

CITY OF ST. CATHARINES

February 2012



WATER DISTRIBUTION SYSTEM 2011 SUMMARY REPORT

Waterworks #260003279

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ST. CATHARINES WATER DISTRIBUTION SYSTEM SUMMARY REPORT

Introduction

The Safe Drinking Water Act, requires Municipal Council members be provided with a summary report for the drinking water system that falls under their municipal responsibility. The report must list any time the City was unable to meet the requirements of the Act, the regulations, the system's approval, drinking water works permit, municipal drinking water licence or any order issued by the Ministry of the Environment. Each failure must specify the duration and measures taken to correct the failure. The report must also list a summary of the quantities and flow rates of the water supplied.

Waterworks Description

The City of St. Catharines water distribution system is classified by the Ministry of the Environment (MOE) as a Class II system. The City's waterworks consists of over 600 kilometres of watermains serving the local street network. This watermain network is one of several municipal networks supplied by the Decew Water Treatment Plant operated by the Regional Municipality of Niagara. The source of water for this plant is surface water, from Lake Erie via an intake from the Welland Canal located approximately six kilometers from the treatment plant, near Allanburg. The water is diverted to Decew's own 5.4 kilometre long open supply channel which flows by gravity directly to the treatment plant. The Decew Water Treatment Plant is a conventional surface water treatment plant which incorporates zebra mussel control, screening, chemically assisted flocculation, coagulation, sedimentation, filtration and disinfection using sodium hypochlorite and ultraviolet light. Further information on the supply of water by the Decew Water Treatment Plant can be obtained from the Region's website at www.niagararegion.ca.

Municipal Drinking Water Licencing Program

The Ministry of the Environment has introduced a new Municipal Drinking Water Licencing Program, originally recommended by Justice O'Connor in the Walkerton Inquiry, as part of a new approvals framework for municipal drinking water systems. This new program requires municipalities to obtain a licence to operate their water distribution systems and to incorporate the concept of quality management into their operations. There are four components to the licence that are applicable to St. Catharines including the requirement for a Drinking Water Works Permit, a Drinking Water Quality Management System, system accreditation and a financial plan.

On October 30, 2009, the City received its first Drinking Water Works Permit (Permit) and Drinking Water Licence (Licence) from the MOE. The Permit allows for the establishment and alteration of the water distribution system. It replaces the existing Certificates of Approval process and results in a single permit for the entire system. The Permit does not expire, while the Licence expires and must be renewed before October 29, 2014 (and every five years thereafter).

The Drinking Water Quality Management System (DWQMS) is a Quality Management System for the City's Water Distribution System. The DWQMS implements a systematic "continuous improvement" approach to planning, operations, corrective actions and management review to allow an organization to demonstrate sound system performance. The success of a DWQMS depends on the commitment from all levels and functions of an organization including operational staff and top management. The DWQMS is documented through an Operational Plan which is currently being implemented. DWQMS awareness training for staff is on-going.

The Canadian General Standards Board (CGSB) is the MOE's Accreditation Body which audits the municipal DWQMS. The CGSB has conducted a *Systems Audit* which reviewed the City's Operational Plan, the System Policy, and other DWQMS documentation to ensure all applicable requirements of the Standard are met. This has been completed, and in October 2009 the City's Water Distribution System was accredited by the CGSB. In October 2010, the application was submitted to the CGSB for the on-site *Verification Audit*. The audit was conducted in September 2011 to ensure procedures are implemented as required by the DWQMS Standard and the Operational Plan. Following the on-site audit, the CGSB will conduct annual surveillance audits on a three-year cycle with a full re-accreditation audit to be completed every third year.

The preparation of a Financial Plan was a new licensing requirement specified in Regulation 453/07 and is intended to demonstrate that the municipality has considered all of the financial impacts of the drinking water system. The City's Financial Plan was submitted to the Ministry of Municipal Affairs and Housing prior to the July 1, 2010 deadline.

The Drinking Water Quality Management System Policy

The City of St. Catharines is committed to:

- **Ensuring a consistent supply of safe, high quality drinking water;**
- **Maintaining and continuously improving its Quality Management System; and**
- **Meeting or surpassing applicable legislation and regulations.**

Actions Taken to Comply with the Safe Drinking Water Act

- To comply with the legislation, the City is required to take a minimum of 114 samples each month from a representative cross-section of its watermain network and to test these samples for microbiological indications of contamination. Testing for the free chlorine residual content is also a requirement. The chlorine residual must be sampled at the same time and location as the microbiological sample.
- At a point that is likely to have an elevated potential for the formation of trihalomethanes (THM's), the City's drinking water is sampled every three months for trihalomethanes.

- The City must undertake a Community Wide Lead Testing Program. The volunteer based sampling program requires samples be taken from 50 residential homes, 5 non-residential buildings and 10 samples taken directly from the distribution system twice each year.
- Anyone who conducts sampling from within the water distribution system must hold an Ontario Water Wastewater Certification Office (OWWCO) Water Quality Analyst licence or a Water Distribution Operator's licence. These licences must be updated every three years and require continuing education for renewal.
- All laboratory analysis must be carried out by an accredited laboratory. The City of St. Catharines currently uses a number of accredited laboratories. Accreditation ensures acceptable laboratory protocols and test methods are in place. It also requires the laboratory to provide evidence and assurances of the proficiency of the analysts performing the test methods. Laboratories are audited by the Canadian Association for Laboratories Accreditation (CALA) and accredited by the Standards Council of Canada (SCC).
- All drinking water sample results are available to the public. Annual reports are available at City Hall, the Lake Street Service Centre and on the City's website, www.stcatharines.ca. The daily sample records are also available at the Lake Street Service Centre for the public to view.
- Notification is given to the MOE, the Regional Public Health Department and Decew Water Treatment Plant of all incidents of regular sampling which exceed the bacteriological limits of zero colonies per 100 mL for *Escherichia coli* (E. coli) or Total Coliforms and free chlorine residual measurements of less than 0.05 mg/L. Notifications are also given for THM's which exceed 0.10 mg/L and lead analyses which exceed 0.010 mg/L.

WATER QUALITY TEST RESULTS

Summary of Results

In 2011, 5300 samples were taken throughout the City and analyzed for microbiological parameters, chlorine residual and chemicals analysis as part of the drinking water surveillance program and follow-up watermain break sampling program. Of these, nine were found to exceed the Ontario Drinking Water Quality Standards. **Table 1** summarizes each parameter tested and it gives the number of samples analyzed, and the range of results.

Table 1: Summary of Water Quality Test Results, 2011

Parameter	MAC	Number of Samples	Results Range	Comments	
Microbiological Analysis					
<i>Escherichia coli</i> (E. coli) CFU/100 mL	ND	1772	0	Indicates presence of fecal matter	
Total Coliforms CFU/100 mL	ND	1772	0 - 3	Indicates the possible presence of fecal contamination	
Background Count CFU/100 mL	NA	1772	0 - <200	Indication of water quality deterioration	
Heterotrophic Plate Count (HPC) CFU/1 mL	NA	997	0 - 750	Indication of overall water quality	
Chemical Analysis					
Trihalomethanes mg/L	0.10 mg/L	16	Based on a four quarter moving annual average 0.034	By-product of chlorination; reaction of chlorine with organic matter	
Lead mg/L	Residential	0.010 mg/L	121	<0.001 - 0.047	Lead water service connections may be found in homes built prior to 1955. No lead piping was used in the distribution system.
	Non-Residential	0.010 mg/L	9	<0.001 - 0.003	
	Distribution	0.010 mg/L	22	<0.001	
	All non-regulation	0.010 mg/L	10	<0.001 - 0.002	
Alkalinity	NA	22	87 - 101	The capacity for neutralizing an acid solution	
pH	NA	178	6.27 - 8.00	Indicates the acidity of the water	
Disinfectant					
Chlorine Residual mg/L	Must be between 0.05 mg/L & 4.0 mg/L	3429	0.00 - 1.86	Level of disinfectant present	

ND - None Detected

NA - Not Applicable

CFU - Colony Forming Units

Summary of Adverse Water Quality Incidents

After each adverse water quality incident, a series of actions are required to ensure the safety of the water and compliance with provincial legislation. The City's Standard Operating Procedures provide clear and detailed instruction for follow up actions. This involves flushing hydrants located in the area of the adverse incident, taking additional water samples from the original location and locations around the adverse incident. It also involves notifying the Niagara Ministry of the Environment office, the Spills Action Centre (SAC) and the Public Health Department both verbally and in writing. **Table 2** summarizes all adverse water quality incidents throughout the City of St. Catharines in 2011 and the corrective action taken.

Table 2: Summary of Adverse Water Quality Incidents, 2011

Incident Date	Location	Adverse Parameter	Result	Corrective Action	Corrective Action Date
Mar 7, 2011	5 Roehampton Ave	Total coliform	1 CFU	Flushed, resampled	March 8-11
Mar 9, 2011	13 Roehampton Ave	Total coliform	1 CFU	Flushed, resampled	March 8-11
Mar 22, 2011	273 Parnall Rd.	Total coliform	3 CFU	Flushed, resampled	March 23 - 24
Mar 29, 2011	507 Geneva St.	Free chlorine	0.04 mg/L	Flushed, resampled	March 29
June 8, 2011	1 Marsdale Ave	Total coliform	2 CFU	Flushed, resampled	June 9 - 10
June 8, 2011	114 Linwell Rd	Total coliform	1 CFU	Flushed, resampled	June 9 - 10
June 21, 2011	1 Geneva St	Free chlorine	0.00 mg/L	Flushed, resampled	June 21
July 7, 2011	Glendale Ave. Hydrant west of Lock 4	Free chlorine	0.02 mg/L	Flushed, resampled	July 7
July 14, 2011	Welland Ave. b/w Berryman and Dunkirk	Duty to report other observations	n/a	Flushed, resampled	July 14 - 18
Sept 20, 2011	Pelham Medical Center	Total coliform	1 CFU	Flushed, resampled	Sept 21 - 22
Oct 19, 2011	1 Geneva St	Free chlorine	0.00 mg/L	Flushed, resampled	Oct 19 - 20
Nov 4, 2011	1 Geneva St	Free chlorine	0.00 mg/L	Flushed, resampled	Nov 4

**An adverse water quality incident does not mean the drinking water supply is unsafe.
An adverse incident simply indicates on that one occasion,
a drinking water quality standard was exceeded.**

Lead Exceedances

As part of the Community Wide Lead Testing Program, the City is required to take samples from within private properties. The results are not indicative of the quality of the water throughout the distribution system. When sampling for lead, the results simply represent the water sampled from within that residence. Potential lead sources include: older lead water service lines, usually built prior to the 1950's; internal plumbing, used mainly in the early 1900's; and older brass or bronze fittings and fixtures. When a lead exceedance occurs, both the Public Health Department and the Ministry of the Environment are notified. The affected resident is also immediately notified and a package containing the results and informational fact sheets detailing what options are available to the resident are delivered. In 2011, there were four lead exceedances found in private properties.

Percentages of Samples Meeting Ontario Drinking Water Quality Standards

Table 3 shows the percentage of drinking water samples that met the Ministry of Environment's Drinking Water Quality Standards in the last three years.

Table 3: Percentage Meeting Ministry of Environment Standards

Parameter	2009	2010	2011
E. coli	100%	100%	100%
Total Coliforms	99.87%	99.62%	99.76%
Background Count	100%	100%	100%
HPC	100%	100%	100%
Chlorine Residual	100%	99.97%	99.86%
Lead	91.17%*	100%	100%
Trihalomethanes	100%	100%	100%

*includes distribution samples only

OPERATIONAL ACTIVITIES

Watermain Repairs

In 2011, there were 114 watermain breaks. The Region of Niagara with the cooperation of the local municipalities has developed standardized watermain break repair guidelines. Following a watermain break repair, the City samples from locations both upstream and downstream from where the break occurred. The samples are analyzed for microbiological parameters and chlorine residual.

When a new watermain is installed, the City is required to sample for microbiological parameters and chlorine residual. In 2011, 203 samples were taken to test the new watermains before being put into service. If any bacteria are present, the new watermains are flushed, rechlorinated and sampled again until no bacterial contamination is found before being put into service. All of the watermains must also meet the required standard for chlorine residual.

Maintenance Costs

The total budget for the 2011 Watermain Replacement Program amounted to \$5.5 million. The total budget allowed for the replacement of approximately 6.3 km of existing watermains and the installation of approximately 0.5 km of new watermains.

When a lead water service is found, for example, during a new watermain construction job or when repairing a water service leak the City will replace the portion of the service on public property at the City's expense. The City will replace the public property side of a lead service when a lead exceedance is found and also whenever the property owner first replaces the private portion of the lead service line. In 2011 there were 8 lead service line replacements totaling over 50 meters. Lead lines were replaced with either copper or plastic service lines.

Water Flows

Table 4 lists the monthly water flows from the Decew Water Treatment Plant to the City of St. Catharines (source: Regional Municipality of Niagara). More detailed flow data can be found the Decew Water Treatment Plant's 2011 Summary Report, available at www.niagararegion.ca.

Table 4: Summary of Monthly Water Flows (in MegaLitres), 2011

Month	Quantity (ML)
January	1241.89
February	1146.09
March	1261.20
April	1218.53
May	1333.20
June	1488.78
July	1862.00
August	1646.47
September	1442.59
October	1596.06
November	1263.04
December	1258.57
Total	16758.42
Monthly Average	1396.54
Daily Average	45.91

Note: 1 MegaLitre = 1,000,000 Litres

DEFINITIONS

MAC - Maximum Acceptable Concentration - this is a health-related standard established for parameters which, when present above a certain concentration, have known or suspected adverse health effects. The length of time the MAC can be exceeded without injury to health will depend on the nature and concentration of the parameter. (Ontario Drinking Water Standards. Ministry of the Environment. Revised June 2006. PIBS 4449e01. Page 02.)

Microbiological parameters (i.e. bacteria) - the source of bacteria may come from wastewater treatment plants, livestock operations, septic systems and wildlife. Microbiological analysis is the most important aspect of drinking water quality due to its association with dangerous water-borne diseases. (Ontario Drinking Water Standards. Ministry of the Environment.)

Total Coliforms - the group of bacteria most commonly used as an indicator of water quality. The presence of these bacteria in a water sample indicates inadequate filtration and/or disinfection. (Ontario Drinking Water Standards. Ministry of the Environment.)

***Escherichia coli* (E. coli)** – a sub-group of Coliform bacteria, it is a fecal Coliform. It is most frequently associated with recent fecal pollution. The presence of E. coli in drinking water may be an indication of sewage contamination. (Ontario Drinking Water Standards. Ministry of the Environment.)

Background Count – the bacterial content in water which can be used to measure water quality deterioration in distribution systems. (Ministry of the Environment. Method MFMICRO-E3371.)

Heterotrophic Plate Count (HPC) – indicates the overall water quality in drinking water systems. Increases in HPC can indicate a problem with drinking water treatment. (Ontario Drinking Water Standards. Ministry of the Environment.)

Trihalomethanes (THM's) – disinfection by-products which are produced when chlorine reacts with naturally occurring organics left in the water after filtration. (Ontario Drinking Water Standards. Ministry of the Environment.)

Lead – present as a result of corrosion of lead solder, lead containing brass fittings or lead water service pipes. (Ontario Drinking Water Standards. Ministry of the Environment.)