



**STAFF REPORT
ACTION REQUIRED
with Confidential Attachment**

Impact of New Federal Wastewater Systems Effluent Regulations on Toronto Water

Date:	February 28, 2013
To:	Public Works and Infrastructure Committee
From:	General Manager, Toronto Water City Solicitor
Wards:	All
Reason for Confidential Information:	This report is about potential litigation that affects the City and contains solicitor-client privileged advice.
Reference Number:	P:\2013\Cluster B\TW\pw13003

SUMMARY

The purpose of this report is to advise Council of Environment Canada's new Federal Wastewater Systems Effluent Regulations and the impact of the regulations on the operations of Toronto Water's wastewater treatment plants and combined sewer system.

Toronto Water has developed an action plan to address the new federal Fisheries Act Wastewater Systems Effluent Regulations.

RECOMMENDATIONS

The General Manager, Toronto Water, and City Solicitor recommend that:

1. City Council adopt the confidential instructions to staff in Attachment 1.
2. The General Manager, Toronto Water, report to the Public Works and Infrastructure Committee in the first quarter of 2014 in regards to status of meeting the Federal Wastewater Systems Effluent Regulations compliance requirements.

3. City Council authorize the public release of the confidential recommendations in Attachment 1 at such time as may be deemed appropriate by the City Solicitor, with the balance of the confidential information in Attachment 1 to remain confidential.

Financial Impact

Activity	Estimated Cost	Budget Allocation
Design and construction of a new effluent disinfection system at the Ashbridges Bay Wastewater Treatment Plant	\$205.4 million	Already contained in Toronto Water's approved 2013 Capital Budget and 2014 to 2022 Capital Plan – CWW039-01 and CWW039-02
Increase in annual operating costs for additional hydro costs to eliminate the effects of ammonia toxicity in the Ashbridges Bay Wastewater Treatment Plant effluent	\$1 million/year	To be incorporated in Toronto Water's forthcoming 2014 Operating Budget submission
Increase to Toronto Water's annual Operating Budget, associated with the requisite wastewater treatment plant monitoring and reporting requirements	\$0.2 million/year	To be incorporated in Toronto Water's forthcoming 2014 Operating Budget submission
Development of a hydrologic/hydraulic computer simulation model to provide for the annual reporting of combined sewer overflow discharges within the City's combined sewer system	\$0.4 million	Already contained in Toronto Water's approved 2013 Capital Budget – CWW452-04
Increase to Toronto Water's annual Operating Budget, associated with the requisite combined sewer overflow reporting requirements	\$0.1 million	To be incorporated in Toronto Water's forthcoming 2014 Operating Budget submission

The Deputy City Manager and Chief Financial Officer has reviewed this report and agrees with the financial impact information.

DECISION HISTORY

At its meeting of September 24, 1997, Metropolitan Toronto Council adopted Clause No. 8 of Report No. 12 of the former Environment and Public Space Committee, titled "Main Treatment Plant Environmental Assessment Implementation Plan". The report recommended that Metropolitan Council endorse the conclusions of the Main Treatment Plant (now Ashbridges Bay Treatment Plant) Environmental Assessment (EA) and authorize its submission to the Ontario Ministry of the Environment for approval. The purpose of the Main Treatment Plant EA was to establish the preferred alternative for reducing environmental impacts and meeting future wastewater treatment needs to 2011.

At its meeting of August 25, 26 and 27, 2010, City Council in considering the August 3, 2010 staff report from the General Manager, Toronto Water titled “*Ashbridges Bay Treatment Plant Environmental Assessment Annual Compliance Reports 2009*”, directed the General Manager of Toronto Water to engage the professional services of a firm specializing in the Province of Ontario’s Municipal Class Environmental Assessment process to undertake a peer review of the option evaluation and scoring methodology used in the selection of the preferred option in the Ashbridges Bay Treatment Plant (ABTP) Effluent Disinfection Class Environmental Assessment Study – February 2010; and report back to the Public Works and Infrastructure Committee on the results of the peer review.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2010.PW35.13>

At its meeting of May 17, 18, and 19, 2011, City Council in consideration of an April 11, 2011 staff report from the General Manager, Toronto Water titled “*Peer Review Findings of the Ashbridges Bay Treatment Plant Effluent Class Environmental Assessment Study*”, directed staff to implement the use of Ultraviolet (UV) to disinfection secondary effluent at ABTP and the use of liquid sodium hypochlorite for disinfection of primary effluent.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2011.PW3.5>

ISSUE BACKGROUND

Development of New Federal Wastewater Regulations

In 2006, Environment Canada began work on a national strategy to manage wastewater effluents under the direction of the Canadian Council of Ministers of the Environment (CCME). In 2007, CCME released a "Draft Canada-wide Strategy for the Management of Municipal Wastewater Effluent"¹. At the same time, Environment Canada published a "Proposed Regulatory Framework for Wastewater"² to explain how the Canada-wide Strategy would be implemented.

Consultations were held in 2007 and 2008, and Toronto Water made written submissions to the CCME (see Attachments 2 and 3, respectively). A draft regulation based on the CCME strategy was released for comment in 2010 and the City, again, took the opportunity to make a written submission (see Attachment 4).

On July 28, 2012, the *Wastewater Systems Effluent Regulations*³ were published in the Canada Gazette. The Regulations are made under the *Fisheries Act*⁴, which prohibits unauthorized deterioration, disruption, and destruction of fish habitat. The new Regulations are the first federal regulations that specifically address municipal wastewater treatment plant effluents.

¹ http://www.ccme.ca/assets/pdf/cda_wide_strategy_mwwe_final_e.pdf

² <http://www.ec.gc.ca/eu-ww/default.asp?lang=En&n=0108BE25-1>

³ <http://laws-lois.justice.gc.ca/eng/regulations/SOR-2012-139/index.html>

⁴ <http://laws-lois.justice.gc.ca/eng/acts/F-14/index.html>

New Federal Regulations Requirements

The new federal Regulations impose operational, administrative, and financial burdens on the City due to additional regulatory requirements beyond those already imposed by the Ontario Ministry of the Environment (MOE).

With respect to wastewater treatment plants, the new Regulations impose:

- a) Strict limits for final effluent quality, which were not previously regulated by the MOE, related to:
 - i) un-ionized ammonia;
 - ii) acute lethality testing; and,
 - iii) total residual chlorine
- b) Methods for testing effluent quality;
- c) Flow monitoring;
- d) Record keeping; and,
- e) Reporting.

As well, the regulations contain requirements for annual reporting of combined sewer overflow (CSO) discharges within the City.

Compliance dates for various aspects of the new Regulations are presented in Table 1.

Table 1 Federal Wastewater Systems Effluent Regulations Compliance Dates

Compliance Requirement	January 1, 2013	May 15, 2013	February 15, 2014	January 1, 2015
Enhanced effluent sampling				
Wastewater treatment plant flow monitoring				
CSO Monitoring				
All record-keeping requirements				
CSO Identification Report is due (one-time report)				
First Monitoring Report is due. After the 1st report, Monitoring Reports must be submitted quarterly.				
First CSO report is due, reporting on 2013 data. Subsequent reports are due every February 15 for the previous year's data.				
Compliance with all final effluent limits (including total residual chlorine, un-ionized ammonia & acute lethality)				
Acute lethality testing begins				
Requirement for Temporary Bypass and Transitional Authorizations				

COMMENTS

Wastewater Treatment in the City of Toronto

At present, the City operates four wastewater treatment plants (Ashbridges Bay, Humber, Highland Creek and North Toronto). All four treatment plants provide secondary treatment, and all operate under Ontario Ministry of the Environment (MOE) Environmental Compliance Approvals (ECAs), which prescribe maximum effluent discharge limits. All treatment plant effluents require disinfection prior to discharge to meet the requisite bacteriological limit.

Over the past century, the use of chlorine has become the most common method of disinfecting wastewater treatment plant effluents, and all City plants were originally designed to use chlorine to disinfect their effluent. However, residual chlorine has been shown to have a negative environmental impact, and the new federal Regulations impose a limit on the amount of total residual chlorine that can be discharged in wastewater treatment plant effluent. Through the control of chlorine addition and the use of dechlorination chemicals, this concern can be mitigated.

Actions by Toronto Water while the Federal Regulations Pertaining to Wastewater Treatment Plant Effluent Disinfection were being Developed

Environment Canada embarked on the development of wastewater treatment plant effluent regulations by first issuing a Notice which was published in the Canada Gazette, in 2004. The 2004 Notice⁵ was made under the *Canadian Environmental Protection Act*, and required preparation of a pollution prevention (P2) plan for inorganic chloramines and chlorinated effluents and implementation of the requisite plan by 2010.

In 2007, in accordance with the 2004 Notice requirements, the City prepared a P2 Plan for each of the City's four wastewater treatment facilities, outlining how the City would limit their discharge of total residual chlorine in their wastewater effluent to no more than 0.02 mg/L. For the Highland Creek, Humber, and North Toronto wastewater treatment plants, the P2 plans identified the need to de-chlorinate the effluent and the City proceeded with the engineering design and construction of de-chlorination facilities at these three plants. The de-chlorination facilities at the Humber and North Toronto treatment plants were completed by June 15, 2010, and at the Highland Creek treatment plant by October 31, 2011 (per an approved extension).

While a similar P2 plan had been prepared for the Ashbridges Bay Treatment Plant (ABTP), it could not be implement without first receiving approval from the Ontario Ministry of the Environment for the comprehensive Environmental Assessment Study which began in 1989 and included effluent disinfection as one of the undertakings at this facility.

⁵ <http://gazette.gc.ca/archives/p1/2004/2004-12-04/html/notice-avis-eng.html#i3>

ABTP Environmental Assessment Background

In 1989, the former Metro Toronto started a Class Environmental Assessment (Class EA) in response to concerns about the need for future servicing capacity at the ABTP (then known as the Main Treatment Plant). Due to the scope and complexity of the undertaking, Metro Toronto elevated the study to a full Environmental Assessment (EA).

In 1997, the City submitted the EA to the MOE for approval. In 1999, the City undertook a self-directed mediation in response to stakeholder concerns about the Class EA. The MOE released their review of the EA and Mediation Agreement in 2004 for public comment. The MOE concluded that the EA had satisfied all the requirements of the EA Act and would be recommending approval. Outstanding issues identified by the public and various stakeholders were deemed either outside the scope of the EA, were being addressed through other City initiatives, or were better addressed at the Certificate of Approval (now Environmental Compliance Approval) stage after which more detailed design information would be available. The public comment period on the review ended in June 2004.

In 2008, the City received final approval from the MOE for the ABTP EA undertakings, which included a new outfall pipe, effluent pumping station, chlorination/de-chlorination for by-pass flows, and ultraviolet (UV) disinfection system for the treated plant effluent. As more than ten years had passed since UV technology had been selected as part of the EA, a review of all available technologies to confirm the findings of the EA was immediately undertaken. The review included an assessment of all available technologies, costs and regulatory requirements.

As contemplated within the MOE's EA Conditions of Approval, the City of Toronto conducted the review as a Schedule B Class Environmental Assessment (Class EA). The Schedule B Class EA provided updates on all the disinfection technologies currently available to determine whether UV disinfection was still the best alternative to disinfect the treated effluent stream from the ABTP. The outcome of the study was intended to help the City achieve the following objectives:

- Provide adequate disinfection of ABTP effluent to meet updated regulations and criteria set out by the Ontario Ministry of the Environment;
- Improve the Blue Flag beach status in the vicinity of the ABTP;
- Eliminate residual chlorine from the effluent to meet federal Pollution Prevention (P2) planning requirements under the *Canadian Environmental Protection Act*; and,
- Eliminate reliance on chlorine gas in order to eliminate any real or perceived public health risk associated with the use of rail cars to haul chlorine.

The Class EA study compared various alternate disinfection strategies against UV disinfection. Based on the then most current information on available technology, effectiveness, energy consumption, environmental impacts, and capital and operating costs, the preferred alternative identified through the Schedule B Class EA was identified as chlorination using sodium hypochlorite and de-chlorination using sodium bisulphite

for both the treated effluent and by-pass flows discharged from the ABTP. The Schedule B Class EA was approved by the MOE in written correspondence to the City in August 2010.

In August 2010, City Council directed staff to undertake a third party Peer Review of the Schedule B Class EA and its decision making model. After a detailed evaluation, chlorination/de-chlorination for both secondary effluent and primary effluent was confirmed as the preferred disinfection strategy for the ABTP. The results of the peer review were presented to City Council in May 2011 and, at that time, City Council rejected the staff recommended preferred strategy and directed staff to implement UV disinfection for secondary effluent and chlorination/de-chlorination for primary effluent at the ABTP.

Conceptual Design of New Disinfection Strategy

Toronto Water subsequently engaged the engineering consulting firm AECOM to develop a conceptual design for the disinfection strategy directed by Council. The challenges in developing the conceptual design were:

- Limited physical footprint and operational constraints at the ABTP.
- High electrical power demand of traditional UV technologies.
- Hydraulic limitations within the plant.
- Limitations on hydro availability in the local area of the plant.
- The need to accommodate a phased implementation approach to match budget availability.

The conceptual design was completed in November 2012 which overcame many of the above-noted challenges, as it relies on a new (next generation) UV lamp technology that is more efficient than conventional UV lamps and provides several advantages:

- Consumes less energy;
- Requires fewer lamps than traditional UV technology,
- Allows for a smaller facility footprint, and thereby resolves a number of operational and hydraulic constraints at the ABTP.

The original 1997 EA-approved concept contemplated that the new disinfection system would be built together with a new outfall pipe in order to achieve an optimal design solution and eliminate the shore based seawall gate discharge of plant by-pass flows, during wet weather conditions. However, due to the high costs (estimated at \$350 million) and timeline associated with the construction of a new outfall coupled with the pressing timelines imposed by the new federal Regulations, construction of the new outfall has been deferred beyond the current ten (10) year Capital Planning horizon. As such, the new disinfection concept will require continued and potentially more frequent use of the existing seawall gates during wet weather flow events; however, the bacteriological quality of the effluent is expected to improve significantly, compared to present conditions. This seawall gate discharge will be eliminated once the new plant outfall is constructed. Toronto Water's 2013 to 2022 Capital Budget and Plan, contains funding for the design and construction of the outfall to begin in 2021.

Further evaluations will be conducted during the detailed design of the new proposed disinfection system in order to confirm that no other plant modifications are necessary to accommodate this concept. Although there is not yet a full scale installation that uses this new UV lamp technology, it has been incorporated into the design of facilities in several other large facilities across North America. Staff intend to tour one or more of these facilities as they are commissioned.

Acute Lethality Testing

Monthly reporting on prescribed laboratory based acute lethality testing (ie. using rainbow trout fingerlings) of wastewater treatment plant effluent is a new requirement within the Regulations. The City has been testing for acute lethality since early 2011 to prepare for the Regulations. Results thus far indicate the requirement can be consistently achieved at two of the four wastewater treatment plants. Further testing is being done at the North Toronto and Ashbridges Bay treatment plants, where intermittent failures suggest that the toxicity is due to elevated ammonia levels. Preliminary results suggest this can be addressed without significant capital upgrades, but will require operational changes at an estimated annual operating cost of up to \$1 million. Further plant testing and sampling in 2013 will confirm these costs and the feasibility of the proposed strategy.

Combined Sewer Overflows

The Regulations require that the estimated occurrence, duration, and volume of CSO events be reported for each calendar year and the data generated through a monitoring program. However, the complexity of a system, such as Toronto's, may not have been contemplated when the Regulations were developed.

The City has an estimated 70 sewer outfalls that receive overflow from combined sewers. Most of these outfalls also receive flow from separated storm sewers. The Regulations are not concerned with stormwater flows, but do require reporting on the flows from the estimated 300 CSO regulators located within the combined sewer system serviced by the outfalls.

Toronto Water has a history of monitoring CSOs in a small number of locations for specific purposes, such as reporting to MOE, sewer system model calibration and verification, and assessment of sewer system performance. However, Toronto Water has not undertaken system-wide monitoring of all CSOs on a year-round basis.

It has been estimated that the cost to install a single flow meter is over \$2,000 and the annual data acquisition and instrumentation maintenance cost is \$21,000 per meter. This represents an estimated \$7 million expenditure in the first year and an estimated \$6.3 million in annual operating and maintenance costs thereafter.

The City indicated, through its original written submissions, that the CSO data required to be provided under the Regulations provide little insight into the operation or condition of the sewer system, as the frequency and volume of overflows discharged is weather dependent (i.e., there will be more CSOs during wetter than normal years, and fewer

CSOs during drier than normal years). The City further highlighted that when plans, such as Toronto's Wet Weather Flow Master Plan, are in place to address CSO discharges, all levels of government should work to support the implementation of these plans, to ultimately eliminate CSO discharges, rather than expending resources on unnecessary and costly monitoring.

Despite the City's submissions, the Regulations as enacted impose CSO reporting requirements. Since there are no restrictions in the Regulations on estimation methods that can or cannot be used, the City plans to rely on Toronto Water's InfoWorks CS computer model and the use of hydrologic (rainfall data) collected for the year to report the estimated occurrence, duration, and volume of CSO events. InfoWorks CS has been used to determine the hydrologic and hydraulic behaviour and responsiveness of the City's sewer systems since 2006.

Toronto Water is in the process of confirming details and locations of all CSOs, collecting and analyzing rainfall data from the City's 23 rain gauges, and determining appropriate hydrological and hydraulic parameters. Further work must be done to calibrate and validate the InfoWorks CS computer model to verify output under dry weather flow and wet weather flow conditions. This will require external engineering services and is expected to cost up to \$400,000. This one time cost is included in Toronto Water's approved 2013 Capital Budget.

Results will be generated for the non-winter period. The cost to operate and maintain the InfoWorks computer model, generate results, and prepare the annual CSO report as prescribed by the Regulations is estimated to be \$100,000 per year.

Toronto Water will seek concurrence from Environment Canada that the above-described approach is acceptable to ensure the City will meet the CSO reporting requirements imposed by the Regulations, wherein the first report, based on 2013 results, is to be submitted to Environment Canada by February 15, 2014.

CONCLUSIONS

Toronto Water has developed an action plan to address the new federal Fisheries Act Wastewater Systems Effluent Regulations.

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SIGNATURE

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ATTACHMENTS

- Attachment 1 – Confidential Attachment from General Manager, Toronto Water and City Solicitor on the Impact of New Federal Wastewater Systems Effluent Regulations on Toronto Water
- Attachment 2 – Letter to Jennifer Vigano, Programs Coordinator, Canadian Council of Ministers of the Environment, from Mark Rupke, Senior Engineer, Wastewater Treatment, Toronto Water, dated February 27, 2007
- Attachment 3 – Letter to Jennifer Vigano, Programs Coordinator, Canadian Council of Ministers of the Environment, from Frank Quarisa, Director, Wastewater Treatment, Toronto Water, dated January 31, 2008
- Attachment 4 – Letter to Randall Meades, Director General, Public and Resources Sectors Directorate, Environment Canada, from Joseph P. Pennachetti, City Manager, and Lou Di Gironimo, General Manager, Toronto Water, dated May 19, 2010