Over Strength Surcharge Review for Toronto Water, City of Toronto

Final Report

June, 2012

Table of Contents

Table of Contents

Report Tables

Report Appendices

Appendix 1 Industrial Waste Surcharge Agreement

Appendix 2 City ODF Surcharge Calculation

Appendix 3 ODF Calculation Tables

Executive Summary

The City of Toronto (City) retained Stantec Consulting Ltd. to evaluate over strength discharge fees (ODFs) for Toronto Water for biochemical oxygen demand (BOD_5), total suspended solids (TSS), phenols, total phosphorous (TP) and Total Kjeldahl Nitrogen (TKN).

Preliminary research by Toronto Water revealed significant differences in ODF frameworks between the City and surrounding municipalities. As such, Toronto Water requested a more detailed review of the components that make up the ODF including consideration for the addition of TKN as a surchargeable parameter and address a request by industry on this parameter.

Toronto's Sewers Bylaw (Bylaw 457-2000) came into effect in July 2000 after a two year transition and public consultation period. The current Sewers Bylaw (Municipal Code 681) sets allowable limits for certain parameters that can be treated at the City WWTPs. Although high strength wastewater produced by some industrial dischargers is generally compatible with the City's wastewater treatment plant (WWTP) capacities, it costs the City more to treat high strength wastewater as compared to treating discharges that meet the Bylaw limits. In general, the intent of an ODF program is to recover the additional costs associated with treatment of high strength wastewater discharge and to support sustainable operation and maintenance of the WWTPs.

The City's existing surcharge rate of 0.57/kg for the four current surcharge parameters (BOD_5, phenols, TP, and TSS) has remained unchanged since 1996 and the original basis for this fee, established by the former Metro Toronto, is not documented. The ODF, based on the surcharge rate of $0.57/kg, is calculated based on the parameter with the highest loading differential from the allowable limit set in the Sewer Bylaw.

Two alternative ODF fee structures, commonly used by Ontario municipalities and also detailed in the Water Environment Federation (WEF) Financing and Charges for Wastewater Systems (3rd Edition), were reviewed in this study: Type I Formula (fees developed on individual, compounded parameter weight basis) and Type II Formula (fees developed on total volume basis). Type I represents a more complex analytical approach but more accurately captures the relative treatment cost of each surchargeable parameter.

Application of the Type I methodology produced individual parameter costs similar to other comparable Ontario municipalities surveyed. Application of the Type II methodology produced a volumetric cost value significantly in excess of other Ontario municipalities surveyed. It was recommended that Type I methodology be considered for the City in developing future ODFs.

The following table summarizes the recommended R value for each surchargeable parameter, and represents cost recovery costs for City O&M, reserved funds for capital improvement and

administration costs associated with over strength wastewater. The proposed rates are rounded to the nearest cent to simplify the data.

O&M unit Cost	BOD_5/Phenols	TSS	TP	TKN
O&M unit cost	$0.20	$0.24	$0.72	$0.33
Capital Improvement unit cost	$0.40	$0.33	$0.95	$0.83
ODF Administration unit cost	$0.02	$0.02	$0.02	$0.02
R Value, $/kg	**$0.62**	**$0.60**	**$1.69**	**$1.18**

Proposed R values ($/kg) for the City based on the Type I method calculations presented in this report, compared to R values for other municipalities using a Type I approach, are as follows:

Municipality	R value, $/kg			
	BOD/Phenols	TSS	TP	TKN
Toronto (proposed)	**$0.62**	**$0.60**	**$1.69**	**$1.18**
York (2012)	$0.42	$0.42	$2.10	$0.42
York (2013)	$0.53	$0.53	$2.65	$0.53
Hamilton (2012)	$0.67	$0.53	$1.43	$2.03
Ottawa (2012)	$1.44	$0.77	$2.31	$5.75
Durham (2012)	$0.48	$0.48	$0.48	$0.48

A sensitivity analysis was conducted to compare calculated revenues based on the City's current ODF fee structure (unchanged since 1996) versus the proposed Type I fee structure. The analysis indicates that fees recovered under the current ODF structure are lower in all cases than fees calculated under the proposed Type I ODF cost-recovery structure, with the proposed ODF fees associated with an overall increase in revenues of approximately 36% to 44%. An initial fee of $800 for establishing all new surcharge agreements is also proposed in order to recover administrative costs.

Pre-consultation with industry users prior to implementation of ODF rate changes is recommended in order to inform users of the rationale for the proposed fee changes, and to solicit feedback on an implementation strategy.

It is recommended that the proposed R value be re-assessed two years following implementation, with subsequent reviews every five years.

1.0 Introduction

The City of Toronto (City) retained Stantec Consulting Ltd. (Stantec) to provide consulting services to evaluate over strength discharge fees (ODFs) for Toronto Water. The current Sewers Bylaw (Municipal Code, Chapter 681 - Sewers) allows industrial dischargers to enter into an over strength surcharge agreement with the City to discharge up to four parameters at concentrations that exceed the allowable limits listed in the Bylaw. These parameters include biochemical oxygen demand (BOD_5), total suspended solids (TSS), phenols, and total phosphorous (TP). There is also significant volume of effluent received from food or associated food industries in Toronto that contain high concentrations of Total Kjeldahl Nitrogen (TKN). Since it is not considered practical for these industries to treat TKN prior to sewer discharge due to the need for an on-site wastewater process similar to a municipal WWTP, Toronto Water proposes to evaluate the cost to provide TKN removal for food and other industries at the City's wastewater treatment plants and recuperate the costs via ODFs.

Preliminary research by Toronto Water revealed significant differences in ODF frameworks between the City and surrounding municipalities. As such, Toronto Water requested a more detailed review of the components that make up the ODF including the addition of TKN as a surchargeable parameter. Toronto Water was requested by industries and an Association to consider the addition of TKN to the surcharge program to level the playing field amongst municipalities with similar surcharge programs. The central goal of this project is to evaluate the calculation and cost recovery of such ODFs relative to other municipalities and the City's own operations requirements. This would benefit the City with any future Provincial and/or Federal regulations and cost recovery.

1.1 REPORT STRUCTURE

This report comprises the following three parts:

- Part 1 – Current Regional Approaches to Over Strength Discharge Fees (ODFs);
- Part 2 – Benchmarking Toronto with Nearby Municipalities and Large Ontario Municipalities;
- Part 3 – Recommended Approach for Toronto Water .

Part 1 provides a summary of the current ODF framework and the history of its development along with to whom it applies, how it is executed, the current revenue it generates, and gaps between the current ODFs and treatment cost recovery.

Part 2 provides the results of the benchmarking study with respect to ODF programs, cost recovery, and cost structure.

Part 3 provides a recommended ODF calculation formula for Toronto Water, a recommended methodology to determine the value of R, a proposed phased implementation approach, and methodology to determine future annual rate adjustment.

1.2 INFORMATION SOURCES

In creating this document, Stantec reviewed the following documents:

- Toronto, Water Rate Harmonization Background Study, February 9, 2006
- CWWA, Final Report 2007 Sewer SurCharge Survey, May 28, 2007
- Toronto, Compilation of allowable discharges (volume and strength) from existing Industrial Surcharge Agreements, May 26, 2011
- Toronto, Surcharge Calculation, May 26, 2011
- Toronto, Protecting Water Quality and Preventing Pollution – Assessing the Effectiveness of the City's Sewer Use Bylaw, June 25, 2008
- Toronto, Industrial Waste Surcharge Agreement – Rev.1 (Mar 1, 2012)
- Toronto, Organizations with Surcharge Agreements with the City of Toronto as of January 24, 2011
- OMBI, 2009 Performance Benchmarking Report
- 2010 Toronto Water Annual Report of Each Wastewater Treatment Plant (WWTP)
- Sewer Surcharge Study Phase I Final Report for Howard County Bureau of Utilities, Black and Veatch, July 2006
- Financing and Charges for Wastewater Systems, WEF Manual of Practice No. 27, 2004
- Information from Region of York's Public Information Session on Sewer Surcharge Change
- Sewers Bylaws for Toronto, Halton Region, Peel Region, Hamilton, Durham Region, London, Guelph, Waterloo, Ottawa-Carleton, and York Region
- Certificates of Approval (Cs of A) for WWTPs of the surveyed municipalities
- Sample surcharge agreements for Toronto, York, Peel, Hamilton, Guelph, Waterloo
- City of Toronto , Surcharge Survey Update, October 2010
- Toronto Municipal Code – Chapter 441 (Fees and Charges),
- Toronto Municipal Code – Chapter 849 (Water and Sewage Services and Utility Bill)
- Toronto Municipal Code – Chapter 851 (Water Supply)

The following municipalities were included in the benchmarking study:

- City of Toronto (City)
- Region of Halton (Halton)
- Region of York (York)
- City of Hamilton (Hamilton)
- City of London (London)
- Region of Durham (Durham)
- City of Guelph (Guelph)
- Region of Waterloo (Waterloo)
- City of Ottawa (Ottawa)
- Region of Peel (Peel)

Stantec also obtained information through discussions with the following individuals at the City of Toronto and other municipalities:

- Joanne Di Caro, Manager, Environmental Monitoring & Protection (EM&P)

- Cora Matthews, Engineer, EM&P
- Elena Martellacci, Research Analyst, EM&P
- Emily Zegers, Operations Coordination, Toronto Water
- Martin Shigeishi, Toronto Water
- Susan Atlin, Senior Engineer, Toronto Water
- Cari Vanderperk, Superintendent, Environmental Monitoring & Enforcement, City of Hamilton
- Chris Barlow, Program Manager, Region of York
- Elaine Gilliland, Acting Manager, Environmental Control, Region of Peel
- Tony Van Rossum, Environmental Services Engineer, City of London
- David Large, Supervisor of Industrial Waste, Halton Region

1.3 KEY TERMINOLOGY

The following key terminology is used throughout this report.

BOD_5	The five day BOD which is the determination of the molecular oxygen utilized during a five-day incubation period for the biochemical degradation of organic material (carbonaceous demand), and the oxygen used to oxidize inorganic material such as sulphides and ferrous iron, and the amount of oxygen used to oxidize reduced forms of nitrogen (nitrogenous demand)
Phenols	refers to those organic compounds that contain a hydroxyl group directly bound to benzene ring which can be identified by the 4-Aminoantipyrene method (4-AAP) as set out in the Standard Methods;
TSS	refers to total mass of solids suspended within the water column as determined in accordance with Standard Methods;
TP	refers to the total mass of both organic and inorganic phosphorous as determined in accordance with Standard Methods;
TKN	Total Kjeldahl Nitrogen (TKN, comprising organic nitrogen + ammonia + ammonium) is used instead of total nitrogen (organic nitrogen + ammonia + ammonium + nitrite + nitrate) for the purposes of calculating surchargeable fees as TKN represents that fraction of nitrous compounds that must undergo nitrification through the wastewater process, thereby incurring operational cost
C of A	Certificate of Approval stipulates the quality of effluent from the wastewater treatment plants. As of October 31, 2011, the Ministry of Environment will only be issuing Environmental Compliance Approvals (ECA).
IWSA	Industrial Waste Surcharge Agreement
R Value	the applied rate ($/kg) for individual ODF sewage parameters
Volume	The term ‘Volume’ as used in this report with respect to cost allocations at the City’s WWTPs refers to those costs associated with WWTP facilities’ capital (i.e. sizing of tanks and equipment) and maintenance (i.e. labour, power, cleaning) costs as driven by hydraulic (rather than water quality) requirements. The term ‘Volume’ therefore refers to cost components that are independent of over strength discharge (i.e. water quality) parameters.

2.0 Part I - Current Regional Approaches to ODF

This section provides a summary of the current ODF framework and the history of its development, to whom it applies, how it is executed, the current revenue it generates, and gaps between the current ODFs and treatment cost recovery.

2.1 HISTORY AND RATIONALE OF ODFS

2.1.1 History of ODFs

Conventional wastewater treatment plants (WWTPs) are primarily designed to treat domestic human waste and are less effective at reducing concentrations of metals and persistent organics from non-residential sources. To address this issue, sewer use bylaws are implemented at a municipal level to regulate contaminant concentration limits and effluent going into sewer systems. Sewer Use Bylaws may also establish ODFs which enable municipalities to recover the additional costs associated with treating certain parameters discharged at higher concentrations than the limits set in the Sewer Use Bylaw (MOE, 1988).

In 1988, the Ontario Ministry of the Environment (MOE) launched the Municipal Industrial Strategy for Abatement (MISA) to control discharge limits in wastewater effluent. The initial phase involved monitoring water inflow and outflow at wastewater treatment facilities. Subsequently, data collected from the monitoring phase was used to define discharge limits in forthcoming regulations. Under MISA, the MOE published its "1988 Model Sewer Use Bylaw" (adapted from a 1975 antecedent version) to enforce sewer use control programs including details on sewer charge, over strength surcharge agreements, certified training, and pollution prevention initiatives. Municipalities could readily implement the bylaw, modify it to suit specific requirements, or choose to disregard it entirely (Environmental Commissioner of Ontario, 2004).

The Model Sewer Use Bylaw was updated ten years later in 1998 with new and stricter limits and improved stormwater management strategies. During that period, the former Municipality of Metropolitan Toronto and its neighbouring six municipalities were amalgamated into the City of Toronto. The amalgamation necessitated the unification of seven different sewer use bylaws into one.

Toronto’s Sewers bylaw (Bylaw 457-2000) came into effect in July 2000 after a two year transition and public consultation period. Limits for sanitary and combined sewer discharge in Toronto’s sewer use bylaw were amended in October 2002 (Bylaw 855-2002). The current Toronto Sewers Bylaw (Municipal Code Chapter 681 - Sewers) sets allowable limits for certain parameters that can be treated at the Toronto WWTPs. Although high strength wastewater produced by some industrial dischargers is generally compatible with the WWTP capacities, it costs more to treat them as compared to treating lower strength (residential) wastewater. In general, the intent of an ODF program is to recover the additional costs and to support

sustainable operation and maintenance of the WWTPs. The ODFs for the four surcharge parameters (BOD_5, phenols, TP, and TSS) have remained unchanged since 1996 when they were set by the former Metropolitan Toronto which had responsibility over major collection systems and the treatment plants, including sewer use control and enforcement.

2.1.2 Benefits of ODFs

For industrial dischargers, the costs associated with designing, constructing and operating a wastewater treatment system to reduce the concentration of surchargeable parameters to meet the bylaw limits could be economically prohibitive. Also, industrial dischargers may not have the space or the in-house technical capability to operate such a WWTP. An ODF program can allow industrial dischargers to avoid constructing onsite wastewater treatment systems to remove parameters that are treatable by City facilities.

Although high strength wastewater produced by some industrial customers is generally compatible with the City's wastewater treatment systems, it costs more to treat them as compared to treating "low strength" residential wastewater. Therefore, the primary benefit of an ODF program to the City is to recover the additional costs and to support a sustainable mechanism for the operation and maintenance of the WWTPs.

2.2 PRINCIPLES AND REGULATIONS

Provincial (Ontario Environmental Protection Act and Regulations, Ontario Water Resources Act and Regulations) and Federal (Canadian Environmental Protection Act and Notices) Legislation establish effluent quality criteria for wastewater and sludge generated from the WWTPs. Each WWTP operates under a Certificate of Approval which has defined effluent quality limits.

In November 2003, the Canadian Council of Ministers of the Environment (CCME) agreed to engage in the development of a Canada-Wide Strategy for municipal wastewater effluent (MWWE). This strategy requires non-toxic effluent (such as un-ionized ammonia) from municipal wastewater treatment plants. There is a potential in the future that all WWTPs in the City will need to provide nitrification.

Legislation was tabled at the Provincial level that would require that the operating and capital programs of the City's water works (water and sewer) be fully self-funding through the imposition of a rate upon users who derive a benefit from such service. This "user rate principle" has been adopted by the Ontario Municipal Benchmarking Initiatives (OMBI), of which the City is a member.

The Toronto Sewers Bylaw (Municipal Code, Chapter 681 - Sewers) sets strict discharge limits on parameters such as heavy metals and persistent organic compounds in wastewater discharged into the sewer system. Failure to comply with the Bylaw can result in fines up to $100,000 per day. Under the Sewers Bylaw, facilities who discharge certain treatable parameters, namely, BOD_5, TSS, phenols, and TP at concentrations that exceed the Bylaw

limits, may be able to enter into a Surcharge Agreement for a fee payable to the City. A copy of an example Industrial Waste Surcharge Agreement (IWSA) is provided as Appendix 1.

The Water and Sewage Services and Utility Bill Bylaw (Municipal Code, Chapter 849) allows for a consumer of water to apply for a rebate for the portion of water that is directly consumed or used on-site and is not discharged into the City sewer system. The Water and Sewage Services and Utility Bill Bylaw also allow for industrial consumers of water in excess of 6,000 m^3 per year, to apply for a "Block 2" rate. To be eligible for the Block 2 rate, the facility must submit a comprehensive water conservation plan (which includes a water audit) and annual progress reports. The facility must also remain in compliance with the Sewers Bylaw.

2.3 EXISTING CONTRIBUTORS TO WWTPS

Flows to the City's WWTPs comprise contributions from residential, industrial and commercial sectors. This study focuses on discharge of over strength wastewater to sewers from industrial and commercial entities. At the time of this report, there are approximately 200 industrial and commercial dischargers that are invoiced by the City for discharges of over strength wastewater under a permit or IWSA.

2.4 TORONTO WASTEWATER TREATMENT PLANTS

The City owns and operates four WWTPs, Ashbridges Bay Treatment Plant (ABTP – Canada's second largest wastewater treatment facility), Humber Treatment Plant (HTP), Highland Creek Treatment Plant (HCTP), and North Toronto Treatment Plant (NTTP). Each of these WWTPs is equipped with headworks, primary treatment, secondary treatment, disinfection, and solids handling system. Table 2.1 summarizes the main treatment processes and their associated functions for removing the existing surchargeable parameters, BOD_5, TSS, TP, as well as TKN.

Table 2.1: Summary of Functions of Main Treatment Processes

Processes	BOD_5[1]	TSS	TP	TKN
Headworks		√		
Primary	√	√	√	
Secondary	√	√		√
Disinfection				
Solids Train	√	√	√	

Notes:
[1]phenols (as indicated by 4AAP) are also removed through these processes

Table 2.2 summarizes the annual operating and maintenance (O&M) costs for the four WWTPs, based on the 2010 Toronto Water Annual Report of each facility.

Table 2.2: O&M Cost for Each WWTP (2010)

Item	ABTP	HCTP	HTP	NTTP
Salaries and Benefits	$ 16,396,506	$ 5,982,550	$ 4,634,903	$ 899,838
Materials and Supplies				
Utilities	$ 13,473,814	$ 4,567,953	$ 6,375,963	$ 353,767
Machine and Equipment Parts	$ 3,244,496	$ 691,894	$ 681,318	$ 83,631
Chemicals	$ 4,934,714	$ 1,567,840	$ 668,760	$ 67,994
Other Equipment and Supplies	$ 564,200	$ 400,885	$ 279,225	$ 14,297
New Equipment	$ 285,470	$ 110,449	$ 47,907	$ 3,010
Service and Rent	$ 12,789,442	$ 1,023,632	$ 726,673	$ 73,074
Other Charges	$ 1,104,692	$ 313,457	$ 12,458	$ 6,780
TOTAL	**$ 52,793,334**	**$ 14,658,660**	**$ 13,427,207**	**$ 1,502,391**

The average daily flowrate, influent characteristics, effluent quality (based on 2010 Annual Reports) and Certificate of Approval (C of A) requirements for each WWTP are summarized in Table 2.3.

Table 2.3: City WWTPs' Average Daily Flowrate, Influent and Effluent Quality (2010), and C of A Limits

Item	ABTP			HCTP			HTP			NTTP		
	C of A	Influent	Effluent	C of A	Influent	Effluent	C of A	Influent	Effluent	C of A	Influent	Effluent
Influent Flowrate, MLD	596.3			166.4			362.0			36.2		
TSS, mg/L	25.0	370	7.8	25.0	313	12.4	25.0	290	11.8	25.0	185	7.3
BOD_5, mg/L[1]	25.0	245	6.6	25.0	308	6.5	25.0	312	7.6	25.0	142	3
TP, mg/L	1.0	12	0.68	1.0	5.6	0.5	1.0	4.8	0.5	1.0	4.4	0.7
TKN, mg/L	NA	54.4	18.4	NA	48.6	10.1	NA	36.1	5.7	NA	34	3.1

Notes:
[1]in instances where there was a lack of BOD_5 data in the annual reports, BOD_5 was calculated from reported cBOD data assuming a conversion factor of 0.8 (i.e. cBOD = 80% of BOD_5).

The summary of Table 2.1 and Table 2.3 suggests the following:

- All four WWTPs provide sufficient removal for TSS and BOD_5. These two parameters are mainly removed through primary, secondary, and solids handling systems; therefore, costs associated with these treatment systems need to be considered for each WWTP;
- All four WWTPs currently provide sufficient removal of TP. TP is removed through chemical precipitation by ferrous chloride and subsequent removal via the solids handling system.

Chemical cost for TP removal varies significantly among four WWTPs (see Table 2.4 below for TPO removal data based on 2010 WWTP Annual Reports). The City is generally not entering into new surcharge agreements for TP due to high TP loadings into the WWTPs and the potential of C of A non-compliance. To help reduce TP loading at its WWTPs, the City initiated meetings with many companies with IWSAs to explore pollution prevention opportunities for each company to reduce TP discharge loadings before consideration is given to add TP to IWSA.

Table 2.4: Summary of WWTP Ferrous Chloride Costs for TP Removal (2010)

WWTP	TP Loading[1]	Ferrous Consumption[1]	Ferrous Chloride Cost[1]	$ Fe/TP
ABTP	2,611,794 kg	1,029,922 kg	$ 799,219	$ 0.31
HTP	634,224 kg	890,121 kg	$ 690,734	$ 1.09
HCTP	340,122 kg	540,027 kg	$ 419,061	$ 1.23
NTTP	58,137 kg	32,508 kg	$ 25,266	$ 0.43

Notes:
[1] 2010 Toronto Water Annual Report of each WWTP with $776/ton Fe

- All WWTPs provide TKN removal, although it is not currently required by the C of A Currently, TKN is not a surchargeable parameter under the Toronto Sewers Bylaw although it is surcharged by a number of surrounding municipalities in the Greater Toronto Area. The TKN removal rates for ABTP, HTP, HCTP, and NTTP in 2010 were 66%, 79%, 84%, and 91%, respectively. TKN is removed through naturally occurring nitrification within the aeration tanks (secondary treatment). The main O&M cost associated with TKN removal is blower energy consumption. Aeration processes must therefore meet the energy demands of both BOD_5 removal and partial nitrification in order to maintain a healthy (i.e. sufficiently oxygenated) biological environment. In other words, additional air must be provided to achieve partial nitrification of any influent TKN, else the required biologically-mediated BOD_5 removal will not be achieved. Due to the fact that aeration energy cost is a significant portion of each WWTP energy cost, there is a need to review the O&M cost associated with TKN removal and to consider including TKN as one of the surchargeable parameters

2.5 ODF FEES AND STRUCTURE

The Fees and Charges Bylaw (Municipal Code, Chapter 441 - Fees) prescribes the fees and charges for water and sewerage use. Appendix A – Schedule 3, Wastewater Services, Item 1 sets the surcharge rate of $0.57/kilogram. Appendix D – Schedule 1, Water & Sewer Service Rates – Revenue Services - sets the 2011 Block 1 rate at $2.2842/$m^3$ and Block 2 rate at $1.5989/$m^3$ (for volumes over 6,000 m^3). The cost for discharge to sewer is included in the water rate. However, there is a rebate available if there is a difference in volume of water purchased and discharged. The rebate, which is intended to represent the amount it costs Toronto Water to treat the wastewater discharged to sewer, is 57% of the Block 1 water rate. Based on the current Block 1 rate, the rebate maximum for 2011 was $1.302/$m^3$.

The ODF, based on the surcharge rate of $0.57/kg, is calculated based on the parameter with the highest loading differential from the allowable limit set in the Sewer Use Bylaw. The frequency of sampling to assess loading is dependent upon the size of the expected surcharge fee, and ranges from a minimum of once per year to four samples per quarter for dischargers with annual surcharge fees greater than $75,000. Typically 24-hour composite samples of wastewater effluent are collected by Toronto Water staff and analyzed by the Toronto Water laboratory. Toronto Water uses the Grubb statistical program to evaluate the data used in the rolling four quarter average. The annual average concentrations (mg/L) of the four surchargeable parameters are compared with the Sewers Bylaw limits. The parameter with the highest over strength concentration (actual concentration minus the Sewer Bylaw limit) is used to calculate ODFs. The over strength portion of the loading (kg), determined by the over strength concentration and the total sewer discharge volume [(water purchased + private water) x percentage discharged], is used to calculate the ODFs. See Appendix 1 for the City Industrial Waste Surcharge Agreement which contains the surcharge formula. See Appendix 2 for further details on how City surcharge fees are calculated.

Current annual revenue generated from the industrial waste surcharge agreement program is approximately $8.2M in 2010 and $8.9M in 2011.

The surcharge rate of 0.57/kg has not been changed for more than 10 years and the original basis for this fee, established by the former Metro Toronto, is not documented. It is unknown whether the original basis for the surcharge considered all operating costs of the WWTPs (including energy, chemicals, labour, analytical testing costs), transmission costs (maintenance of sewers), capital costs (upgrades to WWTP and sewer infrastructure), and operating costs associated with managing the surcharge program (labour, analytical testing). The Protecting Water Quality and Preventing Pollution – Assessing the Effectiveness of the City's Sewer Use Bylaw Auditor Report dated June 25, 2008 states "the surcharge rate used to calculate surcharge fees has not changed in over ten years whereas costs to treat have increased. At the moment it is not possible to determine whether program costs are being fully recovered." This statement is still valid at the time of completion of this study.

3.0 Part II - Benchmarking Toronto with Nearby Municipalities and Large Ontario Municipalities

This section provides the results of the benchmarking study with respect to ODF programs, cost recovery, and cost structure. Ten Ontario municipalities were considered as part of the benchmarking study which included a review of their sewer use bylaws and ODF rates and formulae. Six of the ten municipalities also provided additional information through telephone interviews.

3.1 HISTORY AND RATIONALE OF ODFS

In general, the rationale for ODF is to fully recover costs associated with treatment of parameters that exceed the bylaw limits where the WWTP has the capacity to treat these parameters. The following summarizes the findings for each municipality:

- York: Intent is to recover costs but rate has not been revised since at least 2002. ODF allowed by Bylaw S-0064-2005-009. The intent of ODF is to recover costs associated with WWTP O&M costs only (i.e. no capital cost recovery) New rates will be effective January 1, 2012 and increased rates for 2013 have already been determined;

- London: ODF allowed by Bylaw WM-16. Intent is to cover costs; currently only covers a percentage of operating and capital costs. Rates are subject to political influence (i.e. may not be raised in a given year);

- City of Toronto: ODF allowed by Toronto Sewers Bylaw (Municipal Code, Chapter 681). ODF program reportedly based on a user pay principle; however, no documentation exists on the history of the program and the basis for the rate previously operated by former Metropolitan Toronto. Rates has not been revised since 1996;

- Peel: ODF allowed by Bylaw 53-2010. ODF program reportedly based on a user-pay principle to cover wastewater treatment cost, sampling and testing costs. Rates are reviewed annually with consideration of 10-year projection;

- Halton: ODF allowed by Bylaw 2-03. ODF program reportedly based on a user-pay principle to cover wastewater treatment operation, maintenance, and administration. Rates were raised from \$349.10 / 1,000 m^3 in 2010 to \$362.42 / 1000 m^3 in 2011 (an increase of approximately 5 percent);

- Hamilton: ODF allowed by Bylaw 04-150. ODF program reportedly based on a user-pay principle to cover wastewater treatment operation and maintenance. Rates were determined in mid 1990s and increased annually along with the sewer / water rates increase. Each surchargeable parameter has its own surcharge rate;

- Ottawa: ODF allowed by Bylaw No. 2003-514. Bylaw states that intent of ODF program is to cover operation, repair, and maintenance;
- Waterloo – ODF allowed by sewer use Bylaw 1-90, enacted in 1990 and amended in 1992. The Region's Official plan states that the intent of ODF is to recover costs associated with treatment of high concentration effluent. According to staff, it is not clear that the rate is reflective of the intent;
- Guelph: ODF allowed by Bylaw (1996)-18036. Bylaw states that intent of ODF program is to cover operation, repair, replacement, or maintenance;
- Durham: ODF allowed by Bylaw No. 43-2004. Bylaw states that intent of ODF program is to cover operation, repair, replacement, and maintenance.

Based on the above information, the following conclusions are made:

- ODF is defined/allowed by the Sewers Use Bylaw;
- Most of the municipalities apply the user-pay principle to cover the wastewater treatment plant operation and maintenance (O&M) costs. All interviewed municipalities, with the exception of the London, stated that the ODF cover the O&M cost of the WWTPs;
- None of the interviewed municipalities could provide the detailed rationale that was used to determine the surcharge rates (R values);
- Three out of six interviewed municipalities stated that the surcharge rates (R values) are subject to annual review.

3.2 ODF PARAMETERS AND SURCHARGE AGREEMENTS

Typical surchargeable parameters include BOD_5, TSS, TP and TKN. Additional surchargeable parameters include phenols, oil and grease, iron, and sulphate, based on individual WWTP capabilities, design and ability to treat.

Table 3.1 provides a summary of the surchargeable parameters for each municipality at the time of this report (2011).

Table 3.1: Summary of Municipalities' Surchargeable Parameters (2011)

Municipality	BOD_5	TSS	TP	Phenols	TKN	Oil and Grease	Other
Toronto	Y	Y	Y	Y	N	N	
York	Y	Y	Y	Y	Y	Y	Sulphate
London	Y	Y	Y	N	Ammonia[2]	N	
Peel	Y	Y	Y[1]	N	N	Y[3]	

Municipality	BOD_5	TSS	TP	Phenols	TKN	Oil and Grease	Other
Halton	Y	Y	Y	Y	Y	Y	Fe
Hamilton	Y	Y	Y	N	Y	Y	
Durham	Y	Y	Y	N	Y	Y	Sulphate
Guelph	Y	Y	Y	N	N	Y	
Waterloo	Y	Y	Y	Y	Y	N[4]	
Ottawa	Y	Y	Y	Y	Y	N	

Notes:

[1] TP became a part of the ODF program in April 1, 2011 at the Regional Municipality of Peel

[2] Ammonia of 50 mg/L is used as the limit in the Sewer Use Bylaw by the City of London, due to the concern of high ammonia in leachate discharged from landfill sites.

[3] Peel Region places cap on Oil and Grease Surcharge (personal communication)

[4] As of Jan.1.2012 Waterloo Region no longer permits Oil and Grease Surcharge (personal communication)

All interviewed municipalities enter into a written agreement with each discharger. Some have formalized, standard forms; other simply send a letter outlining the terms of the agreement. Where an agreement exists, it typically contains the surchargeable parameters, and maximum concentration of the parameter allowed. Some agreements also limit total volume and flow. The following summarizes the findings from a review of the municipalities:

- Toronto – new standard agreement, legally binding. Contains the surchargeable parameters, maximum concentration of parameter(s) allowed, reference to Bylaw that contains the ODF rate and formula for calculating costs;
- London – no standard surcharge agreement, letter sent detailing fees;
- York – The formula for the ODFs is defined in Schedule D of the Sewers Bylaw. There is currently no standardized surcharge agreement, in process of creating a legally binding standardized document modeled after City of Toronto's new surcharge agreement. Current agreement is in letter form and varies from one discharger to another;
- Peel – generic surcharge agreement used and may be modified case by case. The surcharge agreement is not defined by the Sewer Bylaw. The formula for the ODFs is not defined in the sewers bylaw;
- Halton – standard surcharge agreement available. The surcharge agreement can be modified case by case. The formula for the ODFs is defined in the Sewers Bylaw;
- Hamilton – standard surcharge agreement available and defined within the Sewers Bylaw;

- Durham – no standard surcharge agreement defined within the Sewers Bylaw, letter sent detailing fees;

- Guelph – standard surcharge agreement defined within the Sewers Bylaw. Limits concentration, volume, and flow. States sampling requirements and provides discharger with option of collecting own samples or paying for City to collect them;

- Waterloo – standard surcharge agreement defined within the Sewers Bylaw. Limits concentration, volume, and flow;

- Ottawa – no standard surcharge agreement defined within the Sewers Bylaw. ODF fees are identified in Schedule "B" of the Sewers Bylaw.

3.3 NUMBER AND NATURE OF DISCHARGERS SUBJECT TO ODF

Typical dischargers that enter into surcharge agreements include food and beverage, pulp and paper, chemical manufacturing, waste collection, laundries, etc. Revenue ranges from $300,000 to $8.9 million annually (2011 data). The following summarizes the findings from a review of the municipalities:

- Toronto: Approximately 200 dischargers (approximately 150 discharges with surcharge formal agreements and approximately 50 with surcharge permits) providing revenue $8.9 million (2011)
    - chemical manufacturing
    - food and beverage
    - grease trap treatment
    - hazardous waste treatment and disposal
    - laundry
    - metal product
    - paper
    - petroleum manufacturing
    - plastic manufacturing
    - solid waste collection
    - soap, cleansers, textiles

- York: 52 dischargers with surcharge agreements; revenue $300,000 (2010)
    - food and beverage
    - soap, cleansers, textiles

- London: 17 dischargers with surcharge agreements; revenue $4 million (2010)
    - restaurants
    - food and beverage
    - soap
    - packaging (3M)
    - leachate from landfills (internal)

- Peel: 94 active dischargers entered into surcharge agreement in 2011; revenue $6 million (2010)
    - chemical
    - meat processing/ food and beverage
    - pet food
    - recycle
    - food and beverage (66 dischargers in total)

- Halton: 19 dischargers with surcharge agreements; revenue $1.8 million (2010)
    - food base industry
    - casting
    - tank cleaning

- Hamilton: 14 dischargers with surcharge agreements; revenue $1.7 million (2010)
    - primary steel making
    - food processing
    - textile

3.4 SAMPLING AND MONITORING PROGRAMS

All interviewed municipalities undertake sampling of effluent from dischargers that enter into surcharge agreements. The type and frequency of sampling varies from municipality.

- Toronto: Frequency of sampling is dependent upon amount of annual fee. Typically 24-hour composite samples of wastewater effluent are collected by City at a frequency of one to four samples per quarter depending on the Company's categorization. City uses the Grubb statistical program to evaluate the data;

- York: Frequency of sampling is dependent upon risk and volume. At a minimum, sample frequency is quarterly. For “higher risk” dischargers, it is monthly;

- London: The type and frequency of sampling varies depending on type of industry, strength of surcharge, and what is required to produce representative samples. Minimum number of samples is two per year;

- Peel: Frequency of sampling is dependent upon the dischargers, with variation between twice per week, weekly, and bi weekly;

- Halton: Frequency of sampling is dependent upon the dischargers, with variation between weekly and monthly;

- Hamilton: All dischargers are subject to quarterly samples; and monthly sampling will apply after a Violation;

- Guelph: Sampling protocol is defined as part of the surcharge agreement. Set-up similarly to a provincial C of A with requirements to submit reports, maintain logs, calibrate equipment, etc.

3.5 WASTEWATER TREATMENT PLANT CAPABILITIES

Most WWTPs have C of A limits for TSS, BOD_5, and TP. Some have limits for TKN or Total Ammonia Nitrogen. Typically modeling is not done to determine excess capacity; however, municipalities have the ability to not enter into or negate an agreement if issues arise in the sewer shed or relating to WWTP capacity.

- York: one WWTP, C of A sets limits for TSS, TKN. Lots of capacity; however, for dischargers that discharge to Lake Simcoe, TP is restricted;

- London: All WWTPs required achieving nitrification (treat ammonia) as part of C of A. Only limit /cap over strength to Boxall plant;

- Toronto, four WWTPs, Cs of A sets limits for TSS, BOD_5, and TP. All four WWTPs provide sufficient removal for TSS, BOD_5, and TP. City is restrictive to entering surcharge agreements for TP due to high TP loadings into the WWTPs that may occur and the potential of C of A non-compliance. Companies are asked to reduce their TP levels before via pollution prevention before the City considers TP for IWSA inclusion. All WWTPs provide some degree of TKN removal;

- Peel: two major WWTPs in South Peel. C of As set limits for BOD_5, TSS, TP, and Ammonia. For the surchargeable parameters, all WWTPs have sufficient capacity. Therefore, there is no review conducted on the capacity of the WWTPs prior to determining surcharge limits. Most limits are concentration based, with one exception of airport which has seasonal discharge. TKN is not included as surchargeable parameter due to concerns that high TKN would have impact on sludge settleability;

- Halton: Seven WWTPs, C of A sets limits for TP, TSS, BOD_5, and Ammonia except that no ammonia limit is set for Oakville Southeast WWTP. Both loadings and concentrations are used to set the limits for the surcharge agreement. The upper limits of the surcharge agreement are set to not exceed the treatment capacity of the WWTPs;

- Hamilton: Two WWTPs, C of A sets limits for BOD_5, TSS, and TP. TKN is included as a surchargeable parameter because the WWTPs achieve nitrification, although no effluent ammonia limit is set in the C of A;

- Durham: Two WWTPs, Cs of A sets limits for BOD_5, TSS, TP, and Ammonia;

- Guelph: one WWTP, C of A sets limits for BOD_5, TSS, TP, and Total Ammonia Nitrogen;

- Waterloo: The Cs of A sets limits different for different WWTPs. For example, the C of A of the Kitchener WWTP has limits for BOD_5, TSS, and TP; and the C of A of the Waterloo has limits for BOD_5, TSS, TP, and Total Ammonia Nitrogen;

- Ottawa: The C of A for the Robert Pickard Environmental Center was reviewed; and it has limits for BOD_5, TSS, TP, and sulphite.

3.6 ODF FEES AND STRUCTURE

There are two different types of ODF formulas used by Ontario municipalities. One type is based on a volume of effluent discharged times concentration of the over strength parameter times the ODF rate, typically expressed as $/kg, such as Toronto and Hamilton. ODF rate(s) vary from $0.42/kg to $5.75/kg. Some municipalities have variable rates (such as Hamilton and Ottawa) and others have the same rate regardless of parameter. The concentration on which the charge is based is the difference between the concentration of the surchargeable parameter discharged and the Sewers Bylaw limit.

The second type is based on ODF R value expressed as $/m^3 where the difference between the concentration of the surchargeable parameter discharged and the Sewers Bylaw limit is divided by the allowable limit in their formula, such as Peel, Halton, and London.

Most municipalities' ODF are additive for each surchargeable parameter that exceeds the sewers limit. A few, such as Toronto, Peel and Halton, currently base the rate upon the parameter with the biggest difference between the amount discharged and the amount allowed by the Sewers Bylaw.

A review of current ODF fee structures (rate and formula) used by the municipalities reviewed as part of this study are presented below for reference:

- Toronto:
    - 2011 rate is $0.57/kg, has not been changed since 1996
    - $(Average\ Concentration\ of\ Parameter, \frac{mg}{L} - Bylaw\ Limit) \times \frac{Volume\ (m^3)}{1000} \times (\frac{\$0.57}{kg})$
    - ODF for parameter with highest loading differential from the allowable limit set in the Sewers Bylaw
- York: Concentration (difference between actual and what is allowed by bylaw) times volume
    - 2012 rate is $0.42/kg. This rate was newly introduced in January 2012, prior to which the rate was $0.3283/kg for the period 2002 to 2011.
    - $(Actual\ Concentration, \frac{mg}{L} - Limit\ \frac{mg}{L}) \times (\frac{Volume\ (m^3)}{1{,}000}) \times R_{kg}\ (\frac{\$}{kg})$
    - TP is 5X the formula rate above ($2.10/kg) due to additional costs associated with managing solids from chemical addition
    - Additive for each surchargeable parameter
    - York are planning to further increase the rate to $0.53/kg in 2013 (rate for TP will be $2.65/kg)

- London:
    - 2011 rate is $0.455 per m^3, typically updated annually based on a %
    - $\left(\frac{(Actual\ Concentration\ \left(\frac{mg}{L}\right) - Limit\ \left(\frac{mg}{L}\right))}{(Limit\ \left(\frac{mg}{L}\right)\ x\ Flow\ (m3) x\ R_{kg}\ \left(\frac{\$}{kg}\right))}\right)\ \div\ 2$
- Peel:
    - 2011 rate is $ 310 / 1,000 m^3
    - $\frac{(Actual\ Concentration\ \left(\frac{mg}{L}\right) - Limit\ \left(\frac{mg}{L}\right))}{Limit\ \left(\frac{mg}{L}\right)\ x\ Flow\ (m3) x\ Rate\ \left(\frac{\$310}{1000\ m^3}\right)}$
    - ODF for parameter with highest loading differential from the allowable limit set in the sewers bylaw
    - Additional fees around collection and analysis of samples added
- Halton
    - 2011 rate is $ 362.42 / 1,000 m^3 in 2011, increased from $ 349.10 / 1,000 m^3 in 2010
    - $\frac{(Actual\ Concentration\ \left(\frac{mg}{L}\right) - Limit\ \left(\frac{mg}{L}\right))}{Limit\ \left(\frac{mg}{L}\right)\ x\ Flow\ x\ \ Rate\ \left(\frac{\$362.42}{1000\ m^3}\right)}$
    - ODF for parameter with highest loading differential from the allowable limit set in the sewers bylaw
- Hamilton
    - 2012 rates are different for the surchargeable parameters, including $0.559 / kg oil and grease; $0.6656/ kg BOD_5; $0.5323/ kg TSS, $1.426 / kg TP, and $2.0265 / kg TKN based on the single highest over strength parameter (2011 rates).
    - The baseline rates were established in the mid-1990s and are subject to yearly increase. The increase rate is determined by the sewer/water rate increase.
    - $\left(Actual\ Concentration, \frac{mg}{L} - Limit\ \frac{mg}{L}\right) x\ \left(\frac{Volume\ (m^3)}{1{,}000}\right) x\ R_{kg}\ \left(\frac{\$}{kg}\right)$
- Durham
    - 2012 rate is $0.48/kg

- $\left(Actual\ Concentration, \frac{mg}{L} - Limit\ \frac{mg}{L}\right) x \left(\frac{Volume\ (m^3)}{1{,}000}\right) x\ R_{kg}\ (\frac{\$}{kg})$
- Cost allocation factor for each surchargeable parameter

- Guelph
  - $\left(Actual\ Concentration, \frac{mg}{L} - Limit\ \frac{mg}{L}\right) x \left(\frac{Volume\ (m^3)}{1{,}000}\right) x\ R_{kg}\ (\frac{\$}{kg})$
  - Cost allocation factor for surchargeable parameter
  - Surcharge is additive for each parameter
- Waterloo
  - $\left(Actual\ Concentration, \frac{mg}{L} - Limit\ \frac{mg}{L}\right) x \left(\frac{Volume\ (m^3)}{1{,}000}\right) x\ R_{kg}\ (\frac{\$}{kg})$
  - Cost allocation factor for surchargeable parameter
  - Surcharge is additive for each parameter
- Ottawa
  - Effective May 1, 2012 rates for the surchargeable parameters are: BOD $1.44/kg, TSS $0.77/kg, TKN $5.75/kg and TP $2.31/kg
  - Surcharge each parameter
  - Formula not specified

3.7 REVENUE AND COST RECOVERY STRUCTURE

Costs associated with delivering the surcharge program and treating the over strength wastewater typically include O&M and sometimes includes capital costs, as summarized in Table 3.2 which shows data for those municipalities reviewed for this study for which this information was available.

Costs associated with management of surcharge program (sampling and analytical costs and agreement set-up) are not typically included in the rate. Instead, it is captured in a separate fee recovery program such as a one-time administrative fee for set-up or on a cost-recovery basis (i.e. Peel, Guelph) or it is partially or fully recovered via a minimum fee program. Charges are typically based on an average unit cost for treatment of the surchargeable parameters as an aggregate for some (i.e., BOD_5, TSS) and separately for others (i.e. TP).

Table 3.2: Summary of Revenue and Cost Recovery Structure (2010

Municipality	Revenue (2010)	O&M Costs	Capital Costs	Transmission/ Conveyance	Sampling and Testing Surcharge Program
Toronto	$8.2 M	Not known	Not known	Not likely	Accounted for within minimum fee of $500 only
York	$300 K	Yes: energy, chemicals, maintenance, labour	Yes	No	Future, separate fee
London	$4 M	partial	Partial	No	No
Peel	$6 M	Yes	No	No	Yes
Halton	$1.8 M	Yes	No	No	Unknown
Hamilton	$1.7 M	Yes	No	No	No
Waterloo	$1.6 M	Yes	Not Known	Not known	Partial
Notes Revenue information for Ottawa, Guelph and Durham were not available during the preparation of this report					

4.0 Part III - Recommended Approach for Toronto Water ODF and R Value

This section of the report provides a recommended ODF calculation formula for Toronto Water, a recommended methodology to determine the R value, a proposed phased implementation approach, and methodology to determine future annual rate adjustment.

4.1 SURCHARGEABLE PARAMETERS

It is proposed that the following parameters be considered for the surchargeable parameters for the City, including:

- BOD_5 / phenols: Because phenols are removed through biological process at the WWTPs, it is proposed that the treatment cost of phenols be combined with BOD_5 removal. The secondary treatment system is mainly designed to remove BOD_5. The solids handling system is also designed to remove solids generated through BOD_5 biodegradation processes;

- TSS: The primary treatment system is mainly designed to remove TSS. The solids handling system is also designed to process and dispose of primary sludge;

- TP: Chemicals (e.g., ferrous chloride) are added to remove TP through either primary or secondary processes; and

- TKN: Currently, TKN is not one of the surchargeable parameters but is recommended to be added. Although nitrification is not required by the C of As of any of the WWTPs, a significant level of nitrification is achieved through the biological processes at each plant. For example, partial nitrification is naturally occurred within the aeration tanks. Nitrification requires significantly more oxygen than BOD_5 removal. In order to maintain a healthy aerobic environment for BOD_5 removal, sufficient air has to be provided in the aeration tanks to support complete BOD_5 removal and partial nitrification; therefore, it is recommended that O&M cost associated with nitrification be recovered through the ODF program.

  Ammonia (NH_3-N) and TKN are both measures of the nitrogen content of the wastewater. TKN is defined as ammonia plus Organic Nitrogen. Since TKN includes ammonia, the TKN concentration will obviously be greater than or equal to the ammonia concentration. Proteins (containing Organic Nitrogen) discharged by a food or industrial facility will break down in the sewers or in the treatment process and be converted to ammonia. Therefore, for waste streams that have high protein content (e.g., food processing industry), TKN better represents the nitrogen concentration that would be treated at the WWTPs and is recommended for use to determine the ODF.

  It is noted that other surrounding municipalities include TKN within their surcharge programs. Toronto should consider adding TKN to its surcharge program to provide a level playing field. Further, dischargers of TKN have limited pollution prevention options when it

comes to TKN but destroying/treating the TKN with full scale WWTP and retention times similar to Toronto WWTPs is an option.

4.2 ODF CALCULATION FORMULA

Typically, each surcharge agreement between a municipality and a particular industrial sewer user includes defined surchargeable parameter concentration and flow rate threshold values. Two different types of ODF calculation formulas were identified in Part II of this Report. These are summarized below.

4.2.1 Type I Formula – Unit Cost per Kilogram

The Type I formula is based on the cost to treat a unit (kg) of the surchargeable parameter and is applied to additional units (kg) of the parameter received above the applicable sewers bylaw limit. The ODF is additive for each parameter received above the applicable sewers bylaw limit.

Type I – Unit Cost per Kilogram

$$ODF = \sum_{i=1}^{n} (Actual\ average\ Concentration, mg/L\ - BylawLimit\ , mg/L) \times \frac{Volume\ (m^3)}{1{,}000} \times R_{kg}\ (\$/kg)$$

Where,

i = surchargeable parameter

n = number of surchargeable parameters

Actual concentration = measured average concentration in the effluent of the discharger, mg/L [*]

Bylaw Limit = Sewers Bylaw limit, mg/L

Volume = total flow discharged into the sewer during the invoice period, m^3

R_{kg} = unit cost per kilogram of parameter being treated, $ / kg

York, Hamilton, Durham, Guelph, Waterloo, and Ottawa are using the Type I ODF formula. Below is a hypothetical example of the application of the Type I formula.

Example of Application – Type I ODF Formula:

[*] Note that there are variations in methodologies for determination of 'average' effluent parameter concentration values. Measured annual average concentration values may be generated based 12-month mean average or 50th percentile of laboratory data. Outliers may be detected and removed in advance of averaging from the raw data set using the Grubb's test.

User A discharges industrial wastewater into the City of Hamilton sanitary sewer. The wastewater strength includes1,500 mg/L BOD_5, 1,000 mg/L TSS, 25 mg/L TP, and 300 mg/L TKN. The Sewer Bylaw limits for the above four surchargeable parameters are 300 mg/L BOD_5, 300 mg/L TSS, 10 mg/L TP, and 100 mg/L TKN. The surcharge rate in the City of Hamilton includes \$ 0.6656 / kg BOD_5, \$0.5323 / kg TSS, \$1.426 / kg TP, and \$ 2.0265 / kg TKN. The average flow rate is 100 m^3/d. The quarterly ODF can be calculated as below:

$$ODF_{BOD} = \left(1{,}500\frac{mg}{L} - 300\frac{mg}{L}\right) \times 100\frac{m3}{d} \times \frac{365}{4} \div 1{,}000 \times \$0.6656 = \$7{,}288$$

$$ODF_{TSS} = \left(1{,}000\frac{mg}{L} - 300\frac{mg}{L}\right) \times 100\,{}^{m^3}/_{d} \times \frac{365}{4} \div 1{,}000 \times \$0.5232 = \$3{,}342$$

$$ODF_{TP} = \left(25\frac{mg}{L} - 10\frac{mg}{L}\right) \times 100\,{}^{m^3}/_{d} \times \frac{365}{4} \div 1{,}000 \times \$1.426 = \$195$$

$$ODF_{TKN} = \left(300\frac{mg}{L} - 100\frac{mg}{L}\right) \times 100\,{}^{m^3}/_{d} \times \frac{365}{4} \div 1{,}000 \times \$2.0265 = \$3{,}698$$

$$Total\ ODF = ODF_{BOD} + ODF_{TSS} + ODF_{TP} + ODF_{TKN} = \$14{,}523$$

4.2.2 Type II Formula – Unit Cost per 1,000 m^3

The Type II formula is based on the cost to treat a unit of wastewater (m^3) entering a WWTP regardless of the strength or what parameters it contains. The formula converts the volume of a waste stream with high strength to a volume of wastewater with typical strength. For example, the amount of BOD_5 contained in 5 m^3 wastewater with 600 mg/L BOD_5 is equivalent to the amount of BOD_5 contained in 10 m^3 of wastewater with a concentration of 300 mg/L BOD_5. The Type II formula is typically only applied to the parameter with the highest percentage differential from the Sewers Bylaw limit.

Type II – Unit Cost per 1,000 m^3

$$ODF = \frac{Actual\ Concentration, \frac{mg}{L} - BylawLimit, mg/L}{limit, mg/L} \times \frac{Volume,\ m^3}{1{,}000} \times R_{m^3}\left(\frac{\$}{1{,}000\ m^3}\right)$$

Where,

Actual concentration = measured concentration in the effluent of the discharger, mg/L

Bylaw Limit = Sewers Bylaw limit, mg/L

Volume = total flow discharged into the sewer during the invoice period, m^3

R_{m3} = unit cost per 1,000 m^3 of wastewater, \$ / 1,000 m^3

London, Peel, and Halton are using the Type II ODF formula. Below is a hypothetical example of the application of the Type II formula.

Example of Application – Type II ODF Formula – Example 1:

User B discharges industrial wastewater into the Region of Halton sanitary sewer. The wastewater strength is similar to the wastewater strength from User A, including: 1,500 mg/L BOD_5, 1,000 mg/L TSS, 25 mg/L TP, and 300 mg/L TKN. The surcharge rate in the Region of Halton is $ 310 / 1,000 m^3. The Sewers Bylaw limits for the above four surchargeable parameters are 300 mg/L BOD_5, 300 mg/L TSS, 10 mg/L TP, and 100 mg/L TKN. The average flowrate is 100 m^3/d. The quarterly ODF can be calculated based on the BOD_5 concentration which has the highest differential from the Sewers Bylaw limit, as described below:

$$ODF = \frac{1{,}500\frac{mg}{L} - 300\frac{mg}{L}}{300\frac{mg}{L}} \times 100\,{}^{m^3}/_{d} \times \frac{365}{4} \div 1{,}000 \times \$310 = \$11{,}315$$

Example of Application– Type II ODF Formula – Example 2:

User C discharges industrial wastewater into the Region of Halton sanitary sewer. The wastewater strength is very similar to User B in Example 1 except that the concentration of TKN in the effluent is 150 mg/L TKN. The surcharge rate in the Region of Peel is $ 310 / 1,000 m^3. The Sewers Bylaw limits for the above four surchargeable parameters are 300 mg/L BOD_5, 300 mg/L TSS, 10 mg/L TP, and 100 mg/L TKN. The average flowrate is 100 m^3/d. The quarterly ODF can be calculated based on the BOD_5 concentration which has the highest differential from the Sewer Bylaw limit, as described below:

$$ODF = \frac{1{,}500\frac{mg}{L} - 300\frac{mg}{L}}{300\frac{mg}{L}} \times 100\,{}^{m^3}/_{d} \times \frac{365}{4} \div 1{,}000 \times \$310 = \$11{,}315$$

From the above two examples, it is noted that User C pays the same amount as User B, even though the concentration of TKN in the effluent for User C (150 mg/L) is only 50% of the concentration of TKN in the effluent for User B (300 mg/L).

4.2.3 Evaluation of Type I and Type II ODF Formulae

Table 4.1 provides a comparison between the Type I and Type II ODF formulae.

Table 4.1: Comparison between Type I and Type II ODF Formulae

Item	Type I ODF Formula	Type II ODF Formula
Complexity of ODF Calculation	More complicated	Less complicated
Surcharge each parameter	Yes	No (only the one with highest differential from Sewers Bylaw)
R value determination	Complicated; Requires detailed plant cost allocation data.	Simple $R = \frac{Total\ Cost, \$}{Flow,\ m^3/1000}$
ODF Accuracy	More accurately captures the relative treatment cost for each surchargeable parameter	Less accurately captures the relative treatment cost for each surchargeable parameter.

Type I and Type II ODF formulae are both considered viable methodologies to calculate R Values for cost recovery due to the following reasons:

- Type I allows ODF to include each surchargeable parameter. In some cases, actual discharge BOD_5 and TSS concentrations could be much higher than the Sewers Bylaw limit; and the concentration of TKN could be just slightly higher than the Sewers Bylaw limit. The TKN component for the ODF would not be captured, if Type II formula were used. However, it is very important that detailed cost allocation is available to determine R values for the Type I formula application; and
- Type II is very simple for application.

It was found that application of City data to the Type II formula yields an R value of \$763 / 1000 m^3; this value is substantially higher than R values of other Ontario municipalities that use the Type II R value methodology, for example:

- Peel: \$310 / 1000 m^3
- Halton: \$362 / 1000 m^3
- London: \$455 / 1000 m^3

On the basis of the above, the Type II methodology is not considered suitable for the City to determine ODF fees. It is recommended that the City proceed with the Type I methodology to calculate R values based on cost recovery principles.

4.3 R VALUE FOR TYPE I FORMULA

The methodology reviewed herein, which comprises allocation of costs to cost-causative components, was developed based on the framework detailed in the Water Environment Federation (WEF) Financing and Charges for Wastewater Systems (3rd Edition).

4.3.1 Methodology

There are a number of potential variations in the application of the Type I methodology. A brief description of the approach alternatives, and selection of the preferred approach in each case, is reviewed herein.

1. "Quantity / Quality" versus "Surcharge Limit"

Determining R values based on the Type I formula can be carried out in one the following two ways:

There are two primary approaches to applying R values to users' effluent data, as follows:

i) the "quantity / quality" approach in which users are charged the actual costs of removing or treating each effluent component (resulting in separate charges for Volume, BOD_5, TSS, etc.); and

ii) ii) the "surcharge limit" approach in which users are charged for parameters above a defined 'base' concentration (e.g., typical residential strength concentration).

In the City of Toronto, users are currently invoiced a water rate which is a combined fee for both water and sewer. This makes it difficult to identify the volume of effluent that should be applied under the "quantity / quality" approach; therefore, it is recommended that "surcharge limit' be considered to determine R values for Toronto Water.

2. "Design Basis" versus "Functional Approach"

There are two primary approaches to allocating WWTP costs (including both capital and operational costs), including:

i) The "design basis" approach, which considers the principal parameter for which each part of the WWTP is designed; and

ii) The "functional approach", which considers what parameters are removed in each part of the WWTP.

For example, under the design basis of cost allocation, very little cost associated with primary sedimentation is allocated to surchargeable parameters, since the basis of design for primary clarifiers is primarily the various flow rates (average, peak) into the treatment plant; however, under the functional basis, primary sedimentation costs are allocated mainly to TSS removal.

As another example, from a functional perspective the disinfection process does not remove TSS, BOD_5, TP, and TKN; therefore, the O&M costs allocated to disinfection should not be included in the determination of costs for treating the surchargeable parameters.

It is recommended that the functional approach be applied to identify costs for both "Volume" (i.e. non-ODF parameter related) and strength (i.e. ODF parameter related) components.

Table 4.2 summarizes the cost allocation of each wastewater collection and treatment processes that are applicable to the City.

Table 4.2: Cost Allocation of Wastewater Collection and Treatment Process

Process	Cost Allocation
Collection sewers	The main purpose is to carry wastewater at various flowrates; so the costs are assigned to 'Volume' cost component.
Pump stations	The purpose is to move wastewater at various flowrates; so costs are assigned to the 'Volume' cost component.
Headworks (grit and screens)	The purpose is to remove debris and large material s carried by wastewater; so the costs are mainly assigned to the 'Volume' cost component with a portion assigned to 'TSS' cost component.
Primary Treatment	The purpose is to remove TSS and particulate BOD_5; so the costs are mainly assigned to 'TSS' removal cost component (Note that the particulate BOD_5 is a portion of TSS);
Secondary Treatment	The purpose is to remove BOD and TKN (if nitrification is practiced) from wastewater. In addition, the RAS pumping is also a portion of the O&M cost for secondary treatment; so costs are mainly assigned to 'BOD_5' and 'TKN' cost components and the remaining assigned to Volume.
TP removal	The purpose is to remove TP through chemical precipitation; so costs are assigned to 'TP' removal cost component.
In-plant pipes and pumping	The purpose is to convey wastewater or sludge; so the cost components are assigned to 'Volume', 'TSS', or 'BOD_5' cost components.
Disinfection	The purpose is to reduce bacterial and other pathogens at various flowrates; so the costs are assigned to the 'Volume' cost component.
Solids Processing	The purpose is to handle and process sludge; so costs should be assigned to 'TSS', 'BOD_5', 'TKN', and 'TP' cost components in proportion to their respective loading at the WWTP; another component would be assigned to Volume due to sludge pumping.
Solids Disposal	The purpose is to dispose of sludge; so the costs are assigned to 'TSS', 'BOD_5', 'TKN', and 'TP' cost components in proportion to their respective loading at the WWTP.
Odour Control	The purpose is to contain objectionable smells at the WWTPs; so costs are assigned to the cost component for each facility requiring odor control.
Outfall	The purpose is to carry wastewater at various flow rates; so costs are assigned to the 'Volume' cost components.

The summary provided in Table 4.2 suggests that:

- Collection system, pump station, and outfalls are mainly assigned to the 'Volume' cost components. Although excessive TSS could increase the rate of depreciation of City collection system and pump components through erosion, TSS is not assigned for surchargeable parameters removal due to a lack of data supporting quantification of the cost associated with this process;
- Only the costs associated with the treatment processes should be used to determine the treatment costs for the surchargeable parameters.

Two of the interviewed municipalities (York and London) stated that the ODF covers both O&M and capital costs at the WWTPs. In most cases, the user pay principle defines only the minimum annual amount that must be recovered through user charges applicable to high strength dischargers. Each user must be charged on a cost recovery basis for operations, maintenance, and equipment replacement. Equipment replacement costs are those expenditures needed on short lived equipment to allow a plant to function for up to its original full useful life.

The City has budgeted funds for all capital improvement works at City WWTPs for the next 10 years. These budgeted capital funds were considered in the ODF calculation.

4.3.2 Assumptions Used to Develop R Values

1. Base Concentration

The discharge limits in the Toronto Sewers Bylaw (Chapter 681) have been used as the base concentration for the surchargeable parameters, as summarized in Table 4.3.

Table 4.3: Summary of Base Concentration to Determine ODF

Parameter	Unit	Value
BOD	mg/L	300
TSS	mg/L	350
TP	mg/L	10
TKN[1]	mg/L	100
Phenols	mg/L	1.0

Notes:
[1]TKN is not a surchargeable parameter under the current ODF approach in the City.

2. WWTP O&M Costs

Stantec reviewed the annual report of each WWTP in the City. The five (5) categories per the annual report of each WWTP that are included in the applied O&M costs are listed below for reference:

- Labour (Salaries and benefits);

- Material and Supply, including Utilities, Machinery and Equipment Parts, Chemicals, and other materials;
- New Equipment;
- Services and Rent;
- Other Charges.

3. WWTP Treatment Processes

Using information in the City's accounting system the above O&M costs were allocated to a total of four different processes, including:

- Headworks;
- Primary Treatment;
- Secondary Treatment;
- Solids Handling;
- Other (i.e. "Volume" components, including Pump Station and Disinfection costs).

4. WWTP Capital Costs

Stantec reviewed the City's draft 10-Year Capital Plan for Wastewater Facilities to develop the capital portion of ODF based on calculated average annual capital budget (2012 – 2021 data) for each WWTP. Costs were calculated at Net Present Value (NPV) assuming two (2) percent inflation and three (3) percent discount rate.

5. ODF Administration Cost

It is proposed that ODF administration cost be recovered through the ODF program. The ODF administration cost includes:

- Sampling and monitoring;
- Surcharge agreement issuance and management;
- Lab testing.

6. O&M Budget Allocation Factors

Cost allocation factors for each treatment process were jointly developed by Stantec and the City. Different allocation factors are provided for each WWTP, as described in Section 4.4.3. Table 4.4 is an example budget allocation factors summary (for HTP) based on the plant data. Budget allocation factors were reviewed with the City to best capture actual cost allocations at all WWTPs.

Table 4.4: Budget Allocation Factors for HTP

O&M Cost Item	Headworks	Primary	Secondary	Solids Train	Other[6]
Labour[1]	2.5%	30%	35%	30%	3%
Material and Supply					0%
Utilities[2]	5%	15%	60%	15%	5%
Machinery and Equipment Parts[3]	2.5%	30%	35%	30%	3%
Chemicals[4]	0	30%	0%	1%	69%
Other Materials[3]		100%			0%
New Equipment[3]	2.5%	30%	35%	30%	3%
Services & Rent[5]	2.5%	30%	35%	30%	3%
Other Charges[3]	2.5%	30%	35%	30%	3%

Notes:

[1]It is assumed that secondary and the solids handling requires most of the operator and technicians effort;

[2]it is assumed that the secondary treatment system consumes 45% of the utility cost (mainly blower operation) and the pump station consumes approximately 30% of the utility cost;

[3]It is assumed that primary, secondary, and solids train would require most of the budget.

[4]Chemical cost allocation is based on the annual reports of the WWTPs. Note that ferric chloride costs were separated and assigned to TP removal; and

[5]Services and Rent includes solids handling and management. Based on the 2010 annual report, approximately 80% of the budget is allocated to solids (assuming $45/wet ton for pelletizer and $100 / wet ton for land fill, land application).

[6]'Other' comprises cost allocated to all "Volume" components, e.g. pump station, outfall, disinfection, etc.

7. Capital Budget Allocation Factors

Capital cost allocation factors for each treatment process were jointly developed by Stantec and the City. Table 4.5 provides a sample of budget allocation factors for capital projects (for HTP), as an example; the complete capital budget allocation for each project is attached in Appendix 3. Different allocation factors are provided for different projects; details of all assumed allocation factors for individual capital for all of the City's WWTP projects are also provided in Appendix 3.

Table 4.5: Selected Capital Projects for Budget Allocation Factors

Capital Cost Item	Headworks	Primary	Secondary	Solids Train	Other
Electrical Condition Assessment Recommendations	14%	14%	14%	14%	43%
Equipment Replacement	6%	55%	29%	2%	8%
Facility Forecast Proj/Stat of Good Repair	14%	14%	14%	14%	43%
Flood Protection	17%	17%	17%	17%	33%
Odour Control Engineering	40%	60%			0%
Odour Control Implementation – Phase 1	45%	50%	5%		0%

8. Functional Cost Allocation Factor

The functional cost allocation factors for Volume and strength costs at each treatment plant and process were developed jointly by Stantec and the City. Stantec derived the operating budget allocation factor to each treatment process based on the following methodology:

- Removal of BOD, TKN, TP and TSS was calculated through the primary clarifiers and secondary process based on annual report data and used to calculate relative coagulant demand, sludge generation and aeration energy demand. Solids handling associated with sludge removal were also evaluated;
- The resulting data was used to distribute annual operational and maintenance costs between parameters. The same cost allocation factors were also used to distribute capital costs between parameters.

Table 4.6 is an example of functional cost allocation factors summary (for HTP), based on the plant data. Different allocation factors are provided to each of the City's WWTPs, as attached in Appendix 3. Functional cost allocation factors were reviewed with the City to best capture the actual O&M and Capital cost allocation for Volume and ODF strength components at each WWTP.

Table 4.6: Assumed Functional Cost Allocation Factors for HTP
(Note: Each WWTP has different functional cost allocation percentages)

Treatment Process	Volume	Wastewater Strength			
		BOD_5/Phenols	TSS	TP	TKN
Headworks	95%		5%		
Primary	25%		72%	3%	
Secondary	25%	52%	10%	0%	13%
Solids Train	20%	27%	46%	3%	4%
Other	100%				

Below is a summary of the rationale to develop the percentages for the ABTP as summarized in Table 4.6. Note that the representative parameter concentration values are equivalent to 2010 annual average values.

- **Pump Station:** This includes the cost for the "M" and "T" Buildings. As stated in Table 1.2, all the costs associated with the pump stations should be assigned to 'Volume';
- **Headworks**: During the removal of large debris and material, a small portion of TSS is also removed; therefore, 5% of the cost is assigned to 'TSS' cost component;
- **Primary**: The primary clarifiers at the ABTP remove approximately 50% of the influent TSS, or 95 mg/L of the influent 190 mg/L. The removed TSS also includes approximately

86 mg/L of particulate BOD. It is recommended that no cost associated with the primary clarifiers be assigned to the 'BOD' cost component because the particulate BOD removal is associated with TSS removal. It was determined, in conjunction with the City, that 25% of the primary clarifier costs be assigned to Volume. 72% and 3% of the cost for the primary clarifiers should be assigned to the 'TSS' cost component and the 'TP' cost component, respectively;

- **Secondary:** The secondary treatment system includes the aeration tanks and secondary clarifiers. Aeration is applied to facilitate the biologically removal of BOD and TKN. From a general stoichiometric standpoint, removal of 1 mg/L of BOD would require 1.1 mg/L of O_2; and removal of 1 mg/L of TKN would require 4.57 mg/L O_2. The secondary influent BOD and TKN concentrations at the ABTP are approximately 110 mg/L and 54.4 mg/L, respectively. The secondary effluent BOD and TKN concentrations at the ABTP are approximately 5.3 mg/L and 18.4 mg/L, respectively. In addition, it was determined in conjunction with the City that 25% of the cost on the secondary treatment system were assigned to Volume;

- **Disinfection:** There is no cost for the disinfection system associated with surchargeable parameter removal; and all the costs should be assigned to the 'Volume' cost component;

- **Solids Handling:** It was determined in conjunction with the City that 20% of the cost associated with sludge handling can be assigned to Volume (e.g., sludge pumping and conveyance). The primary clarifiers remove approximately 190 mg/L of TSS (including 86 mg/L of particulate BOD); the secondary system convert BOD to Volatile Suspended Solids (VSS) at a rate of approximately 80 mg VSS / L (assuming 0.7 kg VSS / kg BOD removal); each kg VSS would contain 0.1 kg of TKN; and the TP removal would generate approximately 54 mg $FePO_4$ /L; therefore, the cost percentages for TSS, BOD, TP, and TKN removal within the solids handling system should be approximately 46%, 27%, 3%, and 4%, respectively.

Similar calculations were performed for the other three WWTPs. Differences in cost allocation values are related to differences in influent and effluent water quality, and flow data.

4.3.3 R Value Calculation

4.3.3.1 O&M Cost Recovery

1. Ashbridges Bay Treatment Plant (ABTP)

Table 4.7 summarizes the O&M unit costs allocated to each surchargeable parameter, based on the O&M cost at the ABTP. Data for ABTP was available is based on recent (2010) costs.

Table 4.7: Summary of O&M Unit Cost at the ABTP (2010)

Treatment Process	Total O&M Costs	O&M Cost Allocation, $1000				
		Volume	BOD/Phenols	TSS	TP	TKN
Headworks	$1,933,524	$1,836,848	$0	$96,676	$0	$0
Primary	$3,039,516	$759,879	$0	$2,188,452	$91,185	$0
Secondary	$7,969,329	$1,992,332	$4,144,051	$796,933	$0	$1,036,013
Solids Train	$26,458,686	$5,291,737	$6,008,831	$13,460,844	$926,663	$770,610
Other	$3,580,157	$3,580,157	$0	$0	$0	$0
Total Treatment	$39,401,055	$9,880,796	$10,152,883	$16,542,905	$1,017,848	$1,806,623
Treated loading, kg			35,776,137	57,067,699	1,136,130	5,288,883
O&M Unit cost, $/kg			$0.28	$0.29	$0.90	$0.34

2. Humber Treatment Plant (HTP)

Table 4.8 summarizes the O&M unit cost for each surchargeable parameter, based on the O&M cost at the HTP.

Table 4.8: Summary of O&M Unit Cost at the HTP (2010)

Treatment Process	Total O&M Costs	O&M Cost Allocation, $1000				
		Volume	BOD/ Phenols	TSS	TP	TKN
Headworks	$478,360	$454,442	$0	$23,918	$0	$0
Primary	$4,125,547	$1,031,387	$0	$2,970,394	$123,766	$0
Secondary	$6,059,447	$1,514,862	$2,605,562	$605,945	$0	$1,333,078
Solids Train	$2,889,929	$577,986	$747,857	$1,375,213	$95,199	$93,673
Other	$1,774,808	$1,774,808	$0	$0	$0	$0
Total Treatment	$13,553,283	$3,578,676	$3,353,420	$4,975,470	$218,966	$1,426,751
Treated loading, kg			31,985,370	36,758,566	568,159	4,016,752
O&M Unit cost, $/kg			0.10	0.14	0.39	0.36

3. Highland Creek Treatment Plant (HCTP)

Table 4.9 summarizes the O&M unit cost for each surchargeable parameter, based on the O&M cost at the HCTP.

Table 4.9: Summary of O&M Unit Cost at the HCTP (2010)

Treatment Process	Total O&M Costs	O&M Cost Allocation, $1000				
		Volume	BOD/ Phenols	TSS	TP	TKN
Headworks	$654,541	$621,814	$0	$32,727	$0	$0
Primary	$4,656,477	$1,164,119	$0	$3,399,228	$93,130	$0
Secondary	$4,581,787	$1,145,447	$2,474,165	$458,179	$0	$503,997
Solids Train	$3,617,339	$723,468	$819,840	$1,832,385	$135,497	$106,149
Other	$1,148,516	$1,148,516	$0	$0	$0	$0
Total Treatment	$13,510,144	$3,654,848	$3,294,005	$5,722,519	$228,627	$610,145
Treated loading, kg			14,552,346	18,245,094	309,754	2,338,336
O&M Unit cost, $/kg			0.23	0.31	0.74	0.26

4. North Toronto Treatment Plant (NTTP)

Table 4.10 summarizes the O&M unit cost for each surchargeable parameter, based on the O&M cost at the NTTP.

Table 4.10: Summary of O&M Unit Cost at the NTTP (2010)

Treatment Process	Total O&M Costs	O&M Cost Allocation, $1000				
		Volume	BOD/ Phenols	TSS	TP	TKN
Headworks	$71,720	$68,134	$0	$3,586	$0	$0
Primary	$455,545	$113,886	$0	$327,993	$13,666	$0
Secondary	$519,146	$129,787	$197,276	$51,915	$0	$140,169
Solids Train	$358,599	$71,720	$92,080	$172,406	$10,945	$11,447
Other	$97,381	$97,381	$0	$0	$0	$0
Total Treatment	$1,405,010	$383,527	$289,356	$555,900	$24,612	$151,617
Treated loading, kg			1,831,652	2,346,629	48,888	408,282
O&M Unit cost, $/kg			0.16	0.24	0.50	0.37

5. Summary

It is proposed that all users be charged the same O&M unit cost for each surchargeable parameter across the City regardless of which sewer shed the high strength wastewater is discharged into.

In order to calculate R values to allow full cost recovery, the combined O&M operating budget for all WWTPs was divided by the total treated loading (kg) for each surchargeable parameter, to develop a $/kg for each parameter. Table 4.11 provides a summary of the recommended O&M unit cost for each surchargeable parameter based on this methodology.

Table 4.11: O&M Unit Cost for Each Surchargeable Parameter

O&M Cost Parameters	Surchargeable Parameters			
	BOD/Phenols	TSS	TP	TKN
Total Annual O&M Budget	$17,089,663	$27,796,793	$1,490,053	$3,995,137
Total Treated Loading (all plants), kg	84,145,504	114,417,988	2,062,931	12,052,253
R Value for O&M ($/kg)	$0.20	$0.24	$0.72	$0.33

4.3.3.2 Capital Cost Recovery

1. Ashbridges Bay Treatment Plant (ABTP)

Table 4.12 summarizes the capital unit cost for each surchargeable parameter based on the average annual cost of capital projects at the ABTP for the period 2012 to 2021.

Table 4.12: Summary of Average Capital Unit Cost at the ABTP (2012 – 2021)

Treatment Process	Total Capital Costs	Capital Cost Allocation, $1000				
		Volume	BOD/ Phenols	TSS	TP	TKN
Headworks	$19,872	$18,878	$0	$994	$0	$0
Primary	$4,926	$1,232	$0	$3,547	$148	$0
Secondary	$21,374	$5,344	$11,115	$2,137	$0	$2,779
Solids Train	$13,033	$2,607	$2,960	$6,631	$456	$380
Other	$53,940	$53,940	$0	$0	$0	$0
Total Treatment	$59,206	$28,060	$14,075	$13,309	$604	$3,158
Treated loading, kg			35,776,137	57,067,699	1,136,130	5,288,883
Capital Unit cost, $/kg			$0.39	$0.23	$0.53	$0.60

2. Humber Treatment Plant (HTP)

Table 4.13 summarizes the capital unit cost for each surchargeable parameter based on the average annual cost of capital projects at the HTP for the period 2012 to 2021.

Table 4.13: Summary of Average Capital Unit Cost at the HTP (2012 – 2021)

Treatment Process	Total Capital Costs	Capital Cost Allocation, $1000				
		Volume	BOD/ Phenols	TSS	TP	TKN
Headworks	$5,331	$5,064	$0	$267	$0	$0
Primary	$5,446	$1,361	$0	$3,921	$163	$0
Secondary	$24,782	$6,196	$10,656	$2,478	$0	$5,452
Solids Train	$2,359	$472	$610	$1,123	$78	$76
Other	$7,110	$7,110	$0	$0	$0	$0
Total Treatment	$37,918	$13,093	$11,267	$7,788	$241	$5,529
Treated loading, kg			31,985,370	36,758,566	568,159	4,016,752

Treatment Process	Total Capital Costs	Capital Cost Allocation, $1000				
		Volume	BOD/ Phenols	TSS	TP	TKN
Headworks	$5,331	$5,064	$0	$267	$0	$0
Capital Unit cost, $/kg			$0.35	$0.21	$0.42	$1.38

3. Highland Creek Treatment Plant (HCTP)

Table 4.14 summarizes the capital unit cost for each surchargeable parameter based on the average annual cost of capital projects at the HCTP for the period 2012 to 2021.

Table 4.14: Summary of Average Capital Unit Cost at the HCTP (2012 – 2021)

Treatment Process	Total Capital Costs	Capital Cost Allocation, $1000				
		Volume	BOD/ Phenols	TSS	TP	TKN
Headworks	$6,879	$6,535	$0	$344	$0	$0
Primary	$2,186	$546	$0	$1,596	$44	$0
Secondary	$3,157	$789	$1,705	$316	$0	$347
Solids Train	$27,988	$5,598	$6,343	$14,177	$1,048	$821
Other	$7,565	$7,565	$0	$0	$0	$0
Total Treatment	$40,210	$13,469	$8,048	$16,433	$1,092	$1,169
Treated loading, kg			14,552,346	18,245,094	309,754	2,338,336
Capital Unit cost, $/kg			$0.55	$0.90	$3.53	$0.50

4. North Toronto Treatment Plant (NTTP)

Table 4.15 summarizes the capital unit cost for each surchargeable parameter based on the average annual cost of capital projects at the NTTP for the period 2012 to 2021.

Table 4.15: Summary of Average Capital Unit Cost at the NTTP (2012 – 2021)

Treatment Process	Total Capital Costs, $1000	Capital Cost Allocation, $1000				
		Volume	BOD/ Phenols	TSS	TP	TKN
Headworks	$345	$328	$0	$17	$0	$0
Primary	$345	$86	$0	$249	$10	$0
Secondary	$345	$86	$131	$35	$0	$93
Solids Train	$345	$69	$89	$166	$11	$11
Other	$1,036	$1,036	$0	$0	$0	$0
Total Treatment	$1,381	$570	$220	$466	$21	$104
Treated loading, kg			1,831,652	2,346,629	48,888	408,282
Capital Unit cost, $/kg			$0.12	$0.20	$0.43	$0.26

The detailed and complete allocation factors for all WWTPs are included in Appendix 3.

5. Summary

It is proposed that all users be charged the same capital unit cost for each surchargeable parameter across the City regardless of which sewer shed the high strength wastewater is discharged into.

In order to calculate R values to allow full cost recovery, the combined average annual capital budget for all WWTPs was divided by the total treated loading (kg) for each surchargeable parameter, to develop a $/kg for each parameter. Table 4.16 provides a summary of the recommended capital unit cost for each surchargeable parameter based on this methodology.

Table 4.16: Capital Cost for Each Surchargeable Parameter

Capital Cost Parameters	Surchargeable Parameters			
	BOD/ Phenols	TSS	TP	TKN
Total Annual Capital Budget,	$33,609,000	$37,996,000	$1,958,000	$9,960,000
Total Treated Loading (all plants), kg	84,145,504	114,417,988	2,062,931	12,052,253
R Value for Capital ($/kg)	$0.40	$0.33	$0.95	$0.83

4.3.3.3 ODF Administration Cost Recovery

The City conducted an internal review of administrative costs associated with the ODF program. On the basis of this review, an administration fee of $0.02/kg for all surchargeable parameters was determined to provide the required cost recovery for administration, sampling and analysis.

In addition to recovering administrative costs at $0.02/kg for ongoing IWSA contracts, it is recommended that a once-off fee of $800 be charged to companies entering into an IWSA agreement with the City in order to cover administrative costs associated with contract set-up.

4.3.3.4 Recommended R Value

Table 4.17 summarizes the recommended R value for each surchargeable parameter, including O&M cost, reserved funds for capital improvement projects, and ODF administration costs. The proposed rates are rounded to the nearest cent to simplify the calculation.

Table 4.17: Summary of ODF Administration Cost Recovery

O&M unit Cost	BOD	TSS	TP	TKN
O&M unit cost	$0.20	$0.24	$0.72	$0.33
Capital Improvement unit cost	$0.40	$0.33	$0.95	$0.83
ODF Administration unit cost	$0.02	$0.02	$0.02	$0.02
R Value, $/kg	**$0.62**	**$0.60**	**$1.69**	**$1.18**

4.3.4 Comparison with Other Municipalities

Table 4.18 provides a comparison between the calculated R value of each component for the City and other Ontario municipalities.

Table 4.18: Comparison of ODF Values for Toronto and Other Municipalities

Municipality	R value, $/kg			
	BOD/Phenols	TSS	TP	TKN
Type I Methodology				
Toronto (Proposed)	**$0.62**	**$0.60**	**$1.69**	**$1.18**
York (2012)	$ 0.42	$ 0.42	$ 2.10	$ 0.42
York (2013)	$0.53	$0.53	$2.65	$0.53
Hamilton (2012)	$ 0.67	$ 0.53	$ 1.43	$ 2.03
Ottawa (2012)	$1.44	$0.77	$2.31	$5.75
Durham (2012)	$0.48	$0.48	$0.48	$0.48
Type II Methodology				
Peel (2011)	310	$/1000m^3		
Halton (2011)	362	$/1000m^3		
London (2011)	455	$/1000m^3		
Notes: ODF data for Waterloo and Guelph were not available during the preparation of this report				

The comparison ODF fees for other Ontario municipalities using the Type I methodology as summarized in Table 4.18 suggests that:

- BOD/Phenols: the calculated City R value is comparable with Hamilton. It is higher than the York and Durham R Values, and significantly lower than the City of Ottawa BOD R value;
- TSS: the calculated City R value falls between the R values for Hamilton and Ottawa, and is higher than that of York and Durham;
- TP: the calculated City R value is comparable to that of Hamilton. It is lower than that of York and Ottawa, and higher than that of Durham.
- TKN: The calculated City R value is higher than York and Durham, but significantly lower than that of Hamilton and Ottawa.

4.4 IMPACT ON INDUSTRIAL USERS

R values derived from the Type I analysis was compared against the City's current ODF charges for annual discharge data (annual flow rates, concentrations of surchargeable parameters) from 154 real industrial users as provided by the City (2011 data). Company names were removed for confidentiality purposes.

The data indicated that under the proposed R Value ODF fee structure calculated ODF fees increased within the range 36% to 44% relative to the current ODF fee structure. Table 4.19 illustrates the impact of the proposed R Value fee structure for three randomly selected users.

Table 4.19: Comparison of ODFs Based on Existing and Proposed City R Values

Methodology		Annual ODF Fee, $		
Method	Description	Total fees from all Low invoiced category users (≤$5K)	Total fees from all Medium invoiced category users (>$5K, ≤75K)	Total fees from all High invoiced category users (>$75K)
Existing City R Value	$0.57 / kg, based on the highest differential from Sewer Bylaw limit	$73,897	$1,721,588	$6,684,913
Proposed City R Values[1]	Table 4.17; surcharge fee calculated for each parameter	$104,506	$2,343,070	$9,641,550
Increase associated with Type I Method		**41%**	**36%**	**44%**

Notes:
[1]TKN was not included in the Type I formula calculation, because effluent TKN concentrations for the four example industrial users were not available to Stantec during the course of the report development.
[2]Based on 2011 sampling data

4.5 RECOMMENDED APPROACH TO FEE IMPLEMENTATION

Based on the findings of this report it is recommended that the City implement updates to ODF based on R-Value rates for individual ODF parameters (Type I methodology). In addition to BOD, phenols, TSS and TP, TKN is also recommend for inclusion as an ODF parameter on the basis that:

- Current removal of TKN is associated with capital and operational costs at City WWTPs;
- Cost of TKN treatment is already recovered by other Ontario municipalities through ODF surcharge programs, and therefore addition of this parameter will bring the City into alignment with practices of other municipalities;
- Address industry need;
- The addition of ODF is easily addressed by the City's existing surcharge program and processes thereby allowing full cost recovery to the City with minimal incremental implementation cost.

Based on discussion with the City an initial fee of $800 for establishing all new surcharge agreements is proposed in order to recover administrative costs.

4.5.1 Consultation with Industrial Users

Prior to implementation, it is recommended that the City engage with industrial sewer users (i.e. businesses already in an IWSA with the City and businesses at which the City has previously conducted ODF sampling) in order to:

- Introduce the rationale for re-assessing the current ODF program;
- Introduce the new R values and methodology that was used to develop the R values; and
- Discuss with industrial users potential implementation approaches (e.g., phased-in approach).

4.5.2 Phase-In of Revised ODF Rates

Industrial users that are subject to increases in ODF rates under the new fee structure may require a certain amount of time to plan for the new rates; therefore, it is anticipated that the City may adopt a phased implementation approach. The period for the phased-in approach should be determined by the City based on the discussion with industrial sewer users. For the purpose of this report, a three to five year phased-in period is assumed.

In the interests of ensuring all users are subject to a consistent and equitable fee structure, it is recommended that new users that enter into a ODF surcharge agreement with the City prior to or during phase-in of the new rates should be subject to the same phased fee structure as other users (i.e. the new fee structure should not be applied unless the phase-in deadline has passed).

4.5.3 Future Revisions to ODF Rates

The City will review the R values proposed herein two (2) years after implementation, in order to provide an opportunity for update based on a review of the impact of the introduction of TKN as a surchargeable parameter, and the potential impacts of the Wastewater System Effluent Regulations as currently under development by the Canadian federal government.

Following this preliminary two (2) year review period, subsequent reviews are proposed at a frequency of every five (5) years. Cost reviews may be required to redress issues such as:

- Significant changes to the City's annual WWTP O&M and capital costs, especially in response to legislative requirements imposed by the Federal and/or Provincial Authorities
- Changes in rate of inflation; and
- Overall economic development.

APPENDIX 1:

Industrial Waste Surcharge Agreement

INDUSTRIAL WASTE SURCHARGE AGREEMENT

THIS AGREEMENT, made in quadruplicate this _____ day of _____, 201___

BETWEEN:

CITY OF TORONTO
(hereinafter called the "City")

Of The First Part

- and -

[insert Full **legal** name of Company]

(hereinafter called the "Company")

Of The Second Part

WHEREAS Toronto Municipal Code Chapter 681, Sewers, ("Chapter 681") regulates the discharge of sewage in the City of Toronto and prohibits the discharge of water originating from a source other than the City water supply, including storm water or groundwater, directly or indirectly to a sanitary sewer or combined sewer by Chapter 681;

The discharge of water originating from a source other than the City water supply, including storm water or groundwater, directly or indirectly to a sanitary sewer or combined sewer is prohibited, unless under a sanitary discharge agreement as permitted by Chapter 681.

WHEREAS Chapter 681 provides that the City may permit the discharge of sewage which would otherwise be prohibited by Chapter 681 to the extent fixed by agreement with the City on such terms and conditions as deemed appropriate by the City;

WHEREAS the Company carries on a commercial, institutional or industrial activity within the City at the Premises which produces a sewage discharge in which the quantity of one or more of the parameters permitted by the City under Chapter 681 is above the permissible limits set out in Chapter 681;

WHEREAS the sewage discharge by the Company results in materially adding to the cost of treatment at the municipal sewage works and Chapter 681 provides that an additional sewage service rate may be charged by the City to compensate the City for its additional costs of operation, repair and maintenance of the sewage works; and

WHEREAS this Agreement sets out the terms and conditions with respect to the discharge of the sewage within the requirements of Chapter 681.

IN CONSIDERATION of the mutual covenants herein contained, the parties agree as follows:

1. Interpretation

"Agreement" means this agreement between the City and the Company.

"Chapter 441" means the City of Toronto Municipal Code Chapter 441 – Fees and Charges, as amended from time to time.

"Chapter 681" means the City of Toronto Municipal Code Chapter 681 – Sewers, as amended from time to time.

"City" means the City of Toronto and as the context requires includes any of its designated personnel who are authorized to represent the City and also includes an employee authorized and designated to exercise a discretion on behalf of the City;

"Claims" or "Claim" means any demands, claims, actions, causes of action, suits, proceedings, executions, liens and otherwise for, without limitation, liabilities, damages and loss of any kind and any nature whatsoever including but not limited to property damage or loss, bodily injury and death, loss of reputation, loss of opportunity, economic loss, royalties, judgments, fines, penalties, interest, charges, expenses and costs (including legal costs on a substantial indemnity basis).

"Contaminant" has the same meaning as in the *Environmental Protection Act,* R.S.O. 1990.

"Dangerous Goods" has the same meaning as in the *Transportation of Dangerous Goods Act, 1992* (Canada).

"Effective Date" is the date this Agreement commences upon execution of this Agreement by both parties.

"EM&P" means the Environmental Monitoring & Protection Unit of Toronto Water, City of Toronto or its successor.

"General Manager" means the General Manager of the Toronto Water Division of the City of Toronto or such person's

designate and means the General Manager as defined in Chapter 681.

"Hazardous Waste" has the same meaning as in the *Canadian Environmental Protection Act*, 1999 (1999, c. 33) and *Environmental Protection Act*, R.S.O. 1990.

"including" means "including but not limited to" and "includes" means "includes but is not limited" and neither shall be construed as expressing a limited group or class, unless expressly stated to do so.

"Law" or "Laws" means all applicable statutes, laws, orders-in-council, by-laws, regulations, codes, ordinances, notices, rulings, orders, directives, requirements, policies and controls of the federal, provincial and municipal governments, including a by-law of the municipal council of the City, and all applicable court orders, judgments and declarations of a court or tribunal of competent jurisdiction; and a reference to any Law or to a provision thereof shall be deemed to include a reference to any Law or provision enacted in substitution therefor or amendment thereof.

"MOE" means the Ontario Ministry of the Environment.

"Premises" means the lands and premises municipally known as:
_____,
(ENTER one of the following 2 applicable statements re: owned or leased, as applicable)**
which are *owned by the Company*.
which are *leased by the Company* from _____. **(**also ENTER legal name of owner**)**

"Prohibited Waste" means those wastes which are prohibited from discharge under this Agreement and, save and except those discharges permitted by this Agreement, under Chapter 681 and includes a Contaminant, a Toxic Substance, Dangerous Goods and Hazardous Waste.

"Spill" shall have the same meaning as in Chapter 681.

"Term" means the term of this Agreement as determined and set out in section 3. The initial Term shall be for the period set out in subsection 3(a) and any subsequent Term shall be one (1) year.

"Toxic Substance" has the same meaning as in the *Canadian Environmental Protection Act*, 1999 (1999, c. 33).

Any reference to an officer or representative of the City shall be construed to mean the person holding that office from time to time, and the designate or deputy of that person, and shall be deemed to include a reference to any person delegated, in accordance with any applicable by-laws and policies of the City, the authority of that person, officer or representative of the City so referenced or otherwise duly authorized as a representative of that person to the extent of such authorization.

A reference to any bylaw, policy, rule or procedure or to a provision thereof shall be deemed to include a reference to any bylaw, policy, rule or procedure or provision enacted in substitution thereof or amendment thereof.

2. Chapter 681 Agreement

This Agreement constitutes an agreement under section 6.A.(1) of Chapter 681 and is subject to any restrictions on agreements under Chapter 681. The terms and conditions for the discharge or deposit of sewage, to the extent permissible under Chapter 681, are set out in this Agreement. In all other respects, Chapter 681 shall apply.

3. Term

(a) This Agreement shall commence on _____, 201___ and continue until _____, 201___.

(b) Provided that this Agreement has not been terminated for any reason in accordance with its terms and conditions, including under sections 11, 12(c), 13 or 14; this Agreement shall be automatically renewed for a further Term of one (1) year and renewed annually thereafter on the same terms and conditions as contained in this Agreement, unless expressly amended by written agreement between the parties. Notwithstanding the foregoing, the length of any subsequent Term shall be one (1) year if the initial Term is otherwise.

(c) Notwithstanding subsection 3(b), where notice of termination has been provided by the City or the Company and the effective date of termination provided in such notice extends beyond the end of the current Term of this Agreement, the Term of this Agreement shall not be renewed for a further Term but shall be extended until the effective date of termination provided in the notice.

4. Authorization to Discharge

The authority of the Company to discharge sewage into the City's wastewater system is subject to the following conditions:

(a) the Company is and continues to remain in good standing under this Agreement; and
(b) the sewage shall be in strict compliance with all terms and conditions of this Agreement; and
(c) the sewage does not contain any Prohibited Waste.

Failure to comply with any of the above conditions shall constitute a material default under this Agreement and, in addition to any privileges, rights or remedies of the City under this Agreement or otherwise in contract, at Law or in equity, the City may immediately suspend, terminate or revoke any discharge privileges granted under this Agreement.

5. Discharge Limits

(a) Provided that the Company is in compliance with section 4 of this Agreement, the Company shall be permitted to discharge sewage from the Premises to the City's sanitary sewer or combined sewer system to the extent permitted under subsection 5(b).

(b) During the Term of this Agreement only, the quality and properties of the sewage discharged by the Company from the Premises to the sanitary sewer or combined sewer system may exceed the limits set by Chapter 681, in respect to the parameters set out in Schedule 1 of this Agreement only, provided that:

i. it does not exceed the maximum discharge limits set out in Schedule 1 at any time; and

ii. such parameters and exceedances are permitted by agreement under Chapter 681.

The maximum discharge limits set out in Schedule 1 may be revised from time to time by mutual written agreement between the parties.

(c) (i) Determination of the exceedances and compliance with the discharge limits set out herein will be determined by means of composite sampling randomly selected by EM&P over a 24 hour period in accordance with section 681-8 of Chapter 681, provided that there is appropriate access to the Premises, security of sampling equipment and availability of City resources to carry out same, as determined by EM&P.

(ii) Where EM&P reasonably determines that access to the Premises, security of sampling equipment or availability of City resources do not permit such a sampling method or a spill event has occurred, the City may use such other method or methods as the General Manager determines appropriate and practical in the circumstances in accordance with section 681-8 of Chapter 681. The City will provide a copy of such sampling results, upon the written request of the Company, in such manner and time as EM&P resources permit.

(d) The Company shall ensure that § 681-10A of Chapter 681 is complied with at all times.

(e) In the event of any disagreement between the General Manager and the Company as to the water quality of effluent samples, the determination of the General Manager shall govern.

(f) Without limiting any other right of the City or General Manager under this Agreement, the General Manager reserves the right to change the maximum discharge limits set out in this section, from time to time, provided that the General Manager shall provide the Company thirty (30) days' prior written notice in the event of an increase in such limits and one hundred and twenty (120) days' prior written notice in the event of a decrease in such limits. The notice to the Company shall include the General Manager's basis for such change in maximum discharge limit.

Notwithstanding the foregoing, where the maximum discharge limits are changed by the Council of the City of Toronto, notice to the Company shall be deemed to have been given by the City of the change in maximum discharge limits upon the passage of such resolution by Council. The maximum discharge limits provided in this section shall be deemed adjusted in accordance with the notice so provided and this Agreement amended accordingly. The City agrees that it will advise the Company, by email to the email address set out in subsection 19(b) of this Agreement, of the change in maximum discharge limits as soon as reasonably practical after passage of such resolution by Council.

6. Prohibited Discharge

(a) The discharge of sewage by the Company from the Premises containing parameters or properties of sewage in excess of the limits set out in section 5 is prohibited and shall constitute a default under this Agreement and may constitute a contravention of the Chapter 681.

(b) The Company shall notify the General Manager by telephone forthwith, and in writing as soon as possible thereafter, upon discovering a breach by the Company of subsection (a) of this section or any other unauthorized discharge by the Company. The Company shall notify the General Manager in writing prior to any change in its process and wastewater flows that may affect its compliance with the discharge limits and prohibitions under this Agreement.

(c) At any time, the General Manager may notify the Company that the wastewater concentration discharged by the Company has exceeded the permitted limits set out in section 5 of this Agreement. The General Manager may, but is not obliged to, adjust the discharge limits set out in section 5, upon the written request of the Company, where the General Manager in the exercise of a sole discretion considers it appropriate and not harmful to the City's water system. Where such an adjustment of discharge limits is authorized by the General Manager, the discharge limits set out in Schedule 1 of this Agreement shall be amended accordingly by written agreement.

(d) Without limiting or prejudicing, and in addition to, any other right or remedy the City may have under this Agreement, in Law or equity in respect to a prohibited discharge, the City may charge the Company a reasonable amount, as determined by the General Manager, to compensate the City for its actual administrative and contractual enforcement costs and additional costs of treatment and control of the sewage and of operation, repair and maintenance of the sewage works in respect to or as a result of a prohibited discharge.

7. Discharge Rates

(a) The Company hereby covenants and agrees to pay to the City, for the discharge of sewage permitted under this Agreement, an amount calculated by the General Manager from time to time and based on the following formula:

Surcharge = $ (V x C x F x R)

V = annual volume of discharge, in cubic metres *

* The annual volume of discharge shall be equivalent to the volume of water consumed by the Company and supplied by the City, as determined by meter or sub-meter readings or, where not metered, in accordance with Chapters 851, 849 and 441 of the Toronto Municipal Code; plus the annual volume of any private water supplied to the Company, as determined by subsection 7(e), the Company's records and/or otherwise by the General Manager.

C = excess parameter(s) or properties of sewage permitted under Schedule 1 of this Agreement, in g/m^3

For further clarity, "excess" means the amount by which the actual discharge of the above parameters exceeds the limit for the above parameters set out in Table 1 of Chapter 681 as determined in accordance with section 5(c) of this Agreement.

Note: g/m^3 = mg/L

F = 10^{-3}, factor to convert g to kg

R = the rate for sewage treatment, in $/ kg excess, as established by the City from time to time under Chapter 681 and/or Chapter 441

(b) Notwithstanding subsection 7.(a) above, the Company agrees that, in the event that the City establishes or revises a minimum quarterly discharge rate (surcharge) for industrial waste surcharge agreements under Chapter 681 and/or Chapter 441 or other resolution of Council and the surcharge amount calculated in accordance with subsections 7.(a) is less than such minimum quarterly discharge rate, the amount payable for the discharge of sewage permitted by this Agreement shall be increased to such minimum quarterly discharge rate.

(c) The annual volume of discharge ("V" set out in subsection 7(a) above) shall be reduced by an amount equal to that portion of the annual volume of the water that is directly consumed or used on the Premises by the Company for their industrial or commercial processes; provided that:

(i) It is not discharged to the sanitary or combined sewer system; used, consumed or released outdoors, whether for irrigation purposes or otherwise; or used, consumed or released off site of the Company's Premises; and

(ii) The Company provides to the City's EM&P an engineering report, signed and stamped by a professional engineer licensed in the Province of Ontario and satisfactory to the City's EM&P, which sets out the Company's water consuming processes, the annual volume of water consumed or used from public and private sources, the annual volume of the water that is directly consumed or used on the Premises by the Company for their industrial or commercial processes, and the amount of water discharged in a manner set out in subsection 7(c)(i), if any; and which certifies the annual water balance between water consumption/ usage and discharge for the year in which the reduction is sought.

(d) Where the Company is located within a multi-unit building, it shall install a sub meter on the water line, at the head of any process or water use, as a condition of the City entering into this Agreement and report the readings of the water meter on the 1st of each month, in writing, to the City's EM&P. Proof of the installation of the sub-meter shall be provided to the City's EM&P on or before the execution of this Agreement.

(e) Where the Company obtains water from a private source other than the City, the volume of such water shall be metered and the Company shall retain, at its own expense, an independent 3rd party expert to validate the accuracy of the meter readings or, where applicable, sub-meter readings every quarter. The accuracy validation of

the meter or sub-meter shall be carried out within five (5) days from the end of the quarter. The Company shall submit a validation report in respect to the accuracy of the meter or sub-meter in writing to the City's EM&P within ten (10) days after the end of each applicable quarter. The Company shall make available and submit to the City's EM&P, upon request, records (including copies of same) of the meter readings of such private sourced water. Where the volume of private water, or a portion thereof, supplied to the Company cannot be measured by means of a meter, the Company shall provide to the City's EM&P within ten (10) days after the end of each applicable quarter an engineering report, signed by a professional engineer licensed in the Province of Ontario and satisfactory to the City's EM&P, verifying and setting out the volume of unmetered private water supplied to the Company every quarter.

(f) The amount payable pursuant to this section shall be billed by the City on a quarter yearly basis for the periods ending March 31st, June 30th, September 30th and December 31st in each year of the Term.

(g) Notwithstanding subsections 7(f) and (h), on execution of this Agreement, the Company shall pay the City in advance the amount payable for the discharge of sewage permitted under this Agreement for the first quarter, based on the maximum discharge limits set out in Schedule 1 and a volume estimated by the City based on the Company's prior quarter year's consumption of water or, where no record of consumption is available, based on the consumption of similar operations in the City to those of the Company as determined by the City. In the event that the actual discharge for the first quarter is less than the estimated volume and maximum discharge limits set out in Schedule 1, any remaining credit balance shall be applied against the second quarter amount payable. For further clarity, this pre-payment for the discharge of sewage in accordance with this Agreement shall only apply in respect to the first payment during the initial Term of this Agreement and does not apply in respect to a renewal or extension of this Agreement.

(h) All invoices, issued by the City, for the discharge of sewage and any other charges imposed pursuant to this Agreement or Chapter 681 must be paid by the Company within 30 days from the date of the invoice.

(i) Late payment charges shall be added to all rates and charges that are due and payable under this Agreement at the rate of 1.25% on the first day of default, and every 30 days thereafter during such time as the default continues (15% per annum).

(j) The Company agrees to pay for the discharge of sewage permitted under this Agreement in accordance with the prevailing rates set by the City, from time to time. Where the discharge rates and charges are changed by resolution of the Council of the City of Toronto, notice of the change in discharge rates and charges shall be deemed to have been given by the City to the Company upon the passage of such resolution by the City Council. The discharge rates and charges provided in this section shall be deemed adjusted in accordance with the notice so provided and this Agreement amended accordingly. The City agrees that it will advise the Company, by email to the email address set out in subsection 19(b) of this Agreement, of any change in discharge rates and charges as soon as reasonably practical after passage of such resolution by Council.

8. Warranties of Company

The Company expressly warrants as follows:

(a) The Company is not prohibited or restricted from entering into any of the obligations assumed, liabilities imposed, or restrictions accepted by the Company under this Agreement by any agreement (including any lease), constating documents, constitution, legislation, statute, act, regulation, order or otherwise.

(b) To the best of the Company's information and belief and after making diligent inquiries, the Company is not aware of any material facts or circumstances having a bearing upon its ability to perform or comply with its obligations under this Agreement.

(c) The Company shall comply with section 681-6E of Chapter 681 at all times.

9. Operating Data and Production Records

(a) The Company covenants and agrees, upon the request of the General Manager, to provide such records and documents, including operating data, meter readings and production records, in its possession or control which are reasonably necessary for the purpose of determining the volume of the sewage discharged and compliance with the terms and conditions of this Agreement and the City shall have a right to retain copies of all such records and documents. All such records and documentation shall become a record of the City for the purposes of, and subject to, the *Municipal Freedom of Information and Protection of Privacy Act*, R.S.O. 1990, c.M.56.

(b) Without limiting the General Manager's powers under Chapter 681, the Company agrees that the City shall have the right to inspect, test and sample the discharge from the Premises and any discharge measuring device or meter at any time and to enter on and in the Premises to do so. The Company shall not open, alter, tamper with,

damage or remove or cause or permit, unless otherwise expressly authorized by the City in writing, the opening, alteration, tampering, damage or removal of any City sampling equipment at the Company's Premises and the Company shall protect such equipment from opening, alteration, tampering, damage or removal while at its Premises.

10. Indemnification

For the purposes of this section, "City" means the City of Toronto, as well as any and all of its elected officials, representatives, officers, employees, servants, consultants, agents and contractors and "Company" means the Company as well as any director, officer, employee, servant, member, contractor, subcontractor, consultant, agent, permitted assign, invitee, contractor of the Company or of any person permitted or allowed by the Company to engage in any of the activities of the Company under this Agreement.

The Company agrees at all times to defend and indemnify and save the City harmless from and against any and all Claims that are caused to or incurred by, sustained or suffered by, occasioned to or imposed upon or made or instituted against, any of them or to which any of them may be liable by reason of any neglect or default on the part of the Company or by reason of the Company failing to carry out any obligation or responsibility to which it is subject, or by reason of any breach, violation or non-performance of any covenant, term, warranty, condition or provision in this Agreement by the Company, except to the extent that the same are caused by the gross negligence or deliberate wrong-doing of the City.

The right to indemnity provided for in this Agreement and, in particular, this section shall survive the expiration or any termination of this Agreement.

11. Default and Termination

(a) Without restricting or limiting any other privilege, right or remedy of the City provided in this Agreement, by Law or in equity, in the event that the Company:

(i) has made a misrepresentation in or related to its obligations under this Agreement; or

(ii) has failed to perform its obligations or has otherwise breached any of the terms, covenants, and/or conditions of this Agreement;

the General Manager may, in the exercise of a sole and unfettered discretion, provide the Company written notice of the default and:

A. require that the Company remedy the breach within such time as the General Manager considers appropriate as set out in the notice; or

B. upon ten (10) days' prior written notice:

1. suspend the authorization of the Company to discharge until further notice and reinstate such authorization only upon satisfaction of such terms and conditions as the General Manager deems appropriate to remedy such breach and prevent a reoccurrence of same; or

2. terminate this Agreement.

(b) (i) Notwithstanding the foregoing subsection 11(a) and provided that there has not been more than one (1) occurrence of such non-payment during the Term, where the Company has failed to make a payment within the time required under this Agreement but remedies such default to the complete satisfaction of the General Manager within five (5) business days of the required time for payment then the General Manager shall not suspend or terminate this Agreement.

(ii) Notwithstanding the foregoing subsection 11(a) and provided that there has not been more than three (3) occurrences of such an exceedance during the Term, where the City has determined that the Company has exceeded a parameter set out in subsections 5(a) or (b) by less than twenty percent (20%) but has completely remedied the default, including payment of any discharge rate and City actual costs (administrative, enforcement, treatment and control measures, capital, operational and otherwise) related to such excess discharge to the satisfaction of the General Manager within Ten (10) Working Days of the EM&P's determination of such occurrence of the exceedance or within such longer period of time as the General Manager may permit, then the General Manager shall not suspend or terminate this Agreement.

(c) Notwithstanding subsections 11(a) and (b), if the General Manager in the exercise of a sole discretion determines that one or more of the following events may occur, is occurring or has occurred:

(i) the discharge may cause or contribute to or is causing or contributing to a nuisance or otherwise is interfering with the reasonable use and enjoyment of public or private property or any part thereof;

(ii) the discharge may cause or contribute to or is causing or contributing to damage to the City's sewers or

any part thereof, materially increasing their maintenance costs or causing a dangerous condition;

(iii) the discharge may cause or contribute to or is causing or contributing to damage to a City sewage treatment plant or process or any part thereof; or

(iv) the discharge may cause or contribute to or is causing or contributing to:

a. the biosolids from the City's sewage works to fail to meet any applicable Federal or Provincial Laws or guidelines or affect the quality of the biosolids such that the marketability, sale or general usage of the biosolids for any purpose deemed appropriate by the General Manager may be adversely affected;

b. the sewage works effluent to contravene any Laws including the *Ontario Water Resources Act,* the *Environmental Protection Act (Ontario)*;

c. a threat, danger or hazard to any person, property, plant or animal life,

the General Manager may, in the exercise of a sole and unfettered discretion and upon written notice:

A. suspend the authorization of the Company to discharge immediately until further notice and reinstate such authorization only upon satisfaction of such terms and conditions as the City deems appropriate to remedy such breach and prevent a reoccurrence of same; or

B. terminate this Agreement immediately.

The Company acknowledges and agrees that due to the environmental and health and safety nature of the subject matter of this Agreement, in the event of a breach of this Agreement by the Company, the immediate termination of this Agreement is fair and reasonable. For further clarity, the notice provision in subsection 11(a) and (b) shall not apply in such circumstances.

(d) Any actual loss, expense, costs, charges, damages, and/or liability, which may be sustained, paid or incurred by the Company or any other person or persons, by reason of a breach of this Agreement by the Company and/or by any suspension or termination by reason of such breach shall be solely borne by the Company. Any and all loss, expense, costs, charges, damages, and/or liability incurred by the City as a result of a breach by the Company of this Agreement shall be deemed an additional charge due to the City and shall be paid by the Company upon demand and, if not so paid, shall bear interest at the rate of 1.25% on the first day of default, and every 30 days thereafter during such time as the default continues (15% per annum).

(e) If the Company is in default of any of its payment obligations pursuant to this Agreement, termination of this Agreement by the General Manager shall not relieve the Company from its liability to make any payments, including interest, which are due and outstanding to the City at the date of the termination.

(f) The Company acknowledges that the Ontario Ministry of Environment will be notified where the Company's discharge of sewage contains Hazardous Waste or is otherwise in contravention of discharge restrictions contained in Chapter 681. Such violations will become a public record of the City and the record of same may be disclosed pursuant to the *Municipal Freedom of Information and Protection of Privacy Act*.

(g) Nothing in this Agreement shall limit or otherwise prejudice the City's right to enforce the provisions of Toronto Municipal Code Chapter 681 in the event of non-compliance with such by-law.

12. Emergency Suspension of Discharge

(a) If the General Manager, in the exercise of a sole discretion, determines that an emergency situation exists which:

(i) may pose an immediate threat, danger or hazard to any person, property, plant or animal life, or the City's water or sewage works or a part thereof; or

(ii) the continued discharge permitted under this Agreement either alone or in combination with any or all other discharges into the City's wastewater system, whether permitted, by environmental causes or otherwise, together with all circumstances of the emergency, may in any way or manner and notwithstanding whether it may be minimal or not, impair the City's ability to address to the threat, danger or hazard or contribute to the threat, danger or hazard, or

(iii) a combination of 12.(a)(i) and (ii).

the General Manager may at any time suspend this Agreement or any part or parameter thereof immediately and without prior notice for such time as the General Manager deems appropriate and until otherwise notified by the City.

(b) The General Manager will provide notice to the Company of the suspension thereafter as soon as practical for the City in the circumstances in the event of such suspension.

(c) Where such suspension continues for a continuous period of more than thirty (30) days, this Agreement shall terminate on the thirty-first (31st) day of such suspension.

13. Termination by City Without Cause

This Agreement may be terminated by the General Manager, without cause, at any time on two hundred and seventy (270) days' written notice sent to the Company.

14. Termination by Company

(a) This Agreement may be terminated by the Company, without cause,
   (i) at any time on ninety (90) days' written notice sent to the General Manager; or
   (ii) at the end of the current Term of this Agreement provided that written notice is provided to the General Manager no later than sixty (60) days prior to the end of the Term.

(b) Notwithstanding the foregoing, in the event that the General Manager or Council of the City provides public notice of an increase in discharge rates and charges, the Company may terminate this Agreement by written notice to the General Manager delivered no later than thirty (30) days after the receipt or deemed receipt of the notice of an increase in discharge rates and charges which termination shall be effective on the last day of such notice period.

(c) The Company shall provide no less than ninety (90) days' prior written notice to the General Manager of any cessation of operations at the Premises. If the Company fails to give any such notice, it shall continue to be bound to make all payments required to be made under this Agreement and to be bound by all other of its obligations under this Agreement until such time as the required notice is received by the City.

15. Full Effect of Chapter 681 upon Termination or Expiration

(a) Upon the termination or expiration of this Agreement, the terms and conditions for the discharge of sewage permitted under this Agreement shall cease to apply immediately and Chapter 681 shall apply in all respects.

(b) If the Company is in default of any of its payment obligations pursuant to this Agreement, termination of this Agreement by the General Manager shall not relieve the Company from its liability to make any payments, including interest, which are due and outstanding to the City at the date of the termination.

16. Notice of Contamination

The Company shall give immediate notice, and written notice with complete details thereof, to the City of any spill or escape of Prohibited Waste or contaminant, originating from its Premises, which has entered or may enter the City's wastewater system, including its sewage and stormwater systems.

17. Observance of Laws, Statutes and Regulations

The Company shall comply at its own expense with, and conform to, all applicable Laws from time to time in effect during the Term of this Agreement.

18. Non-Waiver

No term or provision hereof shall be deemed waived and no breach excused unless such waiver or consent is express and in writing and signed by an authorized representative of the City. No waiver or consent shall be inferred from or implied by anything done or omitted by the City save only by express waiver or consent in writing by the City. No delay or omission by the City in exercising any right or remedy shall operate as a waiver thereof or of any other right or remedy, and no single or partial exercise of a right or remedy shall preclude any other or further exercise of them or the exercise of any other right or remedy. No condoning, excusing or overlooking by the City of any default, breach or non-observance by the Company at any time or times in respect of any term or provision herein contained shall operate as a waiver of the City's right hereunder in respect of any continuing or subsequent default, breach or non-observance, or so as to defeat or affect in any way the rights of the City herein in respect of any such continuing or subsequent default or breach. Any consent by any party to, or waiver of, a default or breach by the other, whether expressed or implied, shall not constitute a consent to, waiver of, or excuse for any subsequent default, whether similar or not.

19. Notices

Unless specifically provided otherwise in this Agreement, any demand or notice to be given pursuant to this Agreement shall be duly and properly made and given if made in writing and delivered to the party for whom it is intended at the address as set out below, either personally, by facsimile or by means of prepaid first class mail addressed to such party as follows:

(a) in the case of the City:

General Manager of Toronto Water, City of Toronto

30 Dee Avenue, Toronto, Ontario M9N 1S9
Attention: Toronto Water, Environmental Monitoring & Protection

Phone Number: (416) 392-9940 Facsimile Number: (416) 392-9338

(b) in the case of the Company:

[insert head office address of Company and contact person]

Attention:
Phone Number: Facsimile Number:
Email:

or to such other address as the parties may from time to time notify in writing, and any demand or notice so made or given shall be deemed to have been duly and properly made or given and received on the day on which it shall have been personally delivered or, if delivered by facsimile, shall be deemed to be delivered as of the next business day following the date of transmission or, if mailed, then, in the absence of any interruption in postal service in the City of Toronto affecting the delivery or handling thereof, on the day following three (3) clear business days following the date of mailing.

20. Successors and Assigns

This Agreement and all terms, covenants, conditions and provisions herein shall be binding upon and shall enure to the benefit of the City and the Company and their respective successors and legal representatives. This Agreement is not assignable or transferable by the Company. The Company shall not assign, transfer or encumber this Agreement in any manner or part. In the event that the Company assigns, transfers or encumbers this Agreement in contravention of this section, the Company's rights under this Agreement shall terminate immediately, without prejudice to the City's rights and remedies under this Agreement, in Law or in equity.

21. Entire Agreement

This Agreement and any amendments thereto in accordance with the terms of this Agreement contains the entire agreement between the parties hereto with respect to the subject matters hereof. No verbal arrangement or agreement relating to this Agreement or the subject matter of this Agreement and no amendment, modification or supplement to this Agreement shall be valid or binding unless set out in writing and signed by duly authorized representative of the City. The City shall not be bound by any oral communication or representation whatsoever, including but not limited to any instruction, amendment or clarification of this Agreement or any document comprising this Agreement, or any representation, information, advice, inference or suggestion, from any person (including but not limited to an elected official, employee, agent or any other person acting on the behalf of or at the direction of the City) concerning this Agreement, any document comprising this Agreement, or any other matter concerning this Agreement. The Company expressly waives and releases the City from any claims in negligence or otherwise in respect to any oral communication or representation.

22. Governing Law

This Agreement shall be governed by, subject to and construed in accordance with the laws of the Province of Ontario and the laws of Canada, as applicable to the matters herein. Any action or other legal proceeding arising under or with respect to this Agreement (including any motion or other interlocutory proceeding) shall be brought in a Court or a tribunal, whichever may be applicable, sitting in Toronto, Ontario. The Company and the City each irrevocably submit to the exclusive jurisdiction of the courts of the Province of Ontario in accordance with the foregoing.

23. Severance Where Provision Illegal, Etc.

If any provision or provisions of this Agreement or parts thereof or any of any document comprising this Agreement or the application thereof to any person or circumstances shall be found is/are found to be invalid, unenforceable or void by any court or tribunal of competent jurisdiction, such provision or provisions or parts thereof shall be deemed severable and all other provision or provisions or parts of this Agreement shall be deemed to be separate and independent therefrom and continue in full force and effect unless and until similarly found void and/or unenforceable. The remaining terms and provisions of this Agreement and its application to any person or circumstances shall not be affected thereby, but this provision shall apply only insofar as the effect of that severance is not to change the fundamental nature of the obligations assumed respectively by each of the City and Company.

24. Further Assurances

The Company agrees that it will do all such acts and execute all such further documents and will cause the doing of all

such acts and the execution of all such further documents as are within its power to cause the doing or execution of, as the City may from time to time reasonably request, in writing, and as may be necessary or desirable to give full effect to this Agreement.

IN WITNESS WHEREOF the parties hereto have executed this Agreement by affixing their corporate seals under the hands of their respective proper officers on that behalf duly authorized.

SIGNED, SEALED AND DELIVERED
In the presence of:

CITY OF TORONTO

_____
General Manager - Toronto Water

[insert **full legal** name of Company]

_____
(Signature of authorized representative of Company)
Name:
Title:
I have authority to bind the Company.

Schedule 1 – Maximum Discharge Limits

The quality and properties of the sewage discharged by the Company from the Premises to the sanitary sewer or combined sewer system shall not exceed the following limits at any time:

(i) B.O.D. _____ milligrams/litre

(ii) Total Suspended Solids _____ milligrams/litre

(iii) Phenolic Compounds (4AAP) _____ milligrams/litre

(iv) Total Phosphorus _____ milligrams/litre

APPENDIX 2:

City ODF Surcharge Calculation

City of Toronto Surcharge Sampling Requirements

Sampling Criteria	Frequency	Type of Sample
Minimum Surcharge Industries	Once a Year	Composite
Industries with Annual Surcharge < $5, 000	Once a Quarter	Composite
Industries with Annual Surcharge > $5, 000	Twice a Quarter	Composite
Industries with Annual Surcharge > $75,000	Four Samples per Quarter	Composite
Assessment	Four random samples within a month	Composite

December 2011

CITY OF TORONTO SURCHARGE FORMULA AND CALCULATION

Surcharge = $ (V x C x F x R)
Where,

V = annual volume of discharge, in cubic metres *
* The annual volume of discharge shall be equivalent to the volume of water consumed by the Company and supplied by the City, as determined by meter or sub-meter readings or, where not metered, in accordance with Chapters 851, 849 and 441 of the Toronto Municipal Code; plus the annual volume of any private water supplied to the Company, as determined by subsection 7(e), the Company's records and/or otherwise by the General Manager.

C = excess parameter(s) or properties of sewage permitted under Schedule 1 of this Agreement, in g/m3

F = 10-3, factor to convert g to kg (Note: g/m3 = mg/L)

R = the rate for sewage treatment, in $/ kg excess, as established by the City from time to time under Chapter 681 and/or Chapter 441

Steps to Calculation:

1. Select composite sampling data for: BOD,TSS, Total Phosphorus and Phenolics data from EM&P works management system

2. Enter the data in each appropriate column for BOD, TSS, Total Phosphorus, and Phenolics in the Grubb statistical program

3. The excess BOD, TSS, Total Phosphorus, and Phenolics are calculated (items Q & R). The surcharge will be based on the parameter with the highest value (item W).

4. Enter the annual water consumption or water purchased from WMACS (water billing database) (item S).

5. Item T – private water is amount of water other than city-supplied water e.g. groundwater, lake water, well water used in process.

6. Enter percent discharge (item U). It is 100% unless an engineering report is submitted to justify a lower volume of water discharge. If % discharge is 100, then water purchased is the same volume as water discharge (item V).

7. The current fee for IWSA is $0.57/kg, only charged on highest one parameter

1	2	3	4	5	6	7	8	9	LINE
Q1 Date	All BOD	All SS	All PHOS	All PHENOL	BOD Used	SS Used	Used PHOS	Used PHENOL	
									4
									5
									6
									7
									8
									9
									10
									11
Count	0	0	0	0	0	0	0	0	12
Avg Q1									13
Q2 Date	All BOD	All SS	All PHOS	All PHENOL	BOD Used	SS Used	Used PHOS	Used PHENOL	14
									15
									16
									17
									18
									19
									20
									21
									22
									23
Count	0	0	0	0	0	0	0	0	24
Avg Q2									26
Q3 Date	All BOD	All SS	All PHOS	All PHENOL	BOD Used	SS Used	Used PHOS	Used PHENOL	28
									29
									30
									31
									32
									33
									34
									35
									36
									37
Count	0	0	0	0	0	0	0	0	38
Avg Q3									39
Q4 Date	All BOD	All SS	All PHOS	All PHENOL	BOD Used	SS Used	Used PHOS	Used PHENOL	41
									42
									43
									44
									45
									46
									47
									48
									49
									50
Count	0	0	0	0	0	0	0	0	51
Avg Q4									52

10

ITEM

Name of Company
Address of Company
Industry #

ITEM				
	Calculation of Excess Pollutant (mg/L)		**Calculation of Excess Pollutant (mg/L)**	
A	The number of BOD results used (n must>2) =	0	The number of PHOS results used (n must>2) =	0
B	The number of SS results used (n must> 2) =	0	The number of PHENOL results used (n must> 2) =	0
C	The average of all BOD results used (mg/L) =	#DIV/0!	The average of all PHOS results used (mg/L) =	#DIV/0!
D	The average of all SS results used (mg/L) =	#DIV/0!	The average of all PHENOL results used (mg/L) =	#DIV/0!
E	The standard deviation of all BOD results used (mg/L) =	#DIV/0!	The standard deviation of all PHOS results used (mg/L)	#DIV/0!
F	The standard deviation of all SS results used (mg/L) =	#DIV/0!	The standard deviation of all PHENOL results used (mg/	#DIV/0!
G	The maximum BOD used (mg/L) =	0	The maximum PHOS used (mg/L) =	0.00
H	The minimum BOD used (mg/L) =	0	The minimum PHOS used (mg/L) =	0.00
I	The maximum SS used (mg/L) =	0	The maximum PHENOL used (mg/L) =	0.000
J	The minimum SS used (mg/L) =	0	The minimum PHENOL used (mg/L) =	0.000
K	Calculated Grubbs Z value for BOD used =	#DIV/0!	Calculated Grubbs Z value for PHOS used =	#DIV/0!
L	Critical Z for E		Critical Z for E	
M	Calculated Grubbs Z value for SS used =	#DIV/0!	Calculated Grubbs Z value for PHENOL used =	#DIV/0!
N	Critical Z for S		Critical Z for S	
O	Remove BOD	#DIV/0! #DIV/0! #DIV/0!	Remove PHO	#DIV/0! #DIV/0! #DIV/0!
P	Remove SS c	#DIV/0! #DIV/0! #DIV/0!	Remove PHE	#DIV/0! #DIV/0! #DIV/0!
Q	Excess BOD (mg/L) = Avg of 4 Quarter Averages - 300	#DIV/0!	Excess PHOS (mg/L) = Avg of 4 Quarter Averages - 10	#DIV/0!
R	Excess SS (mg/L) = Avg of 4 Quarter Averages - 350	#DIV/0!	Excess PHENOL (mg/L) = Avg of 4 Quarter Averages - 1	#DIV/0!

Calculation of Waste Volume Discharged (m3/yr)

S	Water Purchased (m3/yr)	
T	Private Water In (m3/yr)	
U	Percent Discharged	
V	Volume of Waste Discharge	0

Calculation of Quarterly Surcharge Invoice

W	Greater of Excess BOD or Excess SS (mg/L)	#DIV/0!
X	Unit Treatment Cost ($/kg Excess BOD or Excess SS)	0.57
Y	Quarterly Invoice = W x X x V x 0.25 x 0.00	#DIV/0!

prepared by:
Name
Position
Toronto Water
Phone Number

Name of Company

APPENDIX 3:

ODF Calculation Tables

ODF Cost Calculation Process Allocation Factors (apply to both capital and operational projects)

Ashbridges Bay Treatment Plant (ABTP)

% Capital Cost Allocation for Individual ODF Parameters

Treatment Process	Volume	Wastewater Strength			
		BOD	TSS	TP	TKN
Headworks	95%		5%		
Primary	25%		72%	3%	
Secondary	25%	52%	10%		13%
Solids Train	20%	23%	51%	4%	3%
Other	100%				

Humber Treatment Plant (HTP)

% Capital Cost Allocation for Individual ODF Parameters

Treatment Process	Volume	Wastewater Strength			
		BOD	TSS	TP	TKN
Headworks	95%		5%		
Primary	25%		72%	3%	
Secondary	25%	43%	10%		22%
Solids Train	20%	26%	48%	3%	3%
Other	100%				

Highland Creek Treatment Plant (HCTP)

% Capital Cost Allocation for Individual ODF Parameters

Treatment Process	Volume	Wastewater Strength			
		BOD	TSS	TP	TKN
Headworks	95%		5%		
Primary	25%		73%	2%	
Secondary	25%	54%	10%		11%
Solids Train	20%	23%	51%	4%	3%
Other	100%				

North Toronto Treatment Plant (NTTP)

% Capital Cost Allocation for Individual ODF Parameters

Treatment Process	Volume	Wastewater Strength			
		BOD	TSS	TP	TKN
Headworks	95%		5%		
Primary	25%		72%	3%	
Secondary	25%	38%	10%		27%
Solids Train	20%	26%	48%	3%	3%
Other	100%				

2012 to 2021 Approved Budget for City of Toronto Wastewater Facilities
Capital project and cost data from 2012 City of Toronto budget summary

Net Present Value: Applied %s	**(User Adjustable)**
Discount Rate	3.0%
Rate of Inflation	2.0%

Facility	Account Name	Headworks	Primary	Secondary	Solids Train	Other	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012-2021 Total $1000s	1000$/Year (Total AVG)	2012 - 2021 NPV, 1000$	1000$/Year (NVP AVG)	Headworks	Primary	Secondary	Solids Train	Other
ABTP	ABTP - DIG. TANKS #1-8 MODS.				100%	0%	$30	$10	$0	$0	$0	$0	$0	$0	$0	$0	$40	$4	$40	$4	$0	$0	$0	$4	$0
ABTP	BIOFILTERS UPGRADE & REPLACEMENT				100%	0%	$600	$3,300	$10,400	$100	$0	$0	$0	$0	$0	$0	$14,400	$1,440	$14,164	$1,416	$0	$0	$0	$1,416	$0
ABTP	BIOSOLIDS PELLETIZER RETROFIT				100%	0%	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$2,000	$200	$1,915	$191	$0	$0	$0	$191	$0
ABTP	BIOSOLIDS IMPRVS & STUDIES				100%	0%	$50	$0	$0	$0	$0	$0	$0	$0	$0	$0	$50	$5	$50	$5	$0	$0	$0	$5	$0
ABTP	BLOWER BLDG & OLD NORTH SUBSTATION IMPROVEMENTS	14%	14%	14%	14%	43%	$0	$320	$1,950	$1,065	$10	$20	$0	$0	$0	$0	$3,365	$337	$3,292	$329	$47	$47	$47	$47	$141
ABTP	CITY IMPROVEMENTS RE: TH COGEN	14%	14%	14%	14%	43%	$150	$900	$1,300	$2,500	$2,200	$1,000	$50	$0	$0	$0	$8,100	$810	$7,859	$786	$112	$112	$112	$112	$337
ABTP	CONTROLLED SUBSTANCE IDENTIFICATION AND ABATEMENT	14%	14%	14%	14%	43%	$270	$270	$270	$270	$0	$0	$0	$0	$0	$0	$1,080	$108	$1,064	$106	$15	$15	$15	$15	$46
ABTP	D BUILDING TREATMENT & BIOFILTER	90%	10%			0%	$28,572	$6,673	$0	$0	$0	$0	$0	$0	$0	$0	$35,245	$3,525	$35,180	$3,518	$3,166	$352	$0	$0	$0
ABTP	DEWATERING EQUIPMENT UPGRADES				100%	0%	$8,600	$7,450	$3,123	$10	$10	$0	$0	$0	$0	$0	$19,193	$1,919	$19,059	$1,906	$0	$0	$0	$1,906	$0
ABTP	DIGESTER HEAT RECOVERY PROJECT				100%	0%	$0	$0	$0	$0	$0	$100	$1,300	$20	$20	$0	$1,440	$144	$1,359	$136	$0	$0	$0	$136	$0
ABTP	DIGESTERS 9-12 REFURBISH				100%	0%	$50	$1,000	$10,000	$10,000	$10,000	$330	$0	$0	$0	$0	$31,380	$3,138	$30,490	$3,049	$0	$0	$0	$3,049	$0
ABTP	DISINFECTION ENGINEERING					100%	$660	$1,500	$4,000	$3,500	$3,000	$4,000	$2,000	$1,320	$20	$0	$20,000	$2,000	$19,300	$1,930	$0	$0	$0	$0	$1,930
ABTP	DISINFECTION SYSTEM CONSTRUCTION					100%	$0	$0	$0	$0	$25,000	$60,000	$55,500	$40,000	$0	$0	$180,500	$18,050	$170,890	$17,089	$0	$0	$0	$0	$17,089
ABTP	ELECTRICAL REHAB	14%	14%	14%	14%	43%	$600	$3,000	$3,500	$5,500	$5,500	$4,500	$4,000	$4,000	$4,000	$4,000	$38,600	$3,860	$36,792	$3,679	$526	$526	$526	$526	$1,578
ABTP	ELECTRICAL REHAB ENGINEERING	14%	14%	14%	14%	43%	$300	$300	$0	$0	$0	$0	$0	$0	$0	$0	$600	$60	$597	$60	$9	$9	$9	$9	$26
ABTP	EMISSION AIR TREATMENT UPGRADE			100%		0%	$10,000	$5,000	$0	$0	$0	$0	$0	$0	$0	$0	$15,000	$1,500	$14,951	$1,495	$0	$0	$1,495	$0	$0
ABTP	FACILITY FORECAST PROJ/STATE OF GOOD REPAIR	14%	14%	14%	14%	43%	$0	$0	$0	$0	$0	$0	$0	$45,000	$68,000	$68,000	$181,000	$18,100	$167,208	$16,721	$2,391	$2,391	$2,391	$2,391	$7,173
ABTP	FACILITY REHAB	90%	10%	0%	0%	0%	$740	$1,940	$1,740	$1,540	$1,540	$1,450	$2,800	$1,300	$1,200	$200	$14,450	$1,445	$13,873	$1,387	$1,249	$139	$0	$0	$0
ABTP	FERROUS UPGRADES			100%		0%	$770	$900	$4,300	$2,850	$570	$50	$0	$0	$0	$0	$9,440	$944	$9,242	$924	$0	$0	$924	$0	$0

Facility	Account Name	Headworks	Primary	Secondary	Solids Train	Other	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012-2021 Total $1000s	1000$/Year (Total AVG)	2012 - 2021 NPV, 1000$	1000$/Year (NVP AVG)	Headworks	Primary	Secondary	Solids Train	Other
ABTP	FINE BUBBLE AERATION TANK 1, 3-11			100%		0%	$0	$0	$0	$0	$0	$0	$0	$10,000	$10,000	$15,000	$35,000	$3,500	$32,328	$3,233	$0	$0	$3,233	$0	$0
ABTP	FINE BUBBLE AERATION TANK 2			100%		0%	$0	$2,500	$5,000	$4,600	$0	$0	$0	$0	$0	$0	$12,100	$1,210	$11,846	$1,185	$0	$0	$1,185	$0	$0
ABTP	GROVE LANDSCAPING PHASE 1	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$2,000	$2,900	$4,900	$490	$4,506	$451	$0	$0	$0	$0	$451
ABTP	LANDSCAPE SITE DESIGN	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$400	$400	$800	$80	$736	$74	$0	$0	$0	$0	$74
ABTP	M & T PUMPING STATION					100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
ABTP	M & T PUMPING STATION REBUILD					100%	$1,825	$1,600	$2,250	$1,600	$1,680	$1,600	$1,500	$250	$50	$0	$12,355	$1,236	$12,004	$1,200	$0	$0	$0	$0	$1,200
ABTP	M & T PUMPING STATION REBUILD					100%	$500	$1,000	$7,500	$24,500	$31,000	$48,000	$40,000	$11,000	$0	$0	$163,500	$16,350	$156,167	$15,617	$0	$0	$0	$0	$15,617
ABTP	M & T RETROFIT					100%	$5,105	$615	$5	$0	$0	$0	$0	$0	$0	$0	$5,725	$573	$5,719	$572	$0	$0	$0	$0	$572
ABTP	MEDIATION AGREEMENT IMPLEMENTATION	90%	10%	0%	0%	0%	$25	$25	$25	$25	$0	$0	$0	$0	$0	$0	$100	$10	$99	$10	$9	$1	$0	$0	$0
ABTP	MESI UPGRADES	0%	0%	100%	0%	0%	$2,165	$2,237	$2,311	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$24,213	$2,421	$23,155	$2,315	$0	$0	$2,315	$0	$0
ABTP	MISC MECH REHAB			20%	70%	10%	$1,850	$3,900	$7,000	$2,000	$0	$0	$0	$0	$0	$0	$14,750	$1,475	$14,519	$1,452	$0	$0	$290	$1,016	$145
ABTP	MOBILE GENERATORS	14%	14%	14%	14%	43%	$25	$25	$0	$0	$0	$0	$0	$0	$0	$0	$50	$5	$50	$5	$1	$1	$1	$1	$2
ABTP	OUTFALL ASSESSMENT					100%	$1,000	$1,650	$0	$0	$0	$0	$0	$0	$0	$0	$2,650	$265	$2,634	$263	$0	$0	$0	$0	$263
ABTP	OUTFALL CONSTRUCTION					100%										$5,000	$5,000	$500	$4,580	$458	$0	$0	$0	$0	$458
ABTP	OUTFALL ENGINEERING					100%						$50	$6,150	$7,500	$4,450	$2,500	$20,650	$2,065	$19,259	$1,926	$0	$0	$0	$0	$1,926
ABTP	PCS UPGRADES	14%	14%	14%	14%	43%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
ABTP	PCS-PLANT SRVS	14%	14%	14%	14%	43%	$4,539	$1,638	$102	$60	$30	$0	$0	$0	$0	$0	$6,369	$637	$6,348	$635	$91	$91	$91	$91	$272
ABTP	POLYMER UPGRADE				100%	0%	$500	$1,500	$4,000	$2,500	$50	$0	$0	$0	$0	$0	$8,550	$855	$8,384	$838	$0	$0	$0	$838	$0
ABTP	PRIMARY AND FINAL TANK UPGRADES		70%	30%		0%	$8,826	$1,463	$0	$0	$0	$0	$0	$0	$0	$0	$10,289	$1,029	$10,275	$1,027	$0	$719	$308	$0	$0
ABTP	PRIMARY TREATMENT UPGRADE - CONST CONT#1	100%				0%	$1,000	$20,300	$35,000	$35,000	$16,000	$0	$0	$0	$0	$0	$107,300	$10,730	$104,805	$10,480	$10,480	$0	$0	$0	$0
ABTP	PRIMARY TREATMENT UPGRADE - CONST CONT#2		100%			0%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
ABTP	PROCESS & EQUIP UPGRADES	14%	14%	14%	14%	43%	$650	$4,430	$220	$200	$200	$200	$200	$200	$200	$200	$6,700	$670	$6,573	$657	$94	$94	$94	$94	$282
ABTP	PROCESS EQUIP UPGRADES	15%	15%	15%	15%	40%	$1,065	$365	$10	$15	$10	$0	$0	$0	$0	$0	$1,465	$147	$1,460	$146	$22	$22	$22	$22	$58
ABTP	PROCESS UPGRADES & ODOUR CONTROL ENGINEERING	100%				0%	$2,035	$1,105	$900	$550	$87	$0	$0	$0	$0	$0	$4,677	$468	$4,630	$463	$463	$0	$0	$0	$0
ABTP	PT ENGINEERING DESIGN & CONTRACT ADMIN	100%				0%	$1,728	$3,148	$1,500	$890	$345	$150	$149	$100	$0	$0	$8,010	$801	$7,889	$789	$789	$0	$0	$0	$0
ABTP	REHAB OF GROUNDS & BUILDINGS	15%	15%	15%	15%	40%	$1,375	$41	$5	$5	$0	$0	$0	$0	$0	$0	$1,426	$143	$1,425	$143	$21	$21	$21	$21	$57
ABTP	SECONDARY			100%		0%	$440	$370	$870	$370	$285	$200	$200	$200	$200	$200	$3,335	$334	$3,227	$323	$0	$0	$323	$0	$0

Facility	Account Name	Headworks	Primary	Secondary	Solids Train	Other	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012-2021 Total $1000s	1000$/Yr (Total AVG)	2012 - 2021 NPV, 1000$	1000$/Yr (NVP AVG)	Headworks	Primary	Secondary	Solids Train	Other
	TREATMENT UPGRADES																								
ABTP	SERVICE AIR UPGRADES	0%	0%	0%	100%	0%	$100	$2,750	$4,250	$1,300	$609	$0	$0	$0	$0	$0	$9,009	$901	$8,839	$884	$0	$0	$0	$884	$0
ABTP	STANDBY POWER GENERATION	14%	14%	14%	14%	43%	$2,134	$5,250	$6,025	$15	$0	$0	$0	$0	$0	$0	$13,424	$1,342	$13,256	$1,326	$190	$190	$190	$190	$569
ABTP	WASTE ACTIVATED SLUDGE UPGRADE			100%		0%	$200	$1,000	$2,800	$2,800	$17,200	$17,000	$17,000	$12,000	$12,000	$100	$82,100	$8,210	$77,820	$7,782	$0	$0	$7,782	$0	$0
ABTP	WORK AREA 1 REHAB	33%	33%			33%	$2,480	$400	$400	$400	$400	$400	$400	$400	$400	$400	$6,080	$608	$5,910	$591	$197	$197	$0	$0	$197
ABTP	WORK AREA 3 REHAB					100%	$500	$300	$300	$300	$300	$300	$300	$300	$300	$300	$3,200	$320	$3,072	$307	$0	$0	$0	$0	$307
ABTP	WORK AREA 4 REHAB					100%	$1,150	$2,370	$1,970	$300	$300	$300	$300	$300	$300	$300	$7,590	$759	$7,410	$741	$0	$0	$0	$0	$741
ABTP	WORK AREA 5 REHAB					100%	$2,690	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700	$1,950	$250	$23,790	$2,379	$22,903	$2,290	$0	$0	$0	$0	$2,290
ABTP	Work Area 8 Rehab				33%	67%	$780	$150	$150	$150	$150	$150	$150	$150	$150	$150	$2,130	$213	$2,066	$207	$0	$0	$0	$68	$138
	ABTP Totals:						**$96,279**	**$95,595**	**$126,076**	**$110,315**	**$121,876**	**$145,200**	**$137,399**	**$139,440**	**$108,340**	**$102,600**	**$1,183,120**	**$118,312**							
	ABTP Net Present Value (NPV):						**$96,279**	**$94,667**	**$123,640**	**$107,133**	**$117,211**	**$138,287**	**$129,587**	**$130,235**	**$100,206**	**$93,975**	**$1,131,220**	**$113,122**	**$1,131,220**	**$113,122**	**$19,872**	**$4,926**	**$21,374**	**$13,033**	**$53,940**
HCTP	EFFLUENT PUMPING STATION					100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
HCTP	BIOSOLIDS TREATMENT UPGRADES				100%	0%	$2,815	$12,358	$17,408	$20,608	$8,400	$2,121	$30	$0	$0	$0	$63,740	$6,374	$62,265	$6,227	$0	$0	$0	$6,227	$0
HCTP	CEPA COMPLIANCE - CL NOTICE - HCTP					100%	$42	$0	$0	$0	$0	$0	$0	$0	$0	$0	$42	$4	$42	$4	$0	$0	$0	$0	$4
HCTP	DIGESTER GAS SYSTEM UPGRADES				100%	0%	$318	$1,670	$4,950	$4,680	$50	$0	$0	$0	$0	$0	$11,668	$1,167	$11,419	$1,142	$0	$0	$0	$1,142	$0
HCTP	ELEC SYSTEM UPGRADES - CONSTR	8%	28%	28%	13%	25%	$3,572	$5,000	$5,500	$0	$0	$0	$0	$0	$0	$0	$14,072	$1,407	$13,917	$1,392	$104	$383	$383	$174	$348
HCTP	ELECTRICAL UPGRADES-ECAR	0%	0%	0%	0%	100%	$1,572	$1,572	$4,858	$4,858	$4,858	$782	$782	$782	$782	$782	$21,628	$2,163	$20,935	$2,094	$0	$0	$0	$0	$2,094
HCTP	FACILITY FORECAST/STATE OF GOOD REPAIR	14%	14%	14%	14%	43%	$0	$0	$0	$0	$0	$0	$0	$2,000	$16,000	$21,000	$39,000	$3,900	$35,901	$3,590	$513	$513	$513	$513	$1,540
HCTP	HIGHLAND CREEK WWTP - BMP IMPLEMENTATION				100%	0%	$700	$4,000	$6,000	$9,000	$20,000	$30,000	$32,000	$31,200	$13,700	$4,600	$151,200	$15,120	$143,298	$14,330	$0	$0	$0	$14,330	$0
HCTP	HIGHLAND CREEK WWTP - HCTP Bldg Rehab and Improvements	14%	14%	14%	14%	43%	$2,500	$1,500	$700	$4,000	$4,000	$0	$0	$0	$0	$0	$12,700	$1,270	$12,403	$1,240	$177	$177	$177	$177	$532
HCTP	HORGAN SUPERNATANT LINE CONNECTION	14%	14%	14%	14%	43%	$0	$0	$250	$250	$0	$0	$0	$0	$0	$0	$500	$50	$488	$49	$7	$7	$7	$7	$21
HCTP	HVAC & PLANT SECURITY UPGRADES	14%	14%	14%	14%	43%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
HCTP	MECH & ELECTRICAL UPGRADE ENGINEERING	9%	12%	42%	9%	29%	$1,240	$1,519	$1,557	$357	$0	$0	$0	$0	$0	$0	$4,673	$467	$4,618	$462	$39	$56	$194	$39	$135
HCTP	MECH SYSTEM UPGRADES - CONSTR	2%	2%	72%	12%	13%	$4,000	$5,000	$3,000	$0	$0	$0	$0	$0	$0	$0	$12,000	$1,200	$11,893	$1,189	$20	$20	$853	$139	$159
HCTP	ODOUR CONTROL UPGRADES - NEW SCREEN BUILDING	100%				0%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

Facility	Account Name	Headworks	Primary	Secondary	Solids Train	Other	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012-2021 Total $1000s	1000$/Year (Total AVG)	2012 - 2021 NPV, 1000$	1000$/Year (NVP AVG)	Headworks	Primary	Secondary	Solids Train	Other
HCTP	ODOUR CONTROL UPGRADES - PHASE 1 CONSTR	75%	5%	5%	5%	10%	$0	$5,000	$20,000	$20,000	$20,000	$5,000	$0	$0	$0	$0	$70,000	$7,000	$67,985	$6,798	$5,099	$340	$340	$340	$680
HCTP	ODOUR CONTROL UPGRADES - PHASE 1 ENG	75%	5%	5%	5%	10%	$910	$764	$610	$510	$230	$200	$100	$10	$0	$0	$3,334	$333	$3,275	$328	$246	$16	$16	$16	$33
HCTP	ODOUR CONTROL UPGRADES - PHASE 2	14%	14%	14%	14%	43%	$0	$0	$0	$0	$0	$0	$400	$6,000	$11,500	$11,300	$29,200	$2,920	$26,968	$2,697	$386	$386	$386	$386	$1,157
HCTP	PCS PLANT SERVICES	0%	0%	0%	100%	0%	$264	$260	$26	$0	$0	$0	$0	$0	$0	$0	$550	$55	$547	$55	$0	$0	$0	$55	$0
HCTP	PLANT FIRM CAPACITY UPGRADES - PHASE V	14%	14%	14%	14%	43%	$0	$0	$0	$0	$0	$0	$0	$0	$1,000	$1,500	$2,500	$250	$2,299	$230	$33	$33	$33	$33	$99
HCTP	PROCESS & FACILITY UPGRADE	14%	14%	14%	14%	43%	$2,785	$1,550	$2,600	$4,100	$2,060	$10	$0	$0	$0	$0	$13,105	$1,311	$12,842	$1,284	$184	$184	$184	$184	$551
HCTP	TRANSFORMERS AND SWITCHGEAR	14%	14%	14%	14%	43%	$0	$0	$1,000	$1,250	$1,690	$1,200	$0	$0	$0	$0	$5,140	$514	$4,963	$496	$71	$71	$71	$71	$213
HCTP	WAS THICKENING - CONSTR				100%	0%	$17,332	$16,750	$6,200	$0	$16	$0	$0	$0	$0	$0	$40,298	$4,030	$40,015	$4,001	$0	$0	$0	$4,001	$0
HCTP	WAS THICKENING AND DEWATERING - ENG				100%	0%	$740	$250	$350	$184	$17	$10	$4	$0	$0	$0	$1,555	$156	$1,539	$154	$0	$0	$0	$154	$0
	HCTP Totals:						**$38,790**	**$57,193**	$75,009	$69,797	$61,321	$39,323	$33,316	$39,992	$42,982	$39,182	$496,905	$49,691							
	HCTP Net Present Value (NPV):						**$38,790**	**$56,638**	$73,560	$67,784	$58,974	$37,451	$31,422	$37,352	$39,755	$35,888	$477,613	$47,761	$477,613	$47,761	$6,879	$2,186	$3,157	$27,988	$7,565
HTP	ADMIN BUILDING EXPANSION	14%	14%	14%	14%	43%	$0	$0	$0	$0	$0	$0	$750	$3,435	$4,000	$1,640	$9,825	$983	$9,117	$912	$130	$130	$130	$130	$391
HTP	BLDG & GROUNDS UPGRADES	14%	14%	14%	14%	43%	$100	$100	$100	$100	$0	$0	$0	$0	$0	$0	$400	$40	$394	$39	$6	$6	$6	$6	$17
HTP	BUILDING UPGRADES ENGINEERING	14%	14%	14%	14%	43%	$90	$0	$0	$0	$0	$0	$0	$0	$0	$0	$90	$9	$90	$9	$1	$1	$1	$1	$4
HTP	CEPA COMPLIANCE - CL NOTICE - HUMBER					100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
HTP	CHLORINE FACILITY UPGRADE					100%	$1,625	$4,137	$2,110	$17	$0	$0	$0	$0	$0	$0	$7,889	$789	$7,808	$781	$0	$0	$0	$0	$781
HTP	CO-GENERATION				100%	0%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
HTP	CONTROL ROOM UPGRADE				100%	0%	$600	$1,400	$0	$0	$0	$0	$0	$0	$0	$0	$2,000	$200	$1,986	$199	$0	$0	$0	$199	$0
HTP	DIGESTER CLEANING & UPGRADES				100%	0%	$200	$250	$0	$0	$0	$0	$0	$0	$0	$0	$450	$45	$448	$45	$0	$0	$0	$45	$0
HTP	ELECTRICAL CONDITION ASSESSMENT RECOMMENDATIONS	14%	14%	14%	14%	43%	$3,125	$1,676	$2,360	$4,750	$2,250	$950	$950	$950	$950	$950	$18,911	$1,891	$18,312	$1,831	$262	$262	$262	$262	$786
HTP	EQUIPMENT REPLACEMENT	6%	55%	29%	2%	8%	$745	$1,780	$1,950	$280	$0	$0	$0	$0	$0	$0	$4,755	$476	$4,692	$469	$28	$258	$136	$9	$35
HTP	FACILITY FORECAST PROJ/STATE OF GOOD REPAIR	14%	14%	14%	14%	43%	$0	$0	$0	$0	$0	$0	$0	$0	$42,000	$42,000	$84,000	$8,400	$77,316	$7,732	$1,106	$1,106	$1,106	$1,106	$3,317
HTP	FLOOD PROTECTION	17%	17%	17%	17%	33%	$250	$250	$0	$0	$0	$0	$0	$0	$0	$0	$500	$50	$498	$50	$8	$8	$8	$8	$17
HTP	GAS COMPRESSOR SYSTEM UPGRADES	14%	14%	14%	14%	43%	$2,532	$3,000	$3,550	$2,850	$1,650	$304	$250	$250	$250	$327	$14,963	$1,496	$14,628	$1,463	$209	$209	$209	$209	$628

Facility	Account Name	Headworks	Primary	Secondary	Solids Train	Other	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012-2021 Total $1000s	1000$/Year (Total AVG)	2012 - 2021 NPV, 1000$	1000$/Year (NVP AVG)	Headworks	Primary	Secondary	Solids Train	Other
HTP	HEADHOUSE UPGRADES Phase 1	100%				0%	$4,343	$3,545	$25	$0	$0	$0	$0	$0	$0	$0	$7,913	$791	$7,878	$788	$788	$0	$0	$0	$0
HTP	HTP - MODS & RE-ROOFING DIGS #1-6				100%	0%	$11	$0	$0	$0	$0	$0	$0	$0	$0	$0	$11	$1	$11	$1	$0	$0	$0	$1	$0
HTP	HTP II - SCREEN #6					100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
HTP	INTERNAL TELEPHONE AND PA UPGRADE	14%	14%	14%	14%	43%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
HTP	LIQUID STREAM UPGRADES			100%		0%	$1,545	$550	$0	$0	$0	$0	$0	$0	$0	$0	$2,095	$210	$2,090	$209	$0	$0	$209	$0	$0
HTP	MISC MECH REHAB	14%	14%	14%	14%	43%	$100	$0	$0	$0	$0	$0	$0	$0	$0	$0	$100	$10	$100	$10	$1	$1	$1	$1	$4
HTP	NEW SUBSTATION	14%	14%	14%	14%	43%	$8,420	$12,420	$5,100	$0	$0	$0	$0	$0	$0	$0	$25,940	$2,594	$25,721	$2,572	$368	$368	$368	$368	$1,103
HTP	ODOUR CONTROL ENGINEERING	40%	60%			0%	$2,245	$820	$721	$100	$101	$0	$0	$0	$0	$0	$3,987	$399	$3,958	$396	$158	$238	$0	$0	$0
HTP	ODOUR CONTROL IMPLEMENTATION - PHASE 1	45%	50%	5%		0%	$1,800	$5,000	$10,000	$10,000	$10,000	$10,000	$5,000	$0	$0	$0	$51,800	$5,180	$50,127	$5,013	$2,256	$2,506	$251	$0	$0
HTP	PCS PLANT SERVICES	14%	14%	14%	14%	43%	$304	$306	$33	$0	$0	$0	$0	$0	$0	$0	$643	$64	$639	$64	$9	$9	$9	$9	$27
HTP	RAS MOTORS & VFDS			100%		0%	$5	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5	$1	$5	$1	$0	$0	$1	$0	$0
HTP	REHAB OF SOUTH PRIMARY CLARIFIERS		100%			0%	$2,899	$518	$18	$0	$0	$0	$0	$0	$0	$0	$3,435	$344	$3,430	$343	$0	$343	$0	$0	$0
HTP	REPLC FINAL TANK RETURN HEADER			100%		0%	$3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3	$0	$3	$0	$0	$0	$0	$0	$0
HTP	SECONDARY TREATMENT UPGRADES			100%		0%	$2,646	$9,796	$5,746	$42,109	$42,109	$42,084	$42,084	$42,809	$1,285	$585	$231,253	$23,125	$220,853	$22,085	$0	$0	$22,085	$0	$0
HTP	SLUDGE THICKENING BLDG UPGRADE				100%	0%	$35	$10	$0	$0	$0	$0	$0	$0	$0	$0	$45	$5	$45	$4	$0	$0	$0	$4	$0
	HTP Totals:						**$33,623**	**$45,558**	**$31,713**	**$60,206**	**$56,110**	**$53,338**	**$49,034**	**$47,444**	**$48,485**	**$45,502**	**$471,012**	**$47,101**							
	HTP Net Present Value (NPV):						**$33,623**	**$45,115**	**$31,100**	**$58,469**	**$53,962**	**$50,799**	**$46,246**	**$44,312**	**$44,845**	**$41,677**	**$450,149**	**$45,015**	**$450,149**	**$45,015**	**$5,331**	**$5,446**	**$24,782**	**$2,359**	**$7,110**
NTTP	NORTH TORONTO TREATMENT PLANT (NTTP) IMPROVEMENTS	14%	14%	14%	14%	43%	$700	$200	$200	$200	$200	$300	$300	$3,450	$10,250	$10,250	$26,050	$2,605	$24,140	$2,414	$345	$345	$345	$345	$1,036
NTTP	CEPA COMPLIANCE - CL NOTICE - North Toronto					100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NTTP	NORTH TORONTO TREATMENT PLANT (NTTP) IMPROVEMENTS	14%	14%	14%	14%	43%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	NTTP Totals:						**$700**	**$200**	**$200**	**$200**	**$200**	**$300**	**$300**	**$3,450**	**$10,250**	**$10,250**	**$26,050**	**$2,605**							
	NTTP Net Present Value (NPV):						**$700**	**$198**	**$196**	**$194**	**$192**	**$286**	**$283**	**$3,222**	**$9,480**	**$9,388**	**$24,140**	**$2,414**	**$24,140**	**$2,414**	**$345**	**$345**	**$345**	**$345**	**$1,036**

Ashbridges Bay Waste Water Treatment Plant - Operations and Maintenance Data

1. O&M Budget Allocation Factors for ABTP
(this table not used in 2011 ODF report calculations, as actual operational data was available as provided in Table 3)

O&M Cost Item	O&M (Annual Rpt)	Headworks	Primary	Secondary	Solids Train	Other
Labour	$ 16,396,506	5%	15%	30%	30%	20%
Material and Supply						0%
Utilities	$ 13,473,814	5%	10%	40%	20%	25%
Machinery and Equipment Parts	$ 3,244,496	5%	15%	30%	30%	20%
Chemicals	$ 4,135,495		17%		65%	18%
Ferrous Chloride	$ 799,219		100%			0%
Other Materials	$ 564,200	5%	15%	30%	30%	20%
New Equipment	$ 285,470	5%	15%	30%	30%	20%
Services & Rent	$ 12,789,442	4%	4%	4%	80%	8%
Other Charges	$ 1,104,692	5%	15%	30%	30%	20%

2. Functional Cost Allocation Factors for ABTP

Treatment Process	Volume	Wastewater Strength			
		BOD	TSS	TP	TKN
Headworks	95%	0%	5%	0%	0%
Primary	25%	0%	72%	3%	0%
Secondary	25%	52%	10%	0%	13%
Solids Train	20%	23%	51%	4%	3%
Other	100%	0%	0%	0%	0%

3. Allocation of O&M Costs for ABTP

Treatment Process	Total O&M Costs	Wastewater Strength				
		Volume	BOD	TSS	TP	TKN
Headworks	**$1,933,524**	$1,836,848	$0	$96,676	$0	$0
Primary	**$3,039,516**	$759,879	$0	$2,188,452	$91,185	$0
Secondary	**$7,969,329**	$1,992,332	$4,144,051	$796,933	$0	$1,036,013
Solids Train	**$26,458,686**	$5,291,737	$6,008,831	$13,460,844	$926,663	$770,610
Other	**$3,580,157**	$3,580,157	$0	$0	$0	$0
Total Treatment	$39,401,055	$9,880,796	$10,152,883	$16,542,905	$1,017,848	$1,806,623
Treated loading, kg			35,776,137	57,067,699	1,136,130	5,288,883
R Value, $/kg			$0.28	$0.29	$0.90	$0.34

Humber Waste Water Treatment Plant - Operations and Maintenance Data

1. O&M Budget Allocation Factors for HTP

O&M Cost Item	O&M (Annual Rpt)	Headworks	Primary	Secondary	Solids Train	Other
Labour	$ 4,634,903	2.5%	30%	35%	30%	3%
Material and Supply						0%
Utilities	$ 6,375,963	5%	15%	60%	15%	5%
Machinery and Equipment Parts	$ 681,318	2.5%	30%	35%	30%	3%
Chemicals	$ 1,878,910	0	30%	0%	1%	69%
Ferrous Chloride	$ 690,734		100%			0%
Other Materials	$ 279,225	2.5%	30%	35%	30%	3%
New Equipment	$ 47,907	2.5%	30%	35%	30%	3%
Services & Rent	$ 726,673	2.5%	30%	35%	30%	3%
Other Charges	$ 12,458	2.5%	30%	35%	30%	3%

2. Functional Cost Allocation Factors for HTP

Treatment Process	Volume	Wastewater Strength			
		BOD	TSS	TP	TKN
Headworks	95%	0%	5%	0%	0%
Primary	25%	0%	72%	3%	0%
Secondary	25%	43%	10%	0%	22%
Solids Train	20%	26%	48%	3%	3%
Other	100%	0%	0%	0%	0%

3. Allocation of O&M Costs for HTP

Treatment Process	Total O&M Costs	Wastewater Strength				
		Volume	BOD	TSS	TP	TKN
Headworks	$478,360	$454,442	$0	$23,918	$0	$0
Primary	$4,125,547	$1,031,387	$0	$2,970,394	$123,766	$0
Secondary	$6,059,447	$1,514,862	$2,605,562	$605,945	$0	$1,333,078
Solids Train	$2,889,929	$577,986	$747,857	$1,375,213	$95,199	$93,673
Other	$1,774,808	$1,774,808	$0	$0	$0	$0
Total Treatment	$13,553,283	$3,578,676	$3,353,420	$4,975,470	$218,966	$1,426,751
Treated loading, kg			31,985,370	36,758,566	568,159	4,016,752
R Value, $/kg			0.10	0.14	0.39	0.36

Highland Creek Waste Water Treatment Plant - Operations and Maintenance Data

1. O&M Budget Allocation Factors for HCTP

O&M Cost Item	O&M (Annual Rpt)	Headworks	Primary	Secondary	Solids Train	Other
Labour[1]	$ 5,982,550	5.0%	30%	35%	25%	5%
Material and Supply						0%
Utilities	$ 4,567,953	5%	30%	35%	25%	5%
Machinery and Equipment Parts	$ 691,894	5.0%	30%	35%	25%	5%
Chemicals	$ 1,148,779		27%		30%	43%
Ferrous Chloride	$ 419,061		100%			0%
Other Materials	$ 400,885	5.0%	30%	35%	25%	5%
New Equipment	$ 110,449	5.0%	30%	35%	25%	5%
Services & Rent	$ 1,023,632	5.0%	30%	35%	25%	5%
Inter-Divional Charge	$ 313,457	5.0%	30%	35%	25%	5%

2. Functional Cost Allocation Factors for HCTP

Treatment Process	Volume	Wastewater Strength			
		BOD	TSS	TP	TKN
Headworks	95%	0%	5%	0%	0%
Primary	25%	0%	73%	2%	0%
Secondary	25%	54%	10%	0%	11%
Solids Train	20%	23%	51%	4%	3%
Other	100%	0%	0%	0%	0%

3. Allocation of O&M Costs for HCTP

Treatment Process	Total O&M Costs	Wastewater Strength				
		Volume	BOD	TSS	TP	TKN
Headworks	$654,541	$621,814	$0	$32,727	$0	$0
Primary	$4,656,477	$1,164,119	$0	$3,399,228	$93,130	$0
Secondary	$4,581,787	$1,145,447	$2,474,165	$458,179	$0	$503,997
Solids Train	$3,617,339	$723,468	$819,840	$1,832,385	$135,497	$106,149
Other	$1,148,516	$1,148,516	$0	$0	$0	$0
Total Treatment	$13,510,144	$3,654,848	$3,294,005	$5,722,519	$228,627	$610,145
Treated loading, kg			14,552,346	18,245,094	309,754	2,338,336
R Value, $/kg			0.23	0.31	0.74	0.26

North Toronto Waste Water Treatment Plant - Operations and Maintenance Data

1. O&M Budget Allocation Factors for NTTP

O&M Cost Item	O&M (Annual Rpt)	Headworks	Primary	Secondary	Solids Train	Other
Labour	$ 899,838	5.0%	30%	35%	25%	5%
Material and Supply						0%
Utilities	$ 353,767	5%	30%	35%	25%	5%
Machinery and Equipment Parts	$ 83,631	5.0%	30%	35%	25%	5%
Chemicals	$ 42,768			40%		60%
Ferrous Chloride	$ 25,226		100%			0%
Other Materials	$ 14,297	5.0%	30%	35%	25%	5%
New Equipment	$ 3,010	5.0%	30%	35%	25%	5%
Services & Rent	$ 73,074	5.0%	30%	35%	25%	5%
Other Charges	$ 6,780	5.0%	30%	35%	25%	5%

2. Functional Cost Allocation Factors for NTTP

Treatment Process	Volume	Wastewater Strength			
		BOD	TSS	TP	TKN
Headworks	95%	0%	5%	0%	0%
Primary	25%	0%	72%	3%	0%
Secondary	25%	38%	10%	0%	27%
Solids Train	20%	26%	48%	3%	3%
Other	100%	0%	0%	0%	0%

3. Allocation of O&M Costs for NTTP

Treatment Process	Total O&M Costs	Wastewater Strength				
		Volume	BOD	TSS	TP	TKN
Headworks	$71,720	$68,134	$0	$3,586	$0	$0
Primary	$455,545	$113,886	$0	$327,993	$13,666	$0
Secondary	$519,146	$129,787	$197,276	$51,915	$0	$140,169
Solids Train	$358,599	$71,720	$92,080	$172,406	$10,945	$11,447
Other	$97,381	$97,381	$0	$0	$0	$0
Total Treatment	$1,405,010	$383,527	$289,356	$555,900	$24,612	$151,617
Treated loading, kg			1,831,652	2,346,629	48,888	408,282
R Value, $/kg			0.16	0.24	0.50	0.37

Type I Formula R Value Calculations (unit cost per kg)

CAPITAL COSTS

1. Average (2012 - 2021) Capital Allocation for WWTP Processes

	ABTP		HTP		HCTP		NTTP	
Treatment Process	Capital, 1000$	% Total Capital	Capital, 1000$	% Total Capital	Capital, 1000$	% Total Capital	Capital, 1000$	% Total Capital
Headworks	$19,872	33.6%	$5,331	14.1%	$6,879	17.1%	$345	25.0%
Primary	$4,926	8.3%	$5,446	14.4%	$2,186	5.4%	$345	25.0%
Secondary	$21,374	36.1%	$24,782	65.4%	$3,157	7.9%	$345	25.0%
Solids Train	$13,033	22.0%	$2,359	6.2%	$27,988	69.6%	$345	25.0%
Other	$53,940	91.1%	$7,110	18.8%	$7,565	18.8%	$1,036	75.0%
Total	**$59,206**	**100.0%**	**$37,918**	**100.0%**	**$40,210**	**100.0%**	**$1,381**	**100.0%**

2. Average (2012 - 2021) Capital Allocation for ODF Parameters

Ashbridges Bay Treatment Plant (ABTP)
$ Capital Cost Allocation for Individual ODF Parameters

		Average Annual Capital Budget Allocation, 1000$				
Treatment Process	Capital, 1000$	Volume	BOD	TSS	TP	TKN
Headworks	$19,872	$18,878	$0	$994	$0	$0
Primary	$4,926	$1,232	$0	$3,547	$148	$0
Secondary	$21,374	$5,344	$11,115	$2,137	$0	$2,779
Solids Train	$13,033	$2,607	$2,960	$6,631	$456	$380
Other	$53,940	$53,940	$0	$0	$0	$0
Total, 1000$	$59,206	$28,060	$14,075	$13,309	$604	$3,158
Treated loading, kg			35,776,137	57,067,699	1,136,130	5,288,883
Capital Unit cost, $/kg			$0.39	$0.23	$0.53	$0.60

Humber Treatment Plant (HTP)

$ Capital Cost Allocation for Individual ODF Parameters

Treatment Process	Capital, 1000$	Average Annual Capital Budget Allocation, 1000$				
		Volume	BOD	TSS	TP	TKN
Headworks	$5,331	$5,064	$0	$267	$0	$0
Primary	$5,446	$1,361	$0	$3,921	$163	$0
Secondary	$24,782	$6,196	$10,656	$2,478	$0	$5,452
Solids Train	$2,359	$472	$610	$1,123	$78	$76
Other	$7,110	$7,110	$0	$0	$0	$0
Total, 1000$	$37,918	$13,093	$11,267	$7,788	$241	$5,529
Treated loading, kg			31,985,370	36,758,566	568,159	4,016,752
Capital Unit cost, $/kg			$0.35	$0.21	$0.42	$1.38

Highland Creek Treatment Plant (HCTP)

$ Capital Cost Allocation for Individual ODF Parameters

Treatment Process	Capital, 1000$	Average Annual Capital Budget Allocation, 1000$				
		Volume	BOD	TSS	TP	TKN
Headworks	$6,879	$6,535	$0	$344	$0	$0
Primary	$2,186	$546	$0	$1,596	$44	$0
Secondary	$3,157	$789	$1,705	$316	$0	$347
Solids Train	$27,988	$5,598	$6,343	$14,177	$1,048	$821
Other	$7,565	$7,565	$0	$0	$0	$0
Total, 1000$	$40,210	$13,469	$8,048	$16,433	$1,092	$1,169
Treated loading, kg			14,552,346	18,245,094	309,754	2,338,336
Capital Unit cost, $/kg			$0.55	$0.90	$3.53	$0.50

North Toronto Treatment Plant (NTTP)

$ Capital Cost Allocation for Individual ODF Parameters

Treatment Process	Capital, 1000$	Average Annual Capital Budget Allocation, 1000$				
		Volume	BOD	TSS	TP	TKN
Headworks	$345	$328	$0	$17	$0	$0
Primary	$345	$86	$0	$249	$10	$0
Secondary	$345	$86	$131	$35	$0	$93
Solids Train	$345	$69	$89	$166	$11	$11
Other	$1,036	$1,036	$0	$0	$0	$0
Total, 1000$	$1,381	$570	$220	$466	$21	$104
Treated loading, kg			1,831,652	2,346,629	48,888	408,282
Capital Unit cost, $/kg			$0.12	$0.20	$0.43	$0.26

2. City-Wide (4 plants) Capital Allocation

	Volume	BOD	TSS	TP	TKN
Total Annual Capital Budget, 1000$	$55,191	$33,609	$37,996	$1,958	$9,960
Total Treated Loading (all Plants), kg		84,145,504	114,417,988	2,062,931	12,052,253
R Value for Capital ($/kg)		$0.40	$0.33	$0.95	$0.83

OPERATIONAL COSTS

3. Summary of O&M Costs

	Volume	BOD	TSS	TP	TKN
Total Annual Operating Budget, 1000$					
ABTP	$9,880,796	$10,152,883	$16,542,905	$1,017,848	$1,806,623
HTP	$3,578,676	$3,353,420	$4,975,470	$218,966	$1,426,751
HCTP	$3,654,848	$3,294,005	$5,722,519	$228,627	$610,145
NTTP	$383,527	$289,356	$555,900	$24,612	$151,617
Treated Loading, kg					
ABTP		35,776,137	57,067,699	1,136,130	5,288,883
HTP		31,985,370	36,758,566	568,159	4,016,752
HCTP		14,552,346	18,245,094	309,754	2,338,336
NTTP		1,831,652	2,346,629	48,888	408,282
Total Annual OPERATING Budget	$17,497,847	$17,089,663	$27,796,793	$1,490,053	$3,995,137
Total Treated Loading (all Plants), kg		84,145,504	114,417,988	2,062,931	12,052,253
R Value for O&M ($/kg)		$0.20	$0.24	$0.72	$0.33

AMINISTRATIVE COSTS

Admin Fee, $/kg	**$0.020**

R VALUE SUMMARY

4. R Value Summary Table

	BOD	TSS	TP	TKN
Capital Unit Cost	$0.40	$0.33	$0.95	$0.83
O&M Unit Cost	$0.20	$0.24	$0.72	$0.33
Admin Fee	**$0.02**	**$0.02**	**$0.02**	**$0.02**
R Value, $/kg	***$0.62***	***$0.60***	***$1.69***	***$1.18***