TORONTO Water

HUMBER
WASTEWATER TREATMENT PLANT

2016 Annual Report

March 31, 2017

EXECUTIVE SUMMARY

The Humber Treatment Plant (HTP) is one of four wastewater treatment facilities operated by the City of Toronto. Located in Toronto's west end, the plant has a nominal treatment capacity of 473,000 m^3/day and serves an equivalent population of 685,000. Treated effluent is discharged to Lake Ontario. In 2016 the facility was operated under Certificate of Approval No. 8477-8C6JZN (January 14, 2011), Amended Environmental Compliance Approval (ECA) No. 0167-A3WRXZ (February 22, 2016) and Amended Environmental Compliance Approval No. 9032-ABZNYQ (July 21, 2016).

The average influent flow rate in 2016 was 257.3 ML/day. The 2016 average influent concentrations of Biological Oxygen Demand (BOD_5), Total Phosphorus (TP) and Suspended Solids (SS) were 299 mg/L, 5.8 mg/L and 311 mg/L, respectively.

In 2016, the plant met or exceeded all final effluent parameters regulated under the Certificate of Approval. The Humber Plant achieved the following effluent quality in 2016:

	ECA[1]	2016 Treated Effluent
Suspended Solids (SS)	25 mg/L	13 mg/L
Carbonaceous Biological Oxygen Demand ($CBOD_5$)	25 mg/L	5.7 mg/L
Total Phosphorus (TP)	1 mg/L	0.7 mg/L
Escheria Coli (*E. Coli*)	200 CFU/100 mL[2]	28.9 CFU/100 mL[3]
pH	6.0-9.5	7.2
Total Chlorine Residual	0.02	SBS Presence detected[4]
TP Loading Rate	473 kg/day	180 kg/day

[1]Referenced from condition 6 & 7 of ECAs
[2] Monthly geometric mean
[3] The arithmetic mean of the monthly geometric mean values
[4]SBS Presence detected. The presence of Bisulphite Residual confirms a TCR of 0.0mg/L.

There were 8 bypass occurrences in 2016 where portions of the flow received preliminary and primary treatment before being disinfected and discharged into Lake Ontario. Total bypassed flows were estimated to be 140 ML. There were a total of 5 spills and abnormal occurances.

An average of 4171 m^3/day of Waste Activated Sludge (WAS) was removed from the system in 2016. Of this, 598 m^3/day was transferred directly to the Ashridges Bay Treatment Plant for further treatment and disposal and 3573 m^3/day was thickened and stabilized prior to transfer. An average of 64 dry tonnes per day of biosolids and WAS was transferred to Ashbridges Bay for further treatment.

The plant continued with numerious capital projects. Notable projects included: PLC Migration, Secondary Treatment Upgrades, North Primary Bridge Replacement, West Substation Upgrades, Operations Centre Upgrades, Main Substation Upgrades, Sodium Hypochlorite Conversion, Backflow Preventer Installation, North & South Primary Upgrades, Cogeneration Facility, Odour Control Phase 1 Implementation, Digester 9 and 10 cleaning and Upgrades, and HVAC Upgrades.

Quantities of nutrient removal chemical, sodium hypochlorite, and sodium bisulphite consumed in 2016 were 189,356 kg (as Fe), 4,723,954 L, and 413,496 L, respectively. The total annual consumption for hydro, natural gas and potable water in 2016 were 52.6M kWh, 1.3M m^3 and 490,857 m^3, respectively.

The plant operating cost for 2016 totalled $17.9M. In 2016, the Humber Treatment Plant had 62 employees. There were 7 lost days due to work related injuries.

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1. INTRODUCTION

The Humber 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 130 The Queensway, on the border of the old City of Toronto and former City of Etobicoke near the mouth of the Humber River. The Humber Treatment Plant services the area bounded by Steeles Avenue in the North, Mimico Creek in the West, Bathurst Street in the East and the lakeshore in the South. The plant serves an estimated population of 685,000 residential and business customers within its service area. The Humber Treatment Plant has a rated capacity of 473,000 m^3 per day.

Major treatment processes and equipment include screening and grit removal, primary treatment, secondary treatment, phosphorus removal, effluent disinfection and dechlorination, final effluent pumping (when required), waste activated sludge thickening, anaerobic sludge digestion and odour control. Numerous auxiliary systems are required for the proper operation of many plant processes and include potable water, process water, HVAC, electrical power distribution, natural gas, chemicals, instrument air and blower air.

The Ministry of the Environment and Climate Change (MOECC) has classified the Humber Treatment Plant as a Class IV wastewater treatment facility under Regulation 129/04. In 2016 the facility was operated under Certificate of Approval No. 8477-8C6JZN (January 14, 2011), Amended Environmental Compliance Approval (ECA) No. 0167-A3WRXZ (February 22, 2016) and Amended Environmental Compliance Approval No. 9032-ABZNYQ (July 21, 2016).

This report is a summary of the operation of the plant and its performance in 2016. Highlights of the report include a discussion of effluent quality and summaries of plant operations and maintenance activities, chemical and utility consumption, operational costs and human resources.

2. OPERATIONS

2.1 Influent

Wastewater flows to the plant via a common sewer which combines the flow from the Queensway Sanitary Trunk Sewer and Humber Sanitary Trunk Sewer. A portion of the Humber Treatment Plant sewershed consists of combined sanitary and storm sewers, causing plant influent to be sensitive to wet weather events.

A summary of annual flow and influent parameter concentrations for the previous three years is shown in Table 1. Total plant influent decreased by 4.1% from 2015 and a comparison of monthly influent flow rates and characteristics for 2015 and 2016 is illustrated in Appendix C.

Table 1: Influent Parameters

Parameter	2016	2015	2014
Influent Flow [ML/day]	257.3	269.0	280.5
Total Annual Flow [ML]	94,168	98,174	102,364
Influent SS [mg/L]	331	369	358
Influent BOD_5 [mg/L]	299	318	295
Influent TP [mg/L]	5.8	5.8	5.0
Influent Total Kjeldahl Nitrogen	45.2	42.7	38.4

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 Humber Treatment Plant Head House which provides grit and screenings removal operations. There are six inlet channels, four (4) equipped with front raking mechanical bar screens and two (2) equipped with back raking bar screens. The screens have bars spaced 1.25 cm apart to remove rags and debris from the wastewater. The wastewater is then split into two streams; one of the streams flows south for grit removal within the Head House and the other flows north to a separate grit removal building. As part of the phosphorus removal system, iron salts in the form of ferrous or ferric chloride are added in the Head House. This will cause some of the soluble phosphorus to become insoluble and precipitate out in the primary treatment system. In the south plant, grit is removed by six vortex chambers (6.1 m in diameter and 6.98 m in depth), each having a hydraulic capacity of 170,500 m^3/day. In the north plant, grit is removed by three Aerated Grit Channels (19 m x 9.1 m x 4.3 m), each having a hydraulic capacity of 209,000 m^3/day. Grit and screenings are hauled to a sanitary landfill site. Refurbishment of the grit collection and conveyance system, as well as the replacement of two bar screens is ongoing.

The quantity of grit and screenings removed by the aerated grit channels, vortex tanks and mechanical bar screens averaged approximately 1.6 tonnes per day in 2016.

2.3 Primary Treatment

The next step in the treatment process is called Primary Settling or Clarification where the flow velocity is reduced through the Primary Clarification Tanks. This allows the heavier solids in the wastewater to settle to the bottom, including non-soluble phosphorus. 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 the sludge is pumped to the anaerobic digestion tanks. Floatable materials called scum is skimmed off the top of the tank and also pumped to the anaerobic digestion tanks.

There are a total of 11 Primary Clarification Tanks: eight rectangular tanks with dimensions of 72 m x 10.36 m x 3.28 m, each having a hydraulic capacity of 90,000 m^3/day (South Plant), and three rectangular tanks with dimensions of 76.2 m x 24.7 m x 3.6 m, each having a hydraulic capacity of 227,000 m^3/day (North Plant). The discharge from these tanks (called primary effluent or settled sewage), which still contains organic materials, flows into the Aeration Tanks. Upgrades to one of the North Plant Primary Tanks occurred in 2016, including the installation and commissioning of a new travelling bridge and scum collection system.

Although the plant has the capacity to co-settle Waste Activated Sludge (WAS) from the Final Clarification Tanks in the Primary Clarification Tanks, this did not occur in 2016.

Table 2 contains a summary of key primary treatment effluent parameter concentrations and their respective removal efficiencies in 2016 and 2015.

Table 2: Primary Treatment Effluent Parameters

Parameter	2016	Primary Removal Efficiency	2015	Primary Removal Efficiency
SS [mg/L]	94	70%	97	74%
$cBOD_5$[1] [mg/L]	158	34%	156	39%

[1] *Assumes influent $cBOD_5$ = influent BOD_5 x 0.8*

2.4 Secondary Treatment

In Secondary Treatment, effluent from the Primary Clarifiers is mixed with Return Activated Sludge (RAS) from the Final Clarifiers and aerated. This is known as the Conventional Activated Sludge process. The activated sludge is made up of microorganisms which are a natural part of wastewater. In the presence of oxygen, these microorganisms break down organic solids in the wastewater. Air is supplied to the Aeration Tanks through nine electrically driven blowers. Iron salts can also be added to the end of the aeration tanks for additional phosphorus removal. The precipitated phosphorus will settle in the Final Clarifiers.

There are a total of eight Aeration Tanks each equipped with ceramic fine bubble dome diffusers: five in the South Plant treatment process and three in the North Plant treatment process. The South Plant consists of three-pass tanks (capable of step-feed), each pass measuring 139.3 m x 8.2 m x 4.6 m. The North Plant consists of single-pass, complete-mix type tanks each measuring 73.3 m x 17.8 m x 7.5 m. Total secondary treatment process volume is 108,700 m^3.

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 volume of biomass. The excess is removed as waste activated sludge (WAS) and is either thickened and anaerobically digested prior to transfer to the Ashbridges Bay Treatment Plant (ABTP) for further treatment via the Mid-Toronto Interceptor (MTI), or pumped directly to ABTP. There are 21 Final Clarification Tanks: 9 circular tanks (45.7 m in diameter and 4.6 m in depth) and 12 square tanks (29 m x 29 m x 4.0 m), for a total volume of approximately 106,800 m^3 and a total surface area of 24,900 m^2.

A summary of key aeration basin parameters for the previous two years is shown in Table 3.

Table 3: Secondary Treatment Process Parameters

Parameter	2016	2015
Aeration Loading [kg $CBOD_5/m^3 \cdot d$]	0.38	0.39
Mixed Liquor Suspended Solids[mg/L]	2,953	2,838

2.5 Final Effluent Quality & Disinfection

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 extends approximately 500 m from the shoreline with a total of 15 diffusers.

In 2016, the Humber Treatment Plant continued to produce a high quality effluent which surpassed the requirements of the plant's ECA. This was achieved by continuous improvement in operation and maintenance of the treatment process. The plant also met Federal Government effluent monitoring requirements, including un-ionized ammonia and acute toxicity.

A summary of key final effluent parameters are shown in Table 4, Table 5 and Table 6. Details of the plant's final effluent characteristics are presented in graphical form in Appendix C.

Table 4: Annual Average Final Effluent Parameter Limits and Performance

Parameter	ECA Limit[1]	2016	Removal Efficiency[2]	2015	Removal Efficiency[2]
SS [mg/L]	25	13	96%	11	97%
$CBOD_5$ [mg/L]	25	5.7	98%	5.4	98%
pH	6.0 – 9.5	7.2	-	7.4	-
TP Average Loading Rate (kg/day)	473	180	-	210	-

[1] Referenced from condition 7 of ECAs
[2] Assumes influent cBOD5 = influent BOD5 x 0.8

Table 5: Monthly Average Final Effluent Parameter Limits and Performance

Parameter	ECA[1]	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
TP [mg/L]	1	0.88	0.68	0.52	0.54	0.69	0.69	0.72	0.86	0.72	0.62	0.50	0.97
E. Coli[2] [CFU/100mL]	200	19	23	64	22	14	13	50	16	57	18	41	10
Total Chlorine Residual (mg/L)	0.02	P[3]	P[3]	P[3]	P[3]	P[3]	P[3]	P[3]	P[3]	P[3]	P[3]	P[3]	P[3]

[1] Referenced from condition 7 of ECAs

[2]These figures represent adjusted monthly geometric mean values to include substitution of "1" where "0" was previously reported.

[3]SBS Presence detected. The presence of Bisulphite Residual confirms a TCR of 0.0mg/L.

Table 6: Annual Average Final Effluent Parameter Limits, Objectives and Performance Summary

Parameter	ECA Limits[1]	ECA Objective[1]	2016
SS [mg/L]	25	15	13
$CBOD_5$ [mg/L]	25	15	5.7
pH	6.0 – 9.5	6.5-8.5	7.2
TP [mg/L]	1.0	0.9	0.7
TCR [mg/L]	0.02 mg/L	Non-detect	SBS Presence Detected[2]
pH	6.0-9.5	6.5-8.5	7.2
E. Coli [CFU/100mL]	200[3]	150[3]	28.9[4]

[1] Referenced from conditions 6 and 7 of ECAs
[2] SBS Presence detected. The presence of Bisulphite Residual confirms a TCR of 0.0mg/L.
[3] Monthly geometric mean
[4] The arithmetic mean of the monthly geometric mean values

Final effluent concentrations of nine (9) select heavy metals have been included in Appendix D.

2.6 Bypass, Spills and Abnormal Events

2.6.1 Bypasses

There were eight (8) secondary treatment bypasses in 2016 where portion of the flow received preliminary and primary treatment before being disinfected and discharged into Lake Ontario. Each instance was reported to the MOECC Spills Action Center and recorded in the plant's Monthly Report. Secondary bypass events occur due to high wet weather flows that exceed the plant's secondary treatment capacity.

Total precipitation in the Toronto area[1] was 576.6 mm in 2016, which was a 14.6% decrease from 2015. Average plant influent was 4.1% lower compared to the previous year. A summary of bypass events occurring in 2016 is presented in Table 7**.** Secondary bypass events resulted in an estimated total annual bypass volume of 140 ML. Bypass flow represents 0.15% of the total plant flow in 2016.

Table 7: Bypass Events Summary for 2016

No.	Date	Duration (hr)	Volume (m^3)
1	Jan-10-16	6.3	51,401
2	Feb-24-16	7.2	35,474
3	Mar-31-16	2	754
4	Jul-07-16	0.2	<1
5	Aug-13-16	1.7	14,431
6	Sept-07-16	1.9	9,579
7	Nov-03-16	2.4	10,338
8	Dec-26-16	3.8	18,189

2.6.2 Spills and Abnormal Events

There were two spills that occurred in 2016. Both spills were the unexpected release of methane gas released through the digester emergency pressure release systems which vent to the atmosphere. The first event on May 26, 2016 lasted about 0.2 hours and released 963 Nm^3 of gas. The cause of this pressure build up and subsequent spill was emergency repairs to the digester gas system. The second

1 Adapted from http://climate.weatheroffice.gc.ca/climatedata

event occurred on December 1, 2016 and lasted about 1.5 hours releasing 150 Nm^3 of gas. This pressure buildup and subsequent release was caused by suspected condensation or sediment buildup in the lines. Inspection and cleaning are underway to prevent a reoccurrence. Additionally, new lower alarm setpoints have been established to allow more time to react and avoid a spill.

There were three (3) abnormal events in 2016, which resulted in treated secondary effluent not receiving disinfection. The first two events were caused by two different pump controller malfunctions in the newly commissioned sodium hypochlorite disinfection system. Investigations into the cause of each were conducted and new operational procedures will help avoid reoccurrences. The third event was caused by electrical power switching that caused an unexpected regular and backup power loss. Operating procedures have been modified to prevent this from reoccurring.

Table 8: Abnormal Events Summary for 2016

No.	Date	Duration (hr)	Volume (m^3)	Nature of Event
1	Jan-10-16	1.2	17,292	Secondary effluent not disinfected
2	Feb-23-16	0.8	10,243	Secondary effluent not disinfected
3	Jul-28-16	0.7	6,475	Secondary effluent not disinfected

2.7 Solids Handling

WAS is thickened through centrifugation from approximately 0.5% to between 4% and 5% total solids content. WAS may also be pumped directly to the Ashbridges Bay Treatment Plant via the MTI.

A two-stage, anaerobic, mesophilic sludge digestion process is utilized at the Humber Treatment Plant. This process reduces the sludge volume, mitigates odours and destroys pathogens, thereby stabilizing the sludge. A by-product of sludge digestion is the production of digester gas, which is low grade fuel consisting of approximately 65% methane, 35% carbon dioxide and other trace gases. Primary sludge, scum and thickened waste activated sludge (TWAS) are fed into eight (8) primary digesters. Sludge from the primary digesters is transferred into two (2) secondary digesters. The resulting anaerobically digested sludge (biosolids) is subsequently transferred to the Ashbridges Bay Treatment Plant via the MTI for further treatment.

Four primary and both secondary digesters measure 33.5 m in diameter and 9.75 m in depth for a volume of 6,050 m^3 each, four primary digesters measure 33.5 m in diameter and 10.65 m in depth for a volume of 6,850 m^3 each. Primary digesters have concrete roofs and are equipped with digester gas mixers, while secondary digesters have no mixers and are equipped with steel floating covers which accommodate changes in volume of stored gas and sludge.

In 2016, an average of 2,689 m^3/day of primary sludge was pumped to the Anaerobic Digesters. An average of 3,573 m^3/day of WAS was thickened by centrifugation and 598 m^3/day was transferred directly to the Ashbridges Bay Treatment Plant via the MTI. WAS contained an average SS concentration of 8,630 mg/L. An average of 598 m^3/day of TWAS was pumped to the Anaerobic Digesters from the centrifuge units. The average TS concentration of TWAS was 4.0% and its TVS solids content was 75.0% of TS.

In 2016, a total of two primary digesters were out of service for cleaning and construction. The average hydraulic retention time of sludge in the primary digesters was 12.8 days.

Approximately 59 dry tonnes per day of biosolids and 5 dry tonnes per day of WAS were transferred to the Ashbridges Bay Treatment Plant via the MTI in 2016. A summary of the digestion process including the previous two years can be seen in Table 9.

Table 9: Solids Handling Process Parameters

Parameter	2016	2015	2014
Primary Sludge Digested [m^3/day]	2,689	2,723	3,495
WAS transferred to ABTP [m^3/day]	598	822	1,315
WAS SS [mg/L]	8,630	9,448	8,863
Total WAS Thickened [m^3/day]	3,573	3,135	3,782
Total TWAS Digested [m^3/day]	598	530	512
Biosolids transferred to ABTP [dry tonnes per day]	59	57[1]	64
Biosolids TS [%]	2.08	2.1	1.84

[1]The previously reported number of 74 dry tonnes per day included both Biosolids and WAS.

The average digester gas volume generated in 2016 was 28,093 m^3/day. This was an increase of 10.5% from the 2015 volume. Increase digester gas production can be attributed to a longer HRT as compared to 2015 as well as improved metering. Monthly digester gas production is shown in Appendix C.

The volume of sludge generated at the Humber Plant is not expected to increase in 2017. In 2016, the daily average inflow to the Humber Treatment Plant was 257.3 ML/day. The flow projections for 2017 do not exceed the rated plant capacity of 473 ML/day and the plant is expected to generate a sludge volume that will be within +/-5% of the given volume for 2016.

2.8 Biosolids Management

All biosolids generated at the Humber Treatment Plant are transferred to the Ashbridges Bay Treatment Plant for further treatment and subsequent biosolids management.

2.9 Complaints

All reported complaints were recorded, investigated by plant staff and where possible, action was taken immediately.

Humber Treatment Plant personnel logged nine (9) odour complaints in 2016. In seven of the cases no unusual odour was detected. In three of those cases the complaint was made about previous odours and therefore an investigation into the conditions at that time was not possible. Two of the odour complaints were linked back to cleaning of primary tanks during which scum and sludge were exposed to air. Cleaning was hastened and the odours were eliminated.

The plant received one (1) noise complaint in 2016 about the volume of the outdoor speakers. The volume of the outdoor speakers were reduced and staff were instructed to avoid outdoor pages wherever possible.

2.10 Effluent Quality Assurance or Control Measures undertaken in the reporting period

Analytical tests to monitor required parameters are performed by the Toronto Water Laboratory which is accredited to ISO/IEC 17025 by Canadian Association for Laboratory Accreditation Inc. (CALA).

3. CAPITAL PROJECTS AND STUDIES

Several capital projects have been initiated to replace ageing equipment such as bar screens, grit removal, mechanical equipment in the digesters, aeration equipment and disinfection processes. Other capital projects relate to regulatory changes, such as odour control, and state of good repair.

As part of the Toronto Water Capital program, the Humber Treatment Plant commenced or continued with the following capital works projects and studies in 2016:

- Cogeneration Facility
- North Primary Bridges and Scum Collection Equipment Replacement
- Plant Services PCS
- New Electrical Substation
- Chlorine System Conversion to Hypochlorite & Upgrade
- New Maintenance Building and RAS Control Room
- Odour Control Phase I Implementation
- Digester 9 -10 Cleaning and Upgrades
- Secondary Process Upgrades – South Plant
- HVAC Upgrades
- Backflow Preventer and Primary Sludge and Scum Upgrades
- West Substation Upgrades
- Server/Client iFix Upgrades
- PLC Platform Upgrade
- TW Operations Centre
- Building Condition Assessment
- Legacy Single Line Diagrams
- New field office for Toronto Water Staff
- Waste Gas Burner Refurbishment
- Wet Weather Flow Study
- Geotechnical investigation of the flood berm

The Humber Treatment Plant also undertook, with the assistance of the Operations Coordination group of Toronto Water, a study regarding the replacment of ferrous chloride with a ferrous/feric chloride mixture. This study is ongoing.

4. MAINTENANCE

The Humber Treatment Plant maintenance activities in 2016 were distributed between three process Work Areas and one Support Services group. 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 to meet plant process operation requirements. All legislative maintenance at the plant is scheduled though the Works Management System (WMS). All legislative maintenance was completed in 2016.

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

4.1 Flow Meter Calibration Records

Plant flow is measured by a transit time velocity flow meter which meters total plant influent in a common channel upstream of the Head House. Plant flow is also measured by three venturi flow meters: two measure flow to the north plant through two parallel conduits and one measures flow to the south plant through a single conduit. Calibration records for flow meters are attached in Appendix F. It should be noted that the primary influent flow meter THR-PLT-FIT-0020 does not require calibration as per the manufacturer's manual. The unit will alarm if it is not functioning correctly.

The effluent pH metre and temperature indicating transmitter is verified at least once annually by an EICT as triggered by the Works Management System. Records of the verification are presented in Appendix F.

Flow to the north aeration (tanks 6-8) is measured by electromagnetic flow meters. Calibration records for these flow meters is included in Appendix F.

4.2 Solids (Work Area 1)

Work Area 1 includes WAS thickening centrifuges, anaerobic digesters and gas collection, compression, and burner systems. A total of 2101 work orders were closed in this work area in 2016. The following maintenance was completed in 2016 for Work Area 1.

Regularly scheduled (WMS) maintenance work completed:

- Digesters.
  - All digester dome pressure relief valves (PRV) inspected and cleaned.
  - Gas compressor and gas boosters serviced.
- Sludge thickening centrifuges:
  - Centrifuge maintenance.
  - Replaced sun-wheel bearings on several centrifuges every 4000 run hours as per manufacturer's recommendation.
- Safety:
  - Testing and calibration of all WA-1 back-flow preventers (with documentation).
  - All emergency eyewash station equipment tested weekly and serviced.
  - All Fire extinguishers inspected and serviced if necessary.
  - All first aid kits maintained.

Process specific maintenance projects:

- Digesters and Gas System:
  - Two Digester recirculation pumps overhauled /repaired.
  - Completed overhaul of two gas compressors.
  - Digester gas flare internal structure and refractory brick inspection and repair.
  - Gas header PRV calibration.
  - Scum line flow to digester 7 restored.
  - Plug valves on discharge line of gas compressors 7 & 8 repaired.
  - Safety barrier around coffins for digester 7 & 8 built.
  - Installed winches for lifting coffin covers for operator convenience and safety.
  - Modified four digester gas scrubber clean-out system by installing drain valves.
  - Maintenance of all digester sludge heating hot water pumps.

- Sludge thickening centrifuges.
  - Replaced 6" valve on plant flushing water supply system for building isolation.
  - Removed and cleaned MTI flow meters.
  - Replaced MTI line-2 flow meter with new one.
  - Reinstalled centrifuge 7 that was overhauled by Alfa Laval.
  - Modified torque arms (as suggested by manufacturer) on several centrifuge back-drive input shafts.
  - Over-hauled two Vogelsang TWAS pumps.
  - Made changes to SCADA program to indicate individual run time for each centrifuge.

General area maintenance projects:

- Maintenance of plant flushing water supply piping and valves in work area.
- Replaced ground-water pump near digester 1.
- Maintenance and repair of all work-area sump pumps.
- Installed some cleaning stations in work area and upgraded maintenance shop floor as part of 5S initiative.
- Complete reorganization of maintenance shop with new work stations.
- Facilitating vibration analysis on all equipment in work-area.
- Reorganizing and streamlining the area lubrication storage and handling, using Best Practice tactics.

4.3 Liquid Primaries (Work Area 2)

Work Area 2 encompasses preliminary treatment processes including influent bar screens, aerated grit chambers, vortex grit chambers, and primary clarifiers. A total of 2016 work orders were closed in this work area in 2016. The following maintenance was completed in 2016 for Work Area 2.

Regularly scheduled (WMS) maintenance work completed:

- Headworks:
  - Sluice gates lubricated and exercised, replacement of drive sleeves.
  - Bar screen lubricated, replacement of chute, shock absorbers, rake mechanism.
  - Influent channel maintenance.
  - Compactor wear bar replacement.

  - Screw Conveyer lubricated and replacement of wear liners and shaftless screws.
  - Vortex lubricated and classifier inspected.
  - Vortex blower lubricated, alignment checks and filter replacement.
- Primary Tanks:
  - Primary bridge drive lubricated, wear part replacement.
  - Scum and sludge pump lubricated and inspected.
  - Valves inspected.
- Safety:
  - Testing and calibration of all WA-2 back-flow preventers (with documentation).
  - All emergency eyewash station equipment tested weekly and serviced.
  - All Fire extinguishers inspected and serviced if necessary.
  - All first aid kits maintained.

Process specific maintenance projects:

- Headworks:
  - Compactor tube replacement and bearing change.
  - Rebuild of trailer conveyer.
  - Vortex drive replacement.
- Primary Tanks:
  - Sludge pump header replacement.
  - Lubrication optimization via desiccant breathers.
  - Replacement of cross collector chain and flights.
  - Valve replacement.
  - Scum trough maintenance.
  - Scum pump rebuild.
  - Valve replacement and rebuild.

General area maintenance projects:

- Potable water pipe replacement in tunnel.

4.4 Support Services (Work Area 3)

Work Area 3 includes support services around the plant, process air blowers, and the electrical system. A total of 3773 work orders were closed in this work area in 2016. The following maintenance was completed in 2016 for Work Area 3.

Regularly scheduled (WMS) maintenance work completed:

- Inspection, maintenance and corrective repairs of the following process instrumentation:
  - Disinfection/Dechlorination analyzers.
  - Turbidity analyzer.
  - DO probes.
  - Raw Sludge densitometer.
  - Flow metres.
  - pH analyzer.
  - Temperature probe.
- Inspection, maintenance and corrective repairs of the following safety instrumentation:
  - Gas detectors.
  - Waste gas burner instrumentation.

- Inspection, maintenance and corrective repairs of the following services:
  - Electrical and power equipment
  - HVAC systems

General maintenance projects:

- Installed an emergency stop button for dechlorination process pumps.
- Removed old, disused, digester system piping.
- Installed UPS bypass switches on several RPU cabinets.
- Modified the motor on Primary Tank 3 scum collector.
- Removed disused valves on hot water system.
- Installed new bypass lines for potable water connection to aeration blowers.
- Replaced gas monitors in the engine room and headhouse.
- Install new lighting in tunnels.
- Replaced VFD on MTI pump.
- Upgrade phosphorus removal pumps and flow meters.
- Replaced MTI flowmeter.
- Replaced shaft on blower' air supply fan.
- Repair south sewage flowmeter.
- Relocated temperature sensors for digester recirculation system.
- Relocated control panels on digesters recirculation pumps.
- Modified Gas Compressor Building HVAC unit.
- Installed limit switches on MTI valves and connected to SCADA.
- Repaired breaker in West substation
- Modified limit switch on South scum/sludge collector.
- Modification of limit switches on bar screen.
- Replaced AC units with environment friendly refrigerant.

4.5 Liquid Secondaries (Work Area 4)

Work Area 4 encompasses secondary treatment processes including aeration, phosphorus removal and final clarification. A total of 1625 work orders were closed in this work area in 2016. The following maintenance was completed in 2015 for Work Area 4:

Regularly scheduled (WMS) maintenance work completed:

- Lubricated all mechanical components.
- Safety:
  - Testing and calibration of all WA-4 back-flow preventers (with documentation).
  - All emergency eyewash station equipment tested weekly and serviced.
  - All Fire extinguishers inspected and serviced if necessary.
  - All first aid kits maintained.

Process specific maintenance projects:

- Phosphorus removal:
  - Completed repairs to phosphorus removal system (overhauled various diaphragm dosing pumps).
  - Tested new PIX 337 Product for cost savings with maintenance and volume of usage.

    - Cleaned out 3 136,000 L ferrous tanks.
- Aeration Tanks:
    - Rebuild settled sewage air actuated valves on aeration tanks 1-4.
    - Rebuild various waste activated sludge pumps to original manufactures specifications.
- Secondary Clarifiers:
    - Continued with modifications on scum system for tank 5.
    - Rebuild various scum pumps.
    - Overhauled Final Settling Tanks 3, 4, 10, 15, 20.
    - Clean out various scum tanks and modified for easy of inspection and level sensing.
    - Modified various scum trough support brackets.
    - Replaced T- Section piping in South Return header lines for final tank 4.
- Plant Water:
    - Continued with repairs to flushing water lines and feeder lines throughout Work Area 4
    - Replaced 2 High Lift Pumps in the Filtered Water Building.
    - Cleaned, inspected and changed sand for Filtered Water cells # 2 & #4.

General area maintenance projects:

- Reworked piping and flow for 4 of 14 Back Flow preventers.
- Continued with expansion of 5S principals in the North Finals.
- New plant control room commissioned and new laboratory set up.

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 (WAS Thickening)
- Ferrous Chloride / Ferric Chloride (Nutrient Removal)
- Sodium Hypochlorite (Disinfection)
- Sodium Bisulphite (Dechlorination)

5.1.1 Polymer for WAS Thickening

Polymer can be used for WAS thickening centrifuge units, but was not used in 2016.

5.1.2 Ferrous Chloride and Ferric Chloride for Phosphorus Removal

Ferrous chloride is used as a phosphorus precipitant in the treatment process. A trial of a ferrous/ferric chloride mixture was conducted in 2016 and continues into 2017. Annual coagulant consumption during 2016 was approximately 189,356 kg as Fe. This is a 64% decrease from 2016. The decreased usage is due to improved process control of the dosing system as outlined in section 4 as well as the results of the new chemical mixture trial which adjusted dosing practices.

Ferrous chloride was purchased at an average cost of $800 per tonne Fe, and the ferrous/ferric mix was purchased at an average cost of $1,440 per tonne of Fe plus applicable taxes.

5.1.3 Sodium Hypochlorite for Disinfection

Sodium hypochlorite was used in 2016 for final effluent disinfection, plant water disinfection and return activated sludge control. Total sodium hypochlorite consumption during 2016 was 4,723,954 L. The use of sodium hypochlorite as the primary means of disinfection began partway through 2015, therefore comparison of consumption in previous years is not possible. Sodium hypochlorite was consumed at an average rate of 50 L per ML treated effluent, or the equivalent of 6.7 mg/L as chlorine.

Sodium hypochlorite was purchased at an average cost of $0.130 per L, plus applicable taxes.

5.1.4 Sodium Bisulphite for Dechlorination

Sodium Bisulphite was used in 2016 as a dechlorinating agent. The total sodium bisulphite usage was 413,496 L. This was an increase of 3.71 % from 2015.

Sodium Bisulphite was purchased at an average cost of $2.21 per kilogram, plus applicable taxes.

5.2 Utilities

A summary of utility consumption for the previous three years at Humber Treatment Plant is provided in Table 10.

Table 10: Utility Consumption, 2013-2015

Utility	2016	2015	2014
Water [m^3 / month]	40,905	30,294	34,566
Hydro [kWh/ month]	4,385,031	4,459,774	4,022,168
Gas [m^3/ month]	111,816	112,843	88,566

5.2.1 Water

Potable water consumption increased 35% from 2015 to an annual total of 490,857 m^3. Total cost for potable water was $1,782,597. The average unit cost of water was $3.63 per m^3, a 9.2% increase from 2015. Water usage was increased due to shutdowns of the plant water system for repair. The plant water system provides filtering and further disinfection of the plant effluent for non-potable reuse within the plant.

5.2.2 Hydro

Power consumption decreased 1.64% from 2015 to an annual total of 52.6M kWh. Total cost for power was $5,594,933. The average unit cost of power was $0.11 per kWh, an 18% increase from 2016.

5.2.3 Natural Gas

Natural gas consumption decreased 4.16% from 2015 to an annual rate of 1.3M m^3. Total cost for natural gas was $317,335. The average unit cost of natural gas was $0.24 per m^3, a 9% decrease over 2015.

6. OPERATIONS AND MAINTENANCE COSTS

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 2016 was $17,974,800. This represents a 5.4% increase in costs over 2015. The increase in chemical costs (62%) is due to the switchover from chlorine gas from disinfection to the more expensive sodium hypochlorite as well as the trial of the ferrous/ferric chloride mixture for nutrient removal. Some of the new equipment purchased included analytical equipment for in-house lab to assist with improved process control and a new sludge pump. A breakdown of annual operational costs for 2015 and 2016 are shown in Table 11. The 2016 operating costs are also illustrated in Figure 1.

Table 11: Operations and Maintenance Costs, 2015 & 2016

Operating Cost	2016	2015
Salaries & Benefits	$6,741,499	$6,416,653.50
Materials & Supplies		
Utilities	$7,403,349	$7,215,047.16
Machine & Equipment Parts	$764,434	$654,273.87
Chemicals	$1,535,311	$946,004.83
Other Materials & Supplies	$506,751	$482,930.76
New Equipment	$250,562	$110,281.28
Services & Rents	$616,304	$1,101,646.68
Inter-Divisional Charges	$156,590	$135,951.58
TOTAL PROGRAM COST:	**$17,062,790**	**$17,062,790**

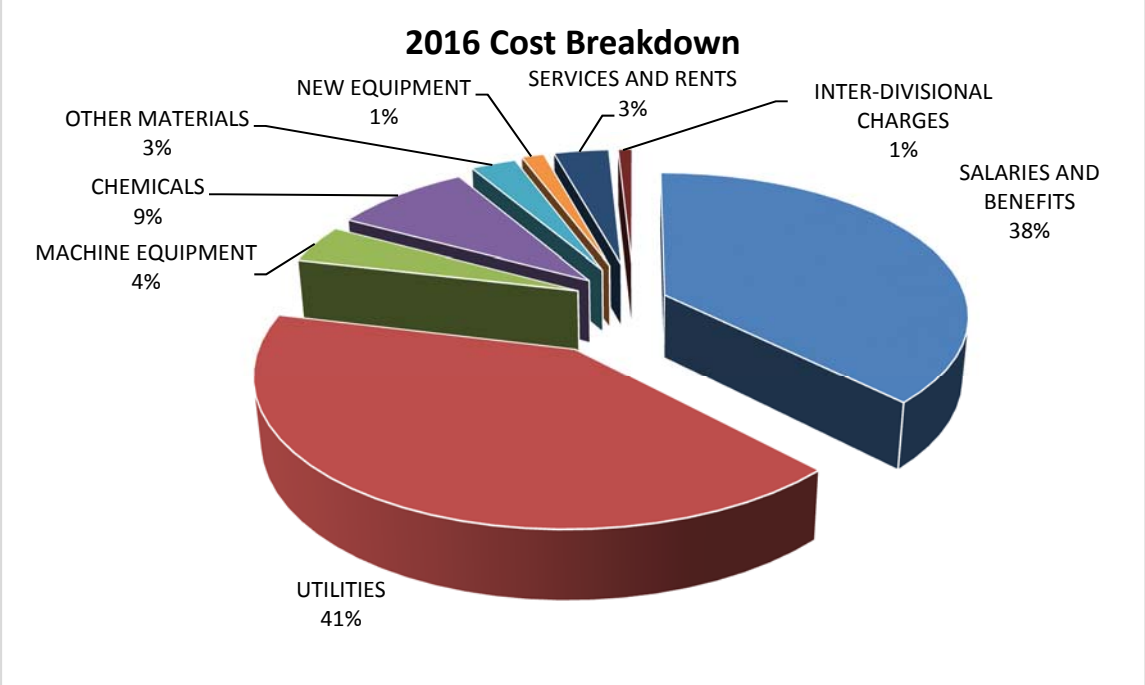


Figure 1: Humber Treatment Plant Operations and Maintenance Costs 2016

7. HUMAN RESOURCES

7.1 Staffing

In 2016, the Humber Treatment Plant had 62 employees. Several positions were vacant due to long term illness or recent retirements. Plant Staffing is shown in Table 12.

Table 12: Plant Staffing

Position Title	Number
Plant Manager	1
Senior Engineer	2
Area Supervisors	4
Electrical & Instrumentation Specialist	1
Electrician	3
Plant Technicians	17
Industrial Millwrights	19
Electrical Instrumentation Control Techs	5
Wastewater Treatment Plant Worker	7
Support/Materials Management Assistants	2
Engineering Technologist	1

7.2 Occupational Health & Safety

Continuous efforts are made to ensure a safe working environment at the Humber Treatment Plant. The Joint Health and Safety Committee (JHSC) assists management staff in resolving issues through monthly meetings and Plant Audits.

Plant Health and Safety statistics for the Humber Treatment Plant in 2015 for active employees were as follows:

Incident	1
First Aid	1
Medical Aid	2
Lost Time	2
Recurrence	0
Total	**6**

In 2015, 7 lost time days were attributed to work related injuries.

7.3 Staff Training & Development

The Technical Training Section of Toronto Water has developed a comprehensive Operator Training Program that expands the abilities of the operational staff, resulting in better service to the public.

All Humber Treatment Plant operating staff 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 training provided for Humber Treatment Plant Staff in 2016 included:

a) Technical and Health Safety Training:

- Cross Connection Specialist Backflow Tester – Recertification
- Transportation of Dangerous Goods
- Wastewater Laboratory Procedures
- Electrical Safety for Maintenance Staff
- Level "C" CPR Renewal
- Safety in a High Voltage Environment
- Mathematics for Operators: Module 1
- Working at Heights
- Common Wear Items for Plant Machinery
- Confined Space Entry & Rescue Training Awareness
- Backflow Prevention Awareness
- Hot Work Permit System Awareness
- Lock out, Tag out & Test Awareness
- Confined Space Awareness
- Fall Protection Awareness
- Rigging Safety Awareness
- Workplace Hazardous Materials Information System WHMIS (MSDS Interpretation)
- Joint Health and Safety Committees – (JHSC) Certification Training
- Emergency First Aid Level 'A' CPR
- Scaffolding Awareness
- Working with Wastewater
- Conductors
- Mathematics for Operators: Module 2
- Standard First Aid – Level "C" CPR & AED

b) Other Training:
- Customer Service Essentials for Administrative Support and Frontline Staff
- Respect in Our Workplace
- Violence in the Workplace

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 OWWCO Level 1 examination.

Table 13 summarizes the status of operator certification at the Humber Treatment Plant in 2016:

Table 13: Wastewater Treatment Certificates

Class Level	Licensed
Class IV	12
Class III	4
Class II	5
Class I	7
O. I. T.	20
TOTAL	**48**

7.5 MOECC/MOL Correspondence

There were no orders issued by either the Ministry of the Environment or the Ministry of Labour to the Humber Treatment Plant in 2016.

The Ministry of the Environment was advised in writing of all spills, bypass events and complaints that occurred in 2016. Dates and details of these events can be seen in section 2.6.

Appendix A

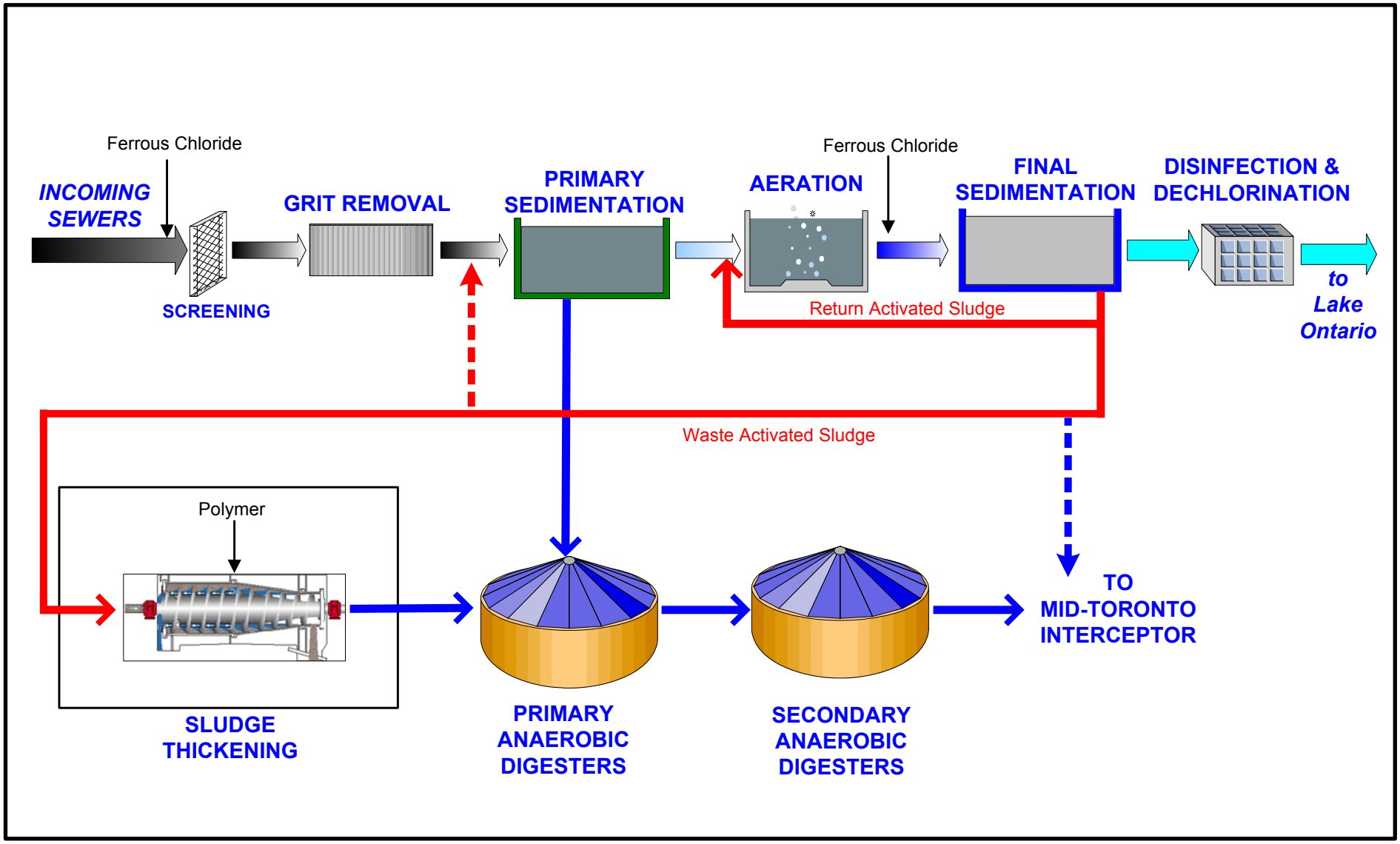
Glossary of Abbreviations

Glossary of Abbreviations

ABTP	Ashbridges Bay Treatment Plant
BOD_5	Five-Day Biological Oxygen Demand (in some instances this may be referred to as BOD)
$CBOD_5$	Five-Day Carbonaceous Biological Oxygen Demand
CEU	Continuing Education Units
CFU	Colony Forming Units
C of A	Certificate of Approval
CPR	Cardiopulmonary Resuscitation
CSO	Combined Sewer Overflow (Tank)
DAF	Air Flotation
D.O.	Dissolved Oxygen
ECA	Environmental Compliance Approval
E. Coli	Escheria Coli
ha	Hectare
HCTP	Highland Creek Treatment Plant
HTP	Humber Treatment Plant
HP	Horsepower
HRT	Hydraulic Retention Time
kg	Kilogram
kg/day	Kilogram per day
kWh	Kilowatt-hour
kWh/month	Kilowatt-hour per month
MWh	Megawatt-hour
m	Metre
m^3	Cubic metre
m^3/month	Cubic metre per month
M	Million
MCC	Motor Control Centre
mA	milliamps
mg/L	Milligrams per litre
mL	Millilitre
ML	Megalitre
ML/day	Megalitre per day
MOECC	Ministry of Environment and Climate Change
No.	Number
P	Presence
MTI	Mid-Toronto Interceptor Forcemain
NTTP	North Toronto Treatment Plant
SBS	Sodium Bisulphite
SCADA	Supervisory Control and Data Acquisition
STS	Sanitary Trunk Sewer
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

Appendix B

Plant Schematic

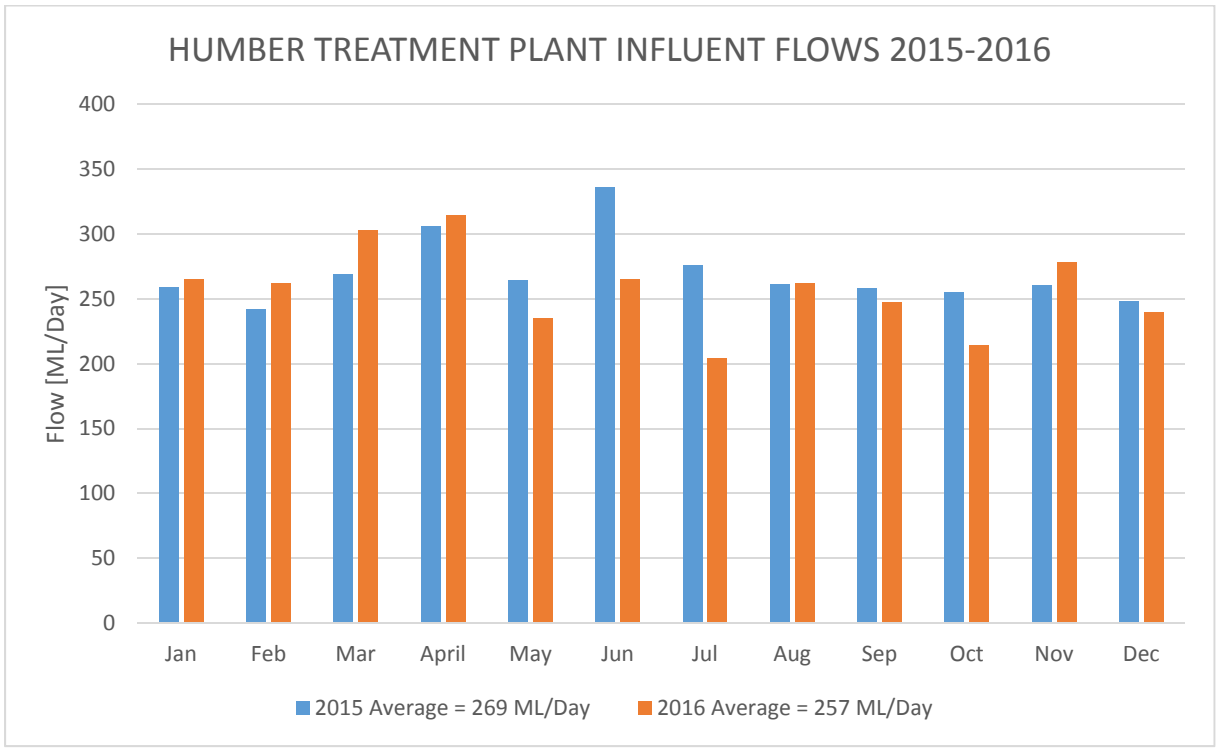


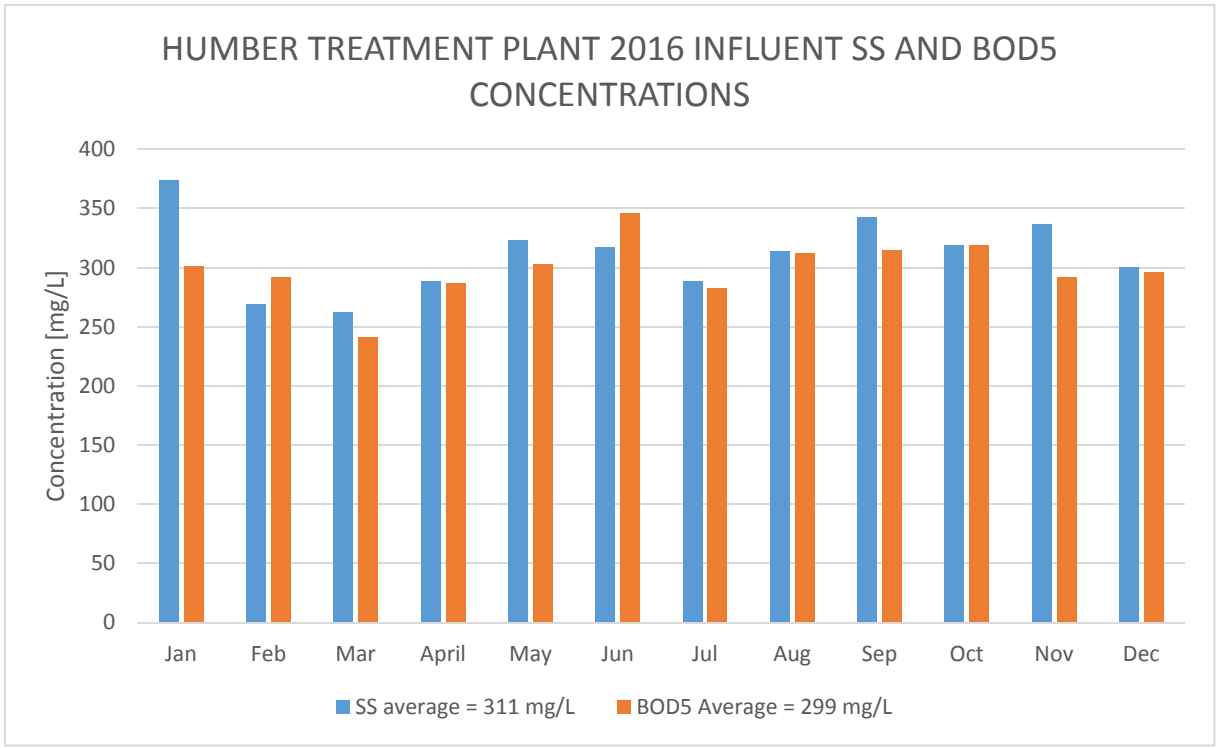
Process Flow Diagram for Humber Wastewater Treatment Plant

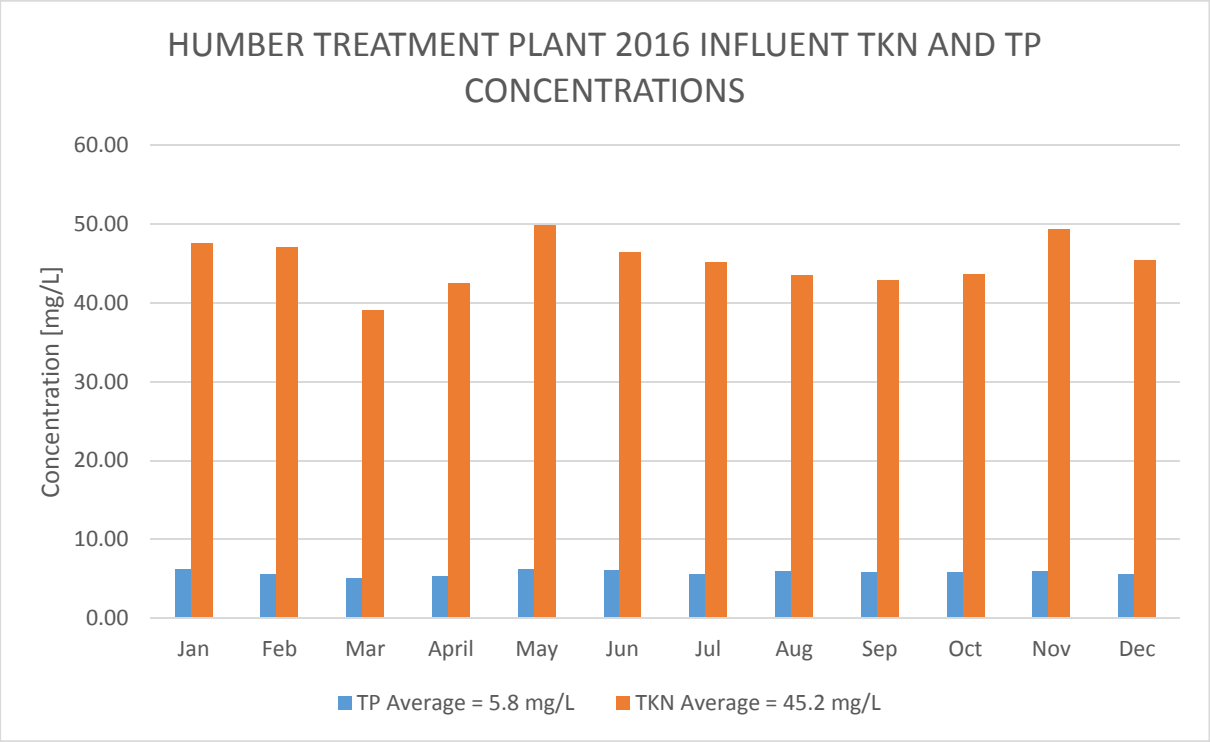
Appendix C

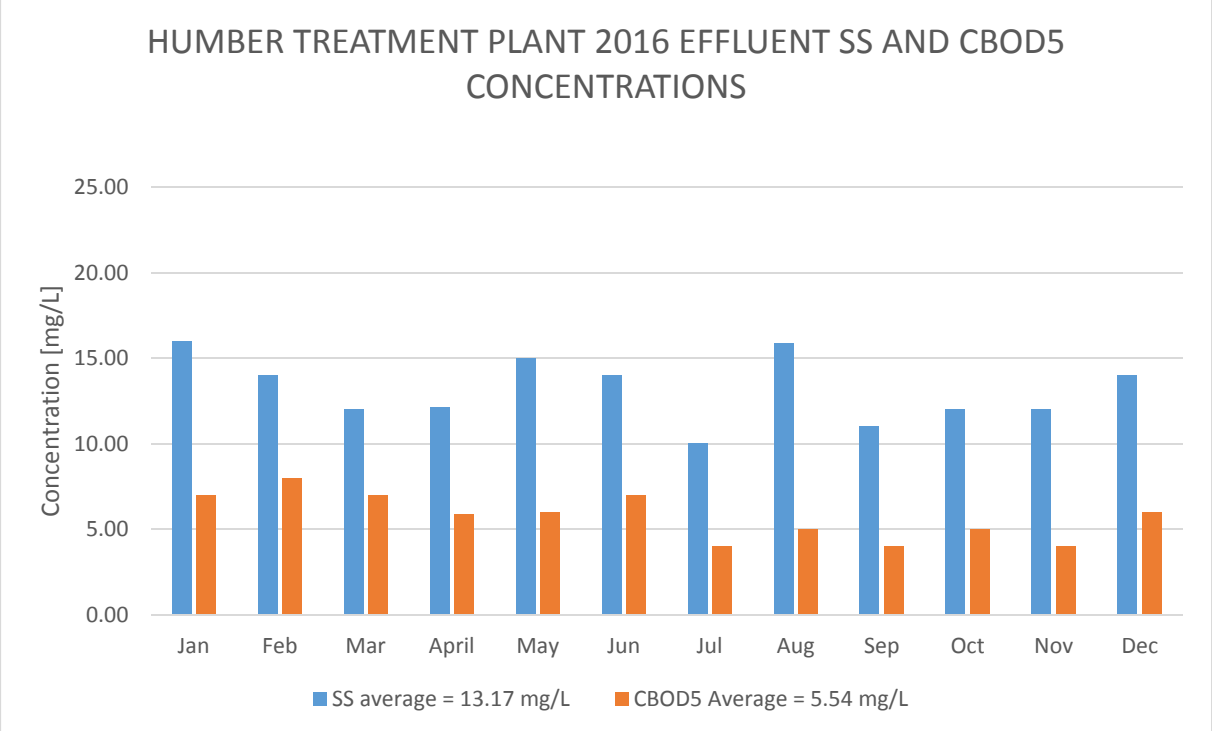
Performance Charts

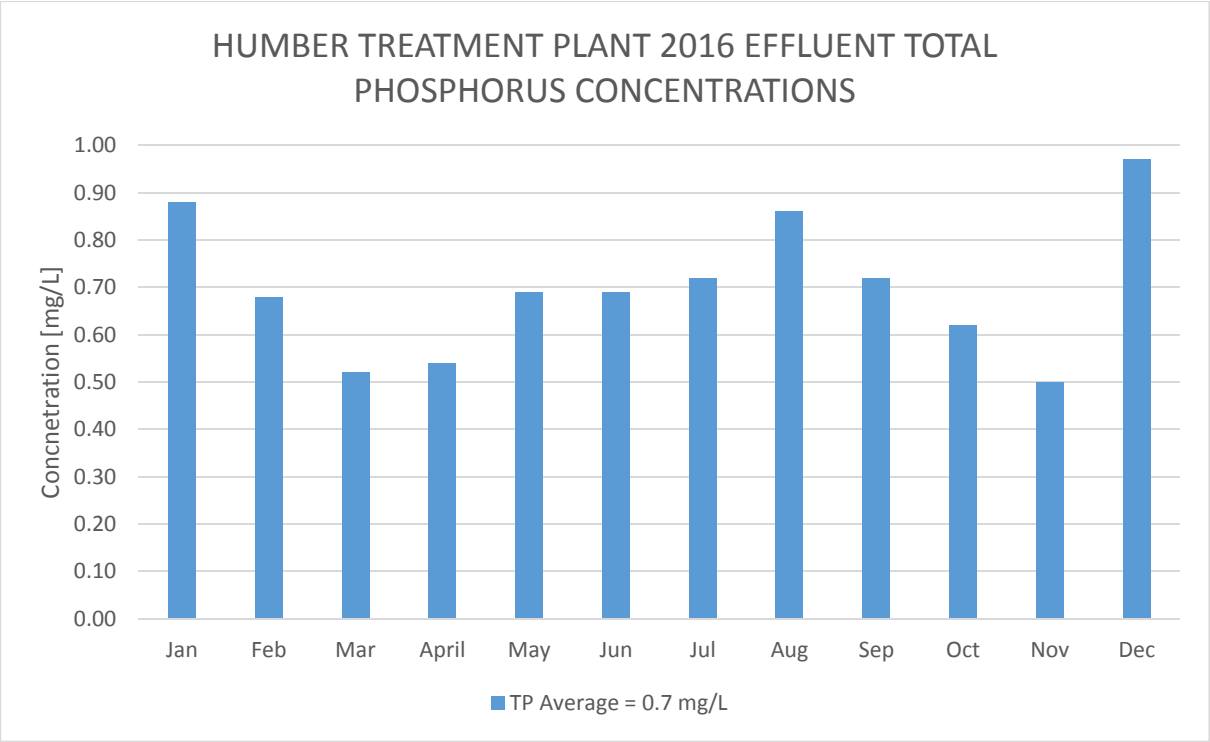
- Influent Flows
- Influent SS & BOD_5 Concentrations
- Influent TKN & Total Phosphorous Concentrations
- Effluent SS & $CBOD_5$ Concentrations
- Effluent Total Phosphorous Concentrations
- Effluent TKN & Ammonia Concentrations
- Effluent *E. Coli*
- Effluent pH
- Effluent Temperature
- Digester Gas Production

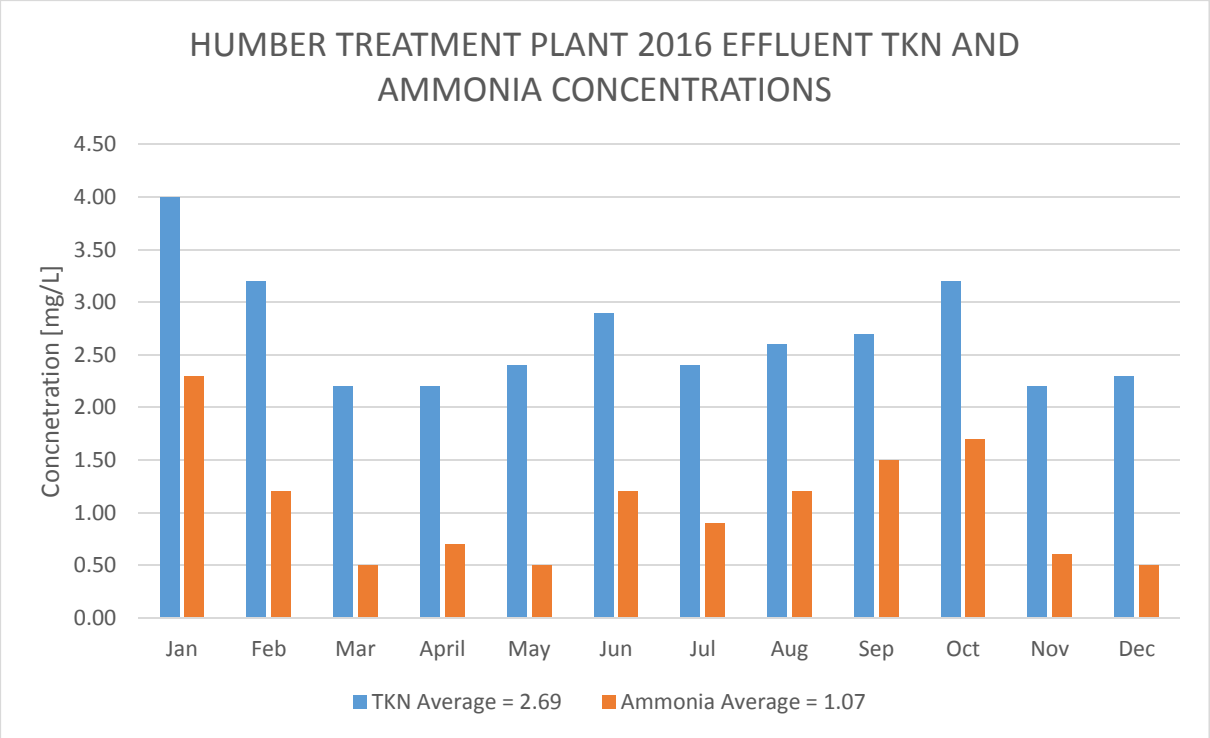

HUMBER TREATMENT PLANT INFLUENT FLOWS 2015-2016
Flow [ML/Day]
400
350
300
250
200
150
100
50
0
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2015 Average = 269 ML/Day
2016 Average = 257 ML/Day

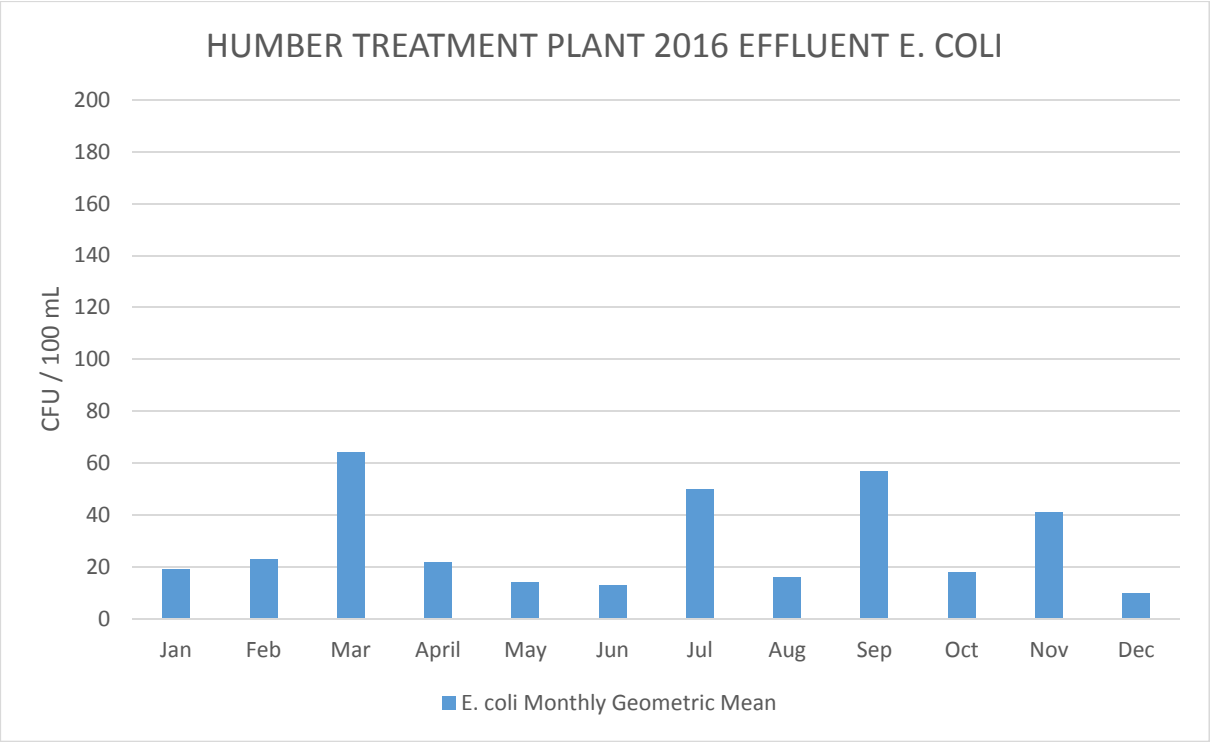

HUMBER TREATMENT PLANT 2016 INFLUENT SS AND BOD5 CONCENTRATIONS
Concentration [mg/L]
400
350
300
250
200
150
100
50
0
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
SS average = 311 mg/L
BOD5 Average = 299 mg/L

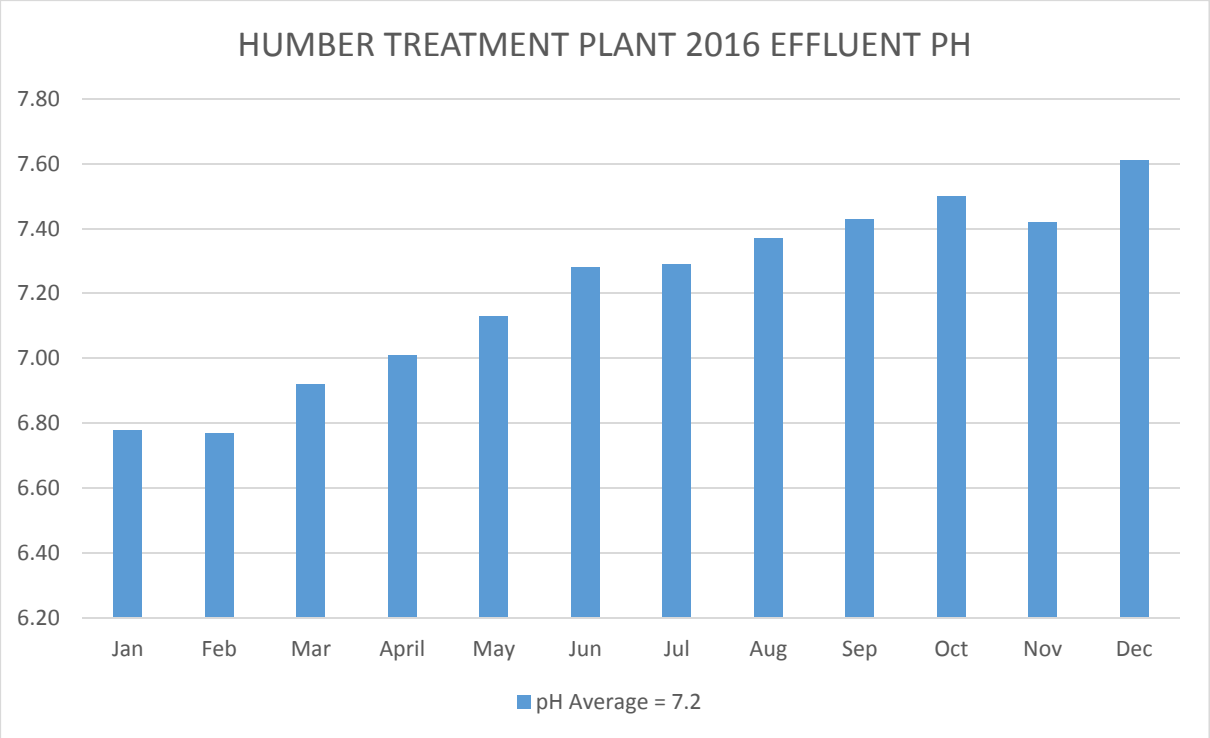

HUMBER TREATMENT PLANT 2016 INFLUENT TKN AND TP CONCENTRATIONS
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Concentration [mg/L]
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
TP Average = 5.8 mg/L
TKN Average = 45.2 mg/L

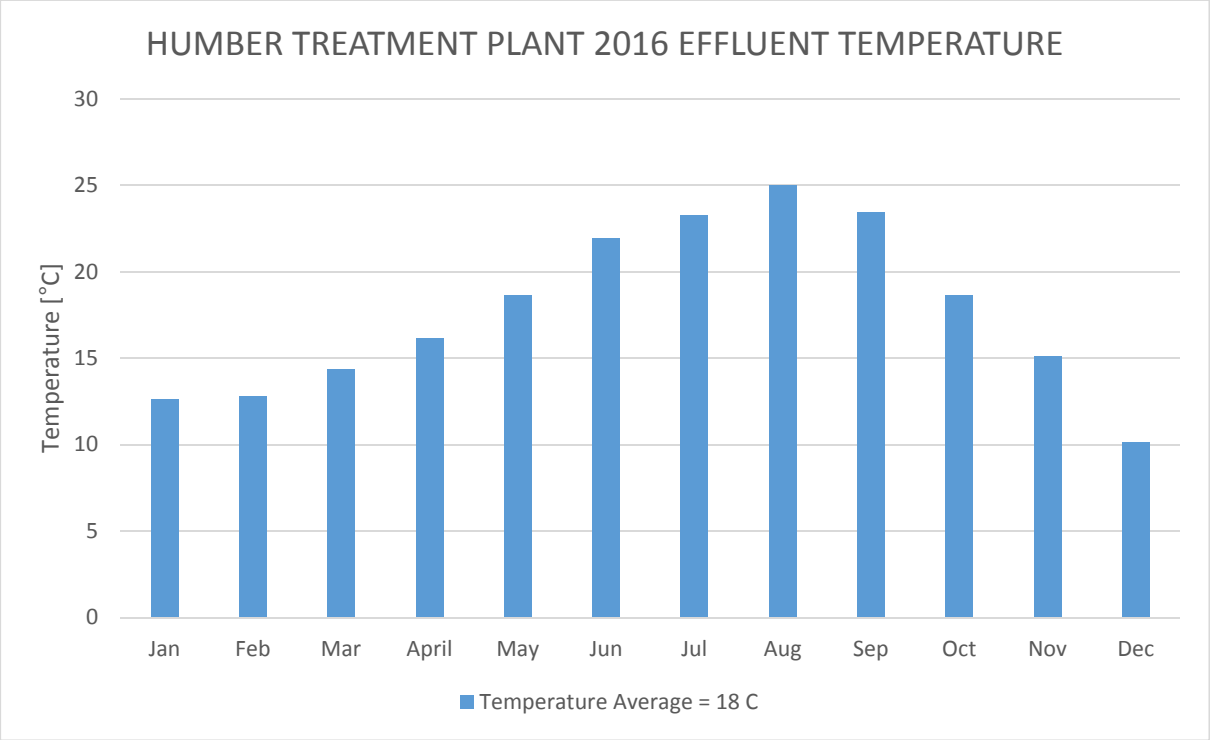

HUMBER TREATMENT PLANT 2016 EFFLUENT SS AND CBOD5 CONCENTRATIONS
25.00
20.00
15.00
10.00
5.00
0.00
Concentration [mg/L]
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
SS average = 13.17 mg/L
CBOD5 Average = 5.54 mg/L

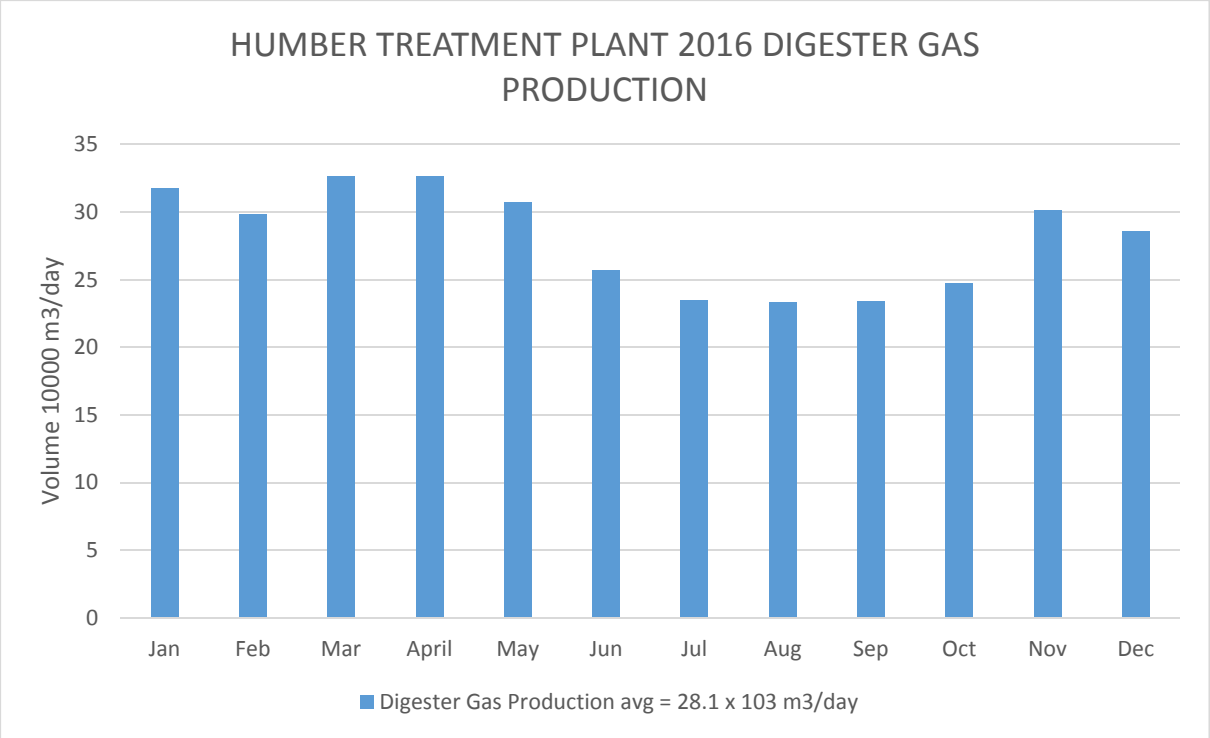

HUMBER TREATMENT PLANT 2016 EFFLUENT TOTAL PHOSPHORUS CONCENTRATIONS
Concnetration [mg/L]
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
TP Average = 0.7 mg/L


HUMBER TREATMENT PLANT 2016 EFFLUENT TKN AND AMMONIA CONCENTRATIONS
Concnetration [mg/L]
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
TKN Average = 2.69
Ammonia Average = 1.07


HUMBER TREATMENT PLANT 2016 EFFLUENT E. COLI
CFU / 100 mL
200
180
160
140
120
100
80
60
40
20
0
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
E. coli Monthly Geometric Mean


HUMBER TREATMENT PLANT 2016 EFFLUENT PH
7.80
7.60
7.40
7.20
7.00
6.80
6.60
6.40
6.20
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
pH Average = 7.2


HUMBER TREATMENT PLANT 2016 EFFLUENT TEMPERATURE
Temperature [°C]
30
25
20
15
10
5
0
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Temperature Average = 18 C


HUMBER TREATMENT PLANT 2016 DIGESTER GAS PRODUCTION
Volume 10000 m3/day
35
30
25
20
15
10
5
0
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Digester Gas Production avg = 28.1 x 103 m3/day

Appendix D

Influent & Effluent Metal Concentrations

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

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

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: January 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0178	mg/L	0.0400	
	Iron	0.830	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0610	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00757	mg/L	0.0800	
	Zinc	0.0466	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00981	mg/L	4.0000	
	Copper	0.136	mg/L	2.0000	
	Iron	1.18	mg/L		
	Lead	0.0112	mg/L	1.0000	
	Manganese	0.0683	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.0107	mg/L	2.0000	
	Zinc	0.263	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-Feb-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

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

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: February 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber 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	0.0148	mg/L	0.0400	
	Iron	1.00	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0693	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00804	mg/L	0.0800	
	Zinc	0.0550	mg/L	0.0400	
INFLUENT	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.0129	mg/L	4.0000	
	Copper	0.146	mg/L	2.0000	
	Iron	1.21	mg/L		
	Lead	0.00941	mg/L	1.0000	
	Manganese	0.0709	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00868	mg/L	2.0000	
	Zinc	0.354	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: 18-Mar-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

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

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: March 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
Monthly Metals at Dee - FINAL EFFLUENT Lab Basement	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0124	mg/L	0.0400	
	Iron	0.829	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0723	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00707	mg/L	0.0800	
	Zinc	0.0511	mg/L	0.0400	
Monthly Metals at Dee. - INFLUENT	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.0141	mg/L	4.0000	
	Copper	0.106	mg/L	2.0000	
	Iron	1.24	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0714	mg/L	5.0000	
	Mercury	0.0002450	mg/L	0.0100	
	Nickel	0.0105	mg/L	2.0000	
	Zinc	0.238	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: 03-May-2016 /

Approved By: TP Chief Chemist /

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

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

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: April 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0134	mg/L	0.0400	
	Iron	0.722	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0691	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00621	mg/L	0.0800	
	Zinc	0.0485	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.0103	mg/L	4.0000	
	Copper	0.133	mg/L	2.0000	
	Iron	1.18	mg/L		
	Lead	0.00539	mg/L	1.0000	
	Manganese	0.0752	mg/L	5.0000	
	Mercury	0.00009800	mg/L	0.0100	
	Nickel	0.00948	mg/L	2.0000	
	Zinc	0.246	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: 16-May-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

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

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: May 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0148	mg/L	0.0400	
	Iron	0.886	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0624	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00764	mg/L	0.0800	
	Zinc	0.0519	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00857	mg/L	4.0000	
	Copper	0.0916	mg/L	2.0000	
	Iron	1.33	mg/L		
	Lead	0.00568	mg/L	1.0000	
	Manganese	0.0741	mg/L	5.0000	
	Mercury	0.00006400	mg/L	0.0100	
	Nickel	0.0120	mg/L	2.0000	
	Zinc	0.263	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-Jun-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

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

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: June 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT- Monthly Metals at Dee	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	0.00796	mg/L	0.0800	
	Copper	0.0827	mg/L	0.0400	
	Iron	1.06	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0644	mg/L	0.0500	
	Mercury	0.0001370	mg/L	0.0004	
	Nickel	0.00920	mg/L	0.0800	
	Zinc	0.210	mg/L	0.0400	
INFLUENT- Monthy Metals at Dee	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.0127	mg/L	4.0000	
	Copper	0.0931	mg/L	2.0000	
	Iron	1.15	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0643	mg/L	5.0000	
	Mercury	0.00008000	mg/L	0.0100	
	Nickel	0.0117	mg/L	2.0000	
	Zinc	0.184	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-Jul-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

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

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: July 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Monthly @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0172	mg/L	0.0400	
	Iron	0.598	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0498	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00690	mg/L	0.0800	
	Zinc	0.0476	mg/L	0.0400	
INFLUENT - Monthly @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.0144	mg/L	4.0000	
	Copper	0.137	mg/L	2.0000	
	Iron	1.36	mg/L		
	Lead	0.00575	mg/L	1.0000	
	Manganese	0.0703	mg/L	5.0000	
	Mercury	0.0006760	mg/L	0.0100	
	Nickel	0.0113	mg/L	2.0000	
	Zinc	0.259	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-Aug-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

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

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: August 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Monthly Meatls @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0171	mg/L	0.0400	
	Iron	1.15	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0565	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00722	mg/L	0.0800	
	Zinc	0.0575	mg/L	0.0400	
INFLUENT - Monthly Meatls @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.0122	mg/L	4.0000	
	Copper	0.157	mg/L	2.0000	
	Iron	1.39	mg/L		
	Lead	0.00687	mg/L	1.0000	
	Manganese	0.0666	mg/L	5.0000	
	Mercury	0.00008800	mg/L	0.0100	
	Nickel	0.0112	mg/L	2.0000	
	Zinc	0.286	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: 03-Oct-2016 /

Approved By: TP Chief Chemist /

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

Tel: 416-392-2894 #
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TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: September 2016 (

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES /
Humber Treatment Plant					
FINAL EFFLUENT - Monthly Metals at Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0171	mg/L	0.0400	
	Iron	0.672	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0508	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00595	mg/L	0.0800	
	Zinc	0.0582	mg/L	0.0400	
INFLUENT - Monthly Metals at Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00794	mg/L	4.0000	
	Copper	0.134	mg/L	2.0000	
	Iron	1.43	mg/L		
	Lead	0.00677	mg/L	1.0000	
	Manganese	0.0650	mg/L	5.0000	
	Mercury	0.0001200	mg/L	0.0100	
	Nickel	0.00866	mg/L	2.0000	
	Zinc	0.273	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: 31-Oct-2016 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

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

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: October 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
EFFLUENT Monthly Metals	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0141	mg/L	0.0400	
	Iron	0.865	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0525	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00701	mg/L	0.0800	
	Zinc	0.0579	mg/L	0.0400	
INFLUENT Monthly Metals	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00816	mg/L	4.0000	
	Copper	0.113	mg/L	2.0000	
	Iron	1.24	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0649	mg/L	5.0000	
	Mercury	0.0001260	mg/L	0.0100	
	Nickel	0.00812	mg/L	2.0000	
	Zinc	0.234	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: 01-Dec-2016 /

Approved By: TP Chief Chemist /

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

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

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: November 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber 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	0.0166	mg/L	0.0400	
	Iron	1.04	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0666	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00974	mg/L	0.0800	
	Zinc	0.0860	mg/L	0.0400	
INFLUENT	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.0153	mg/L	4.0000	
	Copper	0.138	mg/L	2.0000	
	Iron	1.68	mg/L		
	Lead	0.00647	mg/L	1.0000	
	Manganese	0.0745	mg/L	5.0000	
	Mercury	0.0001460	mg/L	0.0100	
	Nickel	0.0144	mg/L	2.0000	
	Zinc	0.265	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: 04-Jan-2017 /

Approved By: TP Chief Chemist /

Central Laboratory (
545 Commissioners Street, #
Toronto,Ontario, M4M 1A5 #

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

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: December 2016

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0204	mg/L	0.0400	
	Iron	0.547	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0364	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00998	mg/L	0.0800	
	Zinc	0.0575	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.0144	mg/L	4.0000	
	Copper	0.0960	mg/L	2.0000	
	Iron	1.12	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0552	mg/L	5.0000	
	Mercury	0.00007400	mg/L	0.0100	
	Nickel	0.0135	mg/L	2.0000	
	Zinc	0.196	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: 16-Jan-2017 /

Approved By: TP Chief Chemist /

Appendix E

Analytical Testing Summary

Toronto Water Laboratory LIMS Sample and Result Counts From: 01/01/2016 To: 12/31/2016

Humber Treatment Plant Number of Samples 6329

	ALK pH DS COND	BOD	CBOD	Chlorine	COD	ECOLI	Ferric Chloride	IONS	Mercury	METALS	NH3 (as N)	Orthophosphate	P	pH	pH_15	SPGR	Sulphite	TKN (as N)	Toxicity	TS	TSS	Un-ionized NH3 (as N)	VA	Total
BYPASS FINAL EFFLUENT	0	0	12	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	13	0	0	37
CUSTOM SAMPLE POINT	51	1	11	0	8	0	0	180	0	44	18	5	10	1	0	3	0	18	0	141	101	0	0	592
FINAL EFFLUENT	72	0	361	51	0	54	0	504	12	108	61	363	363	0	46	0	52	52	24	0	375	35	0	2,533
HTP FE SAMPLE	0	0	0	0	0	0	92	0	0	0	0	0	0	0	0	5	0	0	0	0	1	0	0	98
INFLUENT	6	312	0	0	0	0	0	0	12	108	52	83	365	0	0	0	0	52	0	0	379	0	0	1,369
MIXED LIQUOR TANK 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	0	0	97
MIXED LIQUOR TANK 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	0	0	97
MIXED LIQUOR TANK 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	0	0	97
MIXED LIQUOR TANK 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97	0	0	97
MIXED LIQUOR TANK 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	102	0	0	102
MIXED LIQUOR TANK 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	0	99
MIXED LIQUOR TANK 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	0	99
MIXED LIQUOR TANK 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	0	99
NONE	0	0	0	0	0	0	4	0	0	1	0	0	0	0	0	0	0	0	0	11	0	0	0	16
PRIMARY DIGESTED SLUDGE VA TANK 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92	0	0	75	167
PRIMARY DIGESTED SLUDGE VA TANK 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92	0	0	72	164
PRIMARY DIGESTED SLUDGE VA TANK 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92	0	0	72	164
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	92	0	0	72	164
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	90	0	0	69	159
PRIMARY DIGESTED SLUDGE VA TANK 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	0	0	69	159
PRIMARY EFFLUENT N CONDUIT	6	2	345	0	178	0	0	0	0	0	0	170	93	0	0	0	0	0	0	0	361	0	0	1,155
PRIMARY EFFLUENT S CONDUIT	6	2	344	0	178	0	0	0	0	0	0	173	91	0	0	0	0	0	0	0	360	0	0	1,154
RAW SLUDGE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	224	0	0	0	224
RETURN SLUDGE NORTH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	264	0	0	264
RETURN SLUDGE SOUTH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	270	0	0	270
SECONDARY DIGESTER CROSS SECTION TANK 4 6 LEVEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4
SECONDARY DIGESTER CROSS SECTION TANK 4 CONE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	8
SECONDARY DIGESTER CROSS SECTION TANK 6 12 LEVEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4
SECONDARY DIGESTER CROSS SECTION TANK 6 6 LEVEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6
SECONDARY DIGESTER CROSS SECTION TANK 6 CONE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	14
SLUDGE TO TAB	0	0	0	0	0	0	0	10	1	10	1	0	0	0	0	0	0	0	0	341	0	0	0	363
THICKENING FEED WAS	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	368	0	0	370
WAS THICKENING - CENTRIFUGE #1 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	8
WAS THICKENING - CENTRIFUGE #1 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
WAS THICKENING - CENTRIFUGE #2 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	0	0	74
WAS THICKENING - CENTRIFUGE #2 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	142	1	0	0	143
WAS THICKENING - CENTRIFUGE #3 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	83	0	0	83
WAS THICKENING - CENTRIFUGE #3 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	158	0	0	0	158
WAS THICKENING - CENTRIFUGE #4 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	119	0	0	119
WAS THICKENING - CENTRIFUGE #4 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	235	0	0	0	235
WAS THICKENING - CENTRIFUGE #5 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72	0	0	72
WAS THICKENING - CENTRIFUGE #5 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	126	0	0	0	126
WAS THICKENING - CENTRIFUGE #6 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	15
WAS THICKENING - CENTRIFUGE #6 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	12
WAS THICKENING - CENTRIFUGE #7 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
WAS THICKENING - FLOTATION - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3
Total	141	317	1,073	51	364	54	96	694	25	271	132	795	935	1	46	8	52	122	24	1,981	3,651	35	429	11,297

Ions include: Cl, SO4, NO3, NO2, Br, Ca, Mg, Na, K

Metals by ICP include: Cd, Cr, Cu, Ni, Pb, Zn,

Volatlie Total Solids (VS) are done on 80% of Total Solids, Volatile Suspend Solids (VSS) are done on 2% of the Total Suspended Solids samples.

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TORONTO WATER LABORATORY

Sampling Point: THR01 INFLUENT &

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	272.00	283.00	277.50	mg/L	<1.6
Conductivity	1,330.00	1,370.00	1,350.00	µS/cm	<1.5
pH	7.10	7.60	7.35	SU	<0.10
Group: BOD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Biochemical Oxygen Demand (BOD)	142.00	819.00	297.38	mg/L	<2
Group: METALS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Arsenic	0.010000	0.01000	0.01000	mg/L	<0.01
Cadmium	0.004000	0.00400	0.00400	mg/L	<0.004
Chromium	0.008600	0.01440	0.01188	mg/L	<0.004
Copper	0.091600	0.15700	0.12496	mg/L	<0.004
Iron	1.150000	1.39000	1.25500	mg/L	<0.02
Lead	0.005000	0.01120	0.00680	mg/L	<0.005
Manganese	0.064300	0.07520	0.07014	mg/L	<0.004
Nickel	0.008700	0.01200	0.01070	mg/L	<0.005
Zinc	0.184000	0.35400	0.26163	mg/L	<0.02
Group: Mercury	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Mercury	0.000100	0.00070	0.00019	mg/L	<0.00003
Group: NH3(as N)	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Ammonia(as N)	16.00	37.00	28.19	mg/L	<0.05
Group: Orthophosphate	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Orthophosphate	2.60	16.00	8.26	mg/L	<0.5
Group: P	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Phosphorus (HACH)	2.70	11.00	5.74	mg/L	<0.08
Group: TKN(as N)	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Kjeldahl Nitrogen	27.40	52.90	44.94	mg/L	<0.2
Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	112.00	784.00	308.74	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THR02 PRIMARY EFFLUENT N CONDUIT

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	261.00	265.00	263.00	mg/L	<1.6
Conductivity	1,240.00	1,350.00	1,295.00	µS/cm	<1.5
pH	7.30	7.60	7.45	SU	<0.10
Group: BOD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Biochemical Oxygen Demand (BOD)	115.00	139.00	127.00	mg/L	
Group: CBOD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Carbonaceous Biochemical Oxygen Demand	4.00	305.00	157.17	mg/L	<2
Group: COD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Chemical Oxygen Demand	53.00	7,500.00	451.63	mg/L	<10

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Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	2.80	22.00	7.10	mg/L	<0.5

Group: P	Minimum	Maximum	Average	Units	Reporting Limit
Phosphorus (HACH)	3.20	5.50	4.37	mg/L	<0.08

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	4.00	364.00	91.48	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THR03 PRIMARY EFFLUENT S CONDUIT

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	257.00	257.00	257.00	mg/L	<1.6
Conductivity	1,240.00	1,340.00	1,290.00	µS/cm	<1.5
pH	7.20	7.50	7.35	SU	<0.10

Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	75.00	198.00	136.50	mg/L	

Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	21.00	344.00	154.24	mg/L	<2

Group: COD	Minimum	Maximum	Average	Units	Reporting Limit
Chemical Oxygen Demand	50.00	750.00	410.01	mg/L	<10

Group: Orthophosphate	Minimum	Maximum	Average	Units	Reporting Limit
Orthophosphate	3.10	24.00	7.48	mg/L	<0.5

Group: P	Minimum	Maximum	Average	Units	Reporting Limit
Phosphorus (HACH)	3.20	5.70	4.57	mg/L	<0.08

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	20.00	252.00	92.72	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THR04 FINAL EFFLUENT

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	48.00	139.00	102.43	mg/L	<1.6
Conductivity	912.00	1,230.00	1,061.00	µS/cm	<1.5
pH	7.30	7.80	7.57	SU	<0.10

Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	2.00	19.00	5.95	mg/L	<2

Group: Chlorine	Minimum	Maximum	Average	Units	Reporting Limit
Total Residual Chlorine	0.30	1.00	0.66	mg/L	<0.01

Group: ECOLI	Minimum	Maximum	Average	Units	Reporting Limit
EColi	2.00	268.00	40.11	CFU/100 mL	

Group: IONS	Minimum	Maximum	Average	Units	Reporting Limit
Bromide	0.200000	2.75000	2.50811	mg/L	<0.1
Calcium	51.000000	102.00000	80.22973	mg/L	<0.2
Chloride	133.000000	354.00000	180.08108	mg/L	<0.2
Hardness (Calculation)	186.000000	329.00000	265.35135	mg/L	<1
Magnesium	12.400000	19.30000	15.58919	mg/L	<0.1
Nitrate(as N)	7.540000	21.10000	12.71514	mg/L	<0.01
Nitrite(as N)	0.277000	3.12000	1.17024	mg/L	<0.002
Potassium	8.080000	16.10000	12.01189	mg/L	<0.05
Sodium	90.400000	236.00000	126.14865	mg/L	<0.4

Sulfate	45.400000	64.30000	56.37568	mg/L	<0.2
Group: METALS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Arsenic	0.010000	0.01000	0.01000	mg/L	<0.01
Cadmium	0.004000	0.00400	0.00400	mg/L	<0.004
Chromium	0.004000	0.00800	0.00450	mg/L	<0.004
Copper	0.012400	0.08270	0.02378	mg/L	<0.004
Iron	0.598000	1.15000	0.88438	mg/L	<0.02
Lead	0.005000	0.00500	0.00500	mg/L	<0.005
Manganese	0.049800	0.07230	0.06310	mg/L	<0.004
Nickel	0.006200	0.00920	0.00748	mg/L	<0.005
Zinc	0.046600	0.21000	0.07103	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(as N)	0.20	3.70	1.24	mg/L	<0.05
Group: Orthophosphate	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Orthophosphate	0.50	4.50	1.25	mg/L	<0.5
Group: P	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Phosphorus (HACH)	0.28	2.70	0.70	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	1.28	5.96	2.62	mg/L	<0.2
Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	2.00	46.00	13.27	mg/L	<2
Volatile Suspended Solids				%	
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	0.00	0.00	mg/L	
Group: Un-ionized NH3(as N)	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Ammonia(as N)Un-ionized (Calculation)	0.00	0.03	0.01	mg/L	<0.001
Group: pH_15	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
pH_15C	7.10	7.90	7.38	SU	

Sampling Point: THR06 RAW SLUDGE

Group: TS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	0.04	5.50	1.96	%	
Volatile Total Solids	0.00	92.31	70.58	%	

Sampling Point: THR07 PRIMARY DIGESTED SLUDGE VA TANK 1

Group: TS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	1.00	1.40	1.17	%	
Volatile Total Solids	57.10	73.70	64.98	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	1,850.00	2,750.00	2,236.67	mg/L	<10
Volatile Acids	130.00	200.00	153.33	mg/L	
pH	7.30	7.70	7.51	SU	

Sampling Point: THR08 PRIMARY DIGESTED SLUDGE VA TANK 2

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.00	1.50	1.24	%	
Volatile Total Solids	45.45	72.20	64.15	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	1,950.00	2,600.00	2,310.00	mg/L	<10
Volatile Acids	30.00	280.00	149.33	mg/L	
pH	7.10	7.60	7.45	SU	

Sampling Point: THR09 PRIMARY DIGESTED SLUDGE VA TANK 3

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.00	1.60	1.30	%	
Volatile Total Solids	57.10	79.20	65.20	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	1,950.00	2,550.00	2,280.00	mg/L	<10
Volatile Acids	140.00	200.00	161.33	mg/L	
pH	7.30	7.80	7.56	SU	

Sampling Point: THR10 PRIMARY DIGESTED SLUDGE VA TANK 5

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.90	1.70	1.27	%	
Volatile Total Solids	56.50	71.40	64.26	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	2,150.00	2,500.00	2,363.33	mg/L	<10
Volatile Acids	100.00	210.00	162.00	mg/L	
pH	7.30	7.80	7.59	SU	

Sampling Point: THR11 PRIMARY DIGESTED SLUDGE VA TANK 7

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.00	2.10	1.44	%	
Volatile Total Solids	46.50	74.20	62.73	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	2,150.00	2,500.00	2,343.33	mg/L	<10
Volatile Acids	130.00	210.00	168.67	mg/L	
pH	7.30	7.80	7.55	SU	

Sampling Point: THR12 PRIMARY DIGESTED SLUDGE VA TANK 8

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.90	2.30	1.45	%	
Volatile Total Solids	57.10	71.40	64.70	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	1,950.00	2,700.00	2,343.33	mg/L	<10
Volatile Acids	130.00	250.00	172.00	mg/L	
pH	7.10	7.80	7.44	SU	

Sampling Point: THR16 SECONDARY DIGESTER CROSS SECTION TANK 4 6 LEVEL

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit

Total Solids	0.80	1.10	0.95	%
Volatile Total Solids	53.30	68.20	60.75	%

Sampling Point: THR17 SECONDARY DIGESTER CROSS SECTION TANK 4 CONE

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.90	2.20	1.72	%	
Volatile Total Solids	63.60	68.97	66.99	%	

Sampling Point: THR18 SECONDARY DIGESTER CROSS SECTION TANK 6 12 LEVEL

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.30	2.30	2.30	%	
Volatile Total Solids	68.10	68.10	68.10	%	

Sampling Point: THR19 SECONDARY DIGESTER CROSS SECTION TANK 6 6 LEVEL

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.90	2.30	2.10	%	
Volatile Total Solids	57.50	66.70	62.10	%	

Sampling Point: THR20 SECONDARY DIGESTER CROSS SECTION TANK 6 CONE

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.00	8.00	3.18	%	
Volatile Total Solids	50.00	70.37	62.98	%	

Sampling Point: THR21 SLUDGE TO TAB

Group: IONS	Minimum	Maximum	Average	Units	Reporting Limit
Bromide	2.750000	2.75000	2.75000	mg/L	<0.1
Calcium	113.000000	113.00000	113.00000	mg/L	<0.2
Chloride	163.000000	163.00000	163.00000	mg/L	<0.2
Hardness (Calculation)	401.000000	401.00000	401.00000	mg/L	<1
Magnesium	28.900000	28.90000	28.90000	mg/L	<0.1
Nitrate(as N)	0.275000	0.27500	0.27500	mg/L	<0.01
Nitrite(as N)	0.055000	0.05500	0.05500	mg/L	<0.002
Potassium	50.200000	50.20000	50.20000	mg/L	<0.05
Sodium	124.000000	124.00000	124.00000	mg/L	<0.4
Sulfate	5.500000	5.50000	5.50000	mg/L	<0.2
Group: METALS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Arsenic	0.041100	0.04110	0.04110	mg/L	<0.01
Cadmium	0.013900	0.01390	0.01390	mg/L	<0.004
Chromium	0.950000	0.95000	0.95000	mg/L	<0.004
Cobalt	0.065300	0.06530	0.06530	mg/L	<0.004
Copper	9.890000	9.89000	9.89000	mg/L	<0.004
Lead	0.559000	0.55900	0.55900	mg/L	<0.005
Molybdenum	0.099300	0.09930	0.09930	mg/L	<0.01
Nickel	0.441000	0.44100	0.44100	mg/L	<0.005
Selenium	0.023000	0.02300	0.02300	mg/L	<0.01
Zinc	12.300000	12.30000	12.30000	mg/L	<0.02
Group: Mercury	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Mercury	0.007100	0.00710	0.00710	mg/L	<0.00003

Group: NH3(as N)	Minimum	Maximum	Average	Units	Reporting Limit
Ammonia(as N)	440.00	440.00	440.00	mg/L	<0.05

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.30	5.40	1.98	%	
Volatile Total Solids	56.10	75.30	63.94	%	

Sampling Point: THR22 WAS THICKENING - FLOTATION - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	4.30	4.30	4.30	%	
Volatile Total Solids	77.30	77.30	77.30	%	

Sampling Point: THR24 THICKENING FEED WAS

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,810.00	61,630.00	8,826.83	mg/L	<2
Volatile Suspended Solids	73.20	77.00	75.33	%	

Sampling Point: THR25 WAS THICKENING - CENTRIFUGE #1 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	3.10	3.10	3.10	%	
Volatile Total Solids	74.20	74.20	74.20	%	

Sampling Point: THR26 WAS THICKENING - CENTRIFUGE #1 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	450.00	890.00	570.00	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THR28 WAS THICKENING - CENTRIFUGE #2 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.30	4.95	3.48	%	
Volatile Total Solids	66.10	92.17	75.42	%	

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	8,300.00	8,300.00	8,300.00	mg/L	<2

Sampling Point: THR29 WAS THICKENING - CENTRIFUGE #2 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	170.00	2,610.00	897.45	mg/L	<2

Sampling Point: THR30 MIXED LIQUOR TANK 1

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,930.00	3,520.00	2,849.14	mg/L	<2
Volatile Suspended Solids	76.20	85.00	79.40	%	

Sampling Point: THR31 MIXED LIQUOR TANK 2

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,150.00	3,600.00	2,994.57	mg/L	<2
Volatile Suspended Solids	76.40	89.80	79.38	%	

Sampling Point: THR32 MIXED LIQUOR TANK 3

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,920.00	3,900.00	2,883.14	mg/L	<2
Volatile Suspended Solids	76.50	86.70	79.70	%	

Sampling Point: THR33 MIXED LIQUOR TANK 4

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,880.00	3,930.00	2,769.43	mg/L	<2
Volatile Suspended Solids	76.00	84.70	79.89	%	

Sampling Point: THR34 MIXED LIQUOR TANK 5

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,810.00	4,080.00	2,645.00	mg/L	<2
Volatile Suspended Solids	75.90	85.00	80.07	%	

Sampling Point: THR35 MIXED LIQUOR TANK 6

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,960.00	4,800.00	3,366.39	mg/L	<2
Volatile Suspended Solids	74.60	85.10	78.98	%	

Sampling Point: THR36 MIXED LIQUOR TANK 7

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,710.00	4,810.00	3,306.11	mg/L	<2
Volatile Suspended Solids	74.10	84.60	78.55	%	

Sampling Point: THR37 MIXED LIQUOR TANK 8

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,150.00	4,330.00	2,540.83	mg/L	<2
Volatile Suspended Solids	75.20	89.80	79.50	%	

Sampling Point: THR38 RETURN SLUDGE SOUTH

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	4,180.00	11,370.00	8,428.82	mg/L	<2
Volatile Suspended Solids	75.40	79.30	77.52	%	

Sampling Point: THR44 BYPASS FINAL EFFLUENT

Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	60.00	204.00	120.75	mg/L	<2
Group: P	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Phosphorus (HACH)	2.30	4.20	3.06	mg/L	<0.08
Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	52.00	244.00	113.50	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THR50 HTP FE SAMPLE

Group: Ferric Chloride	Minimum	Maximum	Average	Units	Reporting Limit

Absolute Difference	0.00	0.02	0.01		
Bill of Lading #	82,101,603.00	82,449,431.00	82,375,230.73		
Specific Gravity	1.15	1.30	1.21		
Supplier Specific Gravity	1.15	1.30	1.21		

Sampling Point: THR52 RETURN SLUDGE NORTH

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,970.00	16,210.00	8,606.78	mg/L	<2
Volatile Suspended Solids	74.40	79.50	76.54	%	

Sampling Point: THR81 WAS THICKENING - CENTRIFUGE #3 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.90	6.00	4.69	%	
Volatile Total Solids	66.30	81.80	74.88	%	

Sampling Point: THR82 WAS THICKENING - CENTRIFUGE #3 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	340.00	4,160.00	1,031.09	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THR83 WAS THICKENING - CENTRIFUGE #4 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.80	6.00	3.97	%	
Volatile Total Solids	66.70	80.60	74.32	%	

Sampling Point: THR84 WAS THICKENING - CENTRIFUGE #4 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	250.00	3,030.00	1,087.39	mg/L	<2
Volatile Suspended Solids				%	

Sampling Point: THR85 WAS THICKENING - CENTRIFUGE #5 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.10	6.00	3.64	%	
Volatile Total Solids	64.20	79.60	74.71	%	

Sampling Point: THR86 WAS THICKENING - CENTRIFUGE #5 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	200.00	1,980.00	472.94	mg/L	<2
Volatile Suspended Solids	93.60	93.60	93.60	%	

Sampling Point: THR87 WAS THICKENING - CENTRIFUGE #6 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.80	3.50	3.05	%	
Volatile Total Solids	72.41	76.39	74.99	%	

Sampling Point: THR88 WAS THICKENING - CENTRIFUGE #6 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit

Total Suspended Solids	210.00	1,920.00	525.38	mg/L	<2

Sampling Point: THR89 WAS THICKENING - CENTRIFUGE #7 - TWAS

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	3.20	3.20	3.20	%	
Volatile Total Solids	74.70	74.70	74.70	%	

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

Influent Flow Meter, pH and Temperature Calibration Records

Flowmeter Calibration Verification Certificate

Customer	HUMBER WTP
Date Performed	Tuesday 8 March 2016 08:50
Date Certificate Printed	Tuesday 8 March 2016 09:07

Site Details

Location	THR-AER-FIT-0602
Tag	FIT-0602
Operator	Igor

Results :

Transmitter Zero	Pass
Transmitter Span	Pass
Transmitter Pulse Output	Not Tested
Transmitter Analogue Output	Pass
Sensor Electrode Integrity	Pass
Sensor Energising Coil Integrity	Pass

Accuracy :

The above tests and results verify that the flowmeter is functioning within normal working limits, and is within +/- 2% of original calibration certificate.

Transmitter Settings

Sensor Calibration Factor	1.4104/0/5/1.000
Flow Range	1570.0 l/s
Response Time Constant	15 seconds
Probe Factors	ins 1.00000, prof 1.00000
Analogue Output	4-20 Forward
Second Analogue Range	100.0% (1570.0 l/s)
Pulse Output	Not Tested
Totaliser Units	m^3

Calmaster Details

Instrument, Serial No.	CM0149, V/40122/1/1
Last Calibrated	Fri 11 Dec 2015
Next Calibration Date	Sun 11 Dec 2016
Firmware Version	CalMaster v1.0 36/96
PC Software Version	v2.10 13/03/2000
DVM Serial No.	
Resistor Serial No.	(Not Used)

Flowmeter Details

Type	MagMaster, Electromagnetic
Sensor S/No.	P/25514/1/1
Transmitter S/No.	vkh01868
Tag No.	FIT-0602
Meter Size	24 inch

CalMaster is fully traceable to National and International Standards.
For details please refer to CalMaster Traceability Documentation.

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CALMASTER HELPLINE
Email : calmaster@gb.abb.com or calmaster@us.abb.com

Flowmeter Calibration Verification Certificate

Customer	HUMBER WTP
Date Performed	Tuesday 8 March 2016 09:24
Date Certificate Printed	Tuesday 8 March 2016 09:41

Site Details

Location	THR-AER-FIT-0802
Tag	AN-502
Operator	Igor

Results :

Transmitter Zero	Pass
Transmitter Span	Pass
Transmitter Pulse Output	Not Tested
Transmitter Analogue Output	Pass
Sensor Electrode Integrity	Pass
Sensor Energising Coil Integrity	Pass

Accuracy :

The above tests and results verify that the flowmeter is functioning within normal working limits, and is within +/- 2% of original calibration certificate.

Transmitter Settings

Sensor Calibration Factor	1.3955/-2/5/1.000
Flow Range	1570.0 l/s
Response Time Constant	15 seconds
Probe Factors	ins 1.00000, prof 1.00000
Analogue Output	4-20 Forward
Second Analogue Range	100.0% (1570.0 l/s)
Pulse Output	Not Tested
Totaliser Units	m^3

Calmaster Details

Instrument, Serial No.	CM0149, V/40122/1/1
Last Calibrated	Fri 11 Dec 2015
Next Calibration Date	Sun 11 Dec 2016
Firmware Version	CalMaster v1.0 36/96
PC Software Version	v2.10 13/03/2000
DVM Serial No.	
Resistor Serial No.	(Not Used)

Flowmeter Details

Type	MagMaster, Electromagnetic
Sensor S/No.	P/25514/1/3
Transmitter S/No.	vkh04257
Tag No.	AN-502
Meter Size	24 inch

CalMaster is fully traceable to National and International Standards.
For details please refer to CalMaster Traceability Documentation.

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CALMASTER HELPLINE
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Flowmeter Calibration Verification Certificate

Customer	HUMBER WTP
Date Performed	Tuesday 8 March 2016 10:11
Date Certificate Printed	Tuesday 8 March 2016 10:27

Site Details

Location	THR-AER-FIT-0702
Tag	FT-4309
Operator	Igor

Results :

Transmitter Zero	Pass
Transmitter Span	Pass
Transmitter Pulse Output	Not Tested
Transmitter Analogue Output	Pass
Sensor Electrode Integrity	Pass
Sensor Energising Coil Integrity	Pass

Accuracy :

The above tests and results verify that the flowmeter is functioning within normal working limits, and is within +/- 2% of original calibration certificate.

Transmitter Settings

Sensor Calibration Factor	1.4147/-8/5/1.000
Flow Range	1570.0 l/s
Response Time Constant	15 seconds
Probe Factors	ins 1.00000, prof 1.00000
Analogue Output	4-20 Forward
Second Analogue Range	100.0% (1570.0 l/s)
Pulse Output	Not Tested
Totaliser Units	m^3

Calmaster Details

Instrument, Serial No.	CM0149, V/40122/1/1
Last Calibrated	Fri 11 Dec 2015
Next Calibration Date	Sun 11 Dec 2016
Firmware Version	CalMaster v1.0 36/96
PC Software Version	v2.10 13/03/2000
DVM Serial No.	
Resistor Serial No.	(Not Used)

Flowmeter Details

Type	MagMaster, Electromagnetic
Sensor S/No.	P/25514/1/2
Transmitter S/No.	vkh04252
Tag No.	FT-4309
Meter Size	24 inch

CalMaster is fully traceable to National and International Standards.
For details please refer to CalMaster Traceability Documentation.

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CALMASTER HELPLINE
Email : calmaster@gb.abb.com or calmaster@us.abb.com

INSTRUMENT CALIBRATION DATA SHEET

Location: T-12 Raw sewage Flow East
Tag: THR-PLT-FIT-2001A

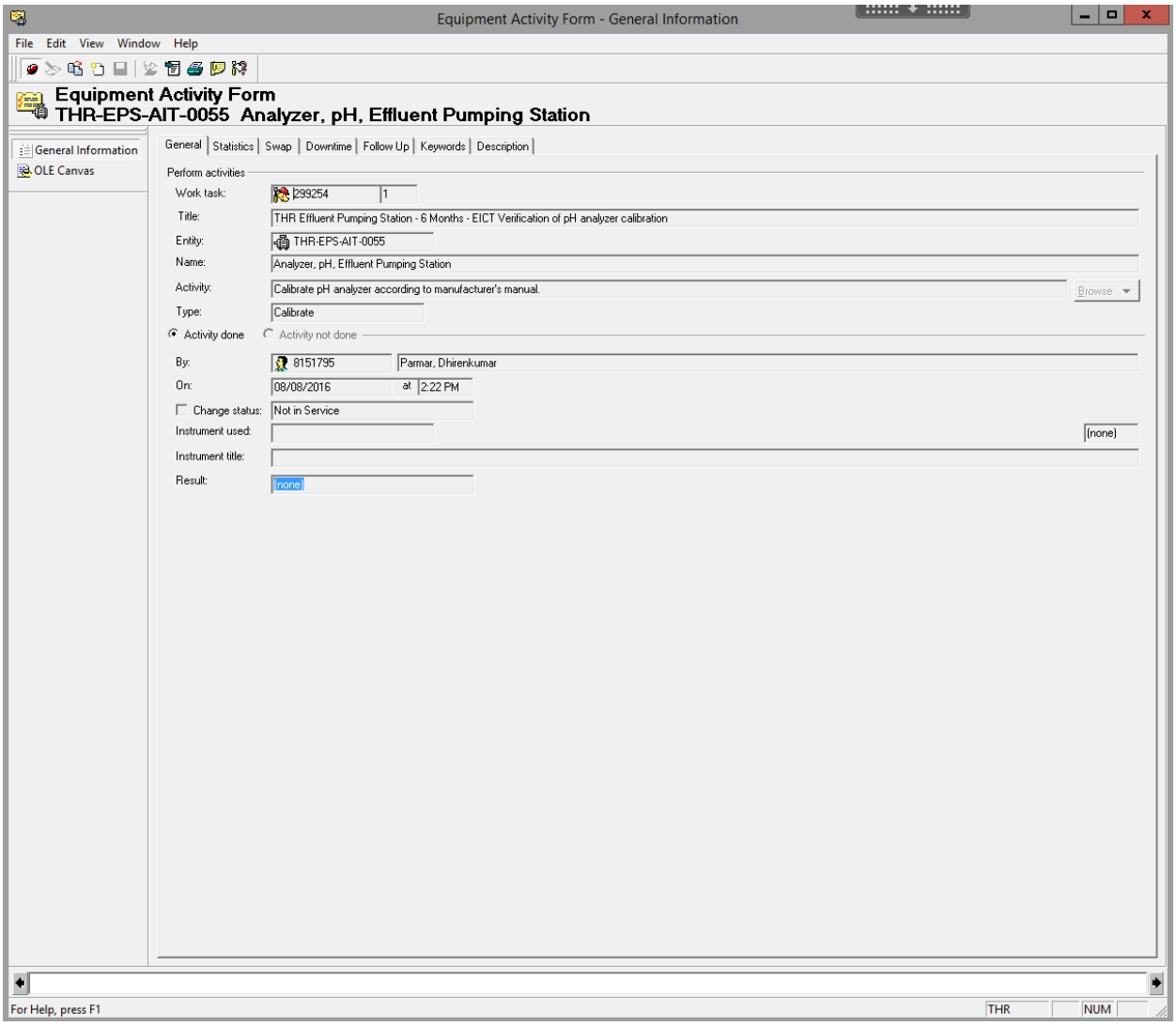
Manufacture: Endress+Hauser Deltabar

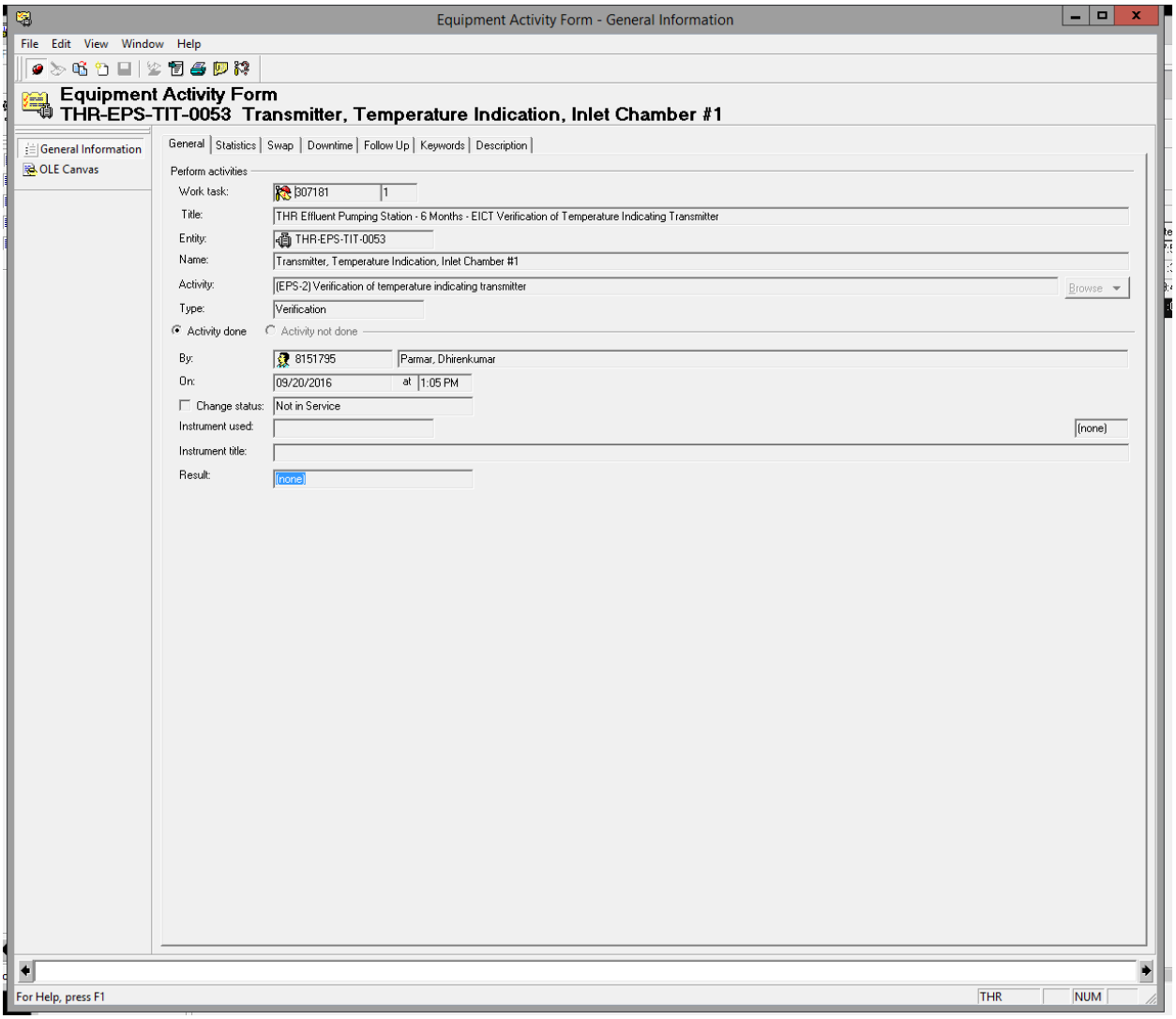
Input Inches of w/c	Desired Output (mA)	Actual Output (mA)	Error Percent %
0.00	4.00	4.020	0.500
8.88	12.00	12.10	0.833
17.75	15.314	15.40	0.558
26.63	17.856	18.00	0.805
35.5	20.00	20.10	0.500

Date: Aug 19th 2016

INSTRUMENT CALIBRATION RECORDER

DATA	AUG 31TH 2016					
TAG	THR-PLT-FIT-1012					
MANUFACTURE	Endress + Hauser					
MODEL #						
MEASUREMENT	Flow					
RANGE	0-42 Inch w/c					
CALIBRATION RESULT	INPUT	RANGE VALUE	OUTPUT	OUTPUT(mA) AS FOUND		% ERROR
	0		4.00	4.010		0.25
	10.50		12.00	11.855		-1.202
	21.00		15.314	15.187		-0.829
	31.50		17.856	17.650		-1.153
	42.00		20.00	20.00		0.000
COMMENT						
TECHNICIAN	Martin Ge		SIGNATURE			


Equipment Activity Form - General Information
File Edit View Window Help
Equipment Activity Form
THR-EPS-AIT-0055 Analyzer, pH, Effluent Pumping Station
General Information
OLE Canvas
General | Statistics | Swap | Downtime | Follow Up | Keywords | Description
Perform activities
Work task: 299254 1
Title: THR Effluent Pumping Station - 6 Months - EICT Verification of pH analyzer calibration
Entity: THR-EPS-AIT-0055
Name: Analyzer, pH, Effluent Pumping Station
Activity: Calibrate pH analyzer according to manufacturer's manual.
Browse
Type: Calibrate
Activity done
Activity not done
By: 8151795 Parmar, Dhirenkumar
On: 08/08/2016 at 2:22 PM
Change status: Not in Service
Instrument used:
(none)
Instrument title:
Result: (none)
For Help, press F1
THR
NUM


Equipment Activity Form - General Information
File Edit View Window Help
Equipment Activity Form
THR-EPS-TIT-0053 Transmitter, Temperature Indication, Inlet Chamber #1
General Information
OLE Canvas
General | Statistics | Swap | Downtime | Follow Up | Keywords | Description
Perform activities
Work task: 807181 1
Title: THR Effluent Pumping Station - 6 Months - EICT Verification of Temperature Indicating Transmitter
Entity: THR-EPS-TIT-0053
Name: Transmitter, Temperature Indication, Inlet Chamber #1
Activity: (EPS-2) Verification of temperature indicating transmitter
Browse
Type: Verification
Activity done
Activity not done
By: 8151795 Parmar, Dhirenkumar
On: 09/20/2016 at 1:05 PM
Change status: Not in Service
Instrument used:
(none)
Instrument title:
Result: (none)
For Help, press F1
THR
NUM