



# **NORTH TORONTO WASTEWATER TREATMENT PLANT**

## **2017 Annual Report**



**March 31, 2018**



## EXECUTIVE SUMMARY

The North Toronto Treatment Plant (NTP) is one of four wastewater treatment facilities operated by the City of Toronto. This facility, located in the Don Valley, normally operates at a controlled flow rate with a rated capacity of 45,500 m<sup>3</sup>/day, or 45.5 ML/day, and serves an equivalent population of approximately 55,000. The North Toronto Treatment Plant discharges to the Don River and operates under the Certificate of Approval (C of A) No. 7665-7NWMH2, issued on March 26, 2009.

The average daily influent flow rate in 2017 was 15.7 ML/day. Influent concentrations of Biochemical Oxygen Demand (BOD<sub>5</sub>), Total Phosphorus (TP) and Total Suspended Solids (TSS) averaged 192 mg/L, 5.2 mg/L and 276 mg/L, respectively.

North Toronto Treatment Plant achieved the following effluent quality and loading rates in 2017 in comparison to C of A limits:

	Certificate of Approval <sup>1</sup>	2017 Final Effluent
Total Suspended Solids (TSS)	25 mg/L	3.4 mg/L
Carbonaceous Biochemical Oxygen Demand (CBOD <sub>5</sub> )	25 mg/L	1.7 mg/L
Total Phosphorus (TP)	1.0 mg/L	0.5 mg/L
Escherichia Coli (E. Coli) <sup>2</sup>	200 CFU/100mL	5 CFU / 100 mL
pH	6.0 - 9.5	7.3
Total Chlorine Residual (Dechlorination)	0.02 mg/L	SBS Presence detected <sup>3</sup>
TSS Loading Rate	1,137.5 kg/day	52.7 kg/day
CBOD <sub>5</sub> Loading Rate	1,137.5 kg/day	26.5 kg/day
TP Loading Rate	45.5 kg/day	8.5 kg/day

<sup>1</sup> Referenced from C of A No. 7665-7NWMH2 issued on March 26, 2009.

<sup>2</sup> Arithmetic mean of monthly geometric mean data.

<sup>3</sup> Sodium Bisulphite (SBS) Presence (P) detected. The presence of Bisulphite Residual confirms a TCR of 0.0 mg/l.

Sludge (raw sludge and waste activated sludge) generated at the North Toronto Treatment Plant is transferred to the North Toronto Trunk Sewer and then conveyed by gravity to the Ashbridges Bay Treatment Plant (ABTP) via the North Toronto Sanitary Trunk Sewer (STS) to the Coxwell STS for further treatment and disposal. An average of 399 m<sup>3</sup> at 0.97% Total Solids (TS) of sludge was transferred in 2017.

Ferrous chloride consumption for phosphorus removal was 8.98 tonnes as iron (Fe) per 1000 ML of wastewater treated. Sodium hypochlorite (12%) consumption for effluent disinfection totalled 21.72 m<sup>3</sup> per 1000 ML treated. Sodium bisulphite (SBS) (38%) consumption for effluent dechlorination totalled 5.94 m<sup>3</sup> per 1000 ML treated.

The plant continued with various capital projects. Notable projects included Combined Sewer Overflow (CSO) Tank improvements, electrical upgrades, and a process upgrade study. A variety of scheduled, preventative, predictive and reactive maintenance was performed, including annual calibration of effluent monitoring equipment.

Total annual consumption for potable water and hydro was 59,600 m<sup>3</sup> and 2.62M kWh, respectively. Plant operating costs for 2017 totalled \$1.93M. In 2017, the North Toronto Treatment Plant had 9.5 employees. There were three health and safety incidents and 19 lost time days due to work related injuries in 2017.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	i
TABLE OF CONTENTS .....	iii
GLOSSARY OF ABBREVIATIONS .....	v
<b>1. INTRODUCTION .....</b>	<b>1</b>
<b>2. PLANT PROCESS OVERVIEW .....</b>	<b>2</b>
2.1. Influent.....	2
2.2. Preliminary Treatment.....	2
2.3. Primary Treatment.....	2
2.4. Secondary Treatment.....	2
2.5. Final Effluent .....	3
2.6. Solids Handling.....	3
2.7. Combined Sewer Overflow Detention System.....	3
<b>3. 2017 PROCESS SUMMARY.....</b>	<b>4</b>
3.1. Process Parameters.....	4
3.2. Biosolids Management .....	6
3.3. Chemical Usage .....	6
3.4. Bypasses, Overflows and Spills .....	6
3.5. Complaints .....	7
3.6. Effluent Quality Assurance or Control Measures.....	7
<b>4. CAPITAL PROJECTS.....</b>	<b>8</b>
<b>5. MAINTENANCE .....</b>	<b>9</b>
<b>6. UTILITIES.....</b>	<b>11</b>
<b>7. ADMINISTRATION.....</b>	<b>12</b>
7.1. Operations and Maintenance Costs.....	12
7.2. Human Resources .....	13
7.3. Occupational Health & Safety .....	13
7.4. Staff Training and Development .....	14
7.5. Utility Operator Certification .....	15
7.6. MOECC/MOL Correspondence .....	16

## APPENDICES

**APPENDIX A – Plant Schematic**

**APPENDIX B – Influent and Effluent 2017 Performance Charts**

**APPENDIX C – Historical Performance Data**

**APPENDIX D – Influent and Effluent Metal Concentrations**

## LIST OF TABLES

Table 1: Final Effluent Parameters .....	4
Table 2: Process Summary.....	5
Table 3: Chemical Usage Summary .....	6
Table 4: Capital Projects .....	8
Table 5: Summary of Effluent Monitoring Equipment Calibration and Maintenance .....	9
Table 6: Average Unit and Total Utility Cost .....	11
Table 7: Plant Staffing.....	13
Table 8: Wastewater Treatment Certificates .....	16
Table 9: Correspondence submitted to the MOECC .....	16

## LIST OF FIGURES

Figure 1: Monthly Utility Consumption (Water, Hydro).....	11
Figure 2: Operations and Maintenance Cost Breakdown .....	12
Figure 3: North Toronto Health and Safety Injury Summary .....	14

## GLOSSARY OF ABBREVIATIONS

AAC	Annual Average Concentration
ABTP	Ashbridges Bay Treatment Plant
BOD <sub>5</sub>	Five-Day Biochemical Oxygen Demand
CBOD <sub>5</sub>	Five-Day Carbonaceous Biochemical Oxygen Demand
CEU	Continuing Education Units
CFU	Colony Forming Units
C of A	Certificate of Approval
CSO	Combined Sewer Overflow
DAF	Dissolved Air Flotation
E. Coli	Escherichia Coli
ECA	Environmental Compliance Approval
Fe	Iron
NTTP	North Toronto Treatment Plant
HP	Horsepower
HRT	Hydraulic Retention Time
kg	kilogram
kWh	Kilowatt-hour
M	Million
MAC	Monthly Average Concentration
MGMD	Monthly Geometric Mean Concentration
MOECC	Ministry of Environment and Climate Change
MWh	Megawatt-hour
m <sup>3</sup>	Cubic metre
m <sup>3</sup> /day	Cubic metre per day
mA	Milliamps
mg/L	Milligrams per litre
mL	Millilitre
ML	Megalitre
NTTP	North Toronto Treatment Plant
No.	Number
Q	Flow Rate
RAS	Return Activated Sludge
SBS	Sodium Bisulphite
SBS (P)	Sodium Bisulphite Presence
SS	Suspended Solids
TCR	Total Chlorine Residual
TP	Total Phosphorus
TS	Total Solids
TSS	Total Suspended Solids
TVS	Total Volatile Solids
TWAS	Thickened Waste Activated Sludge
µg/L	Micrograms per litre
WAS	Waste Activated Sludge

**Definitions**

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

$$\text{Aeration Loading} = \left( \frac{\text{kg cBOD}}{\text{m}^3 \text{ aeration capacity}} \right) = \frac{(Q_{\text{Primary Effluent}} + Q_{\text{RAS}}) \times [\text{cBOD}_5_{\text{primary effluent}}]}{V_{\text{aeration Tanks}}}$$



## 1. INTRODUCTION

The North Toronto 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 21 Redway Road, in the Don Valley on a 27.2 ha site serving a sewershed of approximately 3,060 ha. This area contains an estimated connected population of 55,000. The North Toronto Treatment Plant operates at a controlled flow rate and has a rated capacity of 45,500 m<sup>3</sup>/day, or 45.5 ML/day. Wastewater in excess of the controlled rate is diverted to the North Toronto Trunk Sewer and then conveyed by gravity to the Ashbridges Bay Treatment Plant via the Coxwell STS.

Major treatment processes include screening and grit removal, primary treatment, secondary treatment, phosphorus removal, effluent disinfection and dechlorination. Treated effluent is discharged to the Don River. Co-settled sludges (raw sludge and waste activated sludge) are transferred to the Ashbridges Bay Treatment Plant for disposal via the Coxwell STS. Numerous auxiliary systems are required for proper operation of many plant processes including: potable water, process water, heating, ventilation and air conditioning (HVAC), electrical power distribution, and chemicals.

The Ministry of the Environment and Climate Control (MOECC) has classified the North Toronto Treatment Plant as a Class III wastewater treatment facility under Regulation 129/04. The facility operates under the C of A No. 7665-7NWMH2 issued on March 26, 2009.

This report is a summary of plant operations and performance in 2017. Highlights of the report include a discussion of effluent quality and summaries of process operations, maintenance, chemical and utility consumption, capital projects, operational costs and human resources.

## 2. PLANT PROCESS OVERVIEW

A description of the plant process is included below. A Plant process flow diagram is available in Appendix A. Additional information on the plant's process can be found on the City of Toronto website<sup>1</sup>.

### 2.1. Influent

Wastewater from the Forman-Yonge Combine Trunk Sewer and Millwood Combine Trunk Sewer flows to the plant via a common sewer.

### 2.2. Preliminary Treatment

Raw wastewater enters the Headworks for grit and screenings removal. There is one automatic climber type bar screen that removes rags and large pieces of debris. Grit channels located downstream of the screen remove sand, gravel and similar heavy inorganic material by gravity separation. The removed grit and screenings are hauled to a sanitary landfill site.

### 2.3. Primary Treatment

Primary Treatment occurs in the Primary Clarification Tanks, where the flow velocity of the wastewater is reduced to allow heavier solids to settle to the bottom. There are four Primary Clarification Tanks. Sludge collectors in the tanks sweep the settled sludge, called "primary" or "raw" sludge, into sludge hoppers at the bottom of the tank. Floating solids, called "scum", are drained periodically from the top of the tanks. The primary sludge and scum are then pumped out to Ashbridges Bay Treatment Plant via the North Toronto STS to the Coxwell STS for further treatment. The wastewater, called "primary effluent", continues onto secondary treatment.

### 2.4. Secondary Treatment

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

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<sup>1</sup> <https://www.toronto.ca/services-payments/water-environment/managing-sewage-in-toronto/wastewater-treatment-plants-and-reports/>

The mixed liquor from the Aeration Tanks flows to five large Final Clarification Tanks, where the activated sludge is allowed to settle. A controlled quantity of this sludge is returned to the Aeration Tanks as RAS in order to maintain a sufficient biomass concentration. The excess is removed as waste activated sludge (WAS), a portion of which is diverted to the Primary Clarification Tanks to co-settle with the raw sludge.

## **2.5. Final Effluent**

Sodium hypochlorite is used to disinfect and kill pathogens in the final effluent. Sodium bisulphite (SBS) is added after disinfection to remove excess chlorine from the wastewater (i.e. dechlorinate); helping to protect the aquatic environment. The final effluent is discharged into the Don River. As required by Condition (9)(5) of the C of A, SBS is being monitored as a surrogate to Total Chlorine Residual (TCR). Presence of Bisulphite residual confirms that chlorine has been removed to a level of 0.0 mg/L TCR.

## **2.6. Solids Handling**

All primary sludge, WAS, and scum from the Primary and Secondary Clarification Tanks, collectively called "sludge", is transferred to the Ashbridges Bay Treatment Plant for further treatment.

## **2.7. Combined Sewer Overflow Detention System**

The North Toronto Combined Sewer Overflow (CSO) Detention System operates under Environmental Compliance Approval (ECA) No.2854-9H4JKF, issued May 2, 2014. The CSO Tanks provide holding capacity for combined sewer overflows resulting from wet weather flow conditions. After a wet weather event, the collected CSO is pumped to the Ashbridges Bay Treatment Plant for treatment. Under excessive flow conditions, the CSO Tanks will overflow into the outfall to the Don River. The CSO Tank Improvements Project commenced in 2014 and the tanks have been out of service since then. The CSO Tank Improvements Project is in its final stage with anticipated completion in 2018.

### 3. 2017 PROCESS SUMMARY

#### 3.1. Process Parameters

In 2017, the North Toronto Treatment Plant continued to produce a high quality effluent. A summary of key final effluent parameters against the C of A objectives and limits are shown in Table 1. Regulated parameters are highlighted. Influent and effluent performance charts are available in Appendix B. Historical performance data is included in Appendix C.

**Table 1: Final Effluent Parameters**

Parameter	cBOD <sub>5</sub> (mg/L)	TSS (mg/L)	TP (mg/L)	Chlorine Residual <sup>1</sup> (mg/L)	E-Coli (count/100mL)
<i>January</i>	1.4	3.0	0.4	SBS (P)	1
<i>February</i>	2.4	2.8	0.7	SBS (P)	4
<i>March</i>	2.5	1.5	0.6	SBS (P)	1
<i>April</i>	1.0	1.3	0.6	SBS (P)	2
<i>May</i>	2.0	2.8	0.6	SBS (P)	5
<i>June</i>	1.8	2.3	0.6	SBS (P)	1
<i>July</i>	1.0	3.8	0.4	SBS (P)	3
<i>August</i>	1.0	4.8	0.6	SBS (P)	2
<i>September</i>	1.0	4.8	0.6	SBS (P)	5
<i>October</i>	1.0	3.8	0.6	SBS (P)	17
<i>November</i>	3.0	5.1	0.4	SBS (P)	4
<i>December</i>	2.1	4.2	0.5	SBS (P)	8
<b>Annual Average</b>	1.7	3.4	0.5	N/A	5
<b>Loading (kg/d)</b>	26.5	52.7	8.5	N/A	N/A
<b>Removal Efficiency<sup>2</sup> (%)</b>	99	99	89	N/A	N/A
C of A Requirements <sup>2,3</sup>					
Effluent Objective <sup>2,4</sup>	AAC: 15 mg/L	AAC: 15 mg/L	MAC: 0.9 mg/L	MAC: 0 mg/L	MGMD: 150 CFU/100 mL
Effluent Limit <sup>2,4</sup>	AAC: 25 mg/L	AAC: 25 mg/L	MAC: 1 mg/L	MAC: 0.02 mg/L	MGMD: 200 CFU/100 mL
Average Waste Loading Limit <sup>2,4</sup>	5475 kg/d	5475 kg/d	219 kg/d	N/A	N/A

<sup>1</sup>SBS Presence (P) detected. The presence of Bisulphite Residual confirms a TCR of 0.0 mg/L.

<sup>2</sup>Referenced from C of A No. 7665-7NWMH2 issued on March 26, 2009.

<sup>3</sup>The C of A effluent objective and limit for pH is 6.5 to 8.5 and 6.0 to 9.5 respectively, inclusive, at all times. Effluent pH in 2017 was within the required objective and limit.

<sup>4</sup>AAC refers to Annual Average Concentration, MAC refers to Monthly Average Concentration, and MGMD refers to Monthly Geometric Mean Density.

Influent and Final effluent concentrations of 10 select heavy metals have been included in Appendix D. Any discharge into City sewers must meet the sewer use By-law limits. Final effluent concentrations are presented to assess the treatment plant's removal capacity.

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

**Table 2: Process Summary**

Parameter	Units	2017	2016	2015
<b>Influent</b>				
Flow	ML/day	15.7	17.6	20.0
Total Annual Flow	ML	5,731	6,422	7,281
Total Suspended Solids (TSS)	mg/L	276	286	268
Biochemical Oxygen Demand (BOD)	mg/L	192	197	206
Total Phosphorus (TP)	mg/L	5.2	5.5	5.5
<b>Preliminary Treatment</b>				
Grit and Screenings	kg/day	295.0	306.6	396.4
<b>Primary Treatment</b>				
TSS	mg/L	86	100	116
cBOD5	mg/L	69	89	89
<b>Secondary Treatment</b>				
Aeration Loading	kg cBOD <sub>5</sub> / m <sup>3</sup> /day	0.11	0.15	0.17
Mixed Liquor Suspended Solids	mg/L	2351	2439	2317
<b>Solids Handling</b>				
Sludge to ABTP - Flow	ML/day	0.40	0.48	0.32
Sludge to ABTP - TS	%	0.97	0.96	1.6

To facilitate rehabilitation and refurbishment of the facility huts used to cover Primary and Final Clarification Tank equipment, the following was out of service in 2017: Final Clarification Tanks No. 3-5 and Primary Clarification Tank No.1 from September to November, 2017; and Final Clarification Tanks No. 1-2 and Primary Clarification Tank No. 2 from November 2017 to February 2018. As a result, the influent flows to the plant were restricted and sewage volumes decreased.

The North Toronto Treatment Plant encountered no chronic abnormal operating problems in 2017. One spill event at the CSO Detention System on July 20, 2017, caused the North Toronto Treatment Plant to be shut down in order to protect treatment processes from flooding. Influent flows were diverted to Ashbridges Bay Treatment Plant temporarily until the event was over. The CSO Detention System is located on the plant site but operates under a different ECA No.2854-9H4JKF, issued May 2, 2014. The system has been undergoing upgrades which are not yet complete.

In 2017, the plant continued to produce a high quality effluent which surpassed requirements of the effluent objectives as described in Condition 6 of the plant's C of A. This was achieved through continuous improvement in operations and maintenance of treatment processes, and infrastructure delivery. The plant also met Federal Government effluent monitoring requirements for un-ionized ammonia and acute toxicity.

### 3.2. Biosolids Management

All sludge (primary sludge, WAS, and scum) generated at the North Toronto Treatment Plant is transferred to the Ashbridges Bay Treatment Plant for further treatment. The sludge generated during 2017 averaged 399 m<sup>3</sup>/day (0.97% TS). The flow projections for 2018 do not exceed the rated plant capacity of 45.5 ML/day and are expected to generate a sludge volume that will be +/-5% of the given volume for 2017.

### 3.3. Chemical Usage

Several chemicals are used during the treatment process at the plant. Table 3 outlines the chemical consumption and cost based on 1000ML of wastewater treated in the facility for the past three years. Costs listed are plus applicable taxes.

**Table 3: Chemical Usage Summary**

Process	Chemical	2017 Usage (/1000ML treated)	2017 Unit Cost	2016 Usage (/1000ML treated)	2016 Unit Cost	2015 Usage (/1000ML treated)	2015 Unit Cost
Phosphorus Removal	Ferrous Chloride as Fe	8.98 tonnes	\$800/ tonne Fe	7.70 tonnes	\$800/ tonne Fe	6.11 tonnes	\$815/ tonne Fe
Disinfection	Sodium Hypochlorite (12%)	21.72 m <sup>3</sup>	\$132/ m <sup>3</sup>	16.92 m <sup>3</sup>	\$129/ m <sup>3</sup>	18.01 m <sup>3</sup>	\$128/ m <sup>3</sup>
Dechlorination	Sodium Bisulphite (38%)	5.94 m <sup>3</sup>	\$361/ m <sup>3</sup>	5.15 m <sup>3</sup>	\$344/ m <sup>3</sup>	6.85 m <sup>3</sup>	\$344/ m <sup>3</sup>

### 3.4. Bypasses, Overflows and Spills

#### 3.4.1 Bypasses

Because inflow to the plant is controlled, plant treatment bypasses are not required.

#### 3.4.2 Overflows

There were no overflow events at the North Toronto Treatment Plant in 2017

#### 3.4.3 Spills

There were no spill events at the North Toronto Treatment Plant in 2017.

There was one spill event at the North Toronto CSO Detention System. The event occurred on July 20, and involved the CSO tank spilling over the side walls onto the plant roadways and into building basements.

### **3.5. Complaints**

There were no odour or noise complaints received at the North Toronto Treatment Plant in 2017.

### **3.6. Effluent Quality Assurance or Control Measures**

Analytical tests to monitor required parameters are performed by the Toronto Water Laboratory which is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. Plant operation and performance is monitored by licensed plant technicians as well as by the facility management team. Standard Operation Procedures, emergency plans, equipment preventative and predictive maintenance, and a network of support staff, help ensure a rapid and effective response to issues, and maintain the high quality of the plant's effluent and biosolids.

#### 4. CAPITAL PROJECTS

Under Toronto Water’s capital program, the North Toronto Treatment Plant commenced or continued with the capital works projects and studies listed in Table 4 in 2017.

**Table 4: Capital Projects**

Project Name	Project Description	Project Stage (Dec 31, 2017)
TNT ECAP 02B	Electrical upgrades project including replacement of various MCCs across the plant	Construction
CSO Tank Improvements	New CSO tank and chemical treatment facility	Construction
TNT Process Upgrade	Undertake various process upgrades to restore the treatment capacity to its rated capacity	Study



## 5. MAINTENANCE

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

The annual calibration and maintenance records of flow meters and on-line analysers for regulated parameters was completed in 2017, and found to be within acceptable limits. A summary of effluent monitoring equipment calibration and maintenance performed in 2017 is included in Table 5.

**Table 5: Summary of Effluent Monitoring Equipment Calibration and Maintenance**

Calibration and/or Maintenance Record	Completion Date
Final Effluent Flow Meter Calibration	December 20, 2017
Final Effluent pH and Temperature Meter Calibration	December 23, 2017
Transmitter, Analyzer Indication, Residual Sulphite Calibration	May 25, 2017
Transmitter, Analyzer Indication, ORP Calibration	March 8, June 8, September 1 and December 1, 2017
Transmitter, Analyzer Indication, Chlorine and ORP 0101 Calibration	March 8, June 8, August 31 and December 1, 2017
Transmitter, Analyzer Indication, Chlorine and ORP 0201 Calibration	March 8, June 8, September 1 and December 1, 2017
By-Pass Chamber Flow Meter Clean, Inspect and Calibration	August 3, 2017

The following is a summary of significant maintenance activities completed in 2017; these are considered to be maintenance and/or minor modifications as per Conditions 10(6)(c) of the C of A.

### Regular scheduled (WMS) maintenance work completed:

- Process:
  - Cleaned CI/ORP analyzer sample probe weekly
  - Cleaned D.O. sensor weekly
  - Back flush sampler line weekly
  - Cleaned HVAC system annually
  - Bar Screen and screw conveyor system inspection and gear box oil change
  - RAS and WAS equipment and system maintenance
  - Chlorination and dechlorination equipment and system maintenance
  - Check the ferrous chloride pumps and piping quarterly
  - Chlorine contact tank draining, cleaning and concrete inspection annually
  - Inspection of the furnace oil storage tank surface quarterly
  - Bridge rotating collector inspection and Checks annually
  - Boiler Inspections monthly
  - Above Ground Fuel Oil Tank monthly maintenance
  - 27.6 kV load switch, 600 V breakers, MCC and bus checks annually
  - Auxiliary portable generator inspection and start up weekly
  - Check for fatigued batteries on the UPS system - 6 monthly

- Safety:
  - JHSC Work place inspection monthly
  - All emergency eyewash station equipment tested weekly and maintenance monthly
  - All fire extinguishers and fire hydrant inspection and maintenance
  - All first aid kits maintained
  - Check the operation of the submersible building sump pumps annually
  - Check the MCC grounding system annually
  - Check the operation of the submersible building sump pumps annually
  - Emergency / Exit light Inspection monthly
  - Crane Inspections annually

**Process specific maintenance projects:**

- Replaced blown air stones and repaired damaged stone seats in Aeration Tanks
- Bar screen checks and repairs completed; bar screen auger repaired
- Overhauled Primary Pumps No. 1 and 2
- Overhauled Primary Macerator Grinder No. 1
- Replaced Sodium Bisulphite Pump No. 3
- Replaced Sodium Hypochlorite Pump No. 7
- Replaced Ferrous Pump
- Primary Tank No.3: overhauled centre cone and upper bearing wheels
- Aeration Tank No.3: tank inspection and repairs to air system and acid wash air stones
- Lead abatement and hut restorations: Digester Huts No. 1 – 4 completed; Final Clarification Tanks No. 3, 4, and 5 completed; Primary Tank No. 1 completed; Final Clarification Tanks No. 1 and 2 ongoing; and Primary Clarification Tank No. 2 ongoing.

**General area maintenance projects:**

- Converted Administration office into the plant's new meeting boardroom
- Started 5S Program in the old filter building to make one central maintenance shop

## 6. UTILITIES

A summary of monthly utility consumption for the previous three years at North Toronto Treatment Plant is provided in Figure 1. Table 6 below summarizes the total cost and average unit cost for water and hydro. Total annual consumption for potable water and hydro was 59,600 m<sup>3</sup> and 2.62M kWh, respectively.

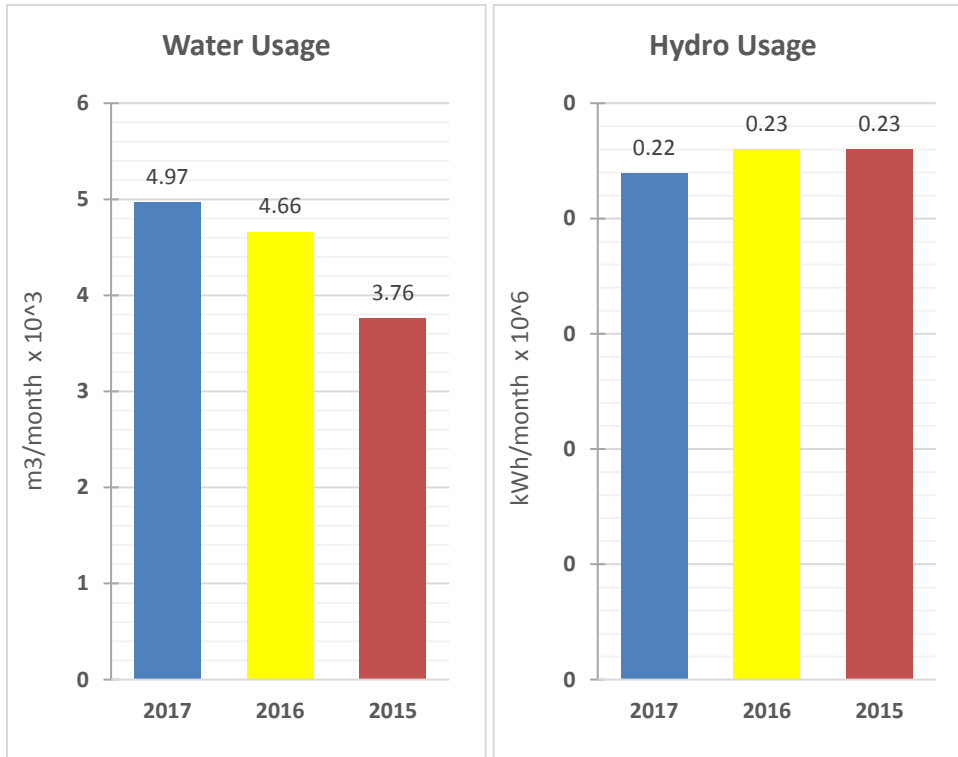


Figure 1: Monthly Utility Consumption (Water, Hydro)

Table 6: Average Unit and Total Utility Cost

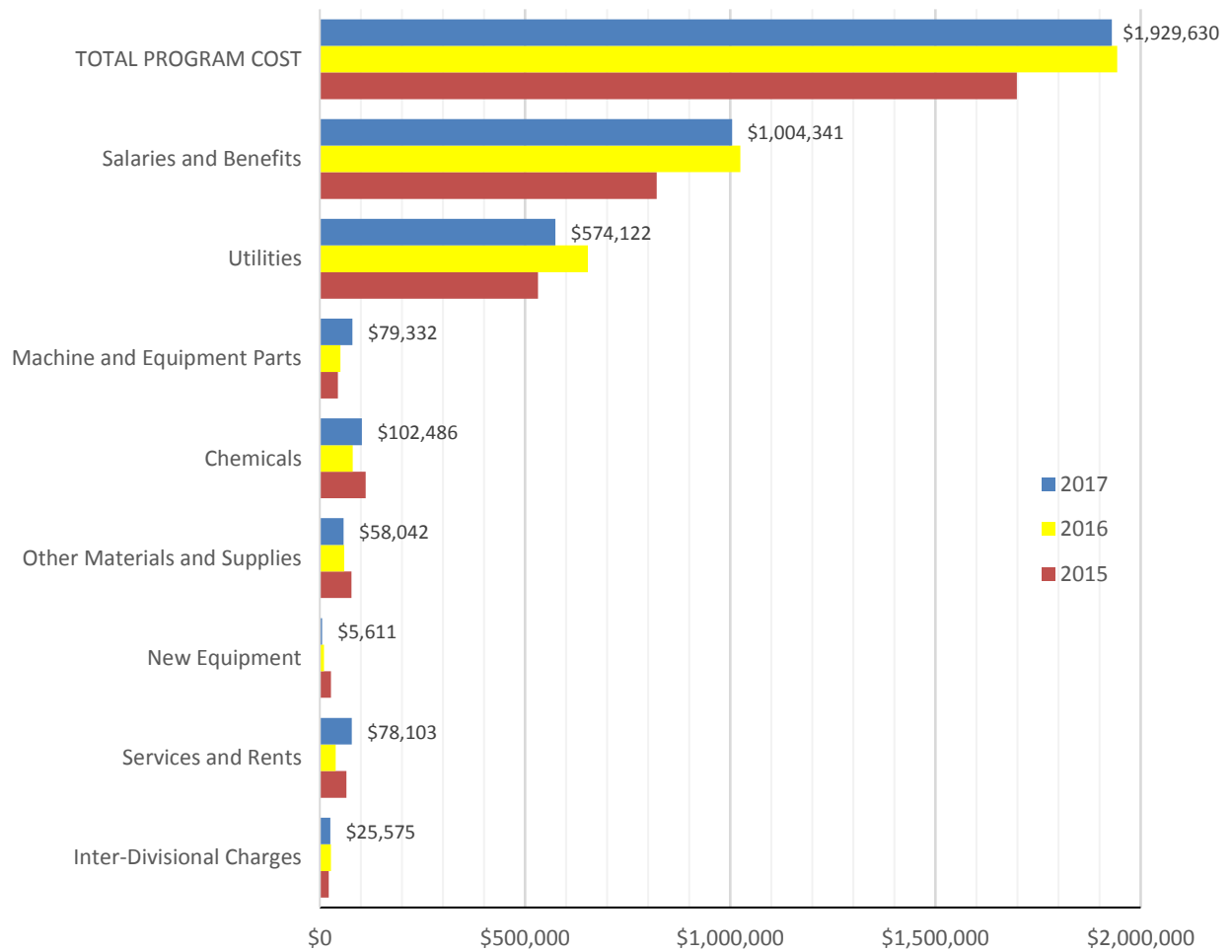
Utility	2017	2016	2015
Water Unit Cost (\$/m <sup>3</sup> )	2.38	3.63	3.30
Water Total Cost (\$/year)	227,261	203,007	148,676
Hydro Unit Cost (\$/kWh)	0.16	0.14	0.13
Hydro Total Cost (\$/year)	395,098	398,591	353,516

There was a 6.6% increase in the measured potable water consumption and a 4.1% decrease in measured hydro consumption from 2016.

## 7. ADMINISTRATION

### 7.1. Operations and Maintenance Costs

The 2017 plant operational costs are broken down into five categories: Salaries and Benefits, Materials and Supplies, New Equipment, Services and Rents, and Inter-Divisional Charges. Materials and Supplies is further segregated into Utilities, Machine and Equipment Parts, Chemicals and Other Materials and Supplies. A breakdown of annual operations and maintenance costs for the past three years is illustrated in Figure 2. Overall, operational costs decreased by 0.7% from 2016.



**Figure 2: Operations and Maintenance Cost Breakdown**

## 7.2. Human Resources

Plant Staffing at the Highland Creek Treatment Plant in 2017 is shown in Table 7.

**Table 7: Plant Staffing**

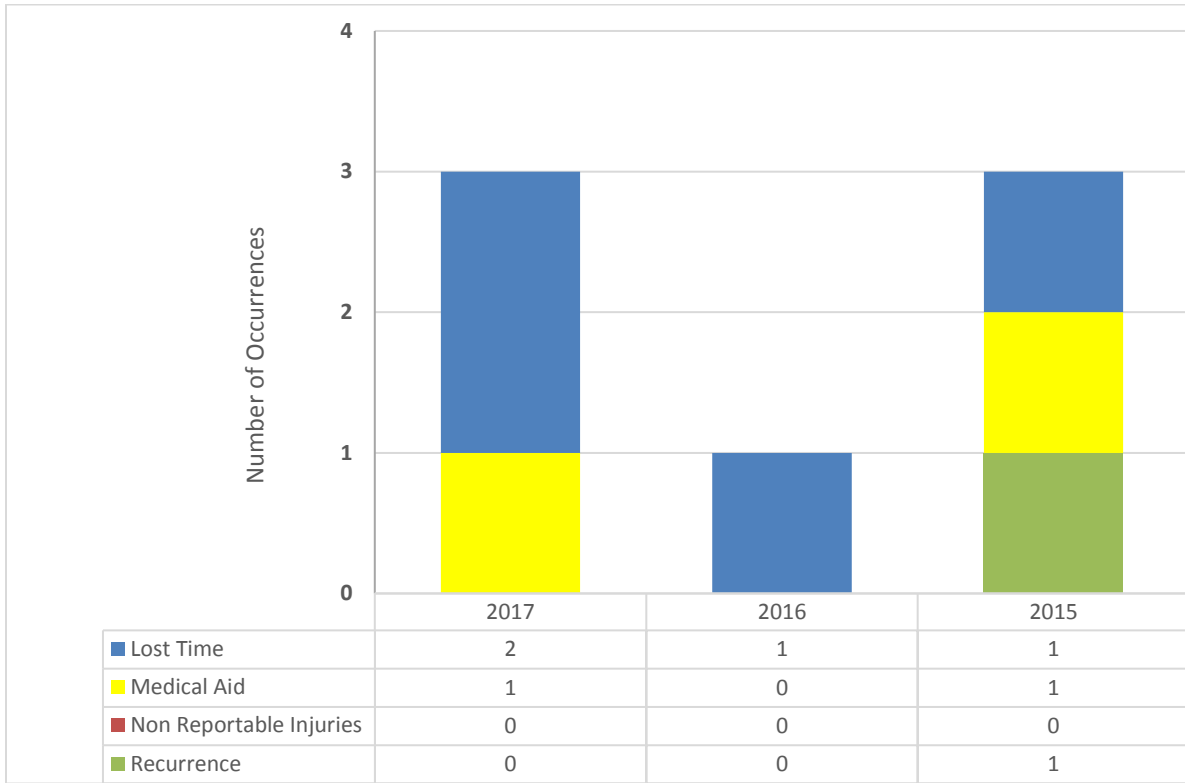
Position	Number of FTE Staff
Supervisor, Operational Support	1
EICT	1
Plant Technician	1
Development Plant Technicians	1
Plant Technician Wastewater	1
Industrial Millwrights	3
Wastewater Plant Worker	1
Seasonal Temporary	0.5
<b>Total FTE Positions</b>	<b>9.5</b>

<sup>1</sup>FTE refers to Full Time Equivalent staff. Seasonal staff are considered 0.5 FTE staff.

## 7.3. Occupational Health & Safety

Continuous efforts are made to ensure a safe working environment at the North Toronto 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 North Toronto Treatment Plant are included in Figure 3.

There was a total of 19 lost time days due to work related injuries in 2017.



**Figure 3: North Toronto Health and Safety Injury Summary**

#### 7.4. Staff Training and Development

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

All North Toronto Treatment Plant operations and skilled trades 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 North Toronto Treatment Plant offered its operation and skilled trade staff the training courses below in 2017. Training to support the capital program was provided as required.

a) Technical and Health and Safety Training:

- 2015 Ontario Electrical Safety Code (26th Edition) New and Amended Requirements General Level 1
- ABTP - Asset Condition Monitoring
- ABTP - North Toronto TP CSO Tank Improvements Project
- ABTP - Tailgate 2017 Ladder Safety
- ABTP - Tailgate 2017 Lockout, Tag & Test

- ABTP - Tailgate 2017 Safe Lifting
- ABTP - Tailgate 2017 WHIMS 2015: New Chemical Safety Info System
- ABTP - Vogelsang Positive Displacement Rotary Lobe Pump
- ABTP Pilot - Introduction
- Air Purifying Respirators (2017)
- Arc Flash for Non-Qualified Persons
- Asbestos Awareness
- Centrifugal And Positive Displacement Pump Operation
- Conductors (2016-2018)
- Confined Space Awareness 1/2 Day (2016-2018)
- Confined Space Entry & Rescue Training Awareness
- Emergency First Aid Level 'A' CPR (2016-2018)
- Hazard Identification and Reporting ( August 2017 Tailgate)
- Incident Reporting (2017)
- Joint Health and Safety Committees - (JHSC) Certification Training Part I - Basic
- Joint Health and Safety Committees - (JHSC) Certification Training Part II - Workplace Specific Hazard Training
- Level "C" Cpr Renewal (2016-2018)
- Rigging Safety Awareness (2016-2018)
- Safety in a High Voltage Environment (2016-2018)
- Scaffolding Awareness Course (2016-2018)
- Standard First Aid - Level "C" CPR & AED - 2 Day (2016-2018)
- The Business Of Environmental Compliance
- Transportation Of Dangerous Goods (2016-2018)
- TW Emergency Plan Awareness (Tailgate May 2017)
- Wastewater Plant Technician Process Training
- WHMIS 2015: New Chemical Safety Info System ( November 2017 Tailgate)
- WMS AVANTIS Workshop
- Working at Heights (2016-2018)

b) Other Training:

- ABTP - Human Rights in the Workplace
- Human Rights in the Workplace
- Distracted Driving (February 2017 Tailgate)
- Conflict Resolution and Negotiation Skills
- Customer Service Excellence for the Internal Customer

## 7.5. Utility Operator Certification

Toronto Water has incorporated the requirement of a Class I operating licence for all skilled trade job profiles at Wastewater Treatment facilities. As part of this initiative, general operational/process training was delivered in order to prepare staff for the certification examination. Table 8 summarizes the status of operator certification at the North Toronto Treatment Plant in 2017.

**Table 8: Wastewater Treatment Certificates**

Class Level	Licensed
Class IV	1
Class III	1
Class II	1
Class I	5
O.I.T.	0
<b>Total</b>	<b>8</b>

### 7.6. MOECC/MOL Correspondence

There were no orders issued by the Ministry of the Environment and Climate Change (MOECC) or the Ministry of Labour (MOL).

There were no odour complaints and noise complaints received at the plant in 2017. Table 9 summarizes the additional correspondence submitted to the MOECC for the North Toronto Treatment Plant.

**Table 9: Correspondence submitted to the MOECC**

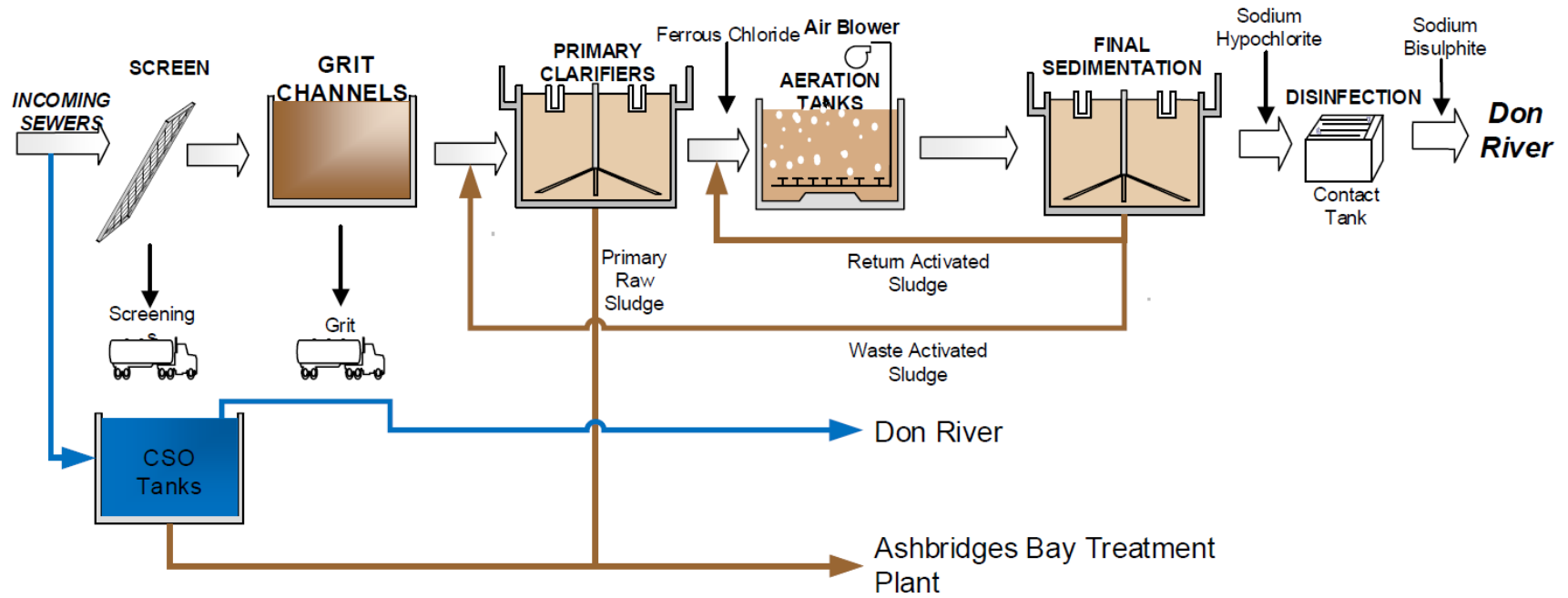
Date	Type	Description
October 25, 2017	Communication on the proposed short term removal of scum baffle at Toronto Water's North Toronto Treatment Plant CSO tank	Communication with Shannon Boland, MOECC Water Inspector, outlining the rationale and the background for the proposed temporary modifications to the facility to mitigate potential for future onsite flooding from the CSO facility at North Toronto Treatment Plant.
<b>Consent Letters</b>		
N/A	N/A	N/A
<b>Notice of Start-up</b>		
N/A	N/A	N/A
<b>MOE Inspection</b>		
No Inspection		



# APPENDIX A – Plant Schematic



APPENDIX A: PLANT SCHEMATIC



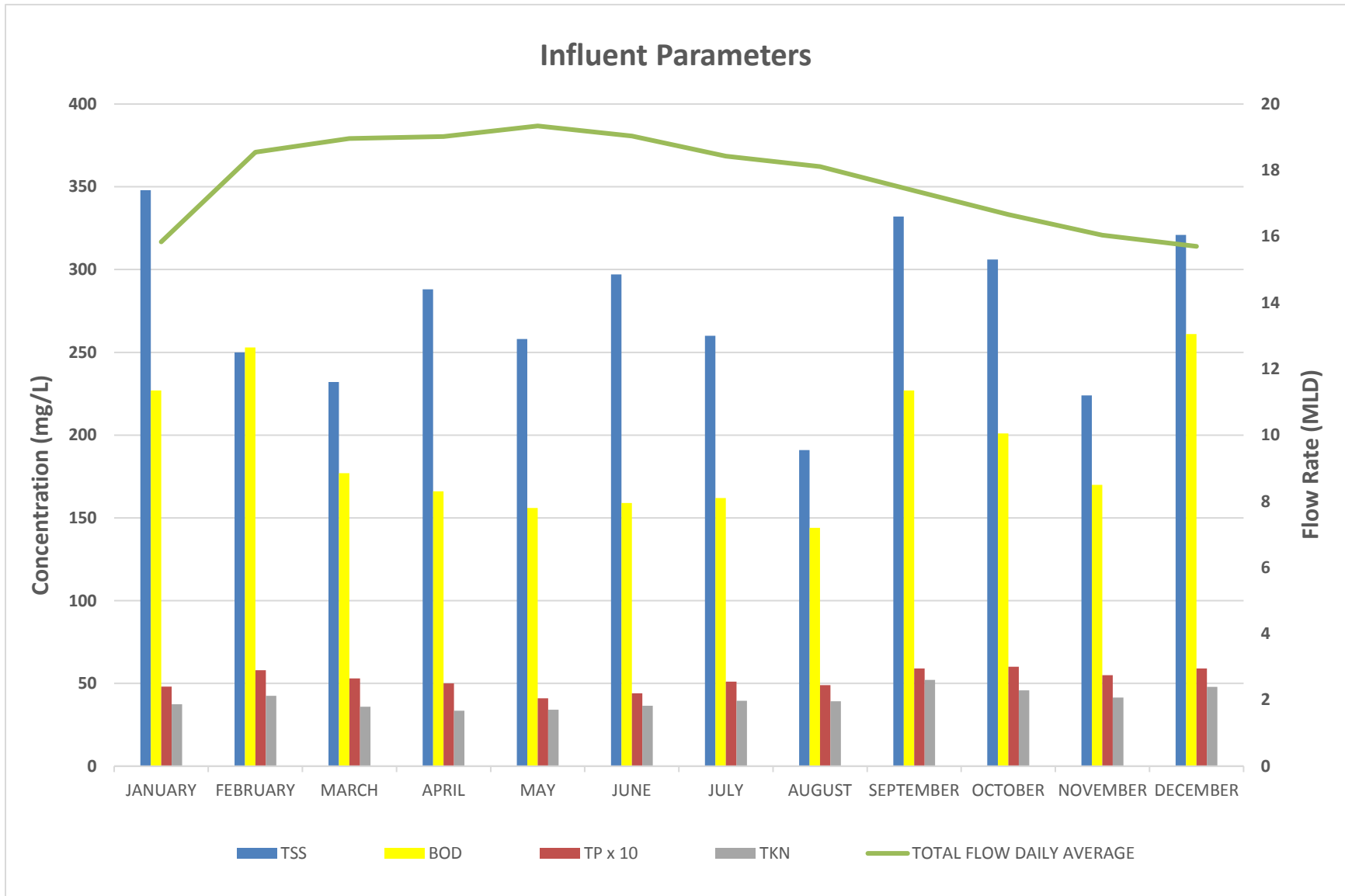
Process Flow Diagram for North Toronto Treatment Plant



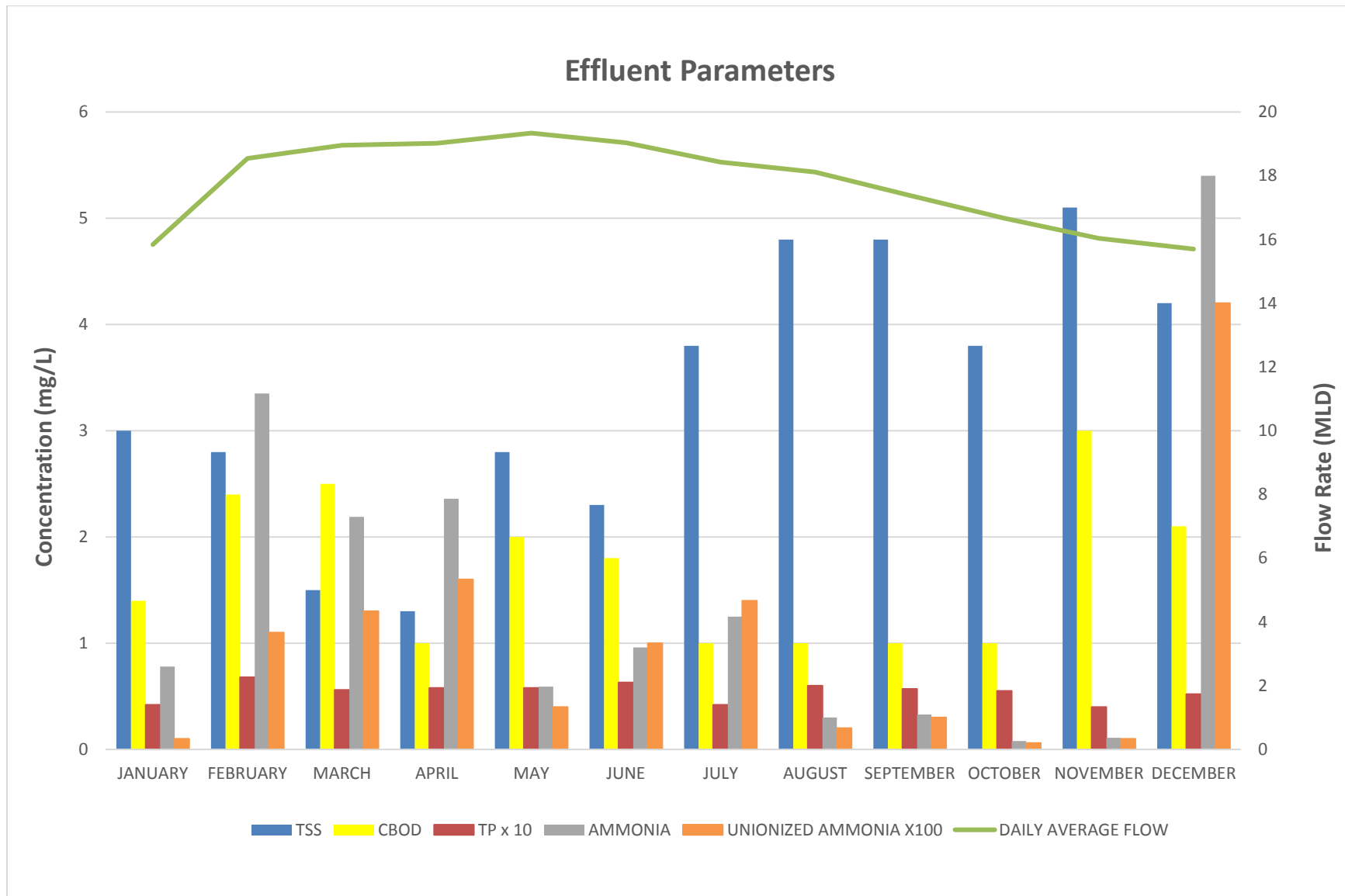
# APPENDIX B – Influent and Effluent 2017 Performance Charts



**APPENDIX B: INFLUENT AND EFFLUENT 2017 PERFORMANCE CHARTS**

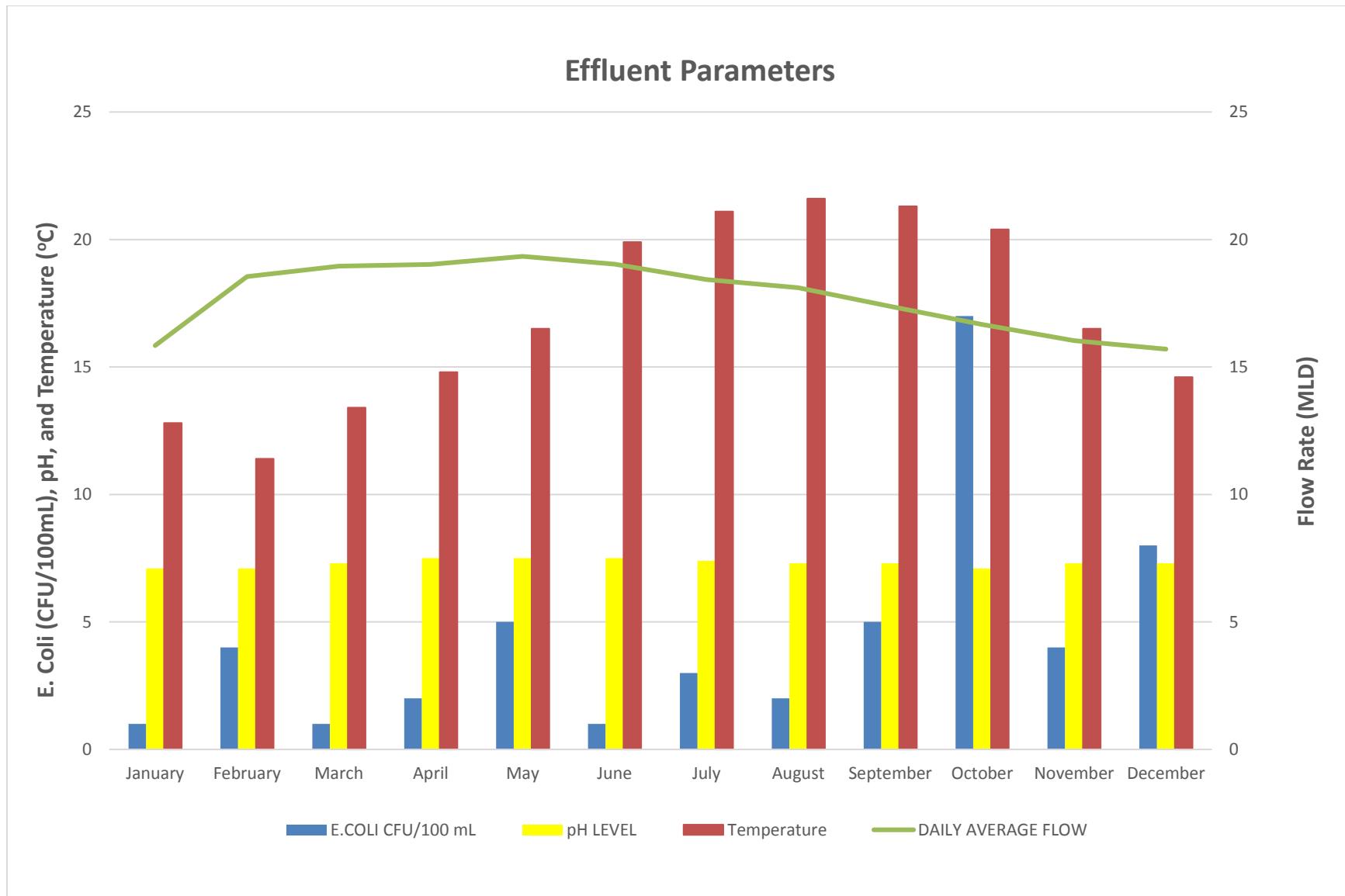


**APPENDIX B: INFLUENT AND EFFLUENT 2017 PERFORMANCE CHARTS**





**APPENDIX B: INFLUENT AND EFFLUENT 2017 PERFORMANCE CHARTS**





# APPENDIX C – Historical Performance Data



## APPENDIX C: HISTORICAL PERFORMANCE DATA

	Units	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
<b>Influent Parameters</b>												
Flow	ML/day	15.7	17.6	20.0	23.2	24.4	26.3	30.2	36.2	33.8	25.7	30.4
Total Annual Flow	ML	5,731	6,42	7,28	8,481	8,703	9,586	11,03	13,20	12,34	9,420	11,11
Total Suspended Solids (TSS)	mg/L	276	286	268	229.2	212.4	213.4	181.3	184.9	167.4	165.5	185.0
Biochemical Oxygen Demand (BOD <sub>5</sub> )	mg/L	192	197	206	169.1	148.6	144.7	119.5	113.3	96.9	86.6	87.3
Total Phosphorus (TP)	mg/L	5.2	5.5	5.5	4.4	4.0	4.2	3.8	4.4	4.1	4.0	4.3
<b>Preliminary Treatment</b>												
Grit and Screenings	tonnes/day	295.0	306.6	396.4	302.9	259.4	228.6	151	253	185	233	243
<b>Primary Treatment</b>												
TSS	mg/L	86	100	116	106.4	106.2	172.5	136.0	153.8	142.3	152.3	221
Carbonaceous Biochemical Oxygen Demand (cBOD <sub>5</sub> )	mg/L	69	89	89	73.5	82.1	90.3	78.1	82.8	81.7	76.1	81
<b>Secondary Treatment</b>												
Aeration Loading	kg CBOD <sub>5</sub> /m <sup>3</sup> .day	0.11	0.15	0.17	0.17	0.19	0.16	0.23	0.30	0.28	0.20	0.26
Mixed Liquor Suspended Solids	mg/L	2,351	2,439	2,317	2,434	2,512	2,274	2,014	2,470	2,131	2,341	2,747
<b>Final Effluent</b>												
TSS	mg/L	3.4	3.0	3.6	4.2	4.9	6.3	8.2	7.3	6.8	7.0	7.3
TSS Loading Rate	kg/day	52.7	52.3	71.2	99.3	120.1	169.1	250.3	266.2	224.9	180.5	221.9
cBOD <sub>5</sub>	mg/L	1.7	1.8	2.2	2.4	2.9	2.6	4.1	2.4	3.0	3.1	3.1
cBOD <sub>5</sub> Loading Rate	kg/day	26.5	31.1	42.9	55.9	73.8	68.1	124.2	87.8	98.1	81.0	94.2
TP	mg/L	0.5	0.7	0.7	0.4	0.4	0.5	0.5	0.6	0.7	0.6	0.5
TP Loading Rate	kg/day	8.5	12.1	13.4	9.9	9.00	12.2	13.8	23.1	21.7	14.5	15.2
Escherichia Coli (E. Coli)	CFU/100 mL	5	10.8	9.0	13.5	6.08	9.02	24.4	1.5	1.3	2	13.4
pH	-	7.3	7.1	7.4	7.6	7.44	7.25	7.1	7.1	7.2	7.1	7.0
Total Chlorine Residual	SBS (P) detected	SBS (P)	SBS	SBS	SBS	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>Solids Handling</b>												
Sludge to Ashbridges Bay Treatment Plant (ABTP) – Flow *	ML/day or dry tonnes/day	0.40	0.48	0.32	0.3	0.30	0.31	**	4.3	4.4	1.2	2.2
Sludge to ABTP – Total Solids (TS)	%	0.97	0.96	1.6	1.4	1.4	1.6	3.5	3.7	3.6	3.8	3.7

\*The North Toronto sludge digestion facilities were decommissioned in April 2011. Before 2011, flows are reported in dry tonnes of digested biosolids per day. After 2011, flows are reported in ML of sludge per day.

\*\*From January to March 2011, the plant pumped 6.7 dry tonnes/day (3.5% TS) of digested biosolids to ABTP. From April to December 2011, the plant pumped 0.32 ML/day (1.97%) of sludge to ABTP.



# APPENDIX D – Influent and Effluent Metal Concentrations





**APPENDIX D: INFLUENT AND EFFLUENT METAL CONCENTRATIONS**

***Influent (Daily Composite tested once/month for metals)***

<b>Parameter</b>	<b>Arsenic</b>	<b>Cadmium</b>	<b>Chromium</b>	<b>Copper</b>	<b>Iron</b>	<b>Lead</b>	<b>Manganese</b>	<b>Mercury</b>	<b>Nickel</b>	<b>Zinc</b>
<b>Units</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>
January	0.005	0.002	0.002	0.109	1.17	0.00651	0.0513	0.00003	0.0025	0.116
February	0.005	0.002	0.002	0.0746	0.7	0.0025	0.0703	0.00003	0.0025	0.0908
March	0.005	0.002	0.002	0.108	1.03	0.00637	0.0515	0.000144	0.0025	0.116
April	0.005	0.002	0.00432	0.0861	1.01	0.0025	0.0496	0.00009	0.0025	0.1
May	0.005	0.002	0.00404	0.0916	1.11	0.00543	0.054	0.00005	0.0025	0.102
June	0.005	0.002	0.002	0.0875	1.01	0.00802	0.0527	0.00005	0.0025	0.103
July	0.005	0.002	0.002	0.0975	0.932	0.0025	0.0497	0.00005	0.0025	0.135
August	0.005	0.002	0.002	0.0954	0.83	0.00502	0.0438	0.000168	0.0025	0.115
September	0.005	0.002	0.002	0.1	1.03	0.0025	0.0441	0.000139	0.0025	0.12
October	0.005	0.002	0.002	0.109	1.67	0.00508	0.067	0.000139	0.00548	0.138
November	0.005	0.002	0.002	0.13	0.913	0.0025	0.0491	0.00005	0.0025	0.119
December	0.005	0.002	0.00404	0.132	0.991	0.00529	0.0486	0.00005	0.0025	0.16
<b>Average</b>	<b>0.005</b>	<b>0.002</b>	<b>0.003</b>	<b>0.102</b>	<b>1.033</b>	<b>0.005</b>	<b>0.053</b>	<b>0.00008</b>	<b>0.0027</b>	<b>0.118</b>

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

<b>Parameter</b>	<b>Arsenic</b>	<b>Cadmium</b>	<b>Chromium</b>	<b>Copper</b>	<b>Iron</b>	<b>Lead</b>	<b>Manganese</b>	<b>Mercury</b>	<b>Nickel</b>	<b>Zinc</b>
<b>Units</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>
January	0.005	0.002	0.002	0.0175	0.413	0.0025	0.0468	0.00003	0.0025	0.0404
February	0.005	0.002	0.002	0.002	0.01	0.0025	0.002	0.00003	0.0025	0.01
March	0.005	0.002	0.002	0.0137	0.223	0.0025	0.0664	0.00003	0.0025	0.0364
April	0.005	0.002	0.002	0.012	0.147	0.0025	0.0385	0.00003	0.0025	0.0336
May	0.005	0.002	0.002	0.0142	0.323	0.0025	0.0433	0.00005	0.0025	0.0292
June	0.005	0.002	0.002	0.0119	0.188	0.0025	0.0375	0.00005	0.0025	0.0304
July	0.005	0.002	0.002	0.0322	0.387	0.0025	0.0472	0.00005	0.00739	0.218
August	0.005	0.002	0.002	0.0161	0.432	0.0025	0.0511	0.00005	0.0025	0.0481
September	0.005	0.002	0.002	0.0221	0.765	0.0025	0.0356	0.00005	0.0025	0.0366
October	0.005	0.002	0.002	0.0269	0.518	0.0025	0.0241	0.00005	0.0025	0.0447
November	0.005	0.002	0.002	0.022	0.714	0.0025	0.0613	0.00005	0.00524	0.0367
December	0.005	0.002	0.002	0.0205	0.802	0.0025	0.0686	0.00005	0.0025	0.0442
<b>Average</b>	<b>0.005</b>	<b>0.002</b>	<b>0.002</b>	<b>0.018</b>	<b>0.410</b>	<b>0.0025</b>	<b>0.044</b>	<b>0.00004</b>	<b>0.0031</b>	<b>0.051</b>

Data in red and italic is half the Method Detection Limit