THICKENING - CENTRIFUGE #4 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	180.00	4,100.00	3,136.00	mg/L	<2

Sampling Point: THC75 WAS THICKENING - CENTRIFUGE #4 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	5.40	7.60	6.92	%	
Volatile Total Solids	71.80	72.50	72.15	%	

Sampling Point: THC77 WAS THICKENING - CENTRIFUGE #5 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	170.00	6,910.00	1,648.33	mg/L	<2
Volatile Suspended Solids	83.20	83.20	83.20	%	

Sampling Point: THC78 WAS THICKENING - CENTRIFUGE #5 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	4.40	6.51	5.50	%	
Volatile Total Solids	72.38	77.50	74.10	%	

Sampling Point: THC80 WAS THICKENING - CENTRIFUGE #6 - CENTRATE

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	3.00	3.00	3.00	%	
Volatile Total Solids	75.70	75.70	75.70	%	

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	230.00	11,760.00	2,249.44	mg/L	<2
Volatile Suspended Solids	81.40	84.80	83.10	%	

Sampling Point: THC81 WAS THICKENING - CENTRIFUGE #6 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.70	6.40	4.28	%	
Volatile Total Solids	66.70	83.30	75.05	%	

Sampling Point: THC82 DEWATERING CAKE # 315

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.30	26.90	22.79	%	
Volatile Total Solids	66.50	82.60	78.11	%	

Sampling Point: THC83 DEWATERING CENTRATE # 315

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	350.00	17,180.00	3,030.50	mg/L	<2

Sampling Point: THC84 DEWATERING CAKE # 310

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	15.90	29.10	22.65	%	
Volatile Total Solids	68.00	85.20	78.12	%	

Sampling Point: THC85 DEWATERING CENTRATE # 310

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	90.00	24,010.00	2,893.05	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THC90 WAS FEED from VAULT

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	960.00	13,010.00	9,543.67	mg/L	<2
Volatile Suspended Solids	74.10	77.80	76.10	%	

Sampling Point: THC91 POLYMER THICKENING

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.12	0.20	0.15	%	

Sampling Point: THC92 POLYMER THICKENING NEAT

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.29	1.34	1.00	%	

Sampling Point: THC93 PRIMARY EFFLUENT 1

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	228.00	290.00	260.00	mg/L	<1.6
Conductivity	1,090.00	1,560.00	1,303.33	µS/cm	<0.4
pH	7.20	7.40	7.33	SU	<0.10

Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
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Biochemical Oxygen Demand (BOD)	88.00	88.00	88.00	mg/L	<2
Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	86.00	318.00	197.08	mg/L	<2
Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	275.00	465.00	386.67	mg/L	<10
Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	3.20	6.20	5.13	mg/L	<0.5
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	20.00	308.00	170.67	mg/L	<2

Sampling Point: THC94 PRIMARY EFFLUENT 2

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	228.00	290.00	259.33	mg/L	<1.6
Conductivity	1,090.00	1,560.00	1,300.00	μS/cm	<0.4
pH	7.20	7.40	7.33	SU	<0.10
Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	1.00	125.00	63.00	mg/L	<2
Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	115.00	267.00	177.58	mg/L	<2
Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	290.00	490.00	401.67	mg/L	<10
Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	4.10	6.30	5.50	mg/L	<0.5
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	12.00	300.00	183.89	mg/L	<2

Sampling Point: THC95 PRIMARY EFFLUENT 3

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	289.00	289.00	289.00	mg/L	<1.6
Conductivity	1,250.00	1,250.00	1,250.00	μS/cm	<0.4
pH	7.40	7.40	7.40	SU	<0.10
Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	1.00	1.00	1.00	mg/L	<2
Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	204.00	204.00	204.00	mg/L	<2
Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	515.00	515.00	515.00	mg/L	<10
Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	1.90	6.30	4.10	mg/L	<0.5
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	104.00	204.00	172.00	mg/L	<2

Sampling Point: THC96 PRIMARY EFFLUENT 4

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	228.00	288.00	261.33	mg/L	<1.6
Conductivity	1,110.00	1,550.00	1,300.00	μS/cm	<0.4
pH	7.10	7.30	7.23	SU	<0.10
Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit

Biochemical Oxygen Demand (BOD)	1.00	101.00	51.00	mg/L	<2
Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	76.00	482.00	222.84	mg/L	<2
Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	280.00	470.00	398.33	mg/L	<10
Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	0.50	8.20	2.98	mg/L	<0.5
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	80.00	320.00	176.15	mg/L	<2

Sampling Point: THC97 PRIMARY EFFLUENT 5

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	258.00	293.00	275.50	mg/L	<1.6
Conductivity	1,100.00	1,100.00	1,100.00	μS/cm	<0.4
pH	7.30	7.30	7.30	SU	<0.10
Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	174.00	174.00	174.00	mg/L	
Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	115.00	208.00	160.54	mg/L	<2
Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	425.00	460.00	442.50	mg/L	<10
Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	1.20	11.00	7.07	mg/L	<0.5
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	44.00	208.00	137.51	mg/L	<2

Sampling Point: THC98 PRIMARY EFFLUENT 6

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	251.00	294.00	272.50	mg/L	<1.6
Conductivity	1,090.00	1,090.00	1,090.00	μS/cm	<0.4
pH	7.30	7.30	7.30	SU	<0.10
Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	157.00	157.00	157.00	mg/L	
Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	91.00	230.00	165.31	mg/L	<2
Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	480.00	550.00	515.00	mg/L	<10
Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	0.62	11.00	6.44	mg/L	<0.5
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	60.00	256.00	146.30	mg/L	<2

Sampling Point: THC99 PRIMARY EFFLUENT 7

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	256.00	285.00	270.50	mg/L	<1.6
Conductivity	1,100.00	1,100.00	1,100.00	μS/cm	<0.4
pH	7.30	7.30	7.30	SU	<0.10
Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit

Biochemical Oxygen Demand (BOD)	142.00	142.00	142.00	mg/L	
Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	98.00	255.00	163.57	mg/L	<2
Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	400.00	445.00	422.50	mg/L	<10
Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	0.50	9.90	4.34	mg/L	<0.5
Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	80.00	236.00	130.26	mg/L	<2

Note: Averages are based on raw data !

Note: Minimum values are normally reported as < the reporting limit for that parameter. !

Note: Average is calculated for ECOLI, if Geometric Mean is required ask the lab for a separate data file.

Appendix F

Flow Meter Calibration/Maintenance Record

Highland Creek Treatment Plant
Inflow measurement
Calibration Report

Date: 04/25/2015

Type: Parshall Flume , Ultrasonic Flow Transd.

Location: Phase 1 Primary 9-10

Instrument No. PRM-FIT-5112

Temperature Compensation : Yes

Exponential Factor: U = 1.587

Maximum Head : 58.67

Range: 0-1600 litres /sec

Output : 4-20 mA

Throat size : 5 Feet (152.4 c.m)

Blanking Distance: 62.33 cm

Overall Distance : 121cm

Range %	Head cm	Cal. mA	Output L/sec	Actual mA	Local L/sec	Actual Remote
0	0	4.00	0	4.12	4	0
8.25	12.19	5.32	132	5.66	157	0.16
22.44	22.86	7.59	359	7.76	370	0.37
32.57	28.96	9.21	521	9.55	549	0.55
60.38	42.68	13.66	966	13.91	991	0.99
98.13	57.91	19.7	1570	19.86	1595	1.60
100	58.67	1600	20.12	20.12	1629	1.63

Aux.. Equipment Used : Target Transducer

Model
XRS-5C SIEMENS MILTRONICS

Milltronics Programmer

OCM-3

General comments: Parshall Flume cleaned and inspected, check zero readings, still have flow of 4 litres per seconds. this is fine. Calibration reading within acceptable limit.

Calibrate by: Lam Chu

**Highland Creek Treatment Plant
Inflow measurement
Calibration Report**

Date: 04/18/2015

Type: Parshall Flume , Ultrasonic Flow Transd.

Location: Phase 4 Primary 11-12

Instrument No. PRM-FIT-5142

Temperature Compensation : Yes

Exponential Factor: U = 1.607

Maximum Head : 43.43cm

Range: 0-1600 litres /sec

Output : 4-20 mA

Throat size : 8 Feet

Blanking Distance: 77.07 cm

Overall Distance : 120.5cm

Range %	Head cm	Cal. mA	Output L/sec	Actual mA	Local L/sec	Actual Remote
0	0	4.00	0	4.11	5	0
8.25	9.14	5.30	130	5.47	152	0.15
16.188	13.72	6.50	250	6.71	271	0.27
21.875	16.76	7.5	350	7.68	367	0.37
31.875	21.34	9.1	510	9.28	533	0.53
61.25	32.00	13.8	980	14.02	1003	1.00
95.625	42.68	19.3	1530	19.41	1542	1.54
100	43.43	20	1600	20.08	1618	1.62

Make
Aux.. Equipment Used : Target Transducer

Model
XRS-5C SIEMENS MILTRONICS

Milltronics Programmer

OCM-3

General comments: Parshall Flume cleaned and inspected, check zero readings, still have flow of 5 litres per seconds. this is fine. Calibration reading within acceptable limit.

Calibrate by: Lam Chu

**Highland Creek Treatment Plant
Inflow measurement
Calibration Report**

Date: 06/20/2015

Type: Parshall Flume , Ultrasonic Flow Transd.

Location: Old Plant Primary 1-4

Instrument No. PRM-FIT-5002

Temperature Compensation : Yes

Exponential Factor: U = 1.550

Maximum Head : 79.43

Range: 0-1000 litres /sec

Output : 4-20 mA

Throat size : 2 Feet

Blanking Distance: 57.07 cm

Overall Distance : 136.5cm

From wall	Range %	Head cm	Cal. mA	Output L/sec	Actual mA	Local L/sec	Actual Remote
53 6/8"	0	0	4.00	0	4.03	0	0.00
45 7/8"	11	19.81	5.76	110	5.75	106	0.11
41 6/8"	22	30.48	7.52	220	7.70	228	0.23
38"	34	39.62	9.44	340	9.53	343	0.34
30 2/8"	64	59.57	14.24	640	14.20	634	0.64
29 6/8"	66	60.96	14.56	660	14.56	654	0.66
22 3/8"	100	79.43	20	1000	19.83	987	0.99

Aux.. Equipment Used : Target Transducer

Make Milltronics Programmer Model ST-25B or ST25C OCM grade

Milltronics Programmer

OCM-3

General comments: Parshall Flume cleaned and inspected, check zero readings, Calibration reading within acceptable limit.

Calibrate by: Lam Chu, Peter Wang, Brad Heard

**Highland Creek Treatment Plant
Inflow measurement
Calibration Report**

Date: 06/20/2015

Type: Parshall Flume , Ultrasonic Flow Transd.

Location: Old Plant Primary 5-8

Instrument No. PRM-FIT-5003

Temperature Compensation : Yes

Exponential Factor: U = 1.550

Maximum Head : 79.43

Range: 0-1000 litres /sec

Output : 4-20 mA

Throat size : 2 Feet

Blanking Distance: 57.07 cm

Overall Distance : 136.5cm

From wall	Range %	Head cm	Cal. mA	Output L/sec	Actual mA	Local L/sec	Actual Remote
53 6/8"	0	0	4.00	0	3.91	1	0.03
45 7/8"	11	19.81	5.76	110	5.90	126	0.12
41 6/8"	22	30.48	7.52	220	7.72	240	0.24
38"	34	39.62	9.44	340	9.67	361	0.36
30 2/8"	64	59.57	14.24	640	14.43	659	0.66
29 6/8"	66	60.96	14.56	660	14.82	684	0.68
22 3/8"	100	79.43	20	1000	20.11	1016	1.00

Aux.. Equipment Used : Make Target Transducer

Model XRS-5C SIEMENS MILTRONICS

Milltronics Programmer

OCM-3

General comments: Parshall Flume cleaned and inspected, check zero readings, Calibration reading within acceptable limit.

Calibrate by: Lam Chu, Peter Wang, Brad Heard

Appendix H

Effluent Suspended Solids Action Plan

Correspondence



Toronto Water
Wastewater Treatment

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Highland Creek Treatment Plant

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April 20th, 2005

Mr. Raymond Valentine
Senior Environmental Officer
Ministry of the Environment
Central Region
Toronto District Office
5775 Yonge Street
8th Floor
Toronto, Ontario
M2M 4J1

RE: Highland Creek Treatment Plant - Effluent Suspended Solids Compliance

Dear Mr. Valentine:

Further to the discussions that occurred last year, this report outlines the cause and identifies the projects that have been initiated to help achieve continuous compliance with respect to the effluent suspended solids concentration at the Highland Creek Treatment Plant. For 2004, the annual average daily concentration and loading rate of effluent suspended solids at the Highland Creek Treatment Plant were 29 mg/L and 4721 kg/day respectively.

Root Cause

The solids inventory in the plant had been high in the month of December 2003. However, this situation was being managed and by the end of December, solids concentrations were returning to normal levels. Unfortunately the adverse weather conditions that occurred throughout the month of January 2004 caused some of the clarifier mechanisms in the Final Settling Tanks to freeze periodically and fail. Despite the ongoing physical efforts to manually break the ice that was forming on the clarifier surfaces, poor solids capture resulted. Compounding this situation was the fact that the Sludge Disposal Building was shut down for three consecutive days from January 14th to 16th inclusive, which caused the solids inventory to increase once again. Other operational problems in the Sludge Disposal Building, mainly related to aging dewatering and incineration equipment, occurred on February 17th to 19th, March 10th, April 26th, May 19th, August 12th, November 22nd and December 21st and 22nd. Together, these process interruptions resulted in lost throughput totaling approximately 395 dry tonnes. During these times, this sludge remained in our primary clarifiers and overloaded the secondary treatment. Consequently, the characteristics of the mixed liquor varied and the final effluent quality was prone to periods of poor settling.

Action Plan

There are a number of actions presently in place, both long term and short term, to help achieve continuous compliance with respect to the effluent suspended solids concentration in the future. These include the following:

1. Biosolids & Residuals Master Plan (BRMP)

The preferred plant strategy to manage the Highland Creek Treatment Plant biosolids is to continue with the on-site incineration and replace the existing multiple hearth incinerators with fluidized bed units. The implementation plan, as outlined in the City of Toronto Biosolids & Residuals Master Plan Executive Summary (September 2004), was to initiate the design and construction in 2005, with completion within 4 to 6 years. The 30-day public review period for this master plan, required under the Class Environmental Assessment Master Planning process, was scheduled to close on September 16th, 2004 but has been extended to late in 2005. Until the public review is complete, the BRMP cannot be brought to the Works Committee of City Council for approval and the implementation cannot begin.

2. Additional Sludge Dewatering Capacity

Our Capital Budget presently includes approved funding to install two (2) new dewatering centrifuges in the Sludge Disposal Building. The technical specification for these units has been completed and they will be purchased in 2005. A separate installation contract will be tendered early in 2006 and completed in early 2007.

3. Waste Activated Sludge Thickening Improvements

Our Capital Budget presently includes approved funding to install Waste Activated Sludge (WAS) thickening centrifuges in place of the decommissioned Dissolved Air Flotation Tanks. Despite study recommendations received from a consulting engineer to continue co-settling the WAS in the primary clarifiers and optimize performance, we believe that separate handling of the WAS will improve plant performance in a more consistent manner. Modifications and other preparatory work in the existing building will begin this year along with the development of the technical specifications for the thickening centrifuges. The centrifuge units will then be purchased in 2006. A separate installation contract will be tendered early in 2007 and completed in 2008. In the meantime, we will continue to co-settle in the primary clarifiers and optimize the performance where possible.

4. Optimization of Anaerobic Digestion Tanks

The four new anaerobic digestion tanks are in service and the commissioning activities are nearly complete. We will be monitoring the operation closely in order to optimize the process performance and determine whether the solids reduction is having a positive impact on our ability to effectively manage the sludge disposal given the current incineration and dewatering equipment.

5. Incineration Operation

Normally, one incinerator is in service while the other unit is out of service for maintenance. Where possible, our strategy to help reduce high sludge inventory has been to extend the overlapping run times when one unit is being taken out of service and the other is being brought into service. This strategy of increasing the throughput is limited however, given the age and condition of the incinerators and related ancillary equipment. We are not always able to achieve extended periods of overlapping operation due to maintenance requirements.

If you require any additional information, please call me at (416) 392-4762.

Yours truly,

A handwritten signature in black ink, appearing to read "M. Shigeishi". The signature is fluid and cursive, with the first letter of the first name being a large, stylized capital 'M'.

M. Shigeishi, P. Eng
Plant Manager
Highland Creek Treatment Plant

cc. L. Di Gironimo, Director – Wastewater Treatment



Ministry of the
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June 13, 2005

Toronto Works & Emergency Services
Toronto Water - Wastewater Treatment
Highland Creek Treatment Plant
51 Beechgrove Drive
Toronto, Ontario M1E 3Z3

Attention: Mr. Martin Shigeishi, P. Eng.
Plant Manager

Dear Mr. Shigeishi:

Re: Highland Creek Treatment Plant - Effluent Suspended Solids Compliance

Thank you for your letter of April 20, 2005, identifying the causes of, and the Action Plan to deal with, the exceedence of the suspended solids limit for 2004 in the plant effluent.

The annual average final effluent suspended solids limit of 25 mg/l in Certificate of Approval No. 1477-595KKC, was exceeded by an annual average for 2004 of 29 mg/l.

This constitutes a contravention of Section 53(5) of the Ontario Water Resources Act, which states,

No person shall use or operate sewage works for which an approval is required under subsection (1) unless the required approval has been granted and complied with.

It is the Ministry's intention to enshrine the City's Action Plan in a voluntary compliance program. In consideration that the time horizons for the items in the Action Plan are in terms of years, it is therefore required that copies of:

- a) your April 20, 2005 letter to me,
- b) this letter to you, and

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- c) annual progress reports on each item in the Action Plan be bound in future Annual Reports for the Highland Creek Treatment Plant, until all the action items have been completed.

The items identified in the Action Plan are:

1. **Biosolids and Residuals Master Plan (BRMP)**
Continuation of on-site incineration and replacement of the existing multiple hearth incinerators with fluidized bed units, as proposed in the Biosolids and Residuals Master Plan, and to be ratified by City Council.
2. **Additional Sludge Dewatering Capacity**
Purchase and installation of two (2) new dewatering centrifuges in the Sludge Disposal Building.
3. **Waste Activated Sludge Thickening Improvements**
Building modifications, purchase, and installation of Waste Activated Sludge thickening centrifuges.
4. **Optimization of Anaerobic Digestion Tanks**
Completion of commissioning of the new anaerobic digestion tanks, and optimization of process performance.
5. **Incineration Operation**
Extension of overlapping of run times for the existing incinerators, as far as practicable. (Reported as a percentage of the year when overlapping occurred)

I look forward to receiving your letter of acknowledgment and intention to comply with the terms of this voluntary compliance program, by June 30, 2005.

Thank you for your attention to this matter.

Yours truly,



Ray Valentine
Senior Environmental Officer

cc. K.Wilson - MOE, TDO