TORONTO Water

HUMBER
WASTEWATER TREATMENT PLANT

2015 Annual Report

March 31, 2016

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. The facility was operated under Certificate of Approval No. 8477-8C6JZN.

The average influent flow rate in 2015 was 269.0 ML/day. The 2015 average influent concentrations of Biological Oxygen Demand (BOD_5), Total Phosphorus (TP) and Suspended Solids (SS) were 318 mg/L, 5.8 mg/L and 369 mg/L, respectively.

In 2015, the plant met or exceeded all final effluent parameters regulated under the Certificate of Approval. The Humber Plant achieved the following effluent quality in 2015:

	Certificate of Approval[1]	2015 Treated Effluent
Suspended Solids (SS)	25 mg/L	11 mg/L
Carbonaceous Biological Oxygen Demand ($CBOD_5$)	25 mg/L	5.4 mg/L
Total Phosphorus (TP)	1 mg/L	0.78 mg/L
Escheria Coli (E. Coli)[2]	200 CFU/100mL	33.8 mg/L
pH	6.0-9.5	7.4
Total Chlorine Residual	0.02	SBS Presence detected[3]
SS Loading Rate	-	2959 kg/day
$CBOD_5$ Loading Rate	-	1438 kg/day
TP Loading Rate	473 kg/day	210 kg/day

[1]Referenced from condition C of A No. 8477-8C6JZN issued on Jaunary 14, 2011
[2]Geometric Mean
[3]The presence of Sodium Bisulphite (SBS) indicates a Total Chlorine Residual of zero.

There were 11 bypass occurrences in 2015 where portions of the flow received primary treatment before being disinfected and discharged into Lake Ontario. Total bypassed flows were estimated to be 388 ML. There were a total of 5 other spills and abnormal occurances.

An average of 3957 m^3/day of Waste Activated Sludge (WAS) was removed from Final Clarification Tanks in 2015. Of this, 822 m^3/day was transferred directly to the Ashridges Bay Treatment Plant for further treatment and disposal and 3135 m^3/day was thickened and stabilized prior to transfer. An average of 74 dry tonnes per day of biosolids 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, South Primary Scum Upgrades, Cogeneration Facility, Chlorine System Conversion to Hypochlorite, Odour Control Phase 1 Implementation, Digester 9 and 10 cleaning and Upgrades, New Electrical Substation and HVAC Upgrades.

Quantities of ferrous chloride, chlorine, sodium hypochlorite, and sodium bisulphite consumed in 2015 were 530,301 kg (as Fe), 164,324 kg, 1,945,257 L, and 398,696 L, respectively. The total annual consumption for hydro, natural gas and potable water in 2015 was 53.5M kWh, 1.4M m^3 and 363,530 m^3, respectively.

The plant operating cost for 2015 totalled $17.1M. In 2015, the Humber Treatment Plant had 66 employees. There were 105 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. The Humber 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, gas, chemicals and instrument 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. As of January 14, 2011, the facility operated under the amended Certificate of Approval No. 8477-8C6JZN.

This report is a summary of the operation of the plant and its performance in 2015. 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 2014 and a comparison of monthly influent flow rates and characteristics for 2014 and 2015 is illustrated in Appendix C.

Table 1: Influent Parameters

Parameter	2015	2014	2013	2012
Influent Flow [ML/day]	269.0	280.5	311.5	287.5
Total Annual Flow [ML]	98,174	102,364	113,709	105,445
Influent SS [mg/L]	369	358	318	405
Influent BOD_5 [mg/L]	318	295	238	261
Influent TP [mg/L]	5.8	5.0	4.4	4.9

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. Ferrous chloride is added in the Head House for phosphorus removal. 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.

The quantity of grit and screenings removed by the aerated grit channels, vortex tanks and mechanical bar screens averaged approximately 2.2 tonnes per day in 2015.

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 and partially removes 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.

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 overflow from these tanks (called primary effluent or settled sewage), which still contains organic materials, flows into the Aeration Tanks. Upgrades to two of the North Plant Primary Tanks occurred in 2015, including the commissioning of a new travelling bridge and scum collection system in one tank and the installation of a new travelling bridge in another. These upgrades will continue on into 2016.

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 2015.

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

Table 2: Primary Treatment Effluent Parameters

Parameter	2015	Primary Removal Efficiency[1]	2014	Primary Removal Efficiency
SS [mg/L]	97	74%	101	71%
$cBOD_5$ [mg/L]	156	39%	138	40%

2.4 Secondary Treatment

In Secondary Treatment, effluent from the Primary Clarifiers is mixed with Return Activated Sludge (RAS) from the Final Clarifier 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.

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 and is either pumped directly to the Ashbridges Bay Treatment Plant (ABTP) via the Mid-Toronto Interceptor (MTI) for further treatment or thickened and anaerobically digested prior to transfer to the 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.

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

Table 3: Secondary Treatment Process Parameters

Parameter	2015	2014	2013
Aeration Loading [kg $CBOD_5/m^3 \cdot d$]	0.39	0.37	0.40
Mixed Liquor Suspended Solids[mg/L]	2,838	2,998	2,885

2.5 Final Effluent Quality & Disinfection

Chlorine was used to disinfect the final effluent through the first half of the year and Sodium Hypochlorite was used for the remainder of the year. Sodium Bisulphite is used as the dechlorination agent prior to discharging into Lake Ontario. The plant outfall is approximately 966m in length with number of diffusers located at intervals between 500m to 966m from the shoreline.

In 2015, the Humber Treatment Plant continued to produce a high quality effluent which surpassed the requirements of the plant's Certificate of Approval. This was achieved by continuous improvement in operation and maintenance of the treatment process.

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

Parameter	C of A Limit[1]	2015	Removal Efficiency	2014	Removal Efficiency
SS [mg/L]	25	11	97%	12	99%
$CBOD_5$ [mg/L]	25	5.4	98%	44.8	98%
pH	6.0 – 9.5	7.4	-	7	-
TP Loading Rate (kg/day)	473	210	-	210	-
Total Chlorine Residual (mg/L)	0.02	SBS Presence Detected[2]		SBS Presence Detected[2]	

[1] Referenced from condition 6 & 7 of C of A No. 8477-8C6JZN issued on January 14, 2011.
[2] The presence of Sodium Bisulphite (SBS) confirms a Total Chlorine Residual of zero.

Table 5: Monthly Average Final Effluent Parameter Limits

Parameter	C of A[1]	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
TP [mg/L]	1	0.8	0.8	0.6	0.7	0.9	0.75	0.75	0.8	0.6	0.8	0.9	0.8
E-Coli[2] [CFU/100mL]	200	38	7	23	149	107	88	28	79	37	24	24	18

[1] Referenced from condition 7 of C of A No. 8477-8C6JZN issued on January 14, 2011

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

Table 6: Annual Average Final Effluent Parameter Objectives

Parameter	C of A Objective[1]	2015
SS [mg/L]	15	11
$CBOD_5$ [mg/L]	15	5.4
pH	6.0-8.5	7.4
TP [mg/L]	0.9	0.8
TCR [mg/L]	0.00	SBS Presence Detected[2]

[1] Referenced from condition 7 of C of A No. 8477-8C6JZN issued on January 14, 2011.
[2] The presence of Sodium Bisulphite (SBS) confirms a Total Chlorine Residual of zero.

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 eleven (11) secondary treatment bypasses in 2015 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[2] was 675 mm in 2015, which was a 4.7% decrease from 2014. Average plant influent was 4.1% lower compared to the previous year. A summary of bypass events occurring in 2015 is presented in Table 7**.** Secondary bypass events resulted in an estimated total annual bypass volume of 388 ML.

Table 7: Bypass Events Summary for 2015

No.	Date	Duration (hr)	Volume (m^3)
1	8-Apr-15	2	13,435
2	20-Apr-15	9.25	96,065
3	5-Jun-15	1.6	7,715
4	08-Jun-15	1.8	25,080
5	10-Jun-15	1.5	3,508
6	16-Jun-15	4.3	31,319
7	23-Jun-15	2.3	16,260
8	27-Jun-15	10.2	62,307
9	28-Jun-15	10.6	20,067
10	10-Aug-15	5.5	37,143
11	28-Oct-15	12	75,045

2.6.2 Spills and Abnormal Events

There were four (4) abnormal events in 2015, which resulted in treated secondary effluent not receiving disinfection. Event number 1 was caused by faulty safety equipment, which has since been decommissioned. Events 2 and 3 were caused by power outages. The new disinfection system includes a back-up power generator which is expected to be commissioned 2016. Event 4 was caused by a process control system communication failure and issues with the newly commissioned hypochlorite disinfection system, which has since been addressed and corrected.

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

Table 8: Abnormal Events Summary for 2015

No.	Date	Duration (hr)	Volume (m^3)	Nature of Event
1	03-Feb-15	0.9	11,800	Secondary effluent not disinfected
2	16-Mar-15	1.3	18,750	Secondary effluent not disinfected
3	16-Jun-15	1.5	29,100	Secondary effluent not disinfected
4	21-Aug-15	0.3	4,166	Secondary effluent not disinfected

There was one spill which occurred on August 12th 2015. The spill lasted approximately 1 minute and resulted in approximately 200L of 20% solution sodium hydroxide (caustic soda) entering a catch basin and subsequently the outfall pipe. The spill was the result of a burst pipe in a now-decommissioned system. The impact of the spill was minimal as plant staff were able to immediately deploy containment measures and mitigate any environmental impacts with addition of a neutralizing agent. This was evident as no pH change was noted on the on-line sensor located downstream of the spill.

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 2015, an average of 2,723 m^3/day of primary sludge was pumped to the Anaerobic Digesters. An average of 3,135 m^3/day of WAS was thickened by centrifugation and 822 m^3/day was transferred directly to the Ashbridges Bay Treatment Plant via the MTI. WAS contained an average SS concentration of 9,448 mg/L. An average of 530 m^3/day of TWAS was pumped to the Anaerobic Digesters from the centrifuge units. The average TS concentration of TWAS was 4.2% and its TVS solids content was 78.6% of TS.

In 2015, a total of four primary digesters were out of service for cleaning and construction, with no more than three out of service at any given time. The average hydraulic retention time of sludge in the primary digesters was 11.8 days.

Approximately 74 tonnes per day of biosolids were transferred to the Ashbridges Bay Treatment Plant via the MTI in 2015. A summary of the digestion process including the previous two years can be seen in Table 9.

Table 9: Solids Handling Process Parameters

Parameter	2015	2014	2013
Total WAS Thickened [m^3/day]	3,135	3,782	2,422
WAS transferred to ABTP [m^3/day]	822	1,315	562
WAS SS [mg/L]	9,448	8,863	10,391
Primary Sludge Digested [m^3/day]	2,723	3,495	2,639
Total TWAS Digested [m^3/day]	530	512	464
Biosolids transferred to ABTP [dry tonnes per day]	74	64	57
Biosolids TS [%]	2.1	1.84	1.97

Biosolids are regulated by *Ontario Regulation 267/03, The Nutrient Management Act*, which governs the maximum metal concentration in biosolids that are applied to land. Although biosolids generated at the Humber Treatment Plant are transferred to the Ashbridges Bay Treatment Plant for further treatment and are not directly applied to land, the biosolids met all metal concentration criteria as designated in O.Reg 267/03. Results may be found in Appendix E.

The average digester gas volume generated in 2015 was 25,381 m^3/day. This was an increase of 3.6% from the 2014 volume. Monthly digester gas production is shown in Appendix C.

In 2015, the daily average inflow to the Humber Treatment Plant was 269.0 ML/day. The flow projections for 2016 do not exceed the rated plant capacity of 473 ML/day and are expected to generate a sludge volume that will be within +/-5% of the given volume for 2015.

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 two (2) odour complaints in 2015.

In the case of the first complaint, the caller described a strong odour coming from the Humber River. As the plant does not discharge to the river, it was determined that the plant was not the cause of the odour. The second odour complaint resulted in an investigation which discovered no unusual odours at the plant. All process equipment was running as normal and no potential source of odour was identified.

3. CAPITAL UPGRADES AND MAINTENANCE

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 2015:

- Cogeneration Facility
- North Primary Bridges and Scum Collection Equipment Replacement
- South Primary Scum Collection Upgrades
- Plant Services PCS
- New Electrical Substation
- Chlorine System Conversion to Hypochlorite & Upgrade
- New Maintenance Building and RAS Control Room
- Process Audit
- Odour Control Phase I Implementation
- Digester 7 -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

4. MAINTENANCE

The Humber Treatment Plant maintenance activities in 2015 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.

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 G. 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 G.

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

4.2 Solids Handling (Work Area 1)

Work Area 1 includes WAS thickening centrifuges, Anaerobic Digesters and gas collection, compression, and burner systems. The following maintenance was completed in 2015 for Work Area 1:

- Digester dome PRV inspected and cleaned as outlined in WMS schedule.
- Gas compressor and gas boosters serviced as outlined in WMS schedule.
- Odour control system exhaust fans serviced as outlined in WMS schedule.
- Chlorine/sodium bisulphite equipment and auxiliary equipment serviced as outlined in WMS schedule.
- Decommissioned chlorine disinfection system and scrubber system.
- All emergency eyewash station equipment tested weekly and serviced as outlined in WMS schedule.
- Testing and calibration with documentation of all WA-1 back-flow preventers as outlined in WMS schedule.
- Three Digester recirculation pumps overhauled /repaired
- Hot water pump digester 7 repaired
- Digester 8 hot water recirculation valve THR-DIG-V-4760 replaced.
- Replaced one sump pump, Digester 9-10 Entity number DIG-P-3977A

- Repaired one sump pump, northwest corner of STB basement THK-SP-1
- Acid cleaned the Claro bubble gun mixing system internals for purpose on unclogging the tubes on digester # 2.
- Replaced one recirculation pump, entity # DIG-P-2521 on digester3.
- Installed a new Wemco chopper recirculation pump.
- Installed some cleaning stations in work area and started upgrading maintenance shop floor as part of 5S initiative.
- Replaced 12" valve on plant flushing water supply system for STB isolation.
- Repaired cracked centrate chute on centrifuge # 2.
- Removed and cleaned MTI flow meters.
- Built storage cage in STB basement.
- Gas compressor building – Complete overhaul of gas compressors, DIG-C-5240 and DIG-C-5280.
- Replaced 8" plug valve sour gas line.
- Removed, repaired and installed 6" plug valve V-5640 on gas compressor digester # 7
- Sludge thickening building – removed and sent for repair centrifuge THK-CF-4071 to Alfa Laval and reinstalled centrifuge
- Modified torque arms (as suggested by manufacturer) on several centrifuge back-drive input shafts.

4.3 Liquids Handling – Primaries (Work Area 2)

Work Area 2 encompasses preliminary treatment processes including influent bar screens, aerated grit chambers, vortex grit chambers, and primary clarifiers. The following maintenance was completed in 2015 for Work Area 2:

- Headwork, Sluice gates preventive maintenance (WMS planned & scheduled)
  - lubrication and exercise,
  - replacement of gates drives sleeves.
- Bar Screens (6) preventive maintenance (WM planned &S scheduled):
  - lubrication, guide wheels, chute,
  - shock absorbers replacement,
  - influent channel maintenance,
  - de-gritting,
  - annual maintenance and repairs Bar screen 3, 4, 5 and 6.
- Compactor (4) preventive maintenance (WMS planned & scheduled):
  - replacement of #6 bar screen compactor tube,
  - bearing change (major)
  - fabrication and installation of new compactor base
- Screw conveyors preventive maintenance (WMS planned & scheduled):
  - lubrication (drives),
  - replacement of wear liners and shaft less screws,
  - oil replacement.
  - Rebuild of trailer conveyor
- Vortex (4) preventive maintenance (WMS planned & scheduled):
  - lubrication (drives, gears),
  - slewing gear replacement #6 Vortex arm,
  - classifier inspections

- Vortex Blowers (4) preventive maintenance (WMS planned & scheduled):
  - lubrication,
  - alignment checks,
  - filter replacement
- Primary Tanks (9&10) preventive maintenance (WMS planned &scheduled):
  - lubrication (drives) alignment checks,
  - replacement of primary tank sludge pump header valves (6),
  - replacement of primary tank sludge pump isolation valves (4)
- Primary Tank (1-8) preventive maintenance (WMS planned &scheduled):
  - reverse wear shoes on collector,
  - lubrication Checks,
  - lube optimization
  - installation of Desiccant Breathers,
  - replacement of cross collector chain and flights
- Primary Pumping Stations north and south preventive maintenance (WMS scheduled):
  - sludge (13) and Scum pumps (10) lubrication and inspections,
  - scum tank, piping and valves inspection,
  - sump pumps preventive maintenance,
  - valve replacement and rebuild
- Air blower (2) for grit tanks preventive maintenance (WMS planned & scheduled):
  - lubrication and bearing replacement,
  - alignment and piping inspections,
  - filter replacement
- Annual testing and inspection of backflow preventers and test kit(WMS scheduled)
- Potable water pipe replacement in tunnels

4.4 Support Services (Work Area 3)

Work Area 3 includes support services around the plant, process air blowers, and the electrical system. The following maintenance was completed in 2015 for Work Area 3:

- Process instrumentation – maintenance, periodic inspection as per WMS schedule and corrective repairs, including:
  - Chlorine/Dechlorination analyzers (weekly)
  - Turbidity metre (3 months)
  - DO Probes (6 months)
  - Gas detectors - Digester gas scrubber room, gallery gas detector (6 months) and head house (1 year)
  - Raw sludge densitometer (6 months)
  - Waste gas burner instrumentation (yearly) and regulating valve (yearly)
  - Flow meters (yearly)
- Electrical and power equipment – maintenance, periodic inspection as per WMS schedule and corrective repairs.
- HVAC systems – maintenance, periodic inspection and corrective repairs.
- Major repair work and improvement process:
  - Added new High-Level Reset Buttons at Palace Pier
  - Installed new receptacles for sump pumps in tunnels, and in digester control room.
  - Relocated networking cables from old control room to new lab room

- Relocated controllers to new RPU
- Installed new electrical heater in temporary Stores facility
- Built portable glycol pumping station
- Relocated emergency lighting for better illumination
- North Aeration air flow meter replacement
- MTI distribution valves position-indicator installation
- Replacement and modification of boilers make-up air flow sensors
- Hot water booster pumps repair
- Boilers pressure relief valve replacement
- South primary settling tank inlet gate position indicators installation
- Air handling units freeze-stats replacement/modification
- South primary settling tank sampling point light installation
- Air compressor repair
- New Main Sub. Power transfer shutdowns
- Filtered plant water clearwell level sensor modification
- Ferrous Chloride Building pH sensor installation
- MTI pump bearings replacement
- New wiring for Bar Screens 5 and 6 water valves

4.5 Liquids Handling – Secondaries (Work Area 4)

Work Area 4 encompasses secondary treatment processes including aeration, phosphorus removal and final clarification. The following maintenance was completed in 2015 for Work Area 4:

- Completed repairs to $FeCl_2$ system (overhauled diaphragm dosing pumps and modified feed systems).
- Inspected and repaired ferrous feed lines to Aerator Tanks # 1-8.
- Continued with repairs to flushing water lines and feeder lines throughout Work Area 4
- Continued with modifications on scum system #5.
- Overhauled Final Settling Tanks No. 7, 15, 19
- Lubricated all mechanical components as per manufacturer's recommendations
- Rebuild all air actuated valves on aeration tanks #6, 7, 8.
- Replaced T- Section piping in South Return header lines for Final Tanks # 3, 7.
- Rebuild various Waste Activated Sludge Pumps to original manufactures specs.
- Replaced Back Wash Storage Tank Pumps in the Filter Flushing Water Building. (Replacement of check valves).
- Cleaned, inspected and changed sand for all cells in the filter water building.
- Developed 5S areas in the North Finals.
- Modified control valves on aeration tanks # 4 & 5.
- Carried out repairs & modifications on various work area sumps.

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 (Nutrient Removal)
- Chlorine (Disinfection)
- 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 2015.

5.1.2 Ferrous Chloride for Phosphorus Removal

Ferrous chloride is used as a phosphorus precipitant in the treatment process. Annual coagulant consumption during 2015 was approximately 530,301 kg as Fe. This is a 64.8 % increase from 2014. The increased usage is a response to an increased phosphorus load coming to the plant.

Ferrous chloride was purchased at an average cost of $815 per tonne Fe, plus applicable taxes.

5.1.3 Chlorine for Disinfection

Chlorine was used in the first half 2015 for final effluent disinfection, plant water disinfection and return activated sludge control. Total chlorine consumption during 2015 was 164,324 kg. This is a decrease of 58.2 % from 2014. The decrease is due to the decommissioning of the system in favor of the new sodium hypochlorite disinfection system in June of 2015. When it was still in use, total chlorine consumption was on average 3.4 mg/L treated effluent. This is a decrease of 5.6% from 2014.

Chlorine was purchased at an average cost of $920 per tonne, plus applicable taxes. This is unchanged from 2014.

5.1.4 Sodium Hypochlorite for Disinfection

Sodium hypochlorite was used in the second half of 2015 for final effluent disinfection, plant water disinfection and return activated sludge control. Total sodium hypochlorite consumption during 2015 was 1,945,257 L. The use of sodium hypochlorite as the primary means of disinfection began in 2015, therefore comparison of consumption in previous years is not possible. Sodium hypochlorite was consumed at an average rate of 19.8 L per ML treated effluent, or the equivalent of 5.2 mg/L as chlorine.

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

5.1.5 Sodium Bisulphite for Dechlorination

Sodium Bisulphite was used in 2015 as a dechlorinating agent. The total sodium bisulphite usage was 398,696 L. This was an increase of 52.1 % from 2014. This increased usage was due to an equipment problem which is currently being addressed by the plant.

Sodium Bisulphite was purchased at an average cost of $2.19 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	2015	2014	2013
Water [m^3 / month]	30,294	34,566	42,492
Hydro [kWh/ month]	4,459,774	4,022,168	3,962,816
Gas [m^3/ month]	112,843	88,566	173,382

5.2.1 Water

Potable water consumption decreased 12.4% from 2014 to an annual total of 363,530 m^3. Total cost for potable water was $1,204,104. The average unit cost of water was $3.31 per m^3, a 6.4% increase from 2014.

5.2.2 Hydro

Power consumption increased 10.9% from 2014 to an annual total of 53.5M kWh. Total cost for power was $5,019,953. The average unit cost of power was $0.09 per kWh, no change since 2014.

5.2.3 Natural Gas

Natural gas consumption increased 27.4% from 2014 to an annual rate of 1.4M m^3. Total cost for natural gas was $352,692. The average unit cost of natural gas was $0.26 per m^3, a 0% increase over 2014.

6. OPERATIONAL 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 2015 was $17,062,790. This represents a 12.89% increase in costs over 2014. The increase in Salaries and Benefits (8%) is in part due to the addition of four new staff members in 2015. There was also a significant increase in utilities costs (22.5%). A breakdown of annual operational costs for 2014 and 2015 are shown in Table 11. The 2015 operating costs are also illustrated in Figure 1.

Table 11: Operating Costs, 2014 & 2015

Operating Cost	2015	2014
Salaries & Benefits	$6,416,653.50	$5,941,074
Materials & Supplies		
Utilities	$7,215,047.16	$5,889,934
Machine & Equipment Parts	$654,273.87	$691,770
Chemicals	$946,004.83	$773,632
Other Materials & Supplies	$482,930.76	$814,974
New Equipment	$110,281.28	$97,973
Services & Rents	$1,101,646.68	$821,579
Inter-Divisional Charges	$135,951.58	$83,875.1
TOTAL PROGRAM COST:	**$17,062,790**	**$15,114,812**

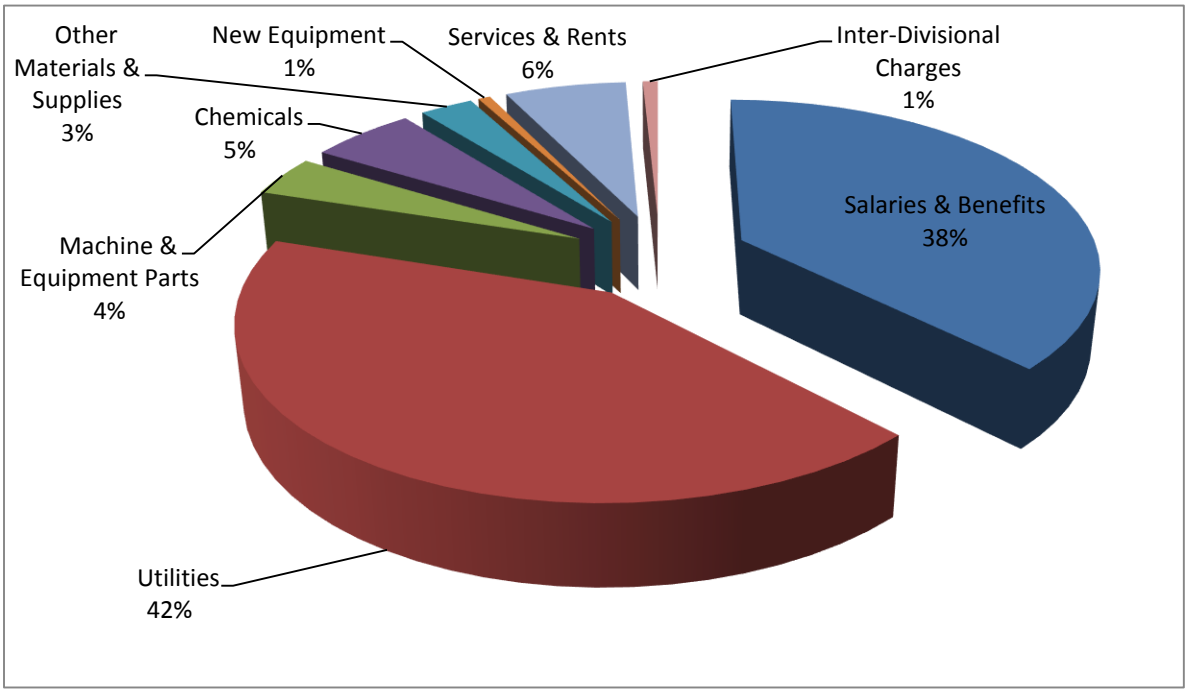


Figure 1: Humber Treatment Plant Operating Costs 2015

7. HUMAN RESOURCES

7.1 Staffing

In 2015, the Humber Treatment Plant had 66 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
Engineer	0
Engineering Technologist Technician 1	1
Area Supervisors	4
Electronic Instrumentation Specialist	1
Support/Materials Management Assistants	2
EICT	6
Electrician	3
Industrial Millwright	21
Plant Technician	18
WTP Worker	7

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	2
First Aid	4
Medical Aid	2
Lost Time	2
Recurrence	0
Total	**12**

In 2015, 105 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).

- **Maintenance Staff Training Program 2015**
  - MMR Self-Contained Breathing Apparatus
  - Lockout, Tagout & Test
  - Microbiology of Wastewater
  - WMS - Hansen CSR
  - WMS - Hansen Workorder
  - WMS - Hansen GIS Viewer
  - Problem Solving in the Plants (Wastewater)
  - Sampling & Testing
  - Confined Space - 2 Day
  - Electrical Safety Authority (Conductors & Safety in a High Voltage Environment)
  - Electrical Safety for District Operators
  - Standard First Aid Level "C" CPR and Automated External Defibrillation (AED)

- **Plant Technician Training Program 2015**
  - Lockout, Tagout & Test
  - Microbiology of Wastewater
  - WMS - Hansen CSR
  - WMS - Hansen Workorder
  - WMS - Hansen GIS Viewer
  - Problem Solving in the Plants (Wastewater)
  - Mathematics for Operators Module 1
  - Sampling & Testing
  - Confined Space - 2 Day
  - Electrical Safety Authority (Conductors & Safety in a High Voltage Environment)
  - Electrical Safety for District Operators
  - Standard First Aid Level "C" CPR and Automated External Defibrillation (AED)
  - Wastewater Treatment Certification Program (4 Day)

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 2015:

Table 13: Wastewater Treatment Certificates

Class Level	Licensed
Class IV	14
Class III	5
Class II	2
Class I	10
O. I. T.	27
TOTAL	**58**

7.5 MOE/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 2015.

The Ministry of the Environment was advised in writing of all spills and bypass events that occurred in 2015. Dates and details of these events can be seen in section 2.6.

Appendix A

Glossary of Abbreviations & Definitions

Glossary of Abbreviations

ABTP	Ashbridges Bay Treatment Plant
BOD	Biological Oxygen Demand
$CBOD_5$	Five-Day Carbonaceous Biological Oxygen Demand
CEU	Continuing Education Units
CFU	Colony Forming Units
CSO	Combined Sewer Overflow (Tank)
DAF	Dissolved Air Flotation
E. Coli	Escheria Coli
HP	horsepower
HRT	Hydraulic Retention Time
kg	kilogram
kWh	Kilowatt-hour
MWh	Megawatt-hour
m^3	cubic metre
mA	milliamps
mg/L	milligrams per litre
mL	Millilitre
ML	Megalitre
MTI	Mid-Toronto Interceptor Forcemain
SBS	Sodium Bisulphite
SS	Suspended Solids
TCR	Total Chlorine Residual
TP	Total Phosphorus
TS	Total Solids
TVS	Total Volatile Solids
TWAS	Thickened Waste Activated Sludge
µg/L	micrograms per litre
WAS	Waste Activated Sludge

Definitions

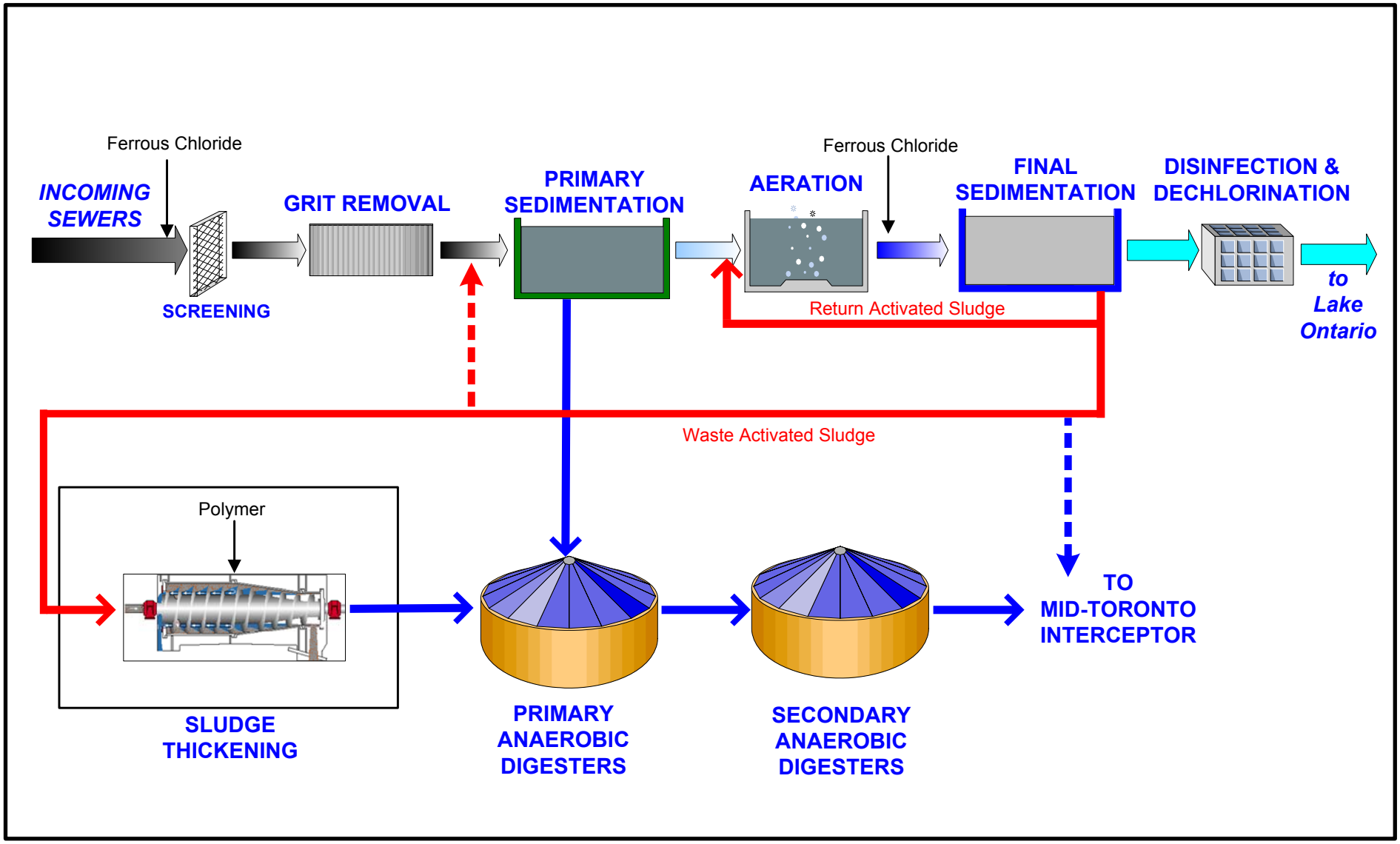
$$\text{Percent Removal (\%)} = 1 - \frac{\text{Concentration (Final)}}{\text{Concentration (Initial)}}$$

$$\text{Aeration Loading (kg CBOD/ m3 Aeration Capacity)} = \frac{\text{Primary } CBOD_5 \text{ x Secondary Treatment Volume}}{\text{Capacity of Aeration Tanks}}$$

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

Appendix B

Plant Schematic

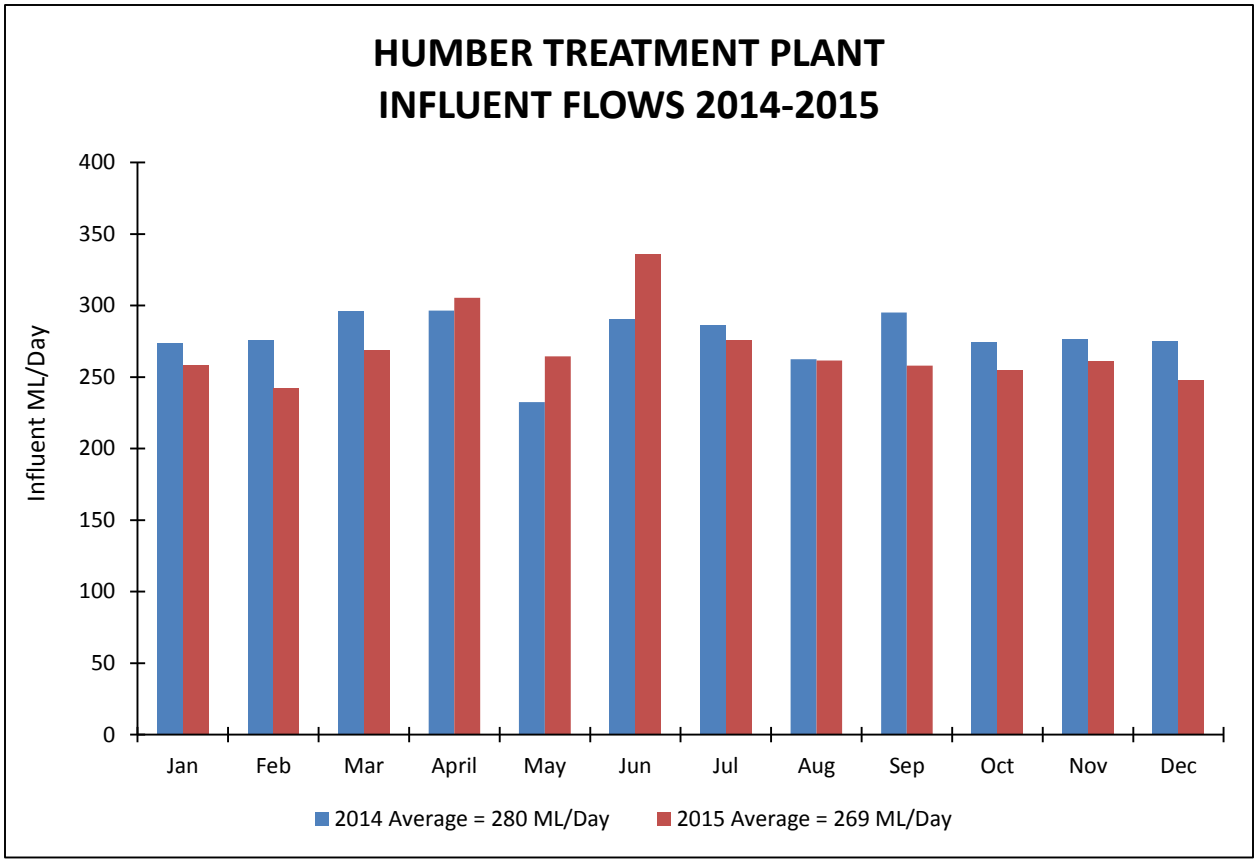


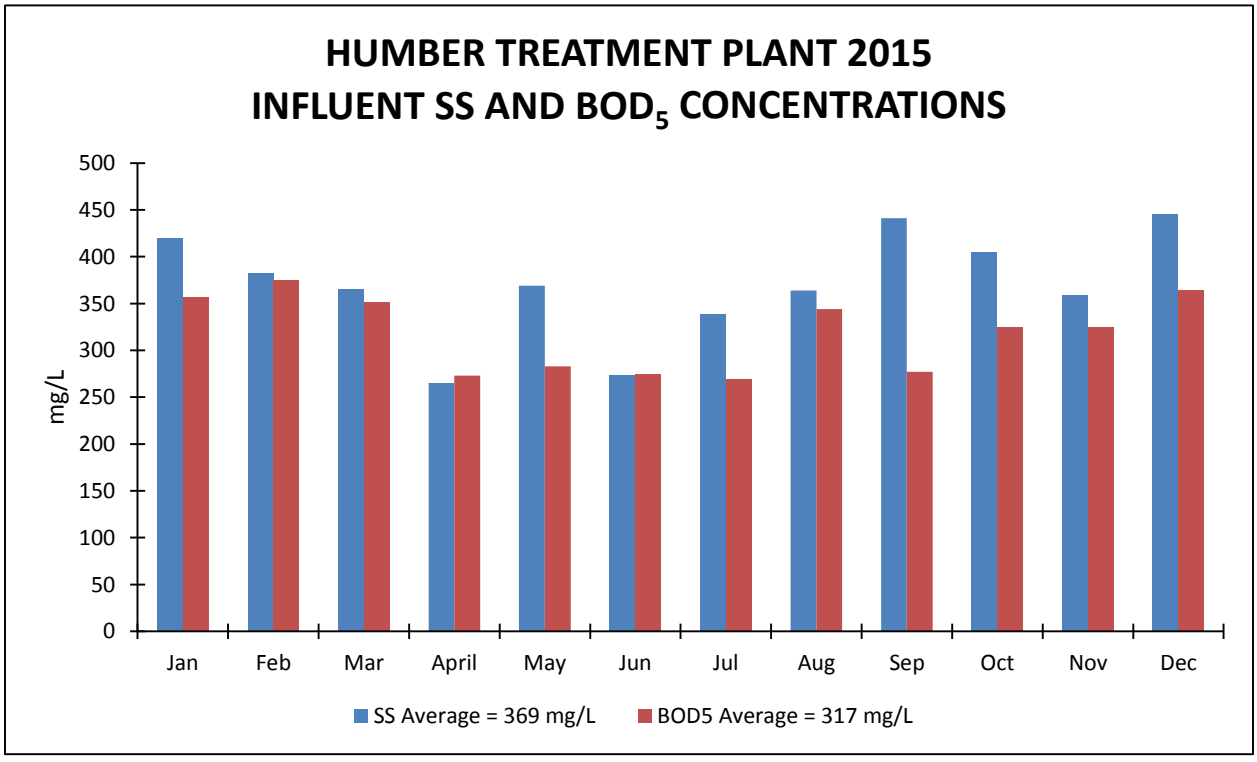
Process Flow Diagram for Humber Wastewater Treatment Plant

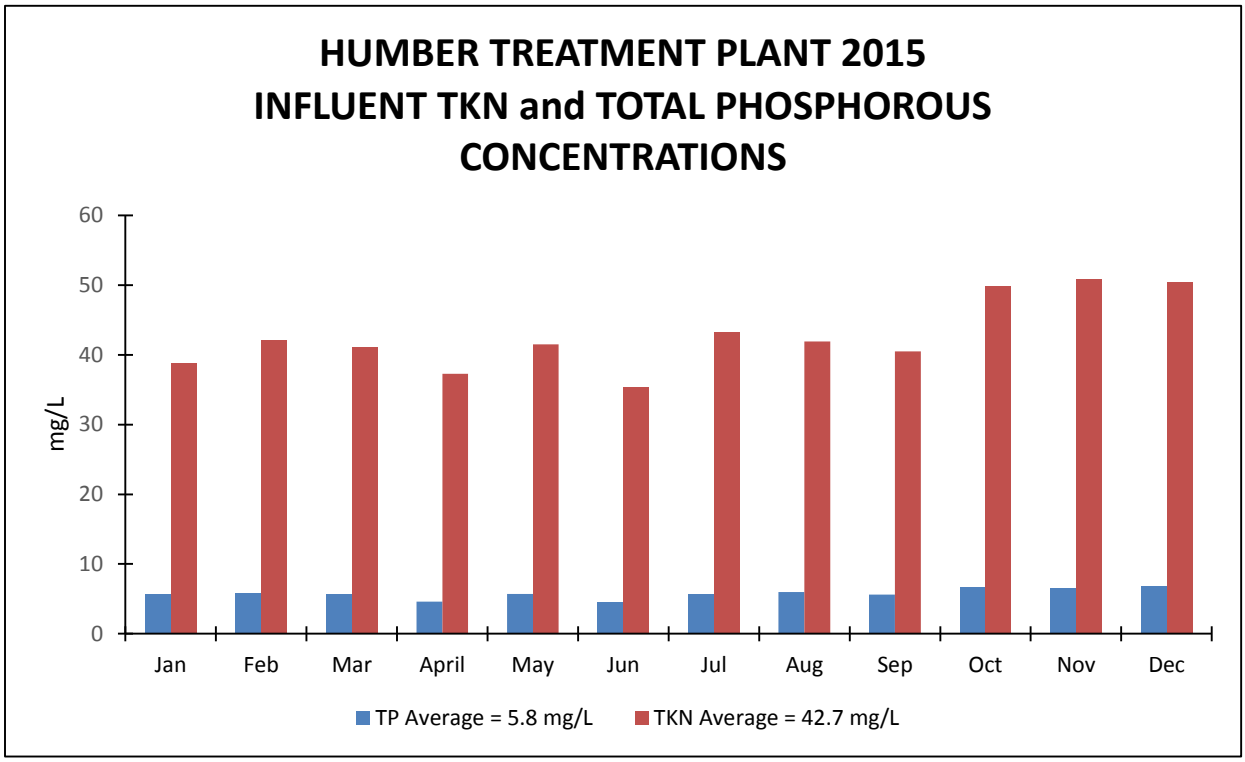
Appendix C

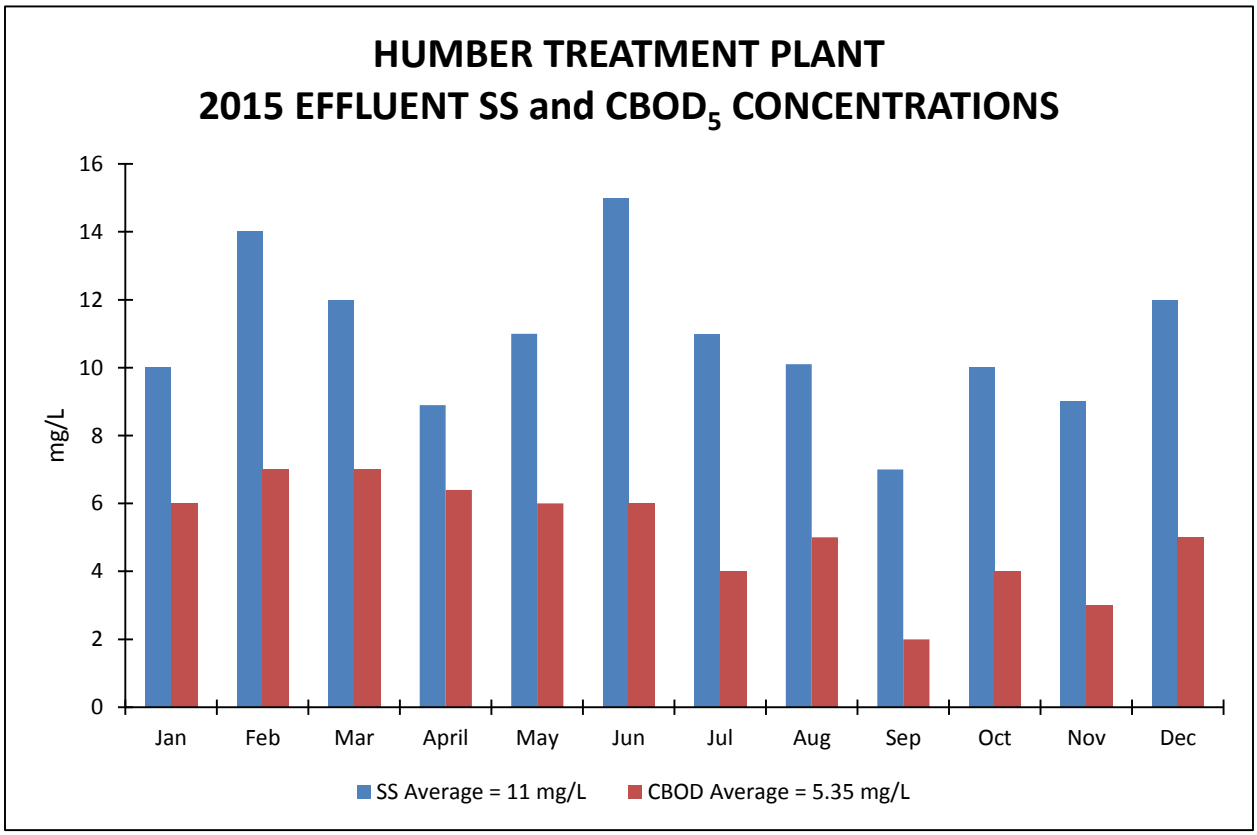
Performance Charts

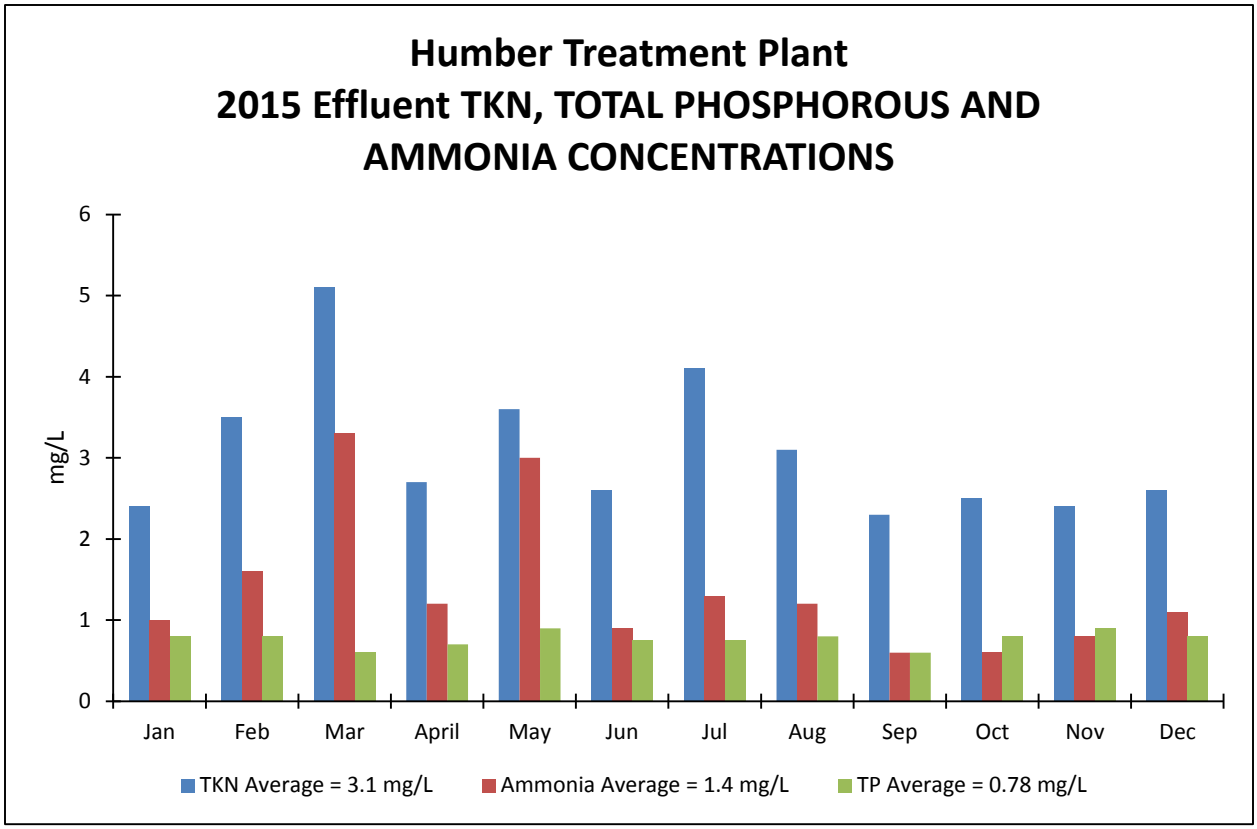
- **Influent Flows**
- **Influent SS & BOD Concentrations**
- **Influent TKN & Total Phosphorus Concentrations**
- **Effluent SS & $CBOD_5$ Concentrations**
- **Effluent TKN, Total Phosphorus, & Ammonia Concentrations**
- **Digester Gas Production**

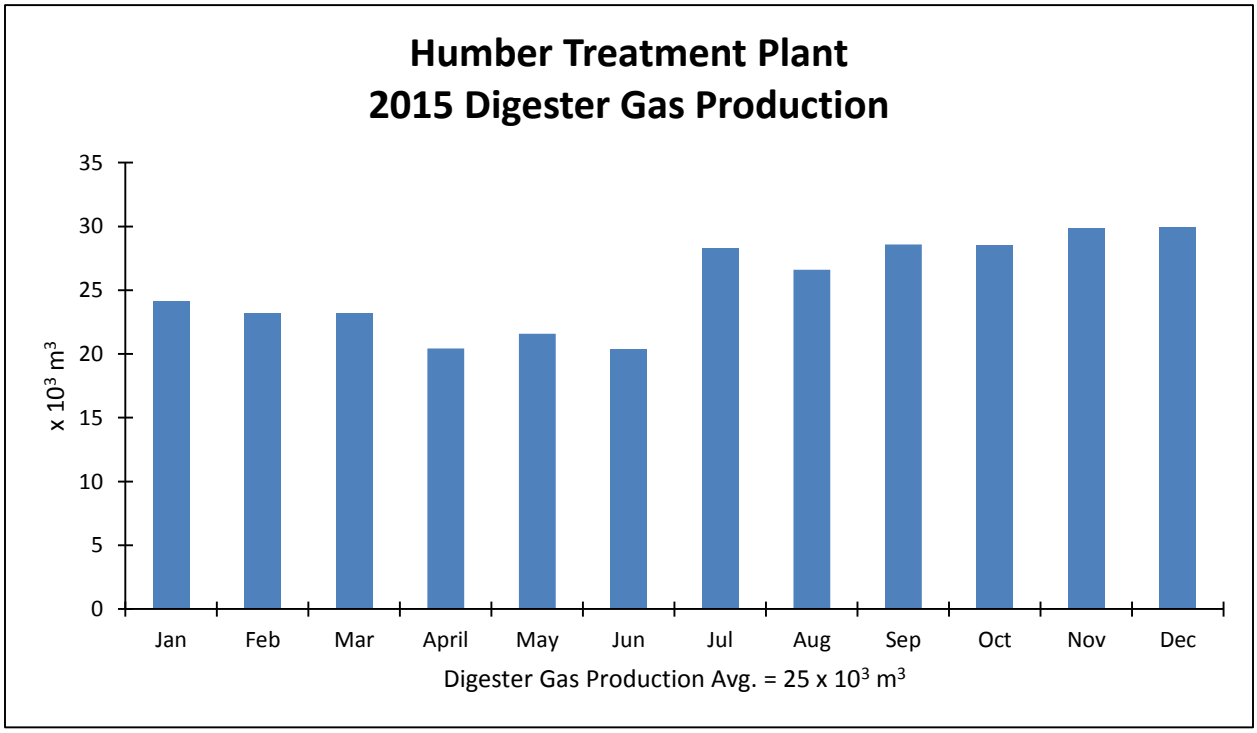

HUMBER TREATMENT PLANT
INFLUENT FLOWS 2014-2015
Influent ML/Day
400
350
300
250
200
150
100
50
0
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2014 Average = 280 ML/Day
2015 Average = 269 ML/Day


HUMBER TREATMENT PLANT 2015
INFLUENT SS AND BOD5 CONCENTRATIONS
mg/L
500
450
400
350
300
250
200
150
100
50
0
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
SS Average = 369 mg/L
BOD5 Average = 317 mg/L


HUMBER TREATMENT PLANT 2015
INFLUENT TKN and TOTAL PHOSPHOROUS CONCENTRATIONS
mg/L
60
50
40
30
20
10
0
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
TP Average = 5.8 mg/L
TKN Average = 42.7 mg/L


HUMBER TREATMENT PLANT
2015 EFFLUENT SS and CBOD5 CONCENTRATIONS
mg/L
16
14
12
10
8
6
4
2
0
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
SS Average = 11 mg/L
CBOD Average = 5.35 mg/L


Humber Treatment Plant
2015 Effluent TKN, TOTAL PHOSPHOROUS AND AMMONIA CONCENTRATIONS
mg/L
0
1
2
3
4
5
6
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
TKN Average = 3.1 mg/L
Ammonia Average = 1.4 mg/L
TP Average = 0.78 mg/L


Humber Treatment Plant
2015 Digester Gas Production
x 10³ m³
0
5
10
15
20
25
30
35
Jan
Feb
Mar
April
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Digester Gas Production Avg. = 25 x 10³ m³

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 2015

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0162	mg/L	0.0400	
	Iron	0.464	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0471	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00570	mg/L	0.0800	
	Zinc	0.0486	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.0118	mg/L	4.0000	
	Copper	0.137	mg/L	2.0000	
	Iron	2.71	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0727	mg/L	5.0000	
	Mercury	0.0001010	mg/L	0.0100	
	Nickel	0.0102	mg/L	2.0000	
	Zinc	0.253	mg/L	2.0000	

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

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

Date Report Printed: 19-Feb-2015 /

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 2015

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT- Monthly Metals @ Dee	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0187	mg/L	0.0400	
	Iron	0.671	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0498	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00809	mg/L	0.0800	
	Zinc	0.0595	mg/L	0.0400	
INFLUENT- Monthly Metals @ Dee	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.0116	mg/L	4.0000	
	Copper	0.117	mg/L	2.0000	
	Iron	4.27	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0817	mg/L	5.0000	
	Mercury	0.0001240	mg/L	0.0100	
	Nickel	0.00971	mg/L	2.0000	
	Zinc	0.195	mg/L	2.0000	

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

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

Date Report Printed: 24-Mar-2015 /

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 2015

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0151	mg/L	0.0400	
	Iron	0.560	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0523	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00578	mg/L	0.0800	
	Zinc	0.0543	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.00925	mg/L	4.0000	
	Copper	0.114	mg/L	2.0000	
	Iron	2.92	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0767	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00952	mg/L	2.0000	
	Zinc	0.204	mg/L	2.0000	

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

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

Date Report Printed: 30-Apr-2015 /

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: April 2015

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0157	mg/L	0.0400	
	Iron	0.382	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0463	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00540	mg/L	0.0800	
	Zinc	0.0489	mg/L	0.0400	
INFLUEN - Monthly Metals @ Dee.	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.00788	mg/L	4.0000	
	Copper	0.0920	mg/L	2.0000	
	Iron	1.81	mg/L		
	Lead	0.00538	mg/L	1.0000	
	Manganese	0.0742	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00788	mg/L	2.0000	
	Zinc	0.174	mg/L	2.0000	

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

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

Date Report Printed: 28-May-2015 /

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 2015

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Monthly Metals at Dee.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0149	mg/L	0.0400	
	Iron	0.435	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0483	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00511	mg/L	0.0800	
	Zinc	0.0440	mg/L	0.0400	
INFLUENT- Monthly Metals @ Dee	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.00839	mg/L	4.0000	
	Copper	0.113	mg/L	2.0000	
	Iron	1.50	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0731	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00781	mg/L	2.0000	
	Zinc	0.194	mg/L	2.0000	

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

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

Date Report Printed: 22-Jun-2015 /

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 2015

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0133	mg/L	0.0400	
	Iron	0.526	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0426	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00556	mg/L	0.0800	
	Zinc	0.0438	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.00776	mg/L	4.0000	
	Copper	0.0953	mg/L	2.0000	
	Iron	1.21	mg/L		
	Lead	0.00535	mg/L	1.0000	
	Manganese	0.0682	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.0121	mg/L	2.0000	
	Zinc	0.168	mg/L	2.0000	

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

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

Date Report Printed: 23-Jul-2015 /

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 2015

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Monthly Metals @ Dee.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0106	mg/L	0.0400	
	Iron	0.564	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0525	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00653	mg/L	0.0800	
	Zinc	0.0377	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.00764	mg/L	4.0000	
	Copper	0.104	mg/L	2.0000	
	Iron	1.34	mg/L		
	Lead	0.00596	mg/L	1.0000	
	Manganese	0.0728	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.0127	mg/L	2.0000	
	Zinc	0.210	mg/L	2.0000	

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

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

Date Report Printed: 21-Aug-2015 /

Approved By: TP Chief Chemist /

TORONTO Water

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

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TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: August 2015

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT- Monthly Metals @ Dee.	Arsenic	<0.006	mg/L	0.0200	
	Cadmium	<0.001	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0133	mg/L	0.0400	
	Iron	0.480	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0400	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00670	mg/L	0.0800	
	Zinc	0.0463	mg/L	0.0400	
INFLUENT- Monthly Metals @ Dee.	Arsenic	<0.006	mg/L	1.0000	
	Cadmium	<0.001	mg/L	0.7000	
	Chromium	0.00829	mg/L	4.0000	
	Copper	0.150	mg/L	2.0000	
	Iron	1.42	mg/L		
	Lead	0.00514	mg/L	1.0000	
	Manganese	0.0712	mg/L	5.0000	
	Mercury	0.00008800	mg/L	0.0100	
	Nickel	0.0110	mg/L	2.0000	
	Zinc	0.220	mg/L	2.0000	

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

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

Date Report Printed: 25-Sep-2015 /

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: September 2015 (

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	0.0128	mg/L	0.0400	
	Iron	0.403	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0383	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	<0.005	mg/L	0.0800	
	Zinc	0.0468	mg/L	0.0400	
INFLUENT - Monthly Metals @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.0108	mg/L	4.0000	
	Copper	0.114	mg/L	2.0000	
	Iron	1.23	mg/L		
	Lead	<0.005	mg/L	1.0000	
	Manganese	0.0648	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00805	mg/L	2.0000	
	Zinc	0.218	mg/L	2.0000	

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

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

Date Report Printed: 27-Oct-2015 /

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 2015

DESCRIPTION	NAME	RESULT	UNITS	LIMITS	NOTES
Humber Treatment Plant					
FINAL EFFLUENT - Biometals @ Dee.	Arsenic	<0.01	mg/L	0.0200	
	Cadmium	<0.004	mg/L	0.0080	
	Chromium	<0.004	mg/L	0.0800	
	Copper	0.0140	mg/L	0.0400	
	Iron	0.465	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0411	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00603	mg/L	0.0800	
	Zinc	0.0485	mg/L	0.0400	
INFLUENT - Biometals @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00999	mg/L	4.0000	
	Copper	0.138	mg/L	2.0000	
	Iron	1.52	mg/L		
	Lead	0.00648	mg/L	1.0000	
	Manganese	0.0723	mg/L	5.0000	
	Mercury	0.00009300	mg/L	0.0100	
	Nickel	0.0111	mg/L	2.0000	
	Zinc	0.262	mg/L	2.0000	

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

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

Date Report Printed: 30-Nov-2015 /

Approved By: TP Chief Chemist /

TORONTO Water

Central Laboratory (
545 Commissioners Street, #
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Tel: 416-392-2894
Fax: 416-397-0342

TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: November 2015

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	0.0117	mg/L	0.0400	
	Iron	0.482	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0467	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00595	mg/L	0.0800	
	Zinc	0.0465	mg/L	0.0400	
INFLUENT - Monthly @ Dee.	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.00927	mg/L	4.0000	
	Copper	0.136	mg/L	2.0000	
	Iron	1.42	mg/L		
	Lead	0.00545	mg/L	1.0000	
	Manganese	0.0729	mg/L	5.0000	
	Mercury	<0.00006	mg/L	0.0100	
	Nickel	0.00894	mg/L	2.0000	
	Zinc	0.299	mg/L	2.0000	

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

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

Date Report Printed: 29-Dec-2015 /

Approved By: TP Chief Chemist /

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TORONTO WATER LABORATORY

Treatment Plant Monthly Metal Analysis for: December 2015

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	0.0131	mg/L	0.0400	
	Iron	0.732	mg/L		
	Lead	<0.005	mg/L	0.1200	
	Manganese	0.0562	mg/L	0.0500	
	Mercury	<0.00006	mg/L	0.0004	
	Nickel	0.00835	mg/L	0.0800	
	Zinc	0.0488	mg/L	0.0400	
INFLUENT	Arsenic	<0.01	mg/L	1.0000	
	Cadmium	<0.004	mg/L	0.7000	
	Chromium	0.0158	mg/L	4.0000	
	Copper	0.167	mg/L	2.0000	
	Iron	1.50	mg/L		
	Lead	0.00655	mg/L	1.0000	
	Manganese	0.0739	mg/L	5.0000	
	Mercury	0.0001140	mg/L	0.0100	
	Nickel	0.0142	mg/L	2.0000	
	Zinc	0.356	mg/L	2.0000	

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

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

Date Report Printed: 29-Jan-2016 /

Approved By: TP Chief Chemist /

Appendix E

Biosolids Metals Analyses

Humber T.P. - Summary of Digested Sludge Metals Analyses

	Arsenic[1]	Cadmium[1]	Cobolt[1]	Chromium[1]	Copper[1]	Mercury[1]	Molybdenum[1]	Nickel[1]	Lead[1]	Selenium[1]	Zinc[1]
Limit[2]	*170*	*34*	*340*	*2,800*	*1,700*	*11*	*94*	*420*	*1,100*	*34*	*4,200*
January	1.6	6.9	3.5	48.6	741.3	0.5	6.4	25.0	36.8	3.6	783.8
February	-	-	-	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	-	-
April	5.1	0.7	5.0	70.2	869.6	0.9	6.6	32.3	48.4	2.7	888.2
May	1.4	0.2	1.7	23.9	287.7	0.4	2.0	10.3	12.6	0.2	363.5
June	-	-	-	-	-	-	-	-	-	-	-
July	1.5	0.8	4.5	61.5	605.1	5.6	6.8	50.3	29.5	2.6	848.7
August	-	-	-	-	-	-	-	-	-	-	-
September	-	-	-	-	-	-	-	-	-	-	-
October	3.8	1.1	4.7	56.5	603.1	0.5	7.0	26.1	27.6	1.6	881.3
November	-	-	-	-	-	-	-	-	-	-	-
December	-	-	-	-	-	-	-	-	-	-	-
Annual Average	4.2	1.9	3.9	52.1	621.4	1.6	5.8	28.8	31.0	2.1	753.1

Notes:

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

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

Appendix F

Analytical Testing Summary

Toronto Water Laboratory LIMS Sample and Result Counts **From: 01/01/2015 To: 12/31/2015 Printed on: 2/1/2016**

Client
Humber Treatment Plant

Number of Samples
6647

	ALK pH DS COND	Alkalinity	BOD	CBOD	Chlorine	COD	ECOLI	Ferric Chloride	IONS	Mercury	METALS	NH3(as N)	Orthophosphate	P	pH_15	Sulphite	TKN(as N)	Toxicity	TS	TSS	Un-ionized NH3(as N)	VA	Total
BYPASS FINAL EFFLUENT	0	0	0	12	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	12	0	0	**36**
FINAL EFFLUENT	1	1	0	356	52	0	54	0	520	12	108	155	356	363	153	52	52	36	0	361	153	0	**2,785**
HTP FE SAMPLE	0	0	0	0	0	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**72**
INFLUENT	0	0	297	0	0	0	0	0	0	12	108	51	0	356	0	0	51	0	0	352	0	0	**1,227**
MIXED LIQUOR TANK 1	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 2	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 3	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 4	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 5	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	102	0	0	**102**
MIXED LIQUOR TANK 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	110	0	0	**110**
MIXED LIQUOR TANK 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	**100**
PRIMARY DIGESTED SLUDGE VA TANK 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88	0	0	63	**151**
PRIMARY DIGESTED SLUDGE VA TANK 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	18	**42**
PRIMARY DIGESTED SLUDGE VA TANK 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88	0	0	66	**154**
PRIMARY DIGESTED SLUDGE VA TANK 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88	0	0	63	**151**
PRIMARY DIGESTED SLUDGE VA TANK 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88	0	0	63	**151**
PRIMARY DIGESTED SLUDGE VA TANK 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	0	66	**126**
PRIMARY DIGESTED SLUDGE VA TANK 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	0	0	99	**195**
PRIMARY EFFLUENT N CONDUIT	0	0	0	340	0	343	0	0	0	0	0	0	0	0	0	0	0	0	0	346	0	0	**1,029**
PRIMARY EFFLUENT S CONDUIT	0	0	0	340	0	345	0	0	0	0	0	0	0	0	0	0	0	0	0	344	0	0	**1,029**
PRIMARY SETTLING TANK 2 OUTLET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	**2**
PRIMARY SETTLING TANK 3 OUTLET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	**2**
RAW SLUDGE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	229	0	0	0	**229**
RETURN SLUDGE NORTH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	238	0	0	**238**
RETURN SLUDGE SOUTH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	238	0	0	**238**
SECONDARY DIGESTER CROSS SECTION TANK 4 12 LEVEL	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 4 6 LEVEL	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 4 CONE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	0	**18**
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	50	0	0	0	**50**
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	20	0	0	0	**20**
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	12	0	0	0	**12**
SLUDGE TO TAB	0	0	0	0	0	0	0	0	50	5	50	5	0	0	0	0	0	0	342	0	0	0	**452**
THICKENING FEED WAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	336	0	0	**336**
WAS THICKENING - CENTRIFUGE #1 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	0	0	**44**
WAS THICKENING - CENTRIFUGE #1 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	102	0	0	0	**102**
WAS THICKENING - CENTRIFUGE #2 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	**30**
WAS THICKENING - CENTRIFUGE #2 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	0	0	0	**56**
WAS THICKENING - CENTRIFUGE #3 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	0	0	**57**
WAS THICKENING - CENTRIFUGE #3 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	116	0	0	0	**116**
WAS THICKENING - CENTRIFUGE #4 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52	0	0	**52**
WAS THICKENING - CENTRIFUGE #4 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	**100**
WAS THICKENING - CENTRIFUGE #5 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76	0	0	**76**
WAS THICKENING - CENTRIFUGE #5 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	152	0	0	0	**152**
WAS THICKENING - CENTRIFUGE #6 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68	0	0	**68**
WAS THICKENING - CENTRIFUGE #6 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	137	0	0	0	**137**
WAS THICKENING - CENTRIFUGE #7 - CENTRATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	**6**
WAS THICKENING - CENTRIFUGE #7 - TWAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	**12**
Total	**1**	**1**	**297**	**1,048**	**52**	**688**	**54**	**72**	**570**	**29**	**266**	**211**	**356**	**731**	**153**	**52**	**103**	**36**	**1,896**	**3,382**	**153**	**438**	**10,589**

Ions include: Cl, SO4, NO3, NO2, Br, Ca, Mg, Na, K
Metals by ICP include: Cd, Cr, Cu, Ni, Pb, Zn, Al, Mn, Fe, B
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.

Toronto Water Laboratory &
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TORONTO WATER LABORATORY

Sampling Point: THR01 INFLUENT

Group: BOD	Minimum	Maximum	Average	Units	Reporting Limit
Biochemical Oxygen Demand (BOD)	69.00	798.00	317.72	mg/L	<2
Group: METALS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Arsenic	0.006000	0.01000	0.00733	mg/L	<0.01
Cadmium	0.001000	0.00400	0.00200	mg/L	<0.004
Chromium	0.007600	0.01580	0.00988	mg/L	<0.004
Copper	0.092000	0.16700	0.12311	mg/L	<0.004
Iron	1.210000	4.27000	1.90417	mg/L	<0.02
Lead	0.005000	0.00660	0.00546	mg/L	<0.005
Manganese	0.064800	0.08170	0.07288	mg/L	<0.004
Nickel	0.007800	0.01420	0.01027	mg/L	<0.005
Zinc	0.168000	0.35600	0.22942	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)	17.00	37.00	25.29	mg/L	<0.05
Group: P	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Dilution	10.00	10.00	10.00		
P_HACH(reading)	1.80	1.80	1.80		
Phosphorus (HACH)	2.40	13.00	5.76	mg/L	<0.08
Group: TKN(as N)	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Kjeldahl Nitrogen	27.70	59.80	42.69	mg/L	<0.2
Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	112.00	1,000.00	369.14	mg/L	<2

Sampling Point: THR02 PRIMARY EFFLUENT N CONDUIT

Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	10.00	418.00	153.54	mg/L	<2
Group: COD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Chemical Oxygen Demand	110.00	650.00	371.47	mg/L	<10
Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	32.00	244.00	98.48	mg/L	<2

Sampling Point: THR03 PRIMARY EFFLUENT S CONDUIT

Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	50.00	382.00	158.07	mg/L	<2
Group: COD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Chemical Oxygen Demand	50.00	635.00	384.62	mg/L	<10
Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	16.00	280.00	95.35	mg/L	<2

Sampling Point: THR04 FINAL EFFLUENT

Group: ALK pH DS COND	Minimum	Maximum	Average	Units	Reporting Limit
Alkalinity	85.80	85.80	85.80	mg/L	<1.6
Group: Alkalinity	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	130.00	130.00	130.00	mg/L	<10
Group: CBOD	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Carbonaceous Biochemical Oxygen Demand	2.00	43.00	5.35	mg/L	<2
Group: Chlorine	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Residual Chlorine	0.50	1.00	0.67	mg/L	<0.01
Group: ECOLI	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
EColi	1.00	2,200.00	122.98	CFU/100 mL	
Group: IONS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Bromide	0.200000	2.75000	1.91615	mg/L	<0.1
Calcium	57.400000	105.00000	73.39615	mg/L	<0.2
Chloride	5.500000	357.00000	177.58654	mg/L	<0.2
Hardness (Calculation)	197.000000	347.00000	246.13462	mg/L	<1
Magnesium	12.400000	20.70000	15.25962	mg/L	<0.1
Nitrate(as N)	4.660000	18.30000	12.09481	mg/L	<0.01
Nitrite(as N)	0.087000	2.92000	0.98648	mg/L	<0.002
Potassium	7.490000	16.80000	12.37077	mg/L	<0.05
Sodium	82.900000	236.00000	125.32500	mg/L	<0.4
Sulfate	44.300000	64.90000	54.44808	mg/L	<0.2
Group: METALS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Arsenic	0.006000	0.01000	0.00733	mg/L	<0.01
Cadmium	0.001000	0.00400	0.00200	mg/L	<0.004
Chromium	0.004000	0.00400	0.00400	mg/L	<0.004
Copper	0.010600	0.01870	0.01412	mg/L	<0.004
Iron	0.382000	0.73200	0.51367	mg/L	<0.02
Lead	0.005000	0.00500	0.00500	mg/L	<0.005
Manganese	0.038300	0.05620	0.04677	mg/L	<0.004
Nickel	0.005000	0.00840	0.00619	mg/L	<0.005
Zinc	0.037700	0.05950	0.04781	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)	0.10	11.00	1.40	mg/L	<0.05
Group: Orthophosphate	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Orthophosphate	0.56	4.80	1.61	mg/L	<0.5
Group: P	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Dilution	2.00	2.00	2.00		
P_HACH(reading)	1.21	1.21	1.21		
Phosphorus (HACH)	0.32	1.80	0.78	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	1.54	7.90	3.08	mg/L	<0.2
Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	2.00	48.00	10.97	mg/L	<2

Group: Toxicity	Minimum	Maximum	Average	Units	Reporting Limit
96h_ Mortality	0.00	0.00	0.00		
96h_LC50	100.00	100.00	100.00	%	
Un-ionized Ammonia	0.00	0.01	0.00	mg/L	
Group: Un-ionized NH3(as N)	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Ammonia(as N)Un-ionized (Calculation)	0.00	0.15	0.01	mg/L	<0.001
Group: pH_15	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
pH_15C	6.60	7.80	7.40	SU	

Sampling Point: THR06 RAW SLUDGE

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.08	6.70	1.74	%	
Volatile Total Solids	25.00	96.00	71.61	%	

Sampling Point: THR07 PRIMARY DIGESTED SLUDGE VA TANK 1

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.70	1.60	1.09	%	
Volatile Total Solids	59.10	72.20	65.58	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	1,550.00	2,550.00	1,954.76	mg/L	<10
Volatile Acids	90.00	190.00	138.57	mg/L	
pH	6.80	7.50	7.21	SU	

Sampling Point: THR08 PRIMARY DIGESTED SLUDGE VA TANK 2

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.90	1.50	1.16	%	
Volatile Total Solids	60.00	72.70	66.01	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	1,650.00	2,650.00	2,077.27	mg/L	<10
Volatile Acids	120.00	1,090.00	200.45	mg/L	
pH	6.70	7.80	7.21	SU	

Sampling Point: THR09 PRIMARY DIGESTED SLUDGE VA TANK 3

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.80	1.50	1.22	%	
Volatile Total Solids	58.62	72.00	65.73	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	1,800.00	2,600.00	2,192.86	mg/L	<10
Volatile Acids	120.00	190.00	141.90	mg/L	
pH	7.00	7.60	7.30	SU	

Sampling Point: THR10 PRIMARY DIGESTED SLUDGE VA TANK 5

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.80	3.10	1.18	%	
Volatile Total Solids	52.80	71.40	65.28	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	1,700.00	2,600.00	2,121.43	mg/L	<10
Volatile Acids	100.00	170.00	128.10	mg/L	

pH	7.00	7.60	7.35	SU

Sampling Point: THR11 PRIMARY DIGESTED SLUDGE VA TANK 7

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.13	1.60	0.98	%	
Volatile Total Solids	40.00	72.70	64.41	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	700.00	2,550.00	1,618.18	mg/L	<10
Volatile Acids	30.00	220.00	142.73	mg/L	
pH	6.60	7.80	7.21	SU	

Sampling Point: THR12 PRIMARY DIGESTED SLUDGE VA TANK 8

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.21	10.00	1.45	%	
Volatile Total Solids	39.50	72.20	62.98	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	750.00	2,700.00	1,759.09	mg/L	<10
Volatile Acids	50.00	1,160.00	195.15	mg/L	
pH	5.80	7.80	7.05	SU	

Sampling Point: THR14 PRIMARY DIGESTED SLUDGE VA TANK 10

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.00	4.60	2.20	%	
Volatile Total Solids	27.10	72.70	57.52	%	
Group: VA	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Alkalinity	1,700.00	2,700.00	2,075.00	mg/L	<10
Volatile Acids	130.00	420.00	268.33	mg/L	
pH	7.00	7.50	7.30	SU	

Sampling Point: THR15 SECONDARY DIGESTER CROSS SECTION TANK 4 12 LEVEL

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.10	2.30	1.43	%	
Volatile Total Solids	50.00	67.70	59.93	%	

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

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.50	2.30	1.80	%	
Volatile Total Solids	59.50	69.20	65.90	%	

Sampling Point: THR17 SECONDARY DIGESTER CROSS SECTION TANK 4 CONE

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.90	2.40	1.69	%	
Volatile Total Solids	52.90	69.20	60.81	%	

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

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.10	2.90	1.21	%	
Volatile Total Solids	25.00	75.00	60.27	%	

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

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.30	2.20	1.01	%	
Volatile Total Solids	40.00	69.60	60.85	%	

Sampling Point: THR20 SECONDARY DIGESTER CROSS SECTION TANK 6 CONE

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.10	2.40	1.50	%	
Volatile Total Solids	51.90	66.70	62.50	%	

Sampling Point: THR21 SLUDGE TO TAB

Group: IONS	Minimum	Maximum	Average	Units	Reporting Limit
Bromide	0.550000	2.75000	1.43000	mg/L	<0.1
Calcium	62.900000	145.00000	104.44000	mg/L	<0.2
Chloride	135.000000	276.00000	192.00000	mg/L	<0.2
Hardness (Calculation)	229.000000	450.00000	338.80000	mg/L	<1
Magnesium	9.280000	32.90000	18.94400	mg/L	<0.1
Nitrate(as N)	0.275000	0.82000	0.56900	mg/L	<0.01
Nitrite(as N)	0.037000	0.05800	0.04640	mg/L	<0.002
Potassium	49.000000	75.10000	62.66000	mg/L	<0.05
Sodium	98.600000	174.00000	131.12000	mg/L	<0.4
Sulfate	5.500000	13.30000	9.02800	mg/L	<0.2
Group: METALS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Arsenic	0.012800	0.08270	0.05072	mg/L	<0.01
Cadmium	0.004900	0.02950	0.01380	mg/L	<0.004
Chromium	0.389000	2.40000	1.08880	mg/L	<0.004
Cobalt	0.027900	0.17600	0.08052	mg/L	<0.004
Copper	5.930000	23.60000	12.13200	mg/L	<0.004
Lead	0.294000	1.15000	0.59860	mg/L	<0.005
Molybdenum	0.050800	0.26700	0.11756	mg/L	<0.01
Nickel	0.200000	1.96000	0.67280	mg/L	<0.005
Selenium	0.010000	0.10000	0.04180	mg/L	<0.01
Zinc	6.270000	33.10000	15.44400	mg/L	<0.02
Group: Mercury	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Mercury	0.004300	0.02190	0.01174	mg/L	<0.00003
Group: NH3(as N)	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Ammonia(as N)	310.00	870.00	526.00	mg/L	<0.05
Group: TS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Solids	0.20	27.23	2.10	%	
Volatile Total Solids	74.10	74.10	74.10	%	

Sampling Point: THR24 THICKENING FEED WAS

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	347.00	23,570.00	9,448.09	mg/L	<2

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

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit

Total Solids	2.70	6.70	4.07	%
Volatile Total Solids	74.80	81.97	78.72	%

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

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	100.00	3,890.00	924.32	mg/L	<2

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

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.90	6.79	4.25	%	
Volatile Total Solids	71.40	81.48	78.38	%	

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

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	160.00	5,240.00	858.67	mg/L	<2

Sampling Point: THR30 — MIXED LIQUOR TANK 1

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,910.00	3,970.00	2,800.00	mg/L	<2
Volatile Suspended Solids	77.20	91.10	82.08	%	

Sampling Point: THR31 — MIXED LIQUOR TANK 2

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,890.00	3,960.00	2,751.57	mg/L	<2
Volatile Suspended Solids	76.60	85.70	81.55	%	

Sampling Point: THR32 — MIXED LIQUOR TANK 3

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,530.00	3,830.00	2,700.78	mg/L	<2
Volatile Suspended Solids	76.00	92.60	81.73	%	

Sampling Point: THR33 — MIXED LIQUOR TANK 4

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,770.00	4,860.00	2,845.69	mg/L	<2
Volatile Suspended Solids	77.40	86.30	81.25	%	

Sampling Point: THR34 — MIXED LIQUOR TANK 5

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,710.00	3,750.00	2,624.12	mg/L	<2
Volatile Suspended Solids	73.60	90.50	81.69	%	

Sampling Point: THR35 — MIXED LIQUOR TANK 6

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	2,210.00	5,310.00	3,500.98	mg/L	<2
Volatile Suspended Solids	78.20	87.50	82.81	%	

Sampling Point: THR36 — MIXED LIQUOR TANK 7

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	1,340.00	4,700.00	3,231.45	mg/L	<2
Volatile Suspended Solids	79.50	91.20	83.56	%	

Sampling Point: THR37 MIXED LIQUOR TANK 8

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	940.00	4,340.00	2,270.80	mg/L	<2
Volatile Suspended Solids	79.90	88.50	84.66	%	

Sampling Point: THR38 RETURN SLUDGE SOUTH

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	3,910.00	20,870.00	8,883.36	mg/L	<2

Sampling Point: THR44 BYPASS FINAL EFFLUENT

Group: CBOD	Minimum	Maximum	Average	Units	Reporting Limit
Carbonaceous Biochemical Oxygen Demand	29.00	279.00	116.83	mg/L	<2
Group: P	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Phosphorus (HACH)	2.10	4.90	3.08	mg/L	<0.08
Group: TSS	**Minimum**	**Maximum**	**Average**	**Units**	**Reporting Limit**
Total Suspended Solids	14.00	200.00	90.50	mg/L	<2

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 #	1,734,146.00	82,366,390.00	67,518,066.38		
Specific Gravity	1.14	1.36	1.22		
Supplier Specific Gravity	1.14	1.35	1.23		

Sampling Point: THR52 RETURN SLUDGE NORTH

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	700.00	68,746.00	9,912.13	mg/L	<2

Sampling Point: THR54 PRIMARY SETTLING TANK 2 OUTLET

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.30	0.30	0.30	%	
Volatile Total Solids	60.00	60.00	60.00	%	

Sampling Point: THR57 PRIMARY SETTLING TANK 3 OUTLET

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	0.20	0.20	0.20	%	
Volatile Total Solids	66.70	66.70	66.70	%	

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

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.88	6.20	4.95	%	
Volatile Total Solids	71.21	81.60	78.89	%	

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

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	720.00	3,110.00	1,321.75	mg/L	<2

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

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	3.30	8.40	4.61	%	
Volatile Total Solids	56.10	87.97	77.64	%	

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

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	500.00	7,190.00	1,095.77	mg/L	<2

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

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.80	6.50	4.40	%	
Volatile Total Solids	74.00	81.30	78.20	%	

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

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	220.00	10,180.00	737.24	mg/L	<2

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

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	2.00	6.50	4.68	%	
Volatile Total Solids	71.90	80.70	77.92	%	

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

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	190.00	2,150.00	625.15	mg/L	<2

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

Group: TS	Minimum	Maximum	Average	Units	Reporting Limit
Total Solids	1.50	5.10	3.88	%	
Volatile Total Solids	75.00	80.20	77.54	%	

Sampling Point: THR90 — WAS THICKENING - CENTRIFUGE #7 - CENTRATE

Group: TSS	Minimum	Maximum	Average	Units	Reporting Limit
Total Suspended Solids	380.00	640.00	546.67	mg/L	<2

Note: Averages are based on raw data

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

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

Appendix G

Flow Meter Calibration/Maintenance Record

INSTRUMENT CALIBRATION DATA SHEET

South Primary (near south parking lot)
THR-PLT-FIT-1012
Raw Sewage Flow
0-42.0 inches of w/c

Input Inches w/c	Desired Output MA	Actual Output MA	Error Percent %
0.00	4.00	4.010	0.250
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	20.000	0.000

Date: Nov 25th 2015

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: Oct 6th 2015

Flowmeter Calibration Verification Certificate

Customer	HUMBER WTP
Date Performed	Wednesday 4 March 2015 10:29
Date Certificate Printed	Wednesday 4 March 2015 13:15

Site Details

Location	THR-AER-FIT-0602
Tag	FIT-0602
Operator	IGOR L

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	1.6 m^3/s
Response Time Constant	? seconds
Probe Factors	ins 1.00000, prof 1.00000
Analogue Output	4-20 Forward
Second Analogue Range	100.0% (1.6 m^3/s)
Pulse Output	Not Tested
Totaliser Units	m^3

Calmaster Details

Instrument, Serial No.	CM0149, V/40122/1/1
Last Calibrated	Fri 10 Oct 2014
Next Calibration Date	Sat 10 Oct 2015
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	600 mm

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	Wednesday 4 March 2015 09:28
Date Certificate Printed	Wednesday 4 March 2015 13:16

Site Details

Location	THR-AER-FIT-0702
Tag	FT-4309
Operator	igor l

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	1.6 m^3/s
Response Time Constant	? seconds
Probe Factors	ins 1.00000, prof 1.00000
Analogue Output	4-20 Forward
Second Analogue Range	100.0% (1.6 m^3/s)
Pulse Output	Not Tested
Totaliser Units	m^3

Calmaster Details

Instrument, Serial No.	CM0149, V/40122/1/1
Last Calibrated	Fri 10 Oct 2014
Next Calibration Date	Sat 10 Oct 2015
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	600 mm

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	Wednesday 4 March 2015 09:58
Date Certificate Printed	Wednesday 4 March 2015 13:17

Site Details

Location	THR-AER-FIT-0802
Tag	AN-502
Operator	IGOR L

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	1.6 m^3/s
Response Time Constant	? seconds
Probe Factors	ins 1.00000, prof 1.00000
Analogue Output	4-20 Forward
Second Analogue Range	100.0% (1.6 m^3/s)
Pulse Output	Not Tested
Totaliser Units	m^3

Calmaster Details

Instrument, Serial No.	CM0149, V/40122/1/1
Last Calibrated	Fri 10 Oct 2014
Next Calibration Date	Sat 10 Oct 2015
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	600 mm

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

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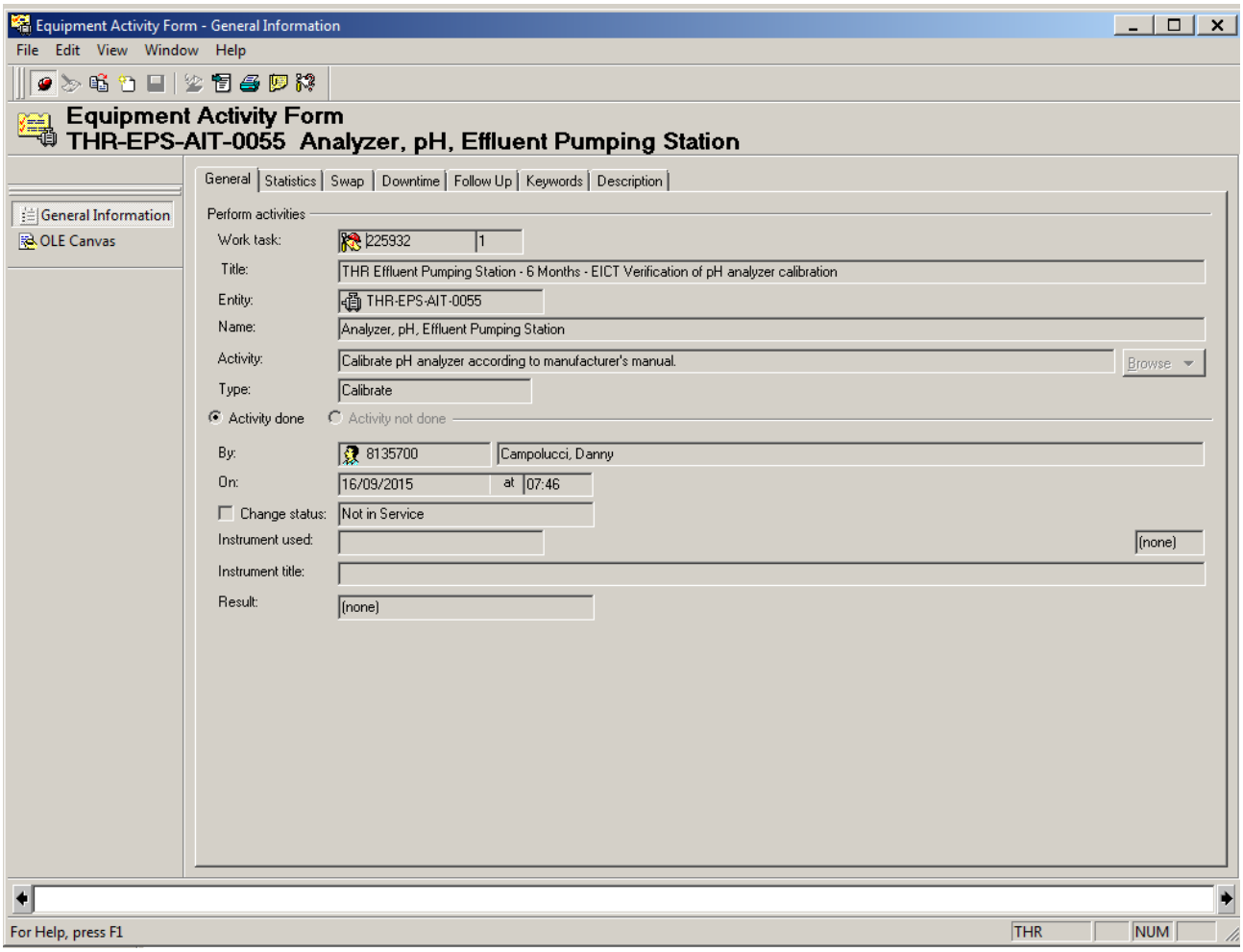
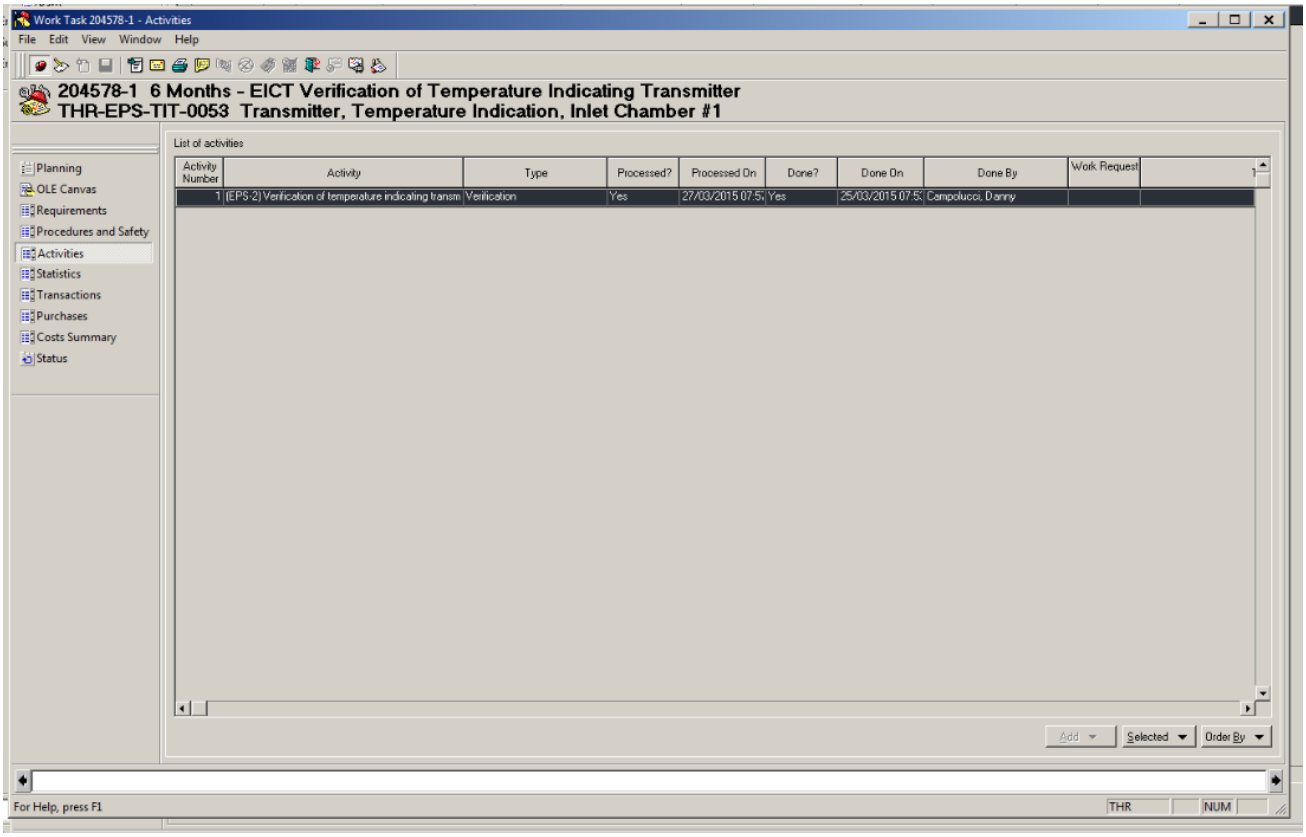
CALMASTER HELPLINE
Email : calmaster@gb.abb.com or calmaster@us.abb.com


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: 225932 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: 8135700 Campolucci, Danny
On: 16/09/2015 at 07:46
Change status: Not in Service
Instrument used:
(none)
Instrument title:
Result: (none)
For Help, press F1
THR
NUM


Work Task 204578-1 - Activities
File Edit View Window Help
204578-1 6 Months - EICT Verification of Temperature Indicating Transmitter
THR-EPS-TIT-0053 Transmitter, Temperature Indication, Inlet Chamber #1
Planning
OLE Canvas
Requirements
Procedures and Safety
Activities
Statistics
Transactions
Purchases
Costs Summary
Status
List of activities
Activity Number
Activity
Type
Processed?
Processed On
Done?
Done On
Done By
Work Request
1 (EPS-2) Verification of temperature indicating transm
Verification
Yes
27/03/2015 07:5
Yes
25/03/2015 07:5
Campolucci, Danny
Add
Selected
Order By
For Help, press F1
THR
NUM