

Annual & Summary Report

For the period of:

Jan. 1, 2016 – Jun. 30, 2016

For:

Guelph Drinking Water System
[Corporation of the City of Guelph]

-And-

Gazer Mooney Subdivision Distribution System
[Township of Guelph/Eramosa]

Prepared by:



Water Services

Environmental Services Department

Revision Date: September 19, 2016

As per the Accessibility for Ontarians with Disabilities Act (AODA), this document is available in an alternate format by e-mailing waterservices@guelph.ca or by calling 519-837-5627.

Executive Summary

The purpose of this report is to provide information to system owners and stakeholders and to satisfy the regulatory requirements of the Safe Drinking Water Act (SDWA) including the Drinking Water Quality Management Standard (DWQMS), and regulatory reporting required under O.Reg. 170/03 (Section 11 and Schedule 22). The report is a compilation of information that helps to demonstrate the ongoing provision of a safe, consistent supply of high quality drinking water to customers located within the City of Guelph and the Gazer Mooney Subdivision (located in the Township of Guelph/Eramosa).

Water Services is a municipally-owned and operated water utility established in 1879. The Guelph Drinking Water System (Guelph DWS) is a Class IV Water Distribution and Supply Subsystem and is composed of water supply and treatment facilities and a water distribution system. The Gazer Mooney Subdivision Distribution System (Gazer Mooney SDS) is a Class I distribution system supplied with water from the Guelph Drinking Water System.

Both the Guelph DWS and the Gazer Mooney SDS are required to comply with the Safe Drinking Water Act (SDWA) and Regulations as well as requirements contained in Permits to Take Water (PTTW), Municipal Drinking Water Licences (MDWL), and Drinking Water Works Permits (DWWP). Having met the quality management system requirements of the SDWA, Guelph Water Services is an accredited Operating Authority with an up-to-date Operational Plan (OP). The OP is available upon request from Guelph Water Services.

The source of Guelph's drinking water is a series of 21 operational groundwater wells and a shallow groundwater collector system; this system consists primarily of true groundwater sources, with some "groundwater under the direct influence of surface water with effective filtration" (GUDI-WEF) sources (i.e. Carter Well field, Arkell 1 and the Glen Collectors).

The City has approximately 42,686 fully metered water service connections, 549 kilometres of underground watermains, and a population of approximately 129,920 within the City of Guelph. The Gazer Mooney Subdivision has approximately 70 fully metered water service connections, 2 kilometres of underground watermains, and an approximate population of 200.

There were no incidents of non-compliance associated with the Guelph DWS and the Gazer Mooney SDS from Jan. 1 to Jun. 30, 2016.

As the Operating Authority for both the Guelph DWS and Gazer Mooney SDS, Guelph Water Services is annually inspected by the Ontario Ministry of the Environment and Climate Change (MOECC) for compliance with regulatory requirements. A score of 88.69% was achieved in the 2014-2015 MOECC Annual Inspection Report for the Guelph DWS. While the City always strives to achieve a score of 100%, a score of 88.69% related to administrative issues does not represent any impacts to public health. A score of 100% was achieved in the 2015-2016 MOECC Annual Inspection Report for the Gazer Mooney SDS.

From Jan. 1 to Jun. 30, 2016, Guelph Water Services reported two AWQIs in the Guelph Drinking Water System: one of the incidents involved the detection of Lead at a distribution sample location and a well site above regulatory limits; and the next incident was related to the detection of total coliform at a distribution sample location. There were no AWQIs in the Gazer Mooney Subdivision Distribution System

from Jan. 1 to Jun. 30, 2016. In conjunction with Wellington-Dufferin-Guelph Public Health and the MOECC, all appropriate corrective actions and reporting were completed.

Water Services' risk assessment updates, emergency response testing, internal and external audits help facilitate continual improvement of **Water Services'** processes and programs through implementation of corrective actions.

The water system is operated to meet daily, seasonal, and other operational demands (fire demands) with various combinations of supplies in operation at any given time. From Jan. 01 to Jun. 30, 2016, a total of 8,695,737 (8.7 billion litres) of water was treated and pumped to the system. The average daily water demand was 47,779 cubic metres (47.8 million litres). The maximum day production of water in 2016 was 56,498 cubic metres (56.5 million litres) and occurred on Jun. 23, 2016. The minimum day production of water in the same time period was 36,408 cubic metres (36.4 million litres) and occurred on Jan. 01, 2016.

All water provided to the Guelph Drinking Water System and the Gazer Mooney Subdivision Distribution System was treated with sodium hypochlorite (for chlorine disinfection) with some sources also using UV. All supplied water was tested and met all regulatory standards.

City Guelph Water Services maintained the drinking water system in a fit state of repair and followed best industry practices during the repair and maintenance of the system.

Details of ongoing and emerging water quality, supply, and distribution initiatives are outlined in Section J of this report and include successful programs related to: water conservation and efficiency, source water protection, and lead reduction. Water Services continues to implement recommendations of the Water Conservation and Efficiency Strategy with an update to the strategy ongoing. Water Services is implementing source water protection based on an MOECC-approved Source Water Protection Plan. Water Services continues to invest in the Arkell Springs Forest Stewardship Project (to protect the Arkell Wellfield's **source water quality**), and is successfully implementing the Lead Reduction Plan in accordance with the regulatory relief provisions of the SDWA.

Water Services' Operational Testing Program was approved for completion by the MOECC and the related Adaptive Management Plan will continue to assess the aquifer in the area of the Arkell Wellfield and pumping conditions to determine a sustainable capacity with respect to environmental conditions in the area. Infrastructure review occurs regularly between Engineering Services and Water Services to optimize priority projects and minimize common costs. The City maintained a robust backflow prevention program overseeing 2,746 properties with 6,266 backflow prevention devices installed. There were no reported backflow incidents.

The City has completed this Annual & Summary Report to satisfy the regulatory requirements of the Safe Drinking Water Act, O.Reg 170/03 (Section 11 and Schedule 22). For more information please review the online report at guelph.ca/water or contact Guelph Water Services at (519) 837-5627 or waterservices@guelph.ca.

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Introduction

Purpose

The purpose of this report is to provide information to several stakeholders and to satisfy the regulatory requirements of the Safe Drinking Water Act (SDWA) including the Drinking Water Quality Management Standard (DWQMS), and regulatory reporting required under O.Reg. 170/03 (Section 11 and Schedule 22). The report is a compilation of information that helps to demonstrate the ongoing provision of a safe, consistent supply of high quality drinking water to customers located within the City of Guelph and the Gazer Mooney Subdivision (located in the Township of Guelph/Eramosa).

Scope

This Annual & Summary Water Services Report includes information from both the **Guelph Drinking Water System** and the **Gazer Mooney Subdivision Distribution System** for the period of Jan.1 to Jun. 30 (unless otherwise noted). The information is required to be reported to the following:

- the Drinking Water System Owners (Guelph City Council, Chief Administrative Officer (CAO) and Deputy CAO – Infrastructure, Development and Enterprise, and the Township of Guelph Eramosa Council and CAO);
- Top Management members of: Guelph Water Services and Township of Guelph/Eramosa; and
- the public and customers.

This report satisfies the requirements of both the Safe Drinking Water Act (SDWA) and Ontario Regulation 170/03:

- Section 11, Annual Reports which includes:
 - o a brief description of the drinking water systems;
 - o a list of water treatment chemicals used;
 - o a summary of the most recent water test results required under O. Reg. 170/03 or an approval, Municipal Drinking Water Licence (MDWL) or order;
 - o a summary of adverse test results and other issues reported to the Ministry including corrective actions taken;
 - o a description of major expenses incurred to install, repair or replace required equipment;
 - o the locations where this report is available for inspection.

And;

- Schedule 22, Summary Report which includes:
 - o **list the requirements of the Safe Drinking Water Act, the regulations, the system's approval, Drinking Water Works Permit (DWWP), Municipal Drinking Water Licence (MDWL), and any orders applicable to the system that were not met at any time during the period covered by the report;**
 - o for each requirement that was not met, the duration of the failure and the measures that were taken to correct the failure;

- o a summary of the quantities and flow rates of the water supplied during the period covered by the report, including monthly average and maximum daily flows; and
- o a comparison of this information to the rated capacity and flow rates approved in the **system's approval, DWWP** and/or MDWL.

This report satisfies applicable requirements for both the Guelph Drinking Water System and the Gazer Mooney Subdivision Distribution System.

A copy of this report is available for viewing at:

- **F.M. Woods Reception**, 29 Waterworks Place, Guelph;
- **Township of Guelph/Eramosa**, 8348 Wellington Rd. 124, Rockwood; and
- **Online** at guelph.ca/water.

Any inquiries can be made by e-mailing waterservices@guelph.ca or by calling 519-837-5627.

Notice:

Please note that every reasonable effort is made to ensure the accuracy of this report. This report is published with the best available information at the time of publication. In the event that errors or omissions occur, the online report will be updated. Please refer to the online version of the report for the most current version.

Systems Overview

Guelph Drinking Water System

The mission of the City of Guelph's Water Services department ("**Water Services**") is to provide customers and the community with a safe, consistent supply of high quality drinking water while meeting, exceeding, and continually improving on legal, operational, and quality management system requirements.

Water Services strives to provide reliable, cost-effective systems for the safe production and delivery of consistently high quality water.

Water Services is a municipally-owned and operated water utility established in 1879. The Guelph Drinking Water System is a Class IV Water Distribution and Supply Subsystem and is composed of water supply and treatment facilities and a water distribution system. From Jan. 1 to Jun. 30, 2016, forty team members (31 operators, 6 managers, 3 technical staff) were certified to operate and maintain the water systems.

Water Services maintains full scope accreditation to the Drinking Water Quality Management Standard after a successful on-site audit in June 2016 conducted by a third-party accreditation body. This full accreditation satisfies part of the requirements under the Municipal Drinking Water Licensing Program.

The distribution system (including watermains, valves, fire hydrants, services, and meters) serves a population of approximately 129,920 within the City of Guelph. All new system components meet NSF 61¹ requirements or approved equivalents and are installed and maintained in accordance with approved industry standards. The system is fully metered and billed in accordance with the Water and Wastewater Customer Accounts by-law.

The Guelph Drinking Water System distribution system is comprised of the following infrastructure:

- 6.38 kilometres of 900-1,050 mm diameter water supply aqueduct;
- five underground storage reservoirs with a combined approximate capacity of 48,000 cubic metres (48 million litres);
- three water towers with a combined approximate capacity of 11,200 cubic metres (11.2 million litres);
- approximately 549 kilometres of buried watermain with a diameter < 900 mm;
- approximately 4,135 watermain valves;
- approximately 2,749 fire hydrants; and
- approximately 42,686 water services and water meters.

The source of Guelph's drinking water is a series of 21 operational groundwater wells and a shallow groundwater collector system; this system consists primarily of true groundwater sources, with some "groundwater under the direct influence of surface water with effective filtration" (GUDI-WEF) sources (i.e. Carter Well field, Arkell 1 and the Glen Collectors). The Guelph Drinking Water System uses 12 per cent

¹ NSF/ANSI Standard 61: Drinking Water System Components -- Health Effects

Sodium Hypochlorite (that is NSF 60² certified) for primary disinfection at 10 locations and for multi-barrier primary disinfection at three locations. At three locations, ultraviolet light is also applied as part of multi-barrier primary disinfection. At two locations (Helmar Well and Queensdale Well), NSF 60-certified sodium silicate is used for aesthetic purposes to sequester dissolved iron and manganese. In total, Water Services operates and maintains 31 facilities for water. These facilities perform the following functions: sources, supply, treatment, storage or transfer.

The replacement cost of the entire system (excluding Gazer Mooney Subdivision Distribution System) is estimated to be \$541.5 million or approximately \$4,400 per capita. The majority of Guelph Drinking Water System operations are funded directly from the sale of water, with minor additional funding through government grant programs. Property taxes are not used to fund operation or maintenance of the system.

From Jan. 01 to Jun. 30, 2016, a total of 8,695,737 (8.7 billion litres) of water was treated and pumped to the system. The average daily water demand was 47,779 cubic metres (47.8 million litres). The maximum day production of water in 2016 was 56,498 cubic metres (56.5 million litres) and occurred on Jun. 23, 2016. The minimum day production of water in the same time period was 36,408 cubic metres (36.4 million litres) and occurred on Jan. 01, 2016.

From Jan. 1 to Jun. 30, all regulatory microbiological and chemical quality samples were taken by certified operators and tests performed by accredited, licensed laboratories on water samples collected throughout the drinking water system. These tests include both regulatory and operational testing – in most cases only regulatory reporting is included in this report. In all cases, the drinking water supplied to all customers was confirmed safe and the water was of higher quality than all Ontario and Canadian health-related guidelines.

The Guelph Drinking Water System is defined as a large residential system operated under the regulatory requirements of the Safe Drinking Water Act and the Ontario Water Resources Act (accessed at <http://www.e-laws.gov.on.ca>). The Guelph Drinking Water System operated under Municipal Drinking Water Licence (MDWL) 017-101 (issue numbers 6, 7 and 8) and the Drinking Water Works Permit (DWWP) 017-201 (issue numbers 5 and 6).

The MDWL and the DWWP describe system-specific requirements that are supplementary to provincial regulations and act as licences for water supply and distribution operations. These documents outline specific conditions and requirements regarding operation, maintenance and upgrades that are required by the system and are considered regulatory in nature. These documents are available by request for viewing at 29 Waterworks Place, Guelph.

² NSF/ANSI Standard 60: Drinking Water Treatment Chemicals -- Health Effects

Figure 1 shows the locations of the Guelph Drinking Water System facilities that were active in 2016.

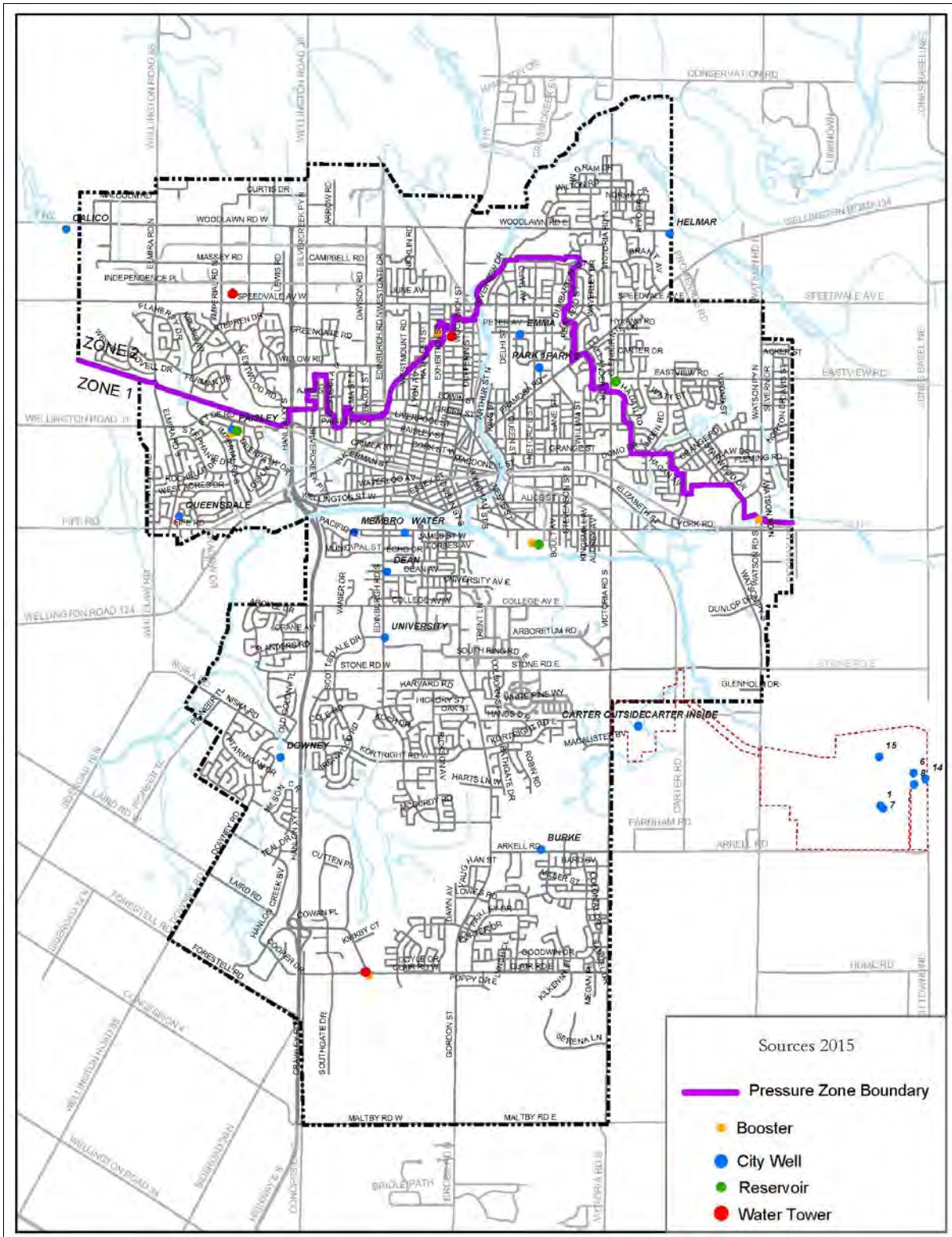


Figure 1: Guelph Drinking Water System Facility Locations

Gazer Mooney Subdivision Distribution System

The Gazer Mooney Subdivision Distribution System is a Class 1 Distribution Subsystem that serves approximately 200 people, and is owned by the Township of Guelph/Eramosa. The system is operated by Water Services through a legal agreement that was last signed by representatives of the City of Guelph and the Township of Guelph/Eramosa on July 30, 2009. The terms of the agreement apply until May 31, 2019. All of the water for the Gazer Mooney Subdivision Distribution System is supplied from the Guelph Drinking Water System. All water is treated to provincial standards in the Guelph Drinking Water System and no further treatment chemicals are added to the Gazer Mooney Subdivision Distribution System.

All new distribution infrastructure components meet NSF 61 requirements or approved equivalents and are installed and maintained in accordance with approved industry standards. The system is fully metered.

The Gazer Mooney Subdivision Distribution System is comprised of the following infrastructure:

- approximately two kilometres of buried watermain with a diameter < 900 mm;
- approximately six watermain valves;
- approximately six fire hydrants; and
- approximately 72 water services and water meters.

The cost of construction of the Gazer Mooney Subdivision Distribution System was listed as \$197,933 in 1980.

The Gazer Mooney Subdivision Distribution System is considered a small residential system and is operated under the regulatory requirements of the Safe Drinking Water Act and the Ontario Water Resources Act which may be found at <http://www.e-laws.gov.on.ca>.

The Gazer Mooney Subdivision Distribution System operated under Municipal Drinking Water Licence No. 104-103 (issue number 1), and Drinking Water Works Permit No. 104-203 (issue number 1). These documents are available by request for viewing at 29 Waterworks Place, Guelph and at Township of Guelph/Eramosa, 8348 Wellington Rd. 124, Rockwood.

Figure 2 shows the location of the Gazer Mooney Subdivision Distribution System.

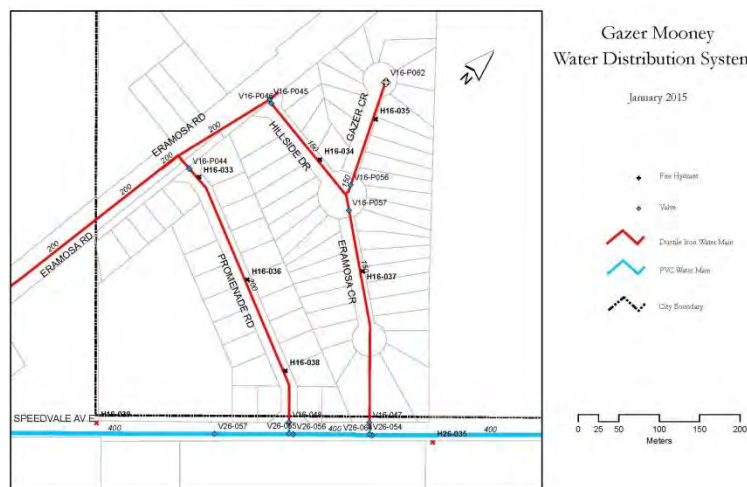


Figure 2: Gazer Mooney Subdivision Distribution System

Annual & Summary Water Services Report

a) Incidents of Regulatory Non-Compliance

This section describes all incidents of non-compliance.

Guelph Drinking Water System

There were no incidents of non-compliance associated with the Guelph Drinking Water System in 2016 (Jan. 01 to Jun. 30).

A score of 88.69% was achieved in the 2014-2015 Ministry of the Environment and Climate Change (MOECC) Annual Inspection Report for the Guelph DWS. Non-compliance items **brought to the Ministry's** attention during the inspection were related to the absence, on one occasion, of monthly UV equipment verification; two occasions where the recording of continuous chlorine monitoring at 5-minute intervals did not occur due to equipment failure; and a measured free chlorine residual in the Distribution system of <0.05 mg/L. Staff are taking additional steps in 2016 to prevent these incidents from reoccurring with the goal of again achieving an inspection score of 100% in 2016 (previously achieved in 2014).

Gazer Mooney Subdivision Distribution System

There were no incidents of non-compliance associated with the Gazer Mooney Subdivision Distribution System in 2016 (Jan. 01 to Jun. 30).

A score of 100% was achieved in the 2015-2016 Ministry of the Environment and Climate Change (MOECC) Annual Inspection Report for the Gazer Mooney SDS.

b) Adverse Water Quality Incidents

This section describes all "Adverse Water Quality Incidents" (AWQI). This term refers to any unusual test result from treated water that does not meet a provincial water quality standard, or situation where disinfection of the water may be compromised. An adverse water quality incident indicates that on at least one occasion and at a certain instance in time, a water quality standard was not met. On average, the Guelph Drinking Water System processes four to five **AWQI's annually**.

Many AWQI's have proven to be the result of water sampling and testing problems rather than poor water quality in the Water System. The process of water quality sampling and testing can result in false positive results; these results can be caused by contaminated sampling containers and equipment, improper sampling technique, handling and transportation, and sampling analysis errors. In almost all cases, mandatory follow-up sampling and analysis confirms that contaminants are not present in the water provided to customers.

Please note: The City was granted full regulatory relief from Schedule 15.1 of O.Reg 170/03 (in its entirety). Any residential tap lead sample results above 10 µg/L collected as per Lead Reduction Plan (LRP) are tracked and reported separately to Wellington-Dufferin-Guelph Public Health, the Ministry of the Environment and Climate Change (MOECC) and the customer. See Section J for more information.

Guelph Drinking Water System

From Jan. 1 – Jun. 30, 2016 there were two **adverse water quality incidents (AWQI's #128568, #129144)** and a summary of these is included in Table 1: Summary of Guelph Drinking Water System Adverse Water Quality Incidents.

Table 1: Summary of Guelph Drinking Water System Adverse Water Quality Incidents

(Jan. 01 to Jun. 30, 2016)

#	Date	AWQI #	Location	Description	Corrective Action	Re-sample Results Good	Deviation from Critical Control Point ³
1	Mar. 10	128568	Kensington Sample Tap (D0245) and Robertson Outlet Sample Tap (S108)	Lead (Pb) result of 11 ppb at D0245 and a result of 95 ppb at S108	Wellington-Dufferin-Guelph Public Health (WDGPH), MOECC, and Spills Action Centre (SAC) were notified. Re-samples showed non-detect results for Lead (Pb) at D0245 plus upstream and downstream locations (S051 and D003 respectively).	Yes	No
2	Apr. 12	129144	Kensington Sample Tap (D0245)	Total Coliform (TC) result of 1 at D0245	Wellington-Dufferin-Guelph Public Health (WDGPH), MOECC, and Spills Action Centre (SAC) notified. Re-samples showed non-detect results for Total Coliforms (TC) at D0245 plus upstream and downstream locations (S006 and D003 respectively).	Yes	No

Gazer Mooney Subdivision Distribution System

From Jan. 1 – Jun. 30, 2016 there were no adverse water quality incidents.

Table 2: Summary of Gazer Mooney Subdivision Distribution System Adverse Water Quality Incidents

(Jan. 01 to Jun. 30, 2016)

#	Date	AWQI #	Location	Description	Corrective Action	Re-sample Results Good	Deviation from Critical Control Point
	n/a	n/a	n/a	n/a	n/a	n/a	n/a

c) Deviations from Critical Control Point (CCP) Limits and Response Actions

This section describes any deviation from essential steps or points in the drinking water system at which control can be applied to prevent or eliminate a drinking water hazard or to reduce it to an acceptable

³ Please see section C of this report for a description of "critical control points".

level. These essential steps or points in the system are known as critical control points (CCP). The CCPs are used to identify control measures that are in place to address hazards and hazardous events. These CCPs are in part stipulated by regulation and in part derived through risk assessment of the Drinking Water System.

Water Services' Critical Control Points include:

- primary disinfection,
- secondary disinfection, and
- backflow prevention.

Additional information (e.g. critical control limits and response actions) is included in **Appendix "A" in the "Summary of Critical Control Points and Critical Control Limits"**.

Deviations from the CCPs are reported to both the Owners and Top Management, and are summarized in the tables included in Section B of this report. There were no deviations from CCP Limits in 2016 (Jan. 01 to Jun. 30).

d) The Efficacy of the Risk Assessment Process

This section confirms the occurrence of reviews of the risk assessment process to determine the effectiveness of the process in identifying and appropriately assessing the risk of hazardous events and hazards, and in identifying the appropriate control measures, critical control points (CCPs) and related critical control limits (CCLs).

The annual risk assessment review **described in "QMS 07 Risk Assessment"** was conducted by Water Services' Continuous Improvement Team Members on Nov. 11, 2015, subsequently approved at a Management Review Meeting on Jan. 28, 2016 and presented in **Appendix "B"** (in summary format).

Following the MOECC's posting of the "Potential Hazardous Events for Municipal Residential Drinking Water Systems to Consider in the DWQMS Risk Assessment" document on the Environmental Bill of Rights, Water Services initiated a more detailed review and update of its risk assessment process, ratings scheme and table formats that formed part of the January 2016 record.

The following hazardous events were added:

- Long-term impacts of climate change (e.g. drought and extreme weather events),
- Source water supply shortfall (e.g. sudden changes to raw water characteristic, aqueduct infrastructure failure),
- Sustained extreme temperatures (e.g. heat wave and deep freeze, such as frozen services),
- Terrorist Threat and Vandalism.

e) Internal and Third-Party Audit Results

This section describes any of the audit outcomes identified to date that require follow-up actions.

Internal auditing and third-party auditing is performed to fulfill the mandatory requirements of the Drinking Water Quality Management Standard (DWQMS). The internal audit is completed using trained internal staff. The purpose of audits is to evaluate the level of conformance of Water Services to the DWQMS. Audits identify both conformance and non-conformance with the Standard as well as opportunities for improvement. **Appendix "C" includes the past 3 years' internal and external audit plans.**

The last internal process audits were completed on Dec. 4-15, 2015. No nonconformities were identified during these internal audits. Various opportunities for improvement suggested by staff (such as improved communications, tracking of service request status, document and records control, training, preventive maintenance, emergency preparedness, and continual improvement tracking) were also noted in the internal audit report. Water Services continuously strives to address issues identified in internal audits. The next scheduled internal audit will take place in December 2016.

The 2016 third-party external on-site audit was completed on Jun. 8 to Jun. 10, 2016. There was one nonconformity identified during this audit related to reporting to the Owner the results of Management Review meetings (deficiencies, decisions and action items), as required under element 20 of the DWQMS. Noted opportunities for improvement by the auditor were related to improving the following processes: document and records control (QMS 05); tracking staff training related to QMS (QMS 10); infrastructure maintenance programs (QMS 15); and instrument calibration (QMS 17). The corrective action issued and opportunities for improvement will be reviewed by the external auditor at the next on-site audit scheduled in November 15-17, 2017.

f) Results of Emergency Response Testing

Emergency response testing is regularly completed as part of the Water **Services' Quality Management System (QMS)** to ensure that Water Services maintains a reasonable readiness to deal with emergencies and abnormal events. The ability to properly manage emergencies and unplanned failures is critical in demonstrating that Water Services has taken a diligent approach in its operations.

Feedback from emergency testing and from actual events is gathered during debriefing sessions and improvement items are incorporated into the Emergency Plan and /or daily operations.

The last emergency test exercise **used the MOECC's new "Watermain Disinfection Procedure" and** took place on Jan. 7, 2016. The test exercise involved Water Services staff and representatives from the MOECC (Inspector and district office Manager) and Wellington-Dufferin-Guelph Public Health (WDGPH).

Water Services staff continue to work on closing corrective actions initiated from debriefing sessions related to Winter 2014-2015's major frozen services events. Council approved its Frozen Water Pipe Policy in November 2015 and Water Services is **presenting its "Frozen Water Services Update Report – Capital Reconstruction Program and Sub-standard Service Replacement Program" report to council in September 2016.**

Table 3 includes the dates of Completed Emergency Response Tests for the past three years.

Table 3: Emergency Response Tests (exercises noted as “test” in brackets)

Hazardous Event / Hazard ⁴	2014	2015	2016
Long-term impacts of climate change			Dec. 2016 (test planned)
Source water supply shortfall			Dec. 2016 (test planned)
Extreme weather events (e.g. tornado, ice storm)			Mar. 23-25, 2016 (ice storm)
Sustained extreme temperatures (e.g. heat wave, deep freeze)	Feb-Mar, 2014 (frozen services)	Feb-Apr, 2015 (frozen services)	
Chemical spill impacting source water			
Sustained pressure loss			Jan. 7, 2016 (test)
Backflow / Cross-connection	Feb. 11, 2014 (test)		
Terrorist threat			
Vandalism			
Sudden changes to raw water characteristics (e.g. turbidity, pH)	Membro Well (Carter in 2013) investigation	Rehabilitation: Membro Well / Carter Wells	Improvements: Membro Well / Carter Wells
Failure of equipment or process associated with primary disinfection (e.g. UV, chlorination)			
Failure of equipment or process associated with secondary disinfection (e.g. chlorination)			
Loss or contamination of treated water supply			Jan. 7, 2016 (test)
Loss of monitoring system			Jan. 14, 2016 (fibre network failure)
City of Guelph Corporate-Level Test by the EOCG	Jul-Aug, 2014 (labour)	Nov. 23, 2015 (test)	3 dates planned for Sep-Oct, 2016 (test)

g) Operational Performance and Statistics

The following section describes Operational performance statistics within Water Services that includes:

- 2016 Totalized Pumpages as per the Municipal Drinking Water Licence and Permits to Take Water;
- 2016 Instantaneous Flows as per Permit to Take Water requirements;
- Water Production and Population;
- 2016 Collector Flows; and
- System Maintenance and Updates.

2016 Totalized Pumpages and Instantaneous Flows (Jan. 01 to Jun. 30).

The Safe Drinking Water Act (SDWA) and the Ontario Water Resources Act (OWRA) each require that operating authorities record and report both water takings as governed by Permits to Take Water (PTTWs), and water being supplied to the City of Guelph.

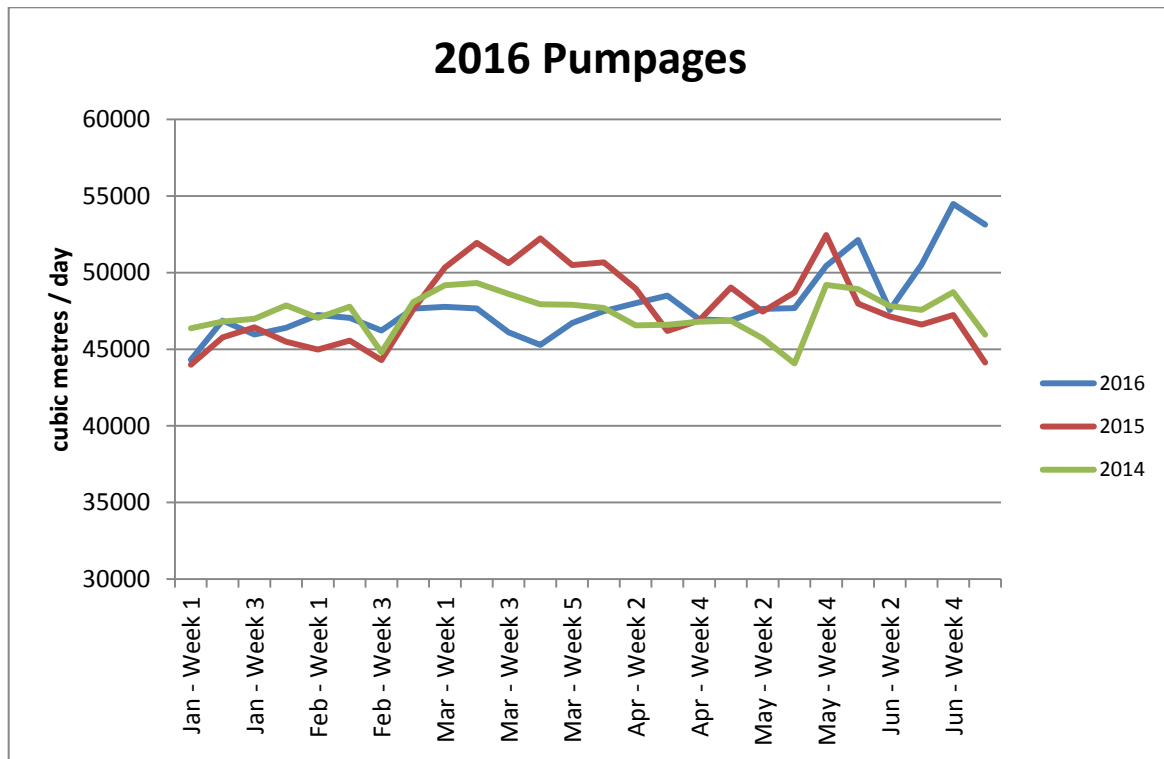
Summaries of total water pumped, instantaneous flows and capacity (flows and volumes compared to rated capacities) by the City of Guelph can be found in Appendix “D” – Total Water Pumped and Instantaneous Flows.

⁴ The Hazardous Event / Hazard list has been updated to reflect MOECC’s mandated “Potential Hazardous Events for Municipal Residential Drinking Water Systems to Consider in the Risk Assessment” document.

2016 Totalized Pumpages (Jan. 01 to Jun. 30).

Figure 3 below depicts the water pumpage rate in cubic metres per day (m^3/day) that is averaged each week.

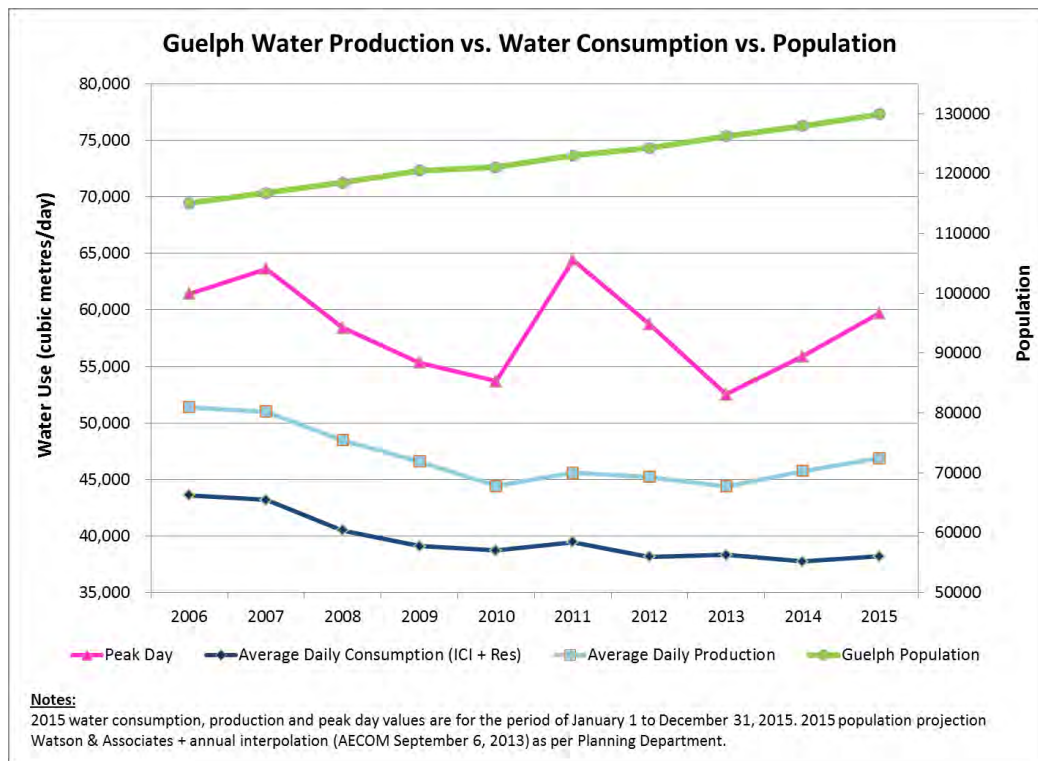
Figure 3: 2016 Totalized Pumpages (Jan. 01 to Jun. 30)



Water Services processed 8,695,737 cubic metres (8.7 billion litres) of water to the distribution system in 2016 (Jan. 01 to Jun. 30). This represents 0.16 per cent more water being supplied to the distribution system in 2016 as compared to the same time period in 2015 and 1.0 per cent more water than in 2014. *The increase in water use in June 2016 over the previous two years is likely due to the lack of precipitation – the Outside Water Use Program moved to Level 1 Yellow watering restrictions on June 6th.* The average daily water demand was 47,779 cubic metres (47.8 million litres). The maximum day production of water in 2016 was 56,498 cubic metres (56.5 million litres) and occurred on Jun. 23, 2016. The minimum day production of water in the same time period was 36,408 cubic metres (36.4 million litres) and occurred on Jan. 01, 2016.

Water Production vs. Water Consumption

Figure 4: Guelph Water Production vs. Water Consumption vs. Population that follows depicts the maximum pumpages (peak water days), average daily water production, and average daily water consumption rates in cubic metres per day (m^3/day) as compared against **Guelph's** population.

Figure 4: Guelph Water Production vs. Water Consumption vs. Population

Collector Flows

The Arkell Spring Grounds Collectors (“Collectors”), one of **Guelph’s** many water sources, consist of a gravity-fed under-drain system that collects shallow overburden groundwater. This system has been in use since the early 1900s and can represent as much as 40 per cent of the total city-wide daily water production. When the output of this source is reduced, Water Services is required to make up the difference from other water supplies. Throughout the year, the production from this water supply varies from an approximate low of 4,000 cubic metres (4 million litres) up to an approximate high of 20,000 cubic metres (20 million litres) per day.

The Collectors can also be used as a measurable index of the state of the environment (i.e. very dry to very wet as they respond to rainfall and other environmental conditions). The volume of water that the Collectors produce is one of the benchmarks used in the decision-making process to determine the appropriate level for the **City’s outside water use program**.

Seasonally, between April 15th and November 15th, the City has a PTTW (permit to take water) that allows water to be pumped from the Eramosa River to a pond and trench-based **“Recharge System”**. In the Recharge System, the river water is filtered in-situ through the ground and approximately 50 per cent of the flow is captured in the Glen Collector System. It should be noted that the Recharge System was not utilized from 2011 through 2014 in order to accommodate the Arkell OTP/AMP (Operational Testing Plan / Adaptive Management Plan) which was a condition of the Arkell Well Field PTTW (Permit to Take Water). The Recharge System was returned to service for the 2015 season. In 2016, the Recharge System has been out of service to accommodate infrastructure improvements including an extension of the trench

system in an effort to capture more water in the Collectors and upgrades to the weir system. The Recharge System is scheduled to be returned to service in September 2016.

The productivity of the Collectors can be used as one of many predictive tools. If the production volume from the Collectors is low, then it can be assumed that other water supplies would be needed to make up the difference. This may alter how regular maintenance is performed as well as the urgency with which repairs are made to supplies that unexpectedly go off-line as they may be needed to supplement overall production for the City when the Collector System is unable to produce a sufficient supply.

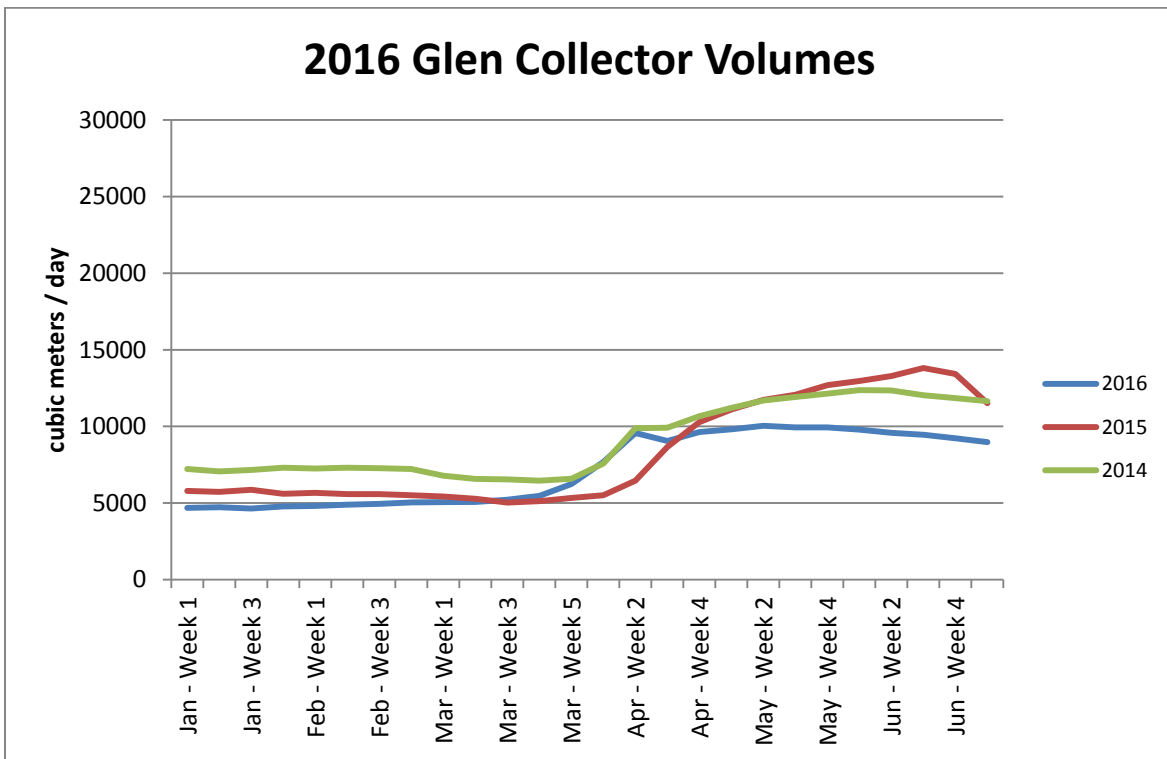
The Collectors have produced 1,304,436 cubic metres (1.3 billion litres) of water in 2016 (Jan. 01 to Jun. 30). This represents 13.6 per cent less water as compared to the same time period in 2015 and 24.4 per cent more water than in 2014.

For a visual representation, please refer to Figure 5: 2016 Glen Collector Volumes (Jan. 01 to Jun. 30):

2016 Glen Collector Volumes (Jan. 01 to Jun.30).

Figure 5 below depicts the Glen Collector flow rate in cubic metres per day (m³/day) that is averaged each week.

Figure 5: 2016 Glen Collector Volumes (Jan. 01 to Jun. 30)



Please note that collector flow was not augmented by the addition of Recharge water from the Eramosa river in 2011 through 2014 and in 2016.

System Maintenance and Updates

The tables that follow summarize Water Services' maintenance work – for Distribution (Table 4) and for Supply (Table 5).

Table 4: Distribution Maintenance Activity

Job Type	2014 Q1&2	2014 Q3&4	2014 Total	2015 Q1&2	2015 Q3&4	2015 Total	2016 Q1&2	2016 Q3&4	2016 Total
Acoustic Leak – Dry	0	3	3	0	1	1	0		
Blow Off Install	0	2	2	0	0	0	0		
Dig to find leak	1	2	3	1	0	1	1		
Hi/Low Jumper Install	0	0	0	0	0	0	0		
Hydrant Install (WW)	0	0	0	0	0	0	0		
Hydrant Remove	1	0	1	0	0	0	1		
Hydrant Repair	2	31	33	2	7	9	0		
Hydrant Repair Hit	0	2	2	0	0	0	0		
Hydrant Replace (WW)	0	6	6	0	1	1	2		
Hydrant Replace Hit	1	1	2	0	0	0	0		
Main Break	58	19	77	57	14	71	26		
Other (e.g. exploratory excavations, miscellaneous repairs, etc.)	3	7	10	2	2	4	1		
Re-route Watermain	0	0	0	0	0	0	0		
Sample Station Install	0	0	0	0	0	0	0		
Sample Station Replace	0	0	0	0	0	0	0		
Service Cut Off	5	7	12	0	5	5	1		
Service Lowered	3	0	3	0	0	0	0		
Service New Install	0	0	0	0	0	0	0		
Service Repair	47	69	116	54	45	99	58		
Service Replace Lead (City-side)	1	2	3	1	1	2	0		
Service Replace Non-Lead	2	16	18	9	16	25	8		
Trench Repair	-	-	-	-	-	-	1		
Valve Install (WW)	0	2	2	0	6	6	0		
Valve Remove	0	0	0	0	0	0	0		
Valve Repair	4	10	14	1	4	5	3		
Valve Replace (WW)	8	14	22	9	5	14	1		
Meters New	217	200	417	141	412	553	336		
Meters Exchanged	373	244	617	202	423	625	286		
ITEMS REPORTED ANNUALLY:									
Hydrants new/replaced by Eng.	-	-	24	-	-	52	-	-	

Job Type	2014 Q1&2	2014 Q3&4	2014 Total	2015 Q1&2	2015 Q3&4	2015 Total	2016 Q1&2	2016 Q3&4	2016 Total
Total City Hydrants	-	-	2,698	-	-	2,749	-	-	
Leak Detection (km of metallic watermains)	-	-	287	-	-	287	-	-	
Valves new/replaced by Eng.	-	-	28	-	-	122	-	-	
Total City Main Valves	-	-	4,062	-	-	4,135	-	-	
Watermains new/replaced by Eng. (km)	-	-	3.25	-	-	9.13	-	-	
Total Watermains Excluding Aqueduct (km)	-	-	542.1	-	-	548.5	-	-	
Watermains Cleaned (km)	-	-	195.3	-	-	107.1	-	-	
Watermains Re-lined (m)	-	-	0	-	-	0	-	-	

The next table includes Water Supply-related major maintenance activities and expenditures (may include programs that have a series of projects)

Table 5: Major Water Supply Maintenance Activity

Major Maintenance Activity / Expenditure	Well Site(s)
Electrical and Instrumentation Upgrades	Various Sites
Facility Repairs and Maintenance	Various Sites
Fencing and Security Upgrades	Various Sites
Monitoring and Process Equipment Replacements	Various Sites
Process Piping Upgrades	Various Sites
Recharge Phase 1 Upgrades	Arkell Spring Grounds
UV and Process Upgrades	Membro Well
Well Inventory Database	Various Sites
Well Rehabilitation, Liner Installation and Pump Replacement	Dean Well
Well Replacement	Membro Well

Water Distribution Locates

In 2014, The City of Guelph registered its utility infrastructure with ON1Call as mandated by the *Ontario Underground Infrastructure Notification System Act 2012*.

Since registering, the City experienced a significant increase in locate request volumes. This increase in volume ensures that the Water Services division is notified of and attends a locate for every excavation in proximity to water infrastructure; enabling the division to further prevent damage **and protect Guelph's** water quality and quantity.

In order to provide efficient locate services across the corporation, the City has been transitioning all of its infrastructure locates into one corporate group. This includes water, sanitary and storm sewers, traffic signals, and fibre optics. In February 2016, one full time utility locator was hired, and the peak season has been supplemented with temporary utility locators. Utility locators now locate all infrastructure in one site

visit rather than each department individually. Table 6 includes all water locate requests received and responded to for the period of Jan.1 to June 30, 2016 with a year to year comparison below.

Table 6: Water Distribution Locates

Number of locate requests received by month - 2016												
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
285	263	697	1,031	1,048	1,100							4,424

Historical locate requests received	
Year	Total
2015	9,255
2014	8,943
2013	7,884

Table 7: Summary of 2016 **Form 1's and Form 2's** includes the summary of **Form 1's and Form 2's** completed over the course of 2016 (Jan. 01 to Jun. 30). These forms are required to document significant changes to the drinking water system. Engineering Services **staff complete "Form 1 – Record of Watermains Authorized as a Future Alteration" and** retain copies in applicable project files and Water Services **staff complete "Form 2- Record of Minor Modification or Replacements to the Drinking Water System"** that are retained by the Compliance Coordinator.

Table 7: Summary of 2016 Form 1's and Form 2's

Date	Form # - Description of Authorized and/or Minor Modifications
January	<i>Form 2</i> – Helmar Well. Well pump replacement.
February	<i>Form 2</i> – Emma Street Well. Well pump replacement. <i>Form 2</i> – Calico Well. Installed an isolation valve on the P.O.E. process piping. <i>Form 2</i> – Calico Well. Installed an isolation valve on the raw water process piping to allow for recirculation.
March	<i>Form 2</i> – Dean Well. Well liner installed. <i>Form 2</i> – Robertson Booster Station. New P.O.E. sample tap installed.
April	<i>Form 2</i> – Dean Well. Well pump replacement. <i>Form 2</i> – Arkell 6. Well flow meter replacement.
May	<i>Form 2</i> – Dean Well. Upgraded treated water process piping including a re-circulation system and the addition of two isolation valves. <i>Form 2</i> – Dean Well. Replaced an isolation valve on the P.O.E. process piping. <i>Form 2</i> – F.M. Woods and Clair Tower. SCADA Server back-up systems installed.
June	<i>Form 2</i> – Downey Well. Increased the size of the sodium hypochlorite chemical storage tank from 500 L to 910 L. This allows for an adequate supply of sodium hypochlorite to treat increased flows from Downey Well. <i>Form 2</i> – Membro Well. Well level probe installed. <i>Form 2</i> – Dean Well. Well level probe installed. <i>Form 2</i> – Dean Well. Booster flow meter replacement.

h) Raw and Treated Water Quality – Guelph Drinking Water System

This section describes the water quality monitoring, both regulatory and operational, that has been completed in 2016 (Jan. 01 to Jun. 30).

Water Quality Review – Guelph Drinking Water System

Under the Safe Drinking Water Act (SDWA), municipalities are required to monitor both the raw and treated quality of the source water supplied. This monitoring is performed for both regulatory compliance and due diligence and is expected to identify any changes within the treated water as well as in raw source waters.

A note about all tables included in this section:

1. All regulated chemical parameters where values above the lab's MDL (minimum detection limit) have been detected in the City of Guelph's treated water sources are underlined indicating a hyperlink to an Excel Workbook in Guelph's electronic document management system (EDMS). **Note: EDMS is available for internal use only.** The workbook contains a definition of the parameter and an Excel worksheet for each treated source where the parameter has been detected with values for all sample results from Jan. 01, 2007 to Jun. 30, 2016. This database is used to closely track the instances of the identified chemical parameters and therefore provide time for planning / budgeting if treatment or an alternative supply is eventually required due to the presence of a given parameter. The database is updated semi-annually.
2. Tabulated values are from best available information at the time of table creation. While the values above satisfy the minimum regulatory requirements, Water Services performs many additional operational tests not listed in this report.
3. If sampling for a particular schedule's parameters (e.g. Schedule 23 and 24) did not occur within the calendar year of the report, then the most recent values are required to be included in the report for reference.
4. All acronyms and initialisms included in tables are described in **Appendix "J" – Glossary.**

The following section summarizes daily Distribution free chlorine residual test results required by O. Reg. 170/03 Schedule 7-2 where "secondary disinfection" is provided for the period of Jan. 01 to Jun. 30, 2016. The Verney Tower sample point is used to represent the water quality provided by the Zone One distribution system pressure zone and the Speedvale Tower sample point represents the water quality provided by Zone Two for the purposes of the regulation. Please note that the City of Guelph takes **additional "operational" daily Distribution samples and** tests for free chlorine residual in order to better monitor the free residual in the Distribution System and respond accordingly. There was no instance of an adverse result in 2016 (Jan. 01 to Jun. 30) associated with these sampling sites.

Table 8: O. Reg. 170/03 Schedule 7-2, City of Guelph - Distribution Manual Free Chlorine Residual Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS Criteria	Total Analyses	Total Samples above Detection Limit	Total Outside ODWQS Criteria	Range	Units
Free Chlorine Residual – Zone One	0.05 – 4.0	182	182	0	0.51 – 1.02	mg/L
Free Chlorine Residual – Zone Two	0.05 – 4.0	182	182	0	0.74 – 1.06	mg/L

Table 9 summarizes raw bacteriological sampling and test results required by O. Reg. 170/03 Schedule 10-4 for the period of Jan. 01 to Jun. 30, 2016.

- Number of raw samples taken: 481
- Number of raw analyses: 1,445

Table 9: O. Reg. 170/03 Schedule 10-4, City of Guelph - Raw Bacteriological Sampling Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS Criteria	Total Analyses	Total Outside ODWQS Criteria	Range	Units
Raw - E. coli	n/a	481	n/a	0	cfu/100 mL
Raw - Total Coliform	n/a	481	n/a	0 - 2	cfu/100 mL
Raw - HPC	n/a	2	n/a	0	cfu/mL
Raw - Background	n/a	481	n/a	0 – 26	cfu/100 mL
Raw River Source (prior to in situ filtration) – E. coli	n/a	0	n/a	n/a	cfu/100 mL
Raw River Source (prior to in situ filtration) – Total Coliform	n/a	0	n/a	n/a	cfu/100 mL
Raw River Source (prior to in situ filtration) - Background	n/a	0	n/a	n/a	cfu/100 mL

Table 10 summarizes treated bacteriological sampling and test results required by O. Reg. 170/03 Schedule 10-3 and 6-3 for the period of Jan. 01 to Jun. 30, 2016.

- Number of POE samples taken: 276
- Number of POE analyses: 1,380
- Number of Distribution samples taken: 835
- Number of Distribution analyses: 4,071

Table 10: O. Reg. 170/03 Schedule 10-2, 10-3 and 6-3, City of Guelph - Treated Bacteriological Sampling Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS Criteria	Total Analyses	Total Outside ODWQS Criteria	Range	Units
POE - E. coli	0	276	0	0	cfu /100 mL
POE - Total Coliform	0	276	0	0	cfu /100 mL
POE - HPC	n/a	276	n/a	0 - 8	cfu /mL
POE - Background	n/a	276	n/a	0	cfu /100 mL
POE - Free Chlorine Residual	0.05 to 4.0	276 ⁵	0	0.65 - 1.33	mg/L
Distribution - E. coli	0	835	0	0	cfu /100 mL
Distribution - Total Coliform	0	835	1 ⁶	0 - 1	cfu /100 mL
Distribution - HPC	n/a	395	n/a	0 - 14	cfu /mL
Distribution - Background	n/a	835	n/a	0 - 2	cfu /100 mL
Distribution - Free Chlorine Residual	0.05 to 4.0	1,171	0	0.27 - 1.19	mg/L

The following section summarizes raw source turbidity sampling and test results required by O. Reg. 170/03 Schedule 7-3 for the period of Jan. 01 to Jun. 30, 2016. Schedule 7-3 requires a "Monthly" sampling schedule, the City of Guelph samples all raw sources and tests for turbidity on a weekly basis to better monitor this aspect of raw water quality.

Table 11: O. Reg. 170/03 Schedule 7-3, City of Guelph - Raw Source Turbidity Sampling Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS Criteria	Total Analyses	Total Samples above Detection Limit	Total Outside ODWQS Criteria	Range	Units
Raw Source Turbidity	n/a	481	481	n/a	0.05- 0.73	ntu

Microparticulate and Laser Particle Counting Sampling

As a part of the Guelph Drinking Water System's Municipal Drinking Water Licence (MDWL), Guelph Water services is required, twice annually, to assess the Arkell Collector System which is groundwater under the influence of surface water with effective in situ filtration (GUDI-WEF). The purpose of the assessment is to ensure that the source continues to meet the GUDI-WEF source water characteristics as outlined by the MOECC. Sampling was performed on this water source in the spring of 2016. The source continues to meet the GUDI-WEF source water characteristics.

⁵ Total number of samples used specifically to satisfy the requirements of O.Reg. 170/03 Schedule 10-3 and 6-3 (Treated Source samples taken for Operational purposes are not included).

⁶ Reported as AWQI #129144 and described in Table 1 of this document.

Treated Water Quality Statistics – O. Reg. 170/03 Schedule 6-5 - “Continuous Monitoring” Results Summary

Water Services utilises over twenty regulatory and operational continuous monitoring devices to measure water quality. Each regulatory device has controls associated with it such that in the event that the device detects that a measured value is outside the acceptable parameters for that location, the device causes an alarm to be sent to an operator for immediate response (24 hours per day seven days per week) and either automatically shuts down the station or activates a second alarm for immediate operator response. Both the minimum allowable levels (if applicable) and the target values for Water Services regulatory continuous monitoring devices are listed below. The target values represent a safety margin to help ensure that regulatory requirements are satisfied at all times. Please note that with the exception of the values reported in the AWQI section of this report if applicable (Section B), **continuous monitoring values all fell within acceptable regulatory standards in 2016** (Jan. 01 to Jun. 30).

Table 12: O. Reg. 170/03 Schedule 6-5, “Continuous Monitoring” Results Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWOS or Regulatory Minimum	Target Range	Units
Point of Entry Free Chlorine Residual	0.05 mg/L	Greater than 0.4	mg/L
UV Dose F.M. Woods Station	24 mJ/cm ²	Greater than 40	mJ/cm ²
UV Dose Urban Wells	40 mJ/cm ²	Greater than 45	mJ/cm ²

Treated Water Quality Statistics – O. Reg. 170/03 Schedule 13-6 and 13-7, “Three Month” Sampling Results Summary

In 2016, all operational Treated Sources were sampled and analyzed for Schedule 13-6 and 13-7 parameters as per O. Reg. 170/03.

Regulation 170/03, Schedule 13-6 requires a minimum of one distribution sample taken from the **Distribution System where THM’s (trihalomethanes) are most likely to develop** (locations with high retention times). Water Services uses Speedvale Tower, Clair Tower and Paisley Reservoir for this purpose in the Guelph Drinking Water System. **The Maximum Allowable Concentration (MAC) for THM’s is 0.1 mg/L.** However, for this parameter the MAC uses a running annual average of quarterly samples.

The results of the running annual average value for THM’s for all related Distribution System samples in 2016 (Jan. 01 to Jun. 30) is below the half of the maximum allowable concentration (½ MAC).

All operational Treated Sources were sampled and analyzed for Nitrates and Nitrites as per Regulation 170/03, Schedule 13-7. **There was no instance of an adverse result in 2016** (Jan 01 to Jun. 30). Raw sampling results are also shown in Table 13 (ODWQS do not apply to these values).

Table 13: O. Reg. 170/03 Schedule 13-6 and 13-7, City of Guelph - "Three Month" Sampling Results Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS MAC	½ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
<u>Trihalomethanes</u>	0.100 ⁷	n/a	8	8	0	0.0263	0.0534	0.0325 ⁶
<u>Nitrate + Nitrite (as nitrogen)</u>	10	5	34	22	0	< 0.10	2.28	1.06
<u>Nitrate + Nitrite (as nitrogen) – Woods' Raw Sources (Operational Sampling)</u>	n/a	n/a	21	21	n/a	0.36	3.63	1.29
<u>Nitrate + Nitrite (as nitrogen) – University Raw Source (Operational Sampling)</u>	n/a	n/a	3	3	n/a	0.28	0.73	0.44
<u>Nitrate + Nitrite (as nitrogen) – Paisley Raw Source (Operational Sampling)</u>	n/a	n/a	3	3	n/a	1.88	2.06	1.99

Treated Water Quality Statistics – Operational VOC Scan Results Summary

Please note that Schedule 13-6 and Schedule 24 parameters are also part of the "Operational VOC Sampling Regime" and therefore the values in the "Operational VOC Scan Results Summary" in Appendix "E" include a repetition of the relevant data from the Schedule 13-6 and Schedule 24 tables. The "Operational VOC Scan Results Summary" lists the total number of samples analyzed for these parameters in 2016 (Jan. 01 to Jun. 30, 2016). Table 14 (below), highlights specific VOC parameters due to their presence / significance within the water supply. There was no instance of an adverse result in 2016.

Table 14: City of Guelph Operational VOC Scan Selected Results Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS MAC	½ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
<u>Trichloroethylene</u>	0.005	0.0025	76	27	0	< 0.0001	0.00219	0.0005
<u>Trihalomethanes⁸</u>	0.100 ⁹	n/a	78	31	0	< 0.0002	0.0392	0.01235

⁷ This standard is expressed as a running annual average.

⁸ This subset of trihalomethane samples represents sampling from treated sources and does not refer to the previous distribution system sampling

⁹ This standard is expressed as a running annual average.

Treated Water Quality Statistics – O. Reg. 170/03 Schedule 23 Results Summary

In 2016, all operational “Treated Sources” were sampled and analyzed for Schedule 23 parameters as per O. Reg. 170/03. All of the City of Guelph’s treated ground water sources are on a three year sampling schedule. F.M. Woods’ Station is the exception and is sampled on the annual surface water schedule due to the fact that three of the eight sources that supply F.M. Woods are GUDI-WEF sources (the Carter Well field, Arkell 1 and the Arkell Glen Collectors).

The results of the Schedule 23 inorganic parameter analysis in 2016 were all under the half of the maximum allowable concentration (½ MAC) and the majority were under the laboratory’s MDL (minimum detection level). Please refer to the section entitled “O. Reg. 170/03 Schedule 23 Results Summary” included in Appendix “E” for more information.

The next scheduled “Three Year” Schedule 23 sampling event takes place in the third quarter of 2019.

The results of the Annual Schedule 23 inorganic parameter analysis in 2016 for F.M. Woods’ Station were all under the ½ MAC and the majority were under the laboratory’s MDL (minimum detection level).

Table 15: O. Reg. 170/03 Schedule 23, 13-2a, City of Guelph - Annual Schedule 23 Sampling Results Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS MAC	½ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
<u>Antimony</u>	0.014	0.007	2	0	0	<0.0005	<0.0005	n/a
<u>Arsenic</u>	0.025	0.0125	2	0	0	< 0.001	< 0.001	n/a
<u>Barium</u>	1.0	0.5	2	2	0	0.044	0.044	0.044
<u>Boron</u>	5.0	2.5	2	2	0	0.013	0.016	0.015
<u>Cadmium</u>	0.005	0.0025	2	0	0	0.00011	0.00013	0.00012
Chromium	0.05	0.025	2	0	0	< 0.005	< 0.005	n/a
Mercury	0.001	0.0005	1	0	0	< 0.0001	< 0.0001	n/a
Selenium	0.01	0.005	2	0	0	< 0.002	< 0.002	n/a
<u>Uranium</u>	0.02	0.01	2	2	0	0.00070	0.00076	0.00073

Treated Water Quality Statistics – O. Reg. 170/03 Schedule 24 Results Summary

In 2016, all operational “Treated Sources” were sampled and analyzed for Schedule 24 parameters as per O. Reg. 170/03. All of the City of Guelph’s treated ground water sources are on a three year sampling schedule. F.M. Woods’ Station is the exception and is sampled on the annual surface water schedule due to the fact that three of the eight sources that supply F.M. Woods’ are GUDI-WEF sources (the Carter Well field, Arkell 1 and the Glen Collectors).

The results of the Schedule 24 organic parameter analysis in 2016 were all under the half of the maximum allowable concentration (½ MAC) and the majority were under the laboratory’s MDL

(minimum detection level). Please refer to the section entitled "O. Reg. 170/03 Schedule 24 Results Summary" included in Appendix "E" for more information.

It should be noted that values for TCE (trichloroethylene) at Membro and Emma have on occasion, crested the ½ MAC value of 0.0025 mg/L and as a result Water Services has moved to an "Increased Frequency Sampling Plan" as required by Regulation 170/03 - 13-5 which requires that sampling for this parameter be sampled every "three months" until two consecutive sample results are below the ½ MAC value. As a precautionary measure, Water Services samples both raw and treated sources on a monthly schedule at Membro and Emma. All other sources, both raw and treated, are sampled annually (minimally) for VOC's (Volatile Organic Carbons) through a "Guelph VOC Scan" in order to better track parameters such as TCE via more data. Currently, TCE is above the MDL but below the ½ MAC at Membro, Water Street, Park and Paisley* POE.

*The TCE at Paisley POE can be attributed to Emma, Membro, Water Street and Park source water via the Paisley Reservoir low zone fill line as VOC analysis from 2007 to the present on Paisley raw water shows values below the lab's MDL (minimum detection level) for all parameters.

The next scheduled "Three Year" Schedule 24 sampling event takes place in 2019.

The results of the Annual Schedule 24 organic parameter analysis in 2016 for F.M. Woods' Station were all under the half of the maximum allowable concentration (½ MAC) and the laboratory's MDL (minimum detection level).

Table 16: O. Reg. 170/03 Schedule 24, 13-4a, City of Guelph - Annual Schedule 24 Sampling Results Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS MAC	½ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Alachlor	0.005	0.0025	1	0	0	< 0.0005	< 0.0005	n/a
Atrazine + N-dealkylated metabolites	0.005	0.0025	1	0	0	< 0.001	< 0.001	n/a
Azinphos-methyl	0.02	0.01	1	0	0	< 0.002	< 0.002	n/a
Benzene	0.005	0.0025	3	0	0	< 0.0001	< 0.0001	n/a
Benzo(a)pyrene	0.00001	0.000005	1	0	0	< 0.000009	< 0.000009	n/a
Bromoxynil	0.005	0.0025	1	0	0	< 0.0005	< 0.0005	n/a
Carbaryl	0.09	0.045	1	0	0	< 0.005	< 0.005	n/a
Carbofuran	0.09	0.045	1	0	0	< 0.005	< 0.005	n/a
Carbon Tetrachloride	0.005	0.0025	3	0	0	< 0.0001	< 0.0001	n/a
Chlorpyrifos	0.09	0.045	1	0	0	< 0.001	< 0.001	n/a
Diazinon	0.02	0.01	1	0	0	< 0.001	< 0.001	n/a
Dicamba	0.12	0.06	1	0	0	< 0.001	< 0.001	n/a
1,2-Dichlorobenzene	0.2	0.1	3	0	0	< 0.0002	< 0.0002	n/a
1,4-Dichlorobenzene	0.005	0.0025	3	0	0	< 0.0002	< 0.0002	n/a

Parameter	ODWQS MAC	½ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
1,2-Dichloroethane	0.005	0.0025	3	0	0	< 0.0002	< 0.0002	n/a
1,1-Dichloroethylene (vinylidene chloride)	0.014	0.007	3	0	0	< 0.0001	< 0.0001	n/a
<u>Dichloromethane</u>	0.05	0.025	3	0	0	< 0.0005	< 0.0005	n/a
2,4-Dichlorophenol	0.9	0.45	1	0	0	< 0.0005	< 0.0005	n/a
2,4-Dichlorophenoxy acetic acid (2,4-D)	0.1	0.05	1	0	0	< 0.001	< 0.001	n/a
Diclofop-methyl	0.009	0.0045	1	0	0	< 0.0009	< 0.0009	n/a
Dimethoate	0.02	0.01	1	0	0	< 0.0025	< 0.0025	n/a
Diquat	0.07	0.0035	1	0	0	< 0.007	< 0.007	n/a
Diuron	0.15	0.075	1	0	0	< 0.01	< 0.01	n/a
Glyphosate	0.28	0.14	1	0	0	< 0.01	< 0.01	n/a
Malathion	0.19	0.095	1	0	0	< 0.005	< 0.005	n/a
2-Methyl-4-chlorophenoxyacetic acid	0.1	0.05	1	0	0	<0.05	<0.05	n/a
Metolachlor	0.05	0.025	1	0	0	< 0.0005	< 0.0005	n/a
Metribuzin	0.08	0.04	1	0	0	< 0.005	< 0.005	n/a
Chlorobenzene	0.08	0.04	3	0	0	< 0.0001	< 0.0001	n/a
Paraquat	0.01	0.005	1	0	0	< 0.001	< 0.001	n/a
Pentachlorophenol (PCP)	0.06	0.03	1	0	0	< 0.0005	< 0.0005	n/a
Phorate	0.002	0.001	1	0	0	< 0.0005	< 0.0005	n/a
Picloram	0.19	0.095	1	0	0	< 0.005	< 0.005	n/a
Polychlorinated Biphenyls (PCB)	0.003	0.0015	1	0	0	< 0.00005	< 0.00005	n/a
Prometryn	0.001	0.0005	1	0	0	< 0.00025	< 0.00025	n/a
Simazine	0.01	0.005	1	0	0	< 0.001	< 0.001	n/a
Terbufos	0.001	0.0005	1	0	0	< 0.0005	< 0.0005	n/a
<u>Tetrachloroethylene (PCE)</u>	0.03	0.015	3	0	0	< 0.0001	< 0.0001	n/a
2,3,4,6-Tetrachlorophenol	0.1	0.05	1	0	0	< 0.0005	< 0.0005	n/a
Triallate	0.23	0.115	1	0	0	< 0.001	< 0.001	n/a
<u>Trichloroethylene</u>	0.005	0.0025	3	0	0	< 0.0001	< 0.0001	n/a
2,4,6-Trichlorophenol	0.005	0.0025	1	0	0	< 0.0005	< 0.0005	n/a
Trifluralin	0.045	0.0225	1	0	0	< 0.001	< 0.001	n/a
Vinyl Chloride	0.002	0.001	3	0	0	< 0.0002	< 0.0002	n/a

Treated Water Quality Statistics – O. Reg. 170/03 Schedule 13-8 and 13-9, “Five Year” Sampling Results Summary

In 2014, all operational “Treated Sources” were sampled and analyzed for the Schedule 13-9 Fluoride parameter as per O. Reg. 170/03. **In 2014, Fluoride (naturally present and not added as part of**

the treatment process) was detected at all treated sources; the analytical results were all under the maximum allowable concentration (MAC). The values in Table 17 reflect the 2014, Schedule 13-9 sampling regime. Sodium, however, is sampled on a more frequent basis (annually) than the Schedule 13-8 requirement. Due to the fact that **at every treated source with the exception of F.M. Woods (currently), sodium levels are above the lower reportable limit of 20 mg/L.**

The increased frequency of sampling provides more data in order to better establish sodium value trends. Sodium results for 2014 can be referenced in Table 18. This data is provided to Wellington-Dufferin-Guelph Public Health.

Table 17: O. Reg. 170/03 Schedule 13-8 and 13-9, City of Guelph - "Five Year" Sampling Results Summary

Parameter	ODWQS MAC	½ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Sodium	20 and 200 ¹⁰	n/a	27	27	27	21	150	58.037
Fluoride	1.5 and 2.4 ¹¹	n/a	20	20	0	0.13	0.77	0.292

Treated Water Quality Statistics – General Chemistry Results Summary

Water Services has initiated an "Annual General Chemistry" sampling event through RCap (Rapid Chemical Analysis Package). This body of data can be used to answer "customer inquiries" as well as inquiries from Water Services staff and consultants in terms of treatment upgrades et cetera.

Please note that Schedule 23 parameters are also part of the "Annual General Chemistry Sampling Regime" and therefore the values in the "General Chemistry Results Summary" section in Appendix "E" include a repetition of the relevant data from the Schedule 23 Table. The "General Chemistry Results Summary" lists the total number of samples analyzed for these parameters in 2016.

In 2016, all operational "Treated Sources" were sampled and analyzed for general chemistry parameters. Please refer to the "General Chemistry Results Summary" in Appendix "E" for the full list of parameters.

Table 18 highlights specific parameters due to their presence / significance within the water supply.

¹⁰ The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

¹¹ Where supplies contain naturally occurring fluoride at levels higher than 1.5 mg/L but less than 2.4 mg/L, the Ministry of Health and Long Term Care recommends an approach through local boards of health to raise public and professional awareness to control excessive exposure to fluoride from other sources.

Table 18: City of Guelph General Chemistry Selected Results Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS MAC	ODWQS AO	ODWQS OG	Total Samples	Samples Above MDL	Total Above Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Ammonia-N	n/a	n/a	n/a	12	0	n/a	< 0.05	< 0.05	n/a
<u>Chloride</u>	n/a	250	n/a	12	12	0	41	240	124.33
<u>Hardness (Calculated as CaCO₃)</u>	n/a	n/a	80-100	12	12	12	360	550	441.7
<u>Iron</u>	n/a	0.3	n/a	14	5	1	< 0.1	0.47	0.306
Lead	0.01	n/a	n/a	14	4	0	<0.0005	0.002	0.00142
<u>Manganese</u>	n/a	0.05	n/a	14	11	1	<0.002	0.066	0.0157
<u>Sodium</u>	n/a	20 and 200	n/a	15	15	15	24	140	64.6

i) Treated Water Quality – Gazer Mooney Subdivision Distribution System

This section describes the Regulatory water quality monitoring that has been collected in the Gazer Mooney Subdivision Distribution System in 2016 (Jan. 01 to Jun. 30, 2016). For regulatory sampling schedules that do not occur in 2016 related to the Gazer Mooney System, the most recent historical data is listed.

Water Quality Review - Gazer Mooney Subdivision Distribution System

Under the Safe Drinking Water Act (SDWA), municipalities are required to monitor both the raw and treated quality of the source water supplied. This monitoring is performed for both regulatory compliance and due diligence and is expected to identify any changes within the treated water as well as in the raw source waters.

A note about all tables included in this section:

1. All regulated chemical parameters where values above the lab's MDL (minimum detection limit) have been detected in the City of Guelph's treated water sources are underlined indicating a hyperlink to an Excel Workbook in Guelph's EDMS (electronic document management system).
Note: EDMS is available for internal use only. The workbook contains a definition of the parameter, an Excel worksheet for each treated source where the parameter has been detected with values for all sample results from Jan. 01, 2007 to Jun. 30, 2016. This database is used to closely track the instances of the identified chemical parameters and therefore provide time for planning / budgeting if treatment or an alternative supply is eventually required due to the presence of a given parameter. The database is updated quarterly.
2. Tabulated values are from best available information at the time of table creation. While the values above satisfy the regulatory minimum regulatory requirements, Water Services performs many additional operational tests not listed in this report.
3. All acronyms and initialisms included in tables are described in Appendix "J" – Glossary.

The following section summarizes daily Distribution free chlorine residual test results required by O. Reg. 170/03 Schedule 7-2 for the period of Jan. 01 to Jun. 30, 2016. **There was no instance of an adverse result in 2016 between Jan. 01 and Jun. 30:**

Table 19: O. Reg. 170/03 Schedule 7-2, Gazer Mooney - Distribution Manual Free Chlorine Residual Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS Range	Total Samples	Total Samples Outside of ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)	Units
Free Chlorine Residual	0.05 – 4.0	182	0	0.63	1.07	0.93	mg/L

Table 20 summarizes bacteriological sampling and test results required by O. Reg. 170/03 Schedule 10 for the period of Jan. 01 to Jun. 20, 2016. **There was no instance of an exceedance for a Regulatory microbiological parameter in 2016 between Jan. 01 and Jun. 30:**

- Number of Distribution samples taken: 26
- Number of Distribution analyses: 286

Table 20: O. Reg. 170/03 Schedule 10-2, Gazer Mooney Treated Bacteriological Sampling Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS Criteria	Total Analyses	Total Outside ODWQS Criteria	Range	Units
Distribution - E. coli	0	26	0	0	cfu/100 mL
Distribution - Total Coliform	0	26	0	0	cfu/100 mL
Distribution – HPC	n/a	26	n/a	0 - 2	cfu/mL
Distribution – Background	n/a	26	n/a	0	cfu/100 mL
Distribution– Free Chlorine Residual	0.05 – 4.0	182	0	0.63 – 1.07	mg/L

Treated Water Quality Statistics – O. Reg. 170/03 Schedule 13-6, “Three Month” Sampling Results Summary

In 2016, Gazer Mooney Subdivision Distribution System was sampled and analyzed for Schedule 13-6 parameters as per O. Reg. 170/03:

Regulation 170/03, Schedule 13-6 requires a minimum of one distribution sample taken from the **Distribution System where THM’s (trihalomethanes) are most likely to develop** (points with high retention times). The MAC for THM’s is 0.1 mg/L. However, for this parameter the MAC uses a running annual average of quarterly samples.

The results of the running average for the Gazer Mooney Subdivision Distribution System samples in 2016 (Jan. 01 to Jun. 30) is below the half maximum allowable concentration ($\frac{1}{2}$ MAC).

Table 21: O. Reg. 170/03 Schedule 13-6, Gazer Mooney - "Three Month" Sampling Results Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS MAC mg/L	1/2 MAC mg/L	Total Samples	Samples Above MDL	# Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Trihalomethanes	0.100 ¹²	n/a	4	4	0	0.0143	0.0419	0.024

Treated Water Quality Statistics – General Chemistry Results Summary

In addition to the Regulatory sampling and analysis required for the operation of the Gazer Mooney Subdivision, Water Services samples for parameters as listed in **Table 22** in order to gather additional data and answer common inquiries from the public.

Table 22: Gazer Mooney General Chemistry Results Summary

(Jan. 01 to Jun. 30, 2016)

Parameter	ODWQS MAC mg/L	ODWQS AO	1/2 MAC mg/L	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Sodium	20 and 200 ¹³	n/a	n/a	1	1	1	25	25	25
Chloride	n/a	250	n/a	1	1	0	42	42	42

j) Status of Ongoing and Emerging Water Quality, Supply and Distribution Initiatives

This includes summaries and updates related to the implementation of the:

- Water Conservation and Efficiency Strategy & Water Supply Master Plan;
- Source Water Protection Plan; and
- Lead Reduction Plan.

Water Conservation and Efficiency

The City of Guelph strives to be a leader in water conservation and efficiency. As one of Canada's largest communities reliant on a finite groundwater source for our drinking water needs, our ability to reclaim precious water and wastewater serving capacity through conservation initiatives offers numerous benefits to our community and local ecosystem. Water Services continues to promote the ongoing sustainability of our finite water resources through active Water Conservation and Efficiency programming. Below is a highlight of the progress made with respect to the 2009 Water Conservation and Efficiency Program for the period of January 1 to June 30, 2016.

¹² This standard is expressed as a running annual average.

¹³ The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

From 2003 to date, an estimated water savings of 4,253 m³/day is attributed to community participation in the City's Water Conservation Programs, while the Leak Detection Program attributed 9,085 m³/d. This observed reduction to date places the City in a competitive position to reach its new 2038 water demand reduction target as outlined in the 2014 Water Supply Master Plan.

In April 2015, an update to the Water Conservation and Efficiency Strategy (WCES) was initiated. The Water Efficiency Strategy Update (WESU) aims to identify preferred program alternatives, associated water savings, program implementation forecasts, and the resources required to achieve the water demand reduction targets of the 2014 Water Supply Master Plan. On April 25, 2016, the City published a draft 2016 Water Efficiency Strategy Update for public review and a two-week comment period. Based on public feedback received, revisions to the draft strategy document were conducted by staff with the final strategy to be presented to council in September 2016 for approval. For reference, additional information on the update available via the City's website at guelph.ca/wesu.

Youth Education and Engagement Programs

The following is a summary of the Youth public education programs completed between January 1 and June 30, 2016.

- The City's curriculum-based, **Grade 2 and Grade 8 in-class water conservation programming** continues to be a popular resource for local educators in both the Upper Grand District School Board (UGDSB) and the Wellington Catholic District School Board (WCDSB), encompassing 64 interactive school presentations reaching 2,106 students in 2016 thus far. There have been increased interest and presentation requests from French immersion schools. The City is working towards being able to offer a bi-lingual presentation starting in January 2017.
- In partnership with the Grand River Conservation Authority's Guelph Lake Nature Centre, a total of 313 local Grades 7, 8 and high school students, as well as volunteers, participated in **guided educational tours** of the City's Water Services facility to date in 2016.
- **H2Awesome:** On May 16, 2016, approximately 950 grade 8 students from the Upper Grand District School Board (UGDSB) and the Wellington Catholic District School Board (WCDSB) participated in the third annual H2Awesome event. This day-long learning event held at the University of Guelph was an opportunity to celebrate water, encourage conservation of this precious resource, and provide focus to the importance of water in our daily lives. The event featured 4 key note guest speakers. These speakers include tornado chaser **Ricky Forbes from the TV show "Tornado Hunters"**, water youth activist Robyn Hamlyn, comedian and water activist Derek Forgie, as well as international environmental journalist Steven Leahy. Key to the event was a variety of 23 different curriculum-linked workshops on various themes, including arts, science, and technology, enabling students to pick their own specific learning venue. The successful event was made possible through collaborative partnership with the Wellington Water Watchers, the Upper Grand District School Board, the Wellington Catholic District School Board and the City of Guelph Water Services Department.
- Water Services is proud to be an ongoing partner, sponsor and contributor to the **Waterloo Wellington Children's Groundwater Festival**. This long-standing festival, held from May 27 to June 2, 2016, celebrated its 21st year in 2016. The annual festival educates more than 5,000 grade two

through five students annually from Guelph, Wellington County and the Region of Waterloo. In total over 1000 students from the City of Guelph attended the 2016 festival.

- The Water Department has also partnered with the Community Energy and Transportation and Infrastructure Departments to offer a curriculum focussed, interactive and activity based online program called **Planet Protectors**. This program helps students understand the importance of water conservation by helping them make personal commitments and sharing them with their family members such as shortening shower time. During the 2015/16 school-year this program has reached over 2000 students and have been offered in over 75 grade 3, 4, 5 and 6 classrooms in the both the Catholic and Upper Grand school boards.

Rebate Programs

Operation and optimization of existing conservation rebate programs continued during the first half of 2016. These programs include the **Residential Rebate Programs** (Smart Wash, Royal Flush, Rainwater Harvesting and Greywater Re-Use), **Blue Built Homes, and the ICI Capacity Buyback Program**. Approximately 331 m³/day in daily water servicing capacity has been reclaimed to date in 2016. For more information on the City's Water Conservation Rebate Programs please visit guelph.ca/rebates.

Public Education

The following is a summary of the public education events completed between January 1 and June 30, 2016.

- **Canada Water Week** is a celebration of water from coast-to-coast-to-coast, held annually in the third week of March to coincide with United Nations World Water Day on March 22.
 - o The City of Guelph celebrated Canada Water Week with the fourth annual H2O Go Festival, a community celebration of water. Collaborating with community partners, H2O Go welcomed the contributions of local businesses, community organizations, experts, performers and families. **This year's event, offered in partnership with the eMERGE Guelph's Ecomarket, attracted over 4,000 participants of all ages to Old Quebec Street Mall for water-themed presentations, live performances , interactive exhibits, games about water and artistic children's activities.**
 - o As part of Canada Water Week, Water Services partnered with the Guelph Public Library for the **fourth year in a row to host 'Water Wednesdays' throughout the Month of March at five different local library branches.** These events offered water-themed educational programming for all ages, including interactive games and activities designed to inform local youth of **Guelph's water sources, steps taken to treat our community's drinking water, and the importance of conservation and protection of our precious water resources.**
 - o Water Services also offered a **Water Camp Day** at the Guelph Civic museum. Over 100 children participating in March break camps participated in live hands-on demonstrations on edible aquifers and vermiculture in addition to water activity stations to learn about the importance of water in our community.
 - o In concert with Water Wednesday, the West End Recreation Center also hosted an **Aqua Lautu art exhibit** during Canada Water Week, which gave residents insight into challenges faced by

communities around world with regards to water scarcity and clean water access. More information on this interactive exhibit can be found at <http://watercanada.net/2014/video-the-aqua-lauta-project-in-action/>.

- The City's water conservation team attended a variety of **spring and summer events** to promote efficient use of indoor and outdoor water at home. These included the Guelph Home Show, the Multi-Cultural Festival, and presentations for Linamar staff during staff meetings and lunchtime events, Earth day festivities at the University of Guelph and Village by the Arboretum.
- **Watr - water conservation Mobile app**: In alignment with the open government objectives of the City's 2012 Strategic Plan, Water Services is working with Focus21, a local technology start-up company specializing in information engagement systems, to develop a mobile-based application to increase customer accessibility to information about household water use. The app will use customer water account information to provide users with easy-to-understand breakout of their household water use and how it compares to their neighbours. Users will also be able to view customized information based on known attributes and given information of their household (e.g. age of home construction, conservation program participation, number of people in household) and will provide tailor-based suggestions for conserving water and reducing bills. The beta testing of this app will commence in Q3 2016 with city-wide rollout in Q4 2016. For more information on Watr please visit <http://www.watr.io/>.
- The annual **Water Services Open House** was held on May 28, 2016. This popular community event showcased Water Services' programs and resources and included a plant, rain barrel and composter sale. It is estimated that over 1000 members of the local public attended the annual open house, with a total of 380 rain barrels sold at the event.
- eMERGE home visits have engaged over 123 households as of June 30, 2016. In verifying the household water consumption data for 2014, the City has concluded that, on average, the home owner who receives the visit will reduce their water consumption by 2 (only installing faucet aerators) to 20 percent (installing faucet aerators, low flow shower heads and taps, and replacing a leaky toilet) depending on the retrofit measures taken.

Peak Season Water Demand Management

Reduction of peak season water demands continue to be a primary objective of the City's Water Conservation programming. The ability to reduce variations in seasonal water use limits impacts on our finite groundwater supply during times of environmental stress and creates operational efficiencies by reducing capital and operational investment to service our community for only a few days a year. Since 2002, the City's Outside Water Use Program has helped to manage peak season water use via regulatory controls with complementary programs, such as Healthy Landscapes, working to proactively manage potential peak demands by assisting residents and local businesses in establishing low outdoor water use environments. The following activities were completed as part of this program between January 1 and June 30, 2016.

- On June 7, 2016 the City initiated a Level 1 Yellow water restriction under its *Outdoor Water Use Program* due to ongoing local drought and reduced Eramosa River base flow conditions.

- In working to proactively manage peak season demand, the *Healthy Landscapes Program* offered various public resources throughout 2016. The annual Healthy Landscapes Workshop/Seminar Series featured numerous free talks on time-of-year appropriate outdoor water conservation topics including water efficient landscape design, plant selection, and proactive maintenance best practices to manage the impact of drought and common turf pests. It is estimated over 350 Guelph residents took part in this Landscape and Seminar series.
- The Healthy Landscapes assessment program continues to be a popular resource with 264 visits completed to date in 2016. This service offers a complementary site-based consultation aiming to educate residents on garden design and maintenance practices to significantly curb outdoor demand at their home.
- A rain barrel truckload sale in May of 2016 at the Water Services Open house yielded the sale of over 380 rain barrels sold. Rain barrels offer homeowners the benefit of capturing free volumes of water for outside use but also assist in managing stormwater impacts on private property.

Municipal Facility Upgrades and Leak Detection

The following is a summary of the municipal facility upgrades and leak detection program completed between January 1 and June 30, 2016.

- **Guelph Transit Rainwater Harvesting System:** Construction for phase 2 of the Guelph Transit's Rainwater Harvesting System was initiated in Q4 2015 and completed in Q2 2016. Through the completion of this next phase, 37 cubic meters of additional rainwater storage capacity will be established to complement water needs for Guelph Transit's Automated Bus Wash Process. Savings from January 1st 2016 to June 24th 2016 (due to phase one of the rainwater harvesting system) equate to 271 m³ of municipal water.
- **Leak Detection Program:** The annual Leak Detection Program was launched in April 2016. This program included sounding and correlation of all metallic watermains within City's distribution system, encompassing 287 km of linear infrastructure. In total, 32 potential system leaks were identified through this survey, eight of which have been fixed as of June 30th with approximately 20,700 m³ of servicing capacity reclaimed. The volume of water reclaimed is determined based on the leaks' flow rates and the timeframe of leakage based on detection dates and the dates the leaks were fixed. If this aforementioned volume of water is averaged out over the course of the year, the daily average volume of reclaimed water equals 60 m³/d. The average volume of daily reclaimed water based on the leak detection dates and the dates the leaks were fixed equals 1,630 m³/d.

Guelph Water Wagon

In support of the City's Public Promotion Action Plan for Drinking Water Consumption, the Guelph Water Wagon has been providing access to tap water at large, outdoor community events since 2013. Growing in popularity year-after-year, the Water Wagon is scheduled to attend 29 events so far in 2016. The Water Wagon continues to provide an excellent opportunity to engage with the public, answering questions about Guelph's water quality and supply, and help address water customer concerns.

Institutional, Commercial and Industrial (ICI) Water Capacity Buyback Program

The ICI Water Capacity Buyback Program offers financial assistance to local business for the completion of detailed water efficiency process audits and incentives towards capital retrofits which reduce water demand. To date in 2016, the following projects have been completed:

- Cargill installed an automated control system for part of their water supply, saving 30.53 m³ per average operating day based on a 5 day work week, less holidays, or 7,327 m³ per year;
- Transgear Manufacturing upgraded their reverse osmosis system, reducing their operating day consumption by 4.25 m³, for a total of 1,553 m³ annually;
- Sleeman Breweries replaced a pasteurizer, saving a minimum of 207 m³ per operating day, or 51,750 m³ per year;
- The University of Guelph completed a leak detection program and repaired a leak that was consuming 100 m³ per day or 36,500 m³ per year.

There are also five water audits in progress at Linamar facilities that are expected to be completed by the end of Q3 2016.

Arkell Springs Forest Stewardship Project

The Arkell Spring Grounds cover an area of 804 acres. The area is comprised of old and new forested areas, which makes it necessary for monitoring, maintenance and new planting plans. The objective of the Arkell Springs Forest Stewardship Project is to manage past plantings, prevent losses while monitoring general forest health and protect the drinking water aquifer.

Delicate forest stands require continued maintenance and observation to ensure the prevention of any unnecessary and undesired losses. The many benefits of the project include the creation of a diverse and functioning forest cover, maintenance and re-generation of older forested areas on the property, **protection and recharge of underground aquifers which supply our City's water, prevention of undesirable surface water runoff and flooding into local waterways, and regulation of the flow of water. This multiple barrier approach results in the highest possible quality of water to supply Guelph's drinking water system.** Forest systems also extend the longevity of the existing snow pack by stabilizing the temperature of the ground and limiting the evaporative impact of the sun. This ensures that this water source recharges the underlying aquifer rather than contributing to damaging runoff and flooding.

Since 2007, the Community Environmental Leadership Program (CELP), on a volunteer basis has planted 20,500 trees on 18 acres, and Bartram Woodlands (on-site contractor) has planted 25,150 trees on another 16 acres.

In the fall of 2016 a commercial thinning harvest will be started on the Arkell site. Commercial thinning is a silviculture treatment that 'thins' out an overstocked stand by removing trees that are large enough to be sold as products such as poles or fence posts. It is carried out to improve the health and growth rate of the remaining crop trees. Commercial thinning is an intermediate harvest where the merchantable wood removed should cover part or all of the cost of harvesting. A communications plan will be in effect and it is scheduled to start in late September of 2016.

Source Water Protection Plan

This section includes summaries on Guelph's Source Water Protection Program initiatives and ongoing work related to preparation for implementation. The Grand River Source Protection Plan was approved by the Minister on November 26, 2015 with an effective date of July 1, 2016. City staff have been preparing for implementation of the Source Protection Plan including a number of new processes that will be integrated into the building permit and development application process.

Currently, City staff are working on: the development of education and outreach materials for stakeholders, development of guidelines for the preparation of risk management plans, and working with internal City of Guelph departments to ensure conformance with the proposed policies in the Source Protection Plan. The City is also in the process of establishing the data management and information needs that will be required to once the Source Protection Plan is in effect.

For more information on Guelph's Source Water Protection Program visit: guelph.ca/sourcewater

Lead Reduction Plan

The MOECC formally approved the City of Guelph's Lead Reduction Plan (LRP) on March 21, 2012. The LRP focuses on physical lead service line replacement and was submitted in lieu of a Corrosion Control Plan (as outlined in O.Reg 170/03 Sched. 15.1) as a result of two rounds of legislated lead sampling indicated that more than ten percent of residential samples taken exceeded the ODWQS of 10 µg/L.

In August 2014, based on the success of the program, the City was granted full regulatory relief from Sched. 15.1 of O.Reg 170/03 (in its entirety) in Schedule D of the City's Municipal Drinking Water Licence issue number 6. In exchange, Water Services will continue with its operational lead identification and removal program as per the LRP and results shared with the local MOECC inspector as needed. This section provides a summary of the aspects of the LRP.

The following table presents summary results for lead sampling in the Guelph Drinking Water System as per our Lead Reduction Plan for the period of Jan. 1 to Jun. 30, 2016:

Table 23: Lead Reduction Plan Lead Sampling – Guelph Drinking Water System 2016¹⁴

Number of Locations	Location Type	Number of Samples	Lead Range (mg/L)	pH Range	Alkalinity Range (mg/L)	Temperature Range (°C)
5	Distribution	5	0.0000 – 0.095	7.4-7.6	n/a	n/a
54	Lead Verification	54	0.0000 - 0.0019	n/a	n/a	n/a

In the Gazer Mooney Subdivision Distribution System, all samples were below the lead detection level.

¹⁴ Includes all samples as required by the MDWL or Lead Reduction Plan.

Table 24: Lead Reduction Plan – Gazer Mooney Subdivision Distribution System 2016¹⁵

Number of Locations	Location Type	Number of Samples	Lead Range (mg/L)	pH Range	Alkalinity Range (mg/L)	Temperature Range (°C)
1	Distribution	3 ¹⁶	0.0025	7.6	260	n/a

Lead Sampling

Lead sampling is conducted to identify the presence of lead service lines (LSL) and to monitor lead levels following a LSL replacement. For the period of Jan. 1 to Jun. 30, 2016, 54 locations were sampled under the Lead Verification program. Of these sample results, none were above 5 µg/L indicating presence of a lead service line. Of all verification samples, none also exceeded the ODWQS of 10 µg/L. Lead samples are collected before and after a LSL replacement has been undertaken. There were 11 locations resampled in order to monitor lead levels post-replacement. Based on sample results to date, regulatory compliance is expected at individual sites that have undergone a full LSL replacement or where there is no lead remaining in the service line.

Lead Service Line Replacements

There were 6 Lead Service Line (LSL) replacements undertaken in the City between Jan. 1 to Jun. 30, 2016. These replacements include the following situations: i) Full LSL Replacement where both the City- and private-side of the LSL is replaced, ii) Partial LSL Replacement where only the City-side of the service is replaced and connected back to lead or a non-lead material on the private-side, and iii) Private LSL Replacement where the private-side of the service is replaced and the City-side is known to be copper. The next table presents a summary of all LSL replacements in the Guelph Drinking Water system for 2016 up to Jun. 30.

Table 25: Lead Service Line Replacements 2016 (Jan. 1 to Jun. 30)

Type of Replacement	#
Full LSL Replacement: Funded under Grant Program ¹⁷	0
Full LSL Replacement: Partner with property owner (not eligible for Grant Program)	0
Partial LSL Replacement: Lead Free - connected back to non-lead material or subsequently replaced under Grant Program	2
Partial LSL Replacement: Lead - Connected back to lead on Private side	0
Private LSL Replacement: Replacement by private contractor	0
Private LSL Replacement: Funded under Grant Program	4
TOTAL	6

¹⁵ Includes all samples as required by the MDWL or Lead Reduction Plan.

¹⁶ At each location three (3) samples are taken - one (1) for lead, one (1) for alkalinity and one (1) for pH.

¹⁷ The LSL Replacement Grant Program provides eligible property owners funding to off-set the cost of replacing an LSL on private property.

Privately Owned Lead Service Line Replacements

Since 2010, the City initiated two financial incentive programs to encourage replacement of privately-owned LSL by reducing the financial burden to property owners. The grants cover 70 to 100 percent of the LSL replacement cost for homeowners. The Private Lead Water Service Replacement Grant Program provides funding to homeowners to replace a confirmed privately owned LSL where the City-owned water service line is confirmed to be copper (i.e., City-side LSL was previously replaced). The Full Lead Water Service Replacement Grant Program provides funding to homeowners to replace a confirmed privately owned LSL in tandem with City-owned LSL replacement. From 2010 to Jun. 30, 2016, 198 privately owned lead service lines were replaced through the grant programs.

Table 26: Private Lead Service Line Replacement Grant Programs (2010 – Jun. 30, 2016)

Grant Program	2010	2011	2012	2013	2014	2015	2016
Full Water Service Replacement Grant Program	15	19	7	2	1	2	0
Private Water Service Replacement Grant Program	45	43	24	18	8	10	4
Yearly Total	60	62	31	20	9	12	4
Cumulative Total	60	122	153	173	182	194	198

Targeted outreach regarding the Grant Programs is directed at all properties with known or suspected privately-owned LSLs. The main barriers to privately owned LSL replacement for homeowners include financial costs, disruption to property, rental properties and people who are unconcerned about the health risks of lead in drinking water. Direct communications continued to be tailored to address these barriers.

k) Expected Future Changes That Could Affect the DWS or the QMS

Changes Affecting the Drinking Water System (DWS) / Licence Approvals / Amendments

Appendix "F" Legal & Other Requirements includes a summary of legislative and regulatory updates from Jan. 1 to Jun. 30, 2016.

Arkell Wellfield – Operational Testing Plan and Adaptive Management Plan (OTP / AMP)

The OTP/AMP was completed successfully allowing for a maximum taking of 28,800 m³/day from the Arkell Bedrock Wells. The purpose of the OTP / AMP was to carry-out a detailed assessment of both the Arkell area aquifer and pumping conditions related to the aquifer to determine a sustainable capacity with respect to environmental considerations in the area over a three year period. Additional details may be obtained by contacting Water Services. Water Services is continuing to assess the sustainability of the bedrock water taking through conditions in the newly amended PTTW (permit-to-take-water). Additional monitoring and data collection / assessment is ongoing.

Carter Monitoring Program – Operational Testing

The Permit to Take Water for Carter Well requires that the Carter Wells be operated at increased levels in conjunction with monitoring in the Torrence Creek Subwatershed. The purpose of the monitoring is to attempt to quantify impacts within this subwatershed.

Arkell Well #15 has been reassessed as a GUDI WEF Source (Groundwater Under the Direct Influence of Surface Water with Effective In Situ Filtration). A DWWP (Drinking Water Works Permit) Amendment Application has been approved by the MOECC with supporting documentation that demonstrates the appropriateness of the requested re-classification and the ability of the existing treatment system at F.M. Woods to treat this source.

Membro Well – In November 2014, fecal bacteria was found for a short period in untreated well water from the Membro municipal well which resulted in Water Services staff removing the well from service and performing an investigation to determine the bacteria source and identify actions to prevent a reoccurrence of this poor water quality event. At all times prior to the Membro well being removed from service, including during the past 19 years of operation, properly disinfected and safe water was provided to customers that met all regulatory guidelines. The investigation has included consultation with both the MOECC and Wellington-Dufferin-Guelph Public Health, and has led Water Services to remove a defective nearby monitoring well, install a more secure replacement pumping well, and initiate plans to enhance the disinfection system for the Membro well water. Staff plan to return Membro well to service in 2016 with both the replacement well and the enhanced disinfection system in service.

Ontario's GUDI (Groundwater Under the Direct Influence of Surface Water) Terms of Reference are under review and may result in classification changes to source waters. The revised GUDI Terms of Reference are expected in 2016 and are anticipated to require disinfection system upgrades for the Emma and Water Street wells.

Ontario's Watermain Disinfection Procedure

Municipal operating authorities are required to use AWWA Standard C651 (Disinfecting Water Mains) for addition, replacement or repair of pipes forming the distribution system, as per condition 2.3.2 of Drinking Water Works Permits. Ontario's [Watermain Disinfection Procedure](#) outlines minimum requirements for compliance, and operating authorities will be able to use their discretion to adopt more stringent standard operating procedures. Requirements for disinfection will also apply to temporary watermains, as well as service pipes of 100 mm diameter or greater. Water Services implemented the procedure May 1, 2016.

Upcoming policy changes under Source Water Protection

The Ministry of the Environment has released Source Protection Standard Operating Policies for Source Protection Prescribed Instruments relating to the installation, operation, and maintenance of municipal sewer infrastructure in the vicinity of municipal water supply wells. Staff continue to work with the Ministry to better define these requirements and the impacts they may have on current City capital replacement and operating programs. Staff will update Council on these requirements and impacts once they are confirmed.

Municipal Drinking Water Licence Renewal – the table below includes Licence documents' dates of issue and expiry.

Table 27: Municipal Drinking Water Licensing documents

Document (hyperlinked)	Issue Date (yyyy-mm-dd)	Expiry (yyyy-mm-dd)
Municipal Drinking Water Licence (#017-101)	2014-08-18	2019-08-17
Drinking Water Works Permit (#017-201)	2015-11-05	2019-08-17
Drinking Water Works Permit (#017-201) - Schedule C	2016-03-24	2019-08-17
Municipal Long Range Financial Plan (#017-301)	2014-02-25	2019-08-17
DWQMS Certificate of Registration - Guelph Drinking Water System (017-OA1)	2016-08-04	2019-07-27
Operational Plan Re-endorsement Guelph Drinking Water System (resolution)	2015-10-26	2019-10-31
Agreement Regarding Water Services for the Gazer-Mooney Subdivision	2009-06-01	2019-05-31
Municipal Drinking Water Licence (#104-103)	2016-01-28	2021-01-26
Drinking Water Works Permit (#017-203)	2016-01-28	2021-01-26
Operational Plan Re-endorsement Gazer Mooney Sub. Dist. System (resolution)	2015-07-14	2019-10-31
DWQMS Certificate of Registration - Gazer Mooney (104-OA2)	2016-08-04	2019-07-27

Permits to Take Water (PTTW) Renewals

Two PTTWs were renewed in 2016 (Jan. 1 to Jun. 30):

1. [Carter Wells PTTW](#) (exp. 2021-05-31)
2. [Helmar Well PTTW](#) (exp. 2025-05-31)

Four PTTWs are scheduled renewal later in 2016:

1. [Arkell Infiltration Gallery PTTW](#) (exp. 2016-10-31)
2. [Emma Well and Park Wells 1 & 2 PTTW](#) (exp. 2016-10-31)
3. [Paisley Well PTTW](#) (exp. 2016-10-31)
4. [Water St. Wellfield \(Water, Dean, University, Membro\) PTTW](#) (exp. 2016 -10-31)

Three PTTWs are scheduled for renewal in 2017:

1. [Edinburgh PTTW](#) (exp. 2017-06-30)
2. [Sacco PTTW](#) (exp. 2017-06-30)
3. [Smallfield PTTW](#) (exp. 2017-06-30)

Staff Certification

Table 28, Table 29 and Table 30 describe staff (Operators, Management, and other Technical staff) with various classes of provincial operator certificates and years' experience.

Table 28: Water Services Staff with Certificates

Certificate Class	Number of Employees (not including management)
OIT	3
Class I	1
Class II	3
Class III	12
Class IV	12

Table 29: Competency & Years' Experience of Management Directly Affecting Drinking Water

Role	Minimum Competency Required ¹⁸	Competency Achieved	Years' Experience
Plant Manager Overall Responsible Operator (ORO)	Class IV Certificate	Class IV Certificate	26+
Manager of Operations	Class III	Class III Certificate	29+
Supervisor of Distribution / Construction	Class I Certificate or higher	Class IV Certificate	19+
Supervisor of Distribution / Metering	Class I Certificate or higher	Class IV Certificate	15+
Supervisor of Supply	Class I Certificate or higher	Class IV Certificate	12+
Supervisor of Water Supply Maintenance	Industrial Mechanic Millwright & Class 1 Certificate or higher	Industrial Mechanic Millwright	7+

Table 30: Years' Experience of Water Services Operators Directly Affecting Drinking Water

Role	<5 years	5-9 years	10-14 years	15-19 years	20-24 years	25+ years
Distribution Operators	3	8	2	1	0	3
Supply Operators	2	1	4	2	0	1
Technical Services Staff	0	1	1	0	1	0

¹⁸ Minimum competency includes the certification requirements listed here, plus the completion of ongoing training requirements of O. Reg. 128/04.

Changes Affecting the Quality Management System (QMS)

Results of the Management Review, the identified deficiencies, decisions and action items:

A Management Review meeting was held on January 28, 2016 and the following is a summary of results of the management review. **Appendix "G"** includes the action items from the meeting. The summary includes identified deficiencies, decisions and action items below:

Deficiencies

- Non-compliance items identified (in 2015) were related to mechanical failures.
- **2 AWQI's occurred in 2015 and 1 CCP deviation was identified as one of the AWQI's.**
- 1 nonconformity re: document and records control identified in the last external audit.

Decisions

- Risk assessment now includes a third risk rating, "capability of responding", edited "consequence" ratings to include amount of water impacted by the hazard, and "updated "control measures" to more accurately include all of Water Services' control measures.
- Decided to include (in the last risk assessment update) MOECC's "Potential Hazardous Events for Municipal Residential Drinking Water Systems to consider in the DWQMS Risk Assessment". Edited hazard / hazardous events categories to better align to MOECC's document.
- Added "aquifer cross-connections", "drought" and "aqueduct infrastructure failure" to hazardous events.
- Linked opportunities for improvement (OFI's) to emergency debriefs and management review meetings to better track progress on these these OFI's.
- Added "sudden changes to raw water characteristics", "potential source water supply shortfall", "distribution system issues", "private property issues" to section m) of the A&S report.

Ontario's updated Drinking Water Quality Management Standard (DWQMS)

Although not yet officially released, Guelph Water Services is working through the implementation of the updated DWQMS in its quality management system. Most significant edits are:

- Throughout: added "once every **Calendar Year**" where applicable in place of "once every year" or "once every 12 months".
- QMS 07: includes consideration of potential hazardous events and associated hazards identified by the ministry. **These hazardous events are identified in the document titled "Potential Hazardous Events for Municipal Residential Drinking Water Systems."**
- QMS 12: suppliers of essential supplies and services identified by Guelph Water Services are considered in the procedure for communications. This document will further describe this statement.
- QMS 14: Outcomes of the risk assessment documented under QMS 08 will be considered in the procedure for reviewing the adequacy of the infrastructure necessary to operate and maintain the drinking water system.
- QMS 15: Long-term forecast of major infrastructure maintenance, rehabilitation and renewal activities is already included as part of QMS 14 (but will elaborate the procedure to include this statement).

- QMS 21: includes consideration of **BMP's** (when available from the MOECC) in continual improvement; a documented process for identification & management of continual improvement reports (that are continual improvement items, corrective actions or preventive actions, where applicable).

I) Consumer Feedback

The table below represents all customer calls received:

Table 31: 2016 Customer Calls Received

Type	# Calls ¹⁹		
	2014	2015	2016
Discoloured Water	-	160	75
Distribution	-	72	20
Flushing	32	27	19
Frozen	-	695	18
Hydrant - Accident Report	-	2	3
Hydrant - Investigation	46	38	18
Hydrant Out-of-Service	-	65	48
Lead	-	9	167
Leak	-	52	41
Meter	-	36	7
Other	199	127	42
Pressure	146	95	37
Private Issue	306	18	11
Service Box Repairs	-	254	117
Swabbing	32	47	31
Trench Investigation	-	9	3
Valve	-	27	25
Water Quality / Appearance	144	47	29
Watermain	124	67	2
Watermain Break Investigation	-	54	46
Well Interference Inquiries	2	2	2

¹⁹ This column generally represents the number of calls received, not necessarily the number of individual issues. Previous years' calls were not collected with the same level of detail as current year, and therefore dashes exist in the table.

m) The Resources Needed to Maintain the DWS and QMS

Water Services currently has one full-time Quality Assurance Coordinator, who is also the Quality Management System Representative, a Compliance Coordinator, access to four Water Services Technicians, and a Customer Service Clerk for reporting and documentation requirements of the QMS.

Operational challenges in the drinking water system continue to drive the need for additional resources, such as:

- Sudden changes to raw water characteristics (e.g. Arkell #15, Membro Well, Carter Wells),
- Potential source water supply shortfall (e.g. current supplies not meeting future demand, drought),
- Distribution system issues (e.g. frozen city-side infrastructure, larger infrastructure failures, Locates Program, Metering Program), and
- Private property issues (e.g. frozen services, Lead Program, water quality).

n) The Results of Infrastructure Review

The review of infrastructure requirements is achieved by reviewing the needs of existing infrastructure and of new infrastructure requirements. This review is carried out for the infrastructure needs of distribution and supply & facilities.

Distribution Infrastructure Needs

At annual specifications review meetings, Guelph's Engineering Services and Water Services staff update Water Services' infrastructure specifications.

During the annual budget preparation process, Engineering Services and Water Services review infrastructure conditions, inventory age, CAPS (capital asset prioritisation system), criticality, etc. From this evaluation, Engineering Services and Water Services finalize the list of priority projects that also considers the priorities of wastewater and road reconstruction projects so that these projects can share the costs of excavation and rehabilitation. New linear infrastructure reviews are primarily driven by Engineering Services.

Annual summaries of road reconstruction, sewer and watermain projects are identified on an infrastructure map that is released early spring each year.

Supply & Facilities Infrastructure Needs

On July 28th, 2014 Guelph City Council unanimously approved the Water Supply Master Plan update, defining preferred water supply servicing alternatives in meeting the needs of existing customers and future community growth.

In concert with the Water Supply Master Plan Update, the City's Engineering Services Department completed an update to the linear water distribution network model as part of the 2014 Development Charges Background Study to define water distribution improvements needed for growth servicing. As part of these two studies, a number of system upgrades have been identified including, additional water supply sources, new pumping stations, storage facilities and new water distribution mains. To help

integrate these complex works the City retained C3 Water Inc. to analyse and define construction sequencing of infrastructure upgrade recommendations, with specific focus to Pressure Zone 2 in the water distribution system. These works were completed in Q4 2015 with study outcomes to support field implementation of capital projects in 2015 and future capital programs needs through the 2017 Water and Wastewater Non-Tax Budget deliberations.

In Q1 2016, Water Services initiated development of the Water Facility and Property Acquisition Master Plan. This Master Plan aims to identify and prioritize the capital projects and land acquisitions required to maintain and renew its existing facility assets and associated operations in accordance with asset management industry best management practices as well as current codes and standards. The Master Plan, planned for completion and presentation to Council in Q3 2016, will provide a clear financial business case and project implementation strategy which will prioritize the capital maintenance and renewal of **Water Services' non-linear infrastructure** over the next twenty-five year planning horizon.

Burke Well Station Upgrades

Manganese concentrations in water from the Burke Well appear to be gradually increasing and are slightly **above the MOECC's Aesthetic Objective for manganese (0.05 mg/L)**. Upgrades to the Burke Well Station to improve the aesthetic quality (iron and manganese) of water from the Burke Well have been planned for a number of years. The upgrades will include construction of a building to house a pressure filtration system. It is planned to begin construction of the upgrades in 2017 and be in operation by spring 2018. The upgrades are expected to result in the Burke Well Station being classified as a Water Treatment Subsystem.

Backflow Prevention Program

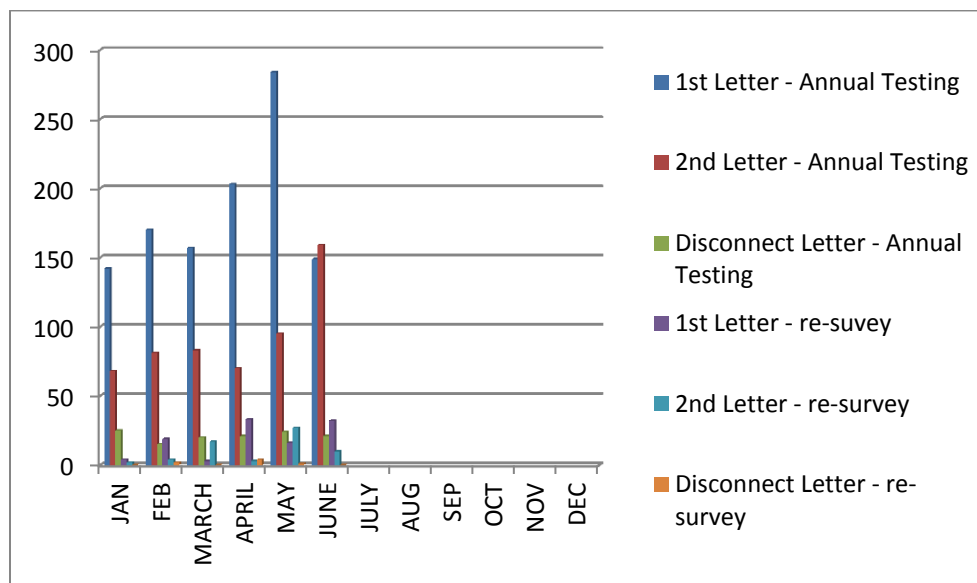
Preservation of drinking water quality within Guelph's infrastructure is supported by the City of Guelph's Building Services and Guelph's Backflow Prevention Regulations ("By-law", Number (2008) – 18660). As per the By-law, "**Backflow**" means the flowing back of or reversal of the normal direction of flow of water. The By-law requires that no connections are made to the City's water supply without the installation of a backflow prevention device to isolate premises, sources, and zones to prevent cross-connections in every building or structure where a City water supply or other potable water supply exists.

On a regular basis, Building Services provides the following "Backflow Report" included in the table below that tracks the number of letters sent out regarding annual testing and re-surveying requirements of the By-law.

The City of Guelph has a total of 2,746 properties (2,639 active and 107 inactive properties) that have a total of 6,266 backflow prevention devices installed. Of the total, 1,904 buildings have premise isolation and 963 buildings are without premise isolation (e.g. residential irrigation systems, plaza facility – plaza owner has premise isolation). New properties from Jan. 01 to Jun. 30: 8 with premise and 13 without premise isolation.

Table 32: 2016 Backflow Report - Number of Letters Sent out for Annual Testing and Re-survey

Letter Type	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Annual Testing – 1 st Letter	142	170	157	203	284	149							1105
Annual Testing – 2 nd Letter	68	81	83	70	95	159							556
Annual Testing – Disconnect Letter	25	15	20	21	24	21							126
Re-survey – 1 st Letter	4	19	3	33	16	32							107
Re-survey – 2 nd Letter	2	4	17	3	27	10							63
Re-survey – Disconnect Letter	0	2	0	4	1	0							7
Water Service Disconnected	0	0	0	0	0	0							0
Number of new devices installed	15	6	11	12	18	7							69

Figure 6: Annual Backflow Prevention Device Re-Survey and Testing Letters from Building Services to Customers in 2016

o) Operational Plan Currency, Content and Updates

See agenda item "k) Expected Future Changes That Could Affect the DWS or the QMS" for Operational Plan updates.

p) Staff Suggestions

Staff suggestions are discussed during staff and operational meetings and taken into account during annual budget processes. Appendix "H" Summary of Staff Suggestions includes a listing of various improvement items that were presented by staff from Jan. 1 to Jun. 30, 2016.

q) New or Other Business

This section provides an update on new or other items of business beyond the scope of this report.

r) Next Meeting Dates

The next Management Review Meetings scheduled to review the updated Annual & Summary Water Services Reports are scheduled for September 2016 and January 2017.

Appendix “A” – Summary of Critical Control Points and Critical Control Limits

Critical Control Point (CCP)	Hazard Description	Critical Control Limit (CCL)	Monitoring Process & / or Procedures	Response Procedures
Multi-Barrier Primary Disinfection <i>To remove or inactivate pathogens potentially present in the source water.</i>	Low Chlorine Dosage <ul style="list-style-type: none"> – Chlorination system failure (e.g. pump, line, fitting, power, PLC, flow meter) – Failure of analyzers (POE or process) to alarm – Poor chemical quality Inadequate UV Dosage <ul style="list-style-type: none"> – UV Treatment system failure (e.g. UV and Turbidity analyzers, high flow, reactor, PLC, power, flow meters) 	<u>Free Chlorine</u> <ul style="list-style-type: none"> – 0.05-4.0 mg/L (PDDW²⁰, SDWA, O. Reg. 170/03) – 0.2 mg/L (PDDW recommended optimal) <u>UV dose</u> <ul style="list-style-type: none"> – at FM Wood: 24 mJ/cm² (Drinking Water Works Permit, DWWP) – at Emma and Water Street wells: 40 mJ/cm² (DWWP) 	<ul style="list-style-type: none"> – Certified and competent operators – Daily operational sampling, testing and monitoring of control limits, as applicable – Redundancy of system components (including equipment) & monitoring (operators, instruments), stand-by power – Monitoring and alarming of control limits – Calibration, maintenance and preventive maintenance - equipment – Robust communication systems – Receiving process for chemicals – Certificates of Analysis required for essential chemicals 	<ul style="list-style-type: none"> – Supply Standard Operating Procedures – Water Services Emergency Plan procedures
Secondary Disinfection <i>To ensure the maintenance of a disinfectant residual throughout the distribution system</i>	Deterioration of chlorine residual, from: <ul style="list-style-type: none"> – Reduced water flows – Occurrence of dead ends – Increased water temperature (causing low chlorine residual) 	<u>Free Chlorine</u> <ul style="list-style-type: none"> – 0.05-4.0 mg/L (PDDW, SDWA, O. Reg. 170/03) – 0.2 mg/L (PDDW recommended optimal) <u>pH</u> <ul style="list-style-type: none"> – 6.5-8.5 (operational criteria) <u>Turbidity</u> <ul style="list-style-type: none"> – 5 NTU (operational criteria) 	<ul style="list-style-type: none"> – Certified and competent operators – Sampling, testing and monitoring of control limits, as applicable – Main flushing programs – Installation of blow-offs in dead ends – Regular samples taken and analyzed for chlorine residual and temperature 	<ul style="list-style-type: none"> – Distribution Standard Operating Procedures – Response to customer calls – Repair and system rehabilitation – Use of appropriately certified and competent contractors and suppliers

²⁰ PDDW – Procedure for Disinfection of Drinking Water in Ontario as adopted by reference by O. Reg. 170/03 under the Safe Drinking Water Act.

Critical Control Point (CCP)	Hazard Description	Critical Control Limit (CCL)	Monitoring Process & / or Procedures	Response Procedures
<p>Backflow Prevention</p> <p><i>To prevent cross-contamination that can result from the flowing back of or reversal of the normal direction of flow of water.</i></p>	<p>System contamination from negative or reduced pressure</p> <ul style="list-style-type: none"> - Lack of backflow prevention device - Main breaks or blow-outs - Large services - Temporary connections - Firefighting drawdown - Depressurization from residential usage - Pipe failure (deterioration) 	<p><u>System pressure</u></p> <ul style="list-style-type: none"> - 275-550 kPa (industry standard for operating pressure) <p><u>Consumer complaints</u></p> <ul style="list-style-type: none"> - Related to system pressure or water characteristics (odour, colour, taste other). 	<ul style="list-style-type: none"> - Backflow Prevention program - Where possible, implementation of backflow prevention devices and small mains - Proactive Watermain and substandard service replacement program 	<ul style="list-style-type: none"> - Distribution Standard Operating Procedures - Response to customer calls - Water Services Emergency Plan procedures

Appendix "B" – Executive Summary of Risk Assessment Outcomes

Process	Hazardous Event	RISK RATING ²¹	City Control Measures ²²			External Control Measures (if applicable)
			Physical	Operational	Management	
Water Supply	Source Degradation & Contamination	High	External to City Control			Ontario Environmental Protection Act, Clean Water Act, Source Protection Plans
	Sudden Changes in Raw Water Characteristic	Moderate				Ontario Environmental Protection Act, Clean Water Act, Source Protection Plans
	Source Water Infrastructure Failures	Moderate				-
	Water Supply / Demand (incl. drought)	Moderate				-
Treatment (Chlorination at all sites + UV disinfection where applicable)	Inadequate Chemical Supply	Low				Chemicals' NSF Certification
	Treatment Infrastructure Failure	Low				-
	Reservoir / Contact Chamber Failure	Low				-
	PLC Failure	Low				-
Storage	Insufficient Secondary Disinfection	Low	+ ²³	+		-
	Storage Infrastructure Failure	Moderate	+	+		-
Distribution	Distribution Infrastructure Failure or Damage	Moderate	+	+		Ontario One Call (ON1Call)
	Cross-connection or backflow	Low	+			-
	Degradation of Treated Water Quality	Moderate	+	+		-
	Conditions of Services	Moderate	+		+	-
Security	Unauthorized Entry, Vandalism, Terrorism	Low				-
Monitoring & Reporting	Failure of Monitoring Equipment	Low				-
	Failure of Communications Equipment	Moderate	+			-
Power	Power Failure	Moderate				Mutual Aid Agreements
	MCC Failure	High				

²¹ Risk Ratings are based on the risk calculation (likelihood rating x consequence rating), as included in the "QMS 08 Risk Assessment Outcome" document. "Low" risk: 1 to 7; "Moderate" risk: 8 to 11; "High" risk: 12 or higher. "QMS 21 Continual Improvement" describes how continual improvement actions are tracked, measured and evaluated for effectiveness.

²² Cells in **GREEN** indicate that Water Services has multiple measures to control risk. Cells in **YELLOW** indicate control measures exist, but require more attention. Cells in **RED** indicate that these risks are outside of City control.

²³ + Improvements are being made

Appendix "C" – Internal and External Audit Plans

Guelph Water Services Process or Program	2014 Audit Plan		2015 Audit Plan		2016 Audit Plan	
	Internal	External	Internal	External	Internal	External
Source Water – Source Water Protection (Engineering)	X	X	X	X	X	
Source Water – Tap Water Promotion, Education & Outreach					X	
Source Water – Water Conservation		X	X			X
Supply – Source & Treated Water Sampling, Testing, Monitoring		X	X	X		X
Supply – Operational Control: Disinfection, Minimum Storage, SCADA / Security	X	X	X	X		X
Supply – Instrumentation Calibration / Verification	X	X	X	X		X
Supply – Reliability-Centered Maintenance Program (RCMP) & Supply Maintenance	X		X	X		X
Supply – Infrastructure (facility and tower) Inspections Program	X				X	X
Distribution – Watermain Maintenance and Service Connections Improvement	X	X	X			X
Distribution – Appurtenance Maintenance (valves, hydrants)			X		X	X
Distribution – Backflow Prevention (Building Services)				X	X	
Distribution – Flushing & Swabbing			X		X	X
Distribution – Infrastructure Locates	X	X	X	X	X	X
Distribution – Leak Detection & Water Loss Mgmt.	X	X	X		X	X
Distribution – No Water Response (incl. Frozen Pipes)					X	
Major Works & New Infrastructure – Engineering / Water: Review of Infrastructure and Specifications		X	X		X	
Major Works & New Infrastructure – Engineering: Infrastructure Reconstruction and Replacement		X	X		X	X
Major Works & New Infrastructure – Engineering: New Construction (new subdivisions)			X		X	X
Management – Owner (Council & CAO) Standard of Care	X	X	X	X		X
Management – Customer Service (Administration, Distribution, Supply)	X	X	X	X		X
Management – Risk & Emergency Management	X	X	X	X		X
Management – Human Resources & Supplier Management	X	X	X	X		X
Management – Communications		X		X		X
Management – Continual Improvement	X	X	X	X		X

Appendix "D" – Total Water Pumped and Instantaneous Flows

Note on Capacity:

Capacity is calculated by comparing the average pumped or flow value against the MDWL allowable volume or PTTW flow. Capacity is representative of the conditions of pumping for that year which may be influenced by other testing programs, maintenance or special operational conditions. Additionally, the actual capacity of the source may not be achievable with current infrastructure. Optimization efforts are included as a component of the Water Supply Master Plan with the intent to match the actual capacity of the water source with the appropriate infrastructure.

City of Guelph Water Services – Pumpage to System – Jan. 01 – Jun. 30, 2016

Facility		Burke Discharge	Calico Discharge	Dean Discharge	Downey Discharge	Emma Street Discharge	Helmar Discharge	Membro Discharge	Paisley Net Discharge	Park Discharge	Queensdale Discharge	University Net Discharge	Water Street Discharge	F.M. Woods Discharge	Total System Discharge
Units		m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³
Month	Regulatory Limit	6,546	5,237	2,300	5,237	3,100	3,273	6,050	13,738	10,300	5,273	5,108	3,400	65,000	n/a
January	Maximum	3,842	860	0	4,151	2,555	955	0	1,015	6,196	0	2,256	2,371	29,813	49,054
	Average	3,148	803	0	3,953	2,421	914	0	758	3,806	0	1,743	1,179	26,572	45,297
	Total	97,592	24,891	0	122,534	75,045	28,343	0	23,496	117,985	0	54,046	36,537	823,746	1,404,215
February	Maximum	4,060	790	0	4,792	2,392	1,095	0	1,008	7,906	0	2,241	2,313	29,070	49,452
	Average	3,449	773	0	4,236	1,205	966	0	975	5,501	0	1,877	1,270	26,870	47,123
	Total	100,016	22,425	0	122,857	34,954	28,025	0	28,268	159,527	0	54,442	36,824	779,230	1,366,568
March	Maximum	5,198	831	146	3,978	2,891	1,093	0	1,015	6,680	0	2,239	2,765	29,950	49,389
	Average	3,692	764	16	3,947	2,618	1,085	0	927	4,816	0	1,738	1,414	25,724	46,742
	Total	114,459	23,685	500	122,351	81,155	33,645	0	28,748	149,306	0	53,878	43,820	797,446	1,448,993
April	Maximum	3,801	828	0	3,947	2,848	1,094	0	989	7,491	1,647	2,248	2,170	29,233	50,473
	Average	3,558	806	0	3,928	2,716	1,087	0	983	3,712	1,290	1,826	1,173	26,551	47,630
	Total	106,746	24,175	0	117,829	81,468	32,614	0	29,478	111,359	38,713	54,785	35,182	796,538	1,428,887
May	Maximum	4,969	819	0	4,036	2,849	1,205	0	980	9,092	1,674	2,248	2,152	29,995	55,888
	Average	3,365	788	0	3,977	2,586	898	0	975	5,493	1,639	585	1,547	26,611	48,465
	Total	104,307	24,429	0	123,297	80,156	27,847	0	30,225	170,290	50,805	18,148	47,970	824,931	1,502,406
June	Maximum	5,317	936	0	4,017	2,735	977	0	974	8,892	1,677	52	2,056	33,875	56,498
	Average	3,875	827	0	3,986	2,648	926	0	966	4,513	1,301	2	1,942	30,503	51,488
	Total	116,245	24,808	0	119,566	79,433	27,789	0	28,973	135,400	39,038	52	58,255	915,076	1,544,635
2016 Year (Jan. – Jun.)	Maximum	5,317	936	146	4,792	2,891	1,205	0	1,015	9,092	1,677	2,256	2,765	33,875	56,498
	Average	3,514	794	3	4,004	2,366	980	0	931	4,640	705	1,295	1,421	27,138	47,791
	Total	639,364	144,414	500	728,434	432,211	178,263	0	169,189	843,867	128,557	235,352	258,588	4,936,966	8,695,703
	Average Capacity	54%	15%	0%	77%	77%	30%	0%	n/a	45%	13%	n/a	42%	42%	n/a

City of Guelph Water Services – Permit to Take Water Pumpages – Jan. 01 – Jun. 30, 2016

Facility	Admiral Well	Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #15	Arkell Wellfield (#6,7,8,14,15) Total	Arkell - Recharge Pump	Arkell Spring Collector System	Burke Well	Calico Well	Carter Wells #1 and #2	Clythe Well	Dean Well	Downey Well	Edinburgh Well	Emma Street Well	Helmar Well	Membro Well	Paisley Well	Park Wells #1 and #2	Queensdale Well	Sacco Well	Smallfield Well	University of Guelph Well	Water Street Well	
Units	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³		
Month	Regulatory Limit	N/O²⁴	3,273	9,600	9,600	9,600	9,600	28,800	9,092	25,000	6,546	5,237	6,547	N/O	2,300	5,273	N/O	3,100	3,273	6,050	3,200	10,300	5,237	N/O	N/O	3,300	3,400	
January	Maximum	N/O	145	7,382	7,565	6,629	7,219	7,075	26,209	0	4,959	3,806	851	6,368	N/O	2	4,207	N/O	2,555	934	0	1,015	6,204	1,390	N/O	N/O	2,256	2,3713
	Average	N/O	14	5,777	6,385	1,398	2,778	5,613	21,951	0	4,725	3,157	795	6,093	N/O	0	4,006	N/O	2,421	896	0	758	3,769	428	N/O	N/O	1,743	1,179
	Total	N/O	427	179,082	197,948	43,341	86,111	174,010	680,492	0	146,465	97,857	24,660	188,898	N/O	2	124,182	N/O	75,045	27,769	0	23,496	116,829	13,265	N/O	N/O	54,046	36,537
February	Maximum	N/O	229	7,322	7,256	3,656	6,476	6,831	24,100	0	5,273	4,088	799	6,112	N/O	0	4,856	N/O	2,392	1,087	0	1,008	7,873	1,482	N/O	N/O	2,241	2,313
	Average	N/O	20	4,879	7,149	487	2,731	6,692	21,937	0	4,926	3,458	733	6,060	N/O	0	4,293	N/O	1,205	947	0	975	5,462	1,368	N/O	N/O	1,877	1,270
	Total	N/O	583	141,488	207,316	14,135	79,191	194,056	636,185	0	142,858	100,289	22,407	175,744	N/O	0	124,500	N/O	34,945	27,463	0	28,268	158,398	39,670	N/O	N/O	54,442	36,824
March	Maximum	N/O	7	7,424	7,395	6,772	6,880	6,980	26,277	0	6,297	5,127	818	6,039	N/O	0	4,000	N/O	2,891	1,092	0	927	6,533	204	N/O	N/O	2,239	2,765
	Average	N/O	1	4,628	7,190	1,764	2,495	4,874	20,951	0	5,343	3,686	750	5,365	N/O	0	4,031	N/O	2,618	1,065	0	1,015	4,732	9	N/O	N/O	1,738	1,413
	Total	N/O	25	143,468	222,893	54,673	77,358	151,095	649,487	0	165,630	114,279	23,244	166,313	N/O	0	123,990	N/O	81,155	33,002	0	28,748	146,696	264	N/O	N/O	53,878	43,815
April	Maximum	N/O	318	7,027	7,406	4,483	7,484	7,135	24,797	0	10,870	3,776	815	5,209	N/O	134	3,999	N/O	2,848	1,088	138	989	7,422	1,677	N/O	N/O	2,248	2,170
	Average	N/O	28	3,404	7,278	1,061	2,988	4,837	19,568	0	8,843	3,530	797	3,591	N/O	5	3,979	N/O	2,716	1,067	5	983	3,681	1,288	N/O	N/O	1,826	1,173
	Total	N/O	852	102,129	218,348	31,822	89,638	145,104	587,041	0	265,275	105,914	23,920	107,724	N/O	152	119,364	N/O	81,468	32,020	138	29,478	110,420	38,638	N/O	N/O	54,785	35,180
May	Maximum	N/O	333	7,277	7,386	3,167	5,998	7,250	24,916	0	10,341	4,953	808	5,197	N/O	0	4,085	N/O	2,849	1,166	4,563	980	9,046	1,709	N/O	N/O	2,248	2,152
	Average	N/O	44	1,941	7,268	341	2,075	5,291	16,916	0	9,913	3,374	784	4,715	N/O	0	4,027	N/O	2,586	881	1,817	975	5,437	1,634	N/O	N/O	585	1,547
	Total	N/O	1,377	60,165	225,305	10,573	64,330	164,024	524,398	0	307,314	104,593	24,293	146,159	N/O	0	124,834	N/O	80,156	27,305	56,342	30,225	168,534	50,667	N/O	N/O	18,148	47,969
June	Maximum	N/O	331	6,878	7,310	3,424	6,376	7,088	26,970	0	9,960	5,302	957	5,151	N/O	0	4,067	N/O	2,735	978	4,430	974	8,867	1,665	N/O	N/O	52	2,056
	Average	N/O	35	4,233	7,041	961	3,405	5,630	21,268	0	9,401	3,877	828	960	N/O	0	4,035	N/O	2,648	908	2,288	966	4,467	1,300	N/O	N/O	2	1,942
	Total	N/O	1,039	126,977	211,217	28,823	102,144	168,888	638,049	0	282,038	116,297	24,844	28,792	N/O	0	121,047	N/O	79,433	27,230	68,631	28,973	134,018	39,007	N/O	N/O	52	58,255
2016 Year	Maximum	N/O	333	7,424	7,565	6,772	7,484	7,250	26,970	0	10,870	5,302	957	6,368	N/O	134	4,856	N/O	2,891	1,166	4,563	1,015	9,046	1,709	N/O	N/O	2,256	2,765
	Average	N/O	24	4,144	7,052	1,002	2,745	5,489	20,432	0	7,192	3,514	788	4,464	N/O	1	4,057	N/O	2,365	961	685	931	4,591	1,004	N/O	N/O	1,295	1,421
	Total	N/O	4,302	753,311	1,283,027	183,366	498,772	997,176	3,715,652	0	1,309,580	639,228	143,367	813,628	N/O	154	737,917	N/O	432,202	174,789	125,111	169,189	834,894	181,512	N/O	N/O	235,352	258,579
	Average Pumped	N/O	1%	43%	74%	11%	29%	57%	71%	0%	29%	54%	15%	69%	N/O	0%	78%	N/O	77%	30%	11%	29%	45%	19%	N/O	n/O	39%	42%

²⁴ N/O – not operational

City of Guelph Water Services – Instantaneous Flows Summary (PTTW) – Jan. 01 – Jun. 30, 2016

Facility		Admiral Well	Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #15	Arkell Wellfield (#6,7,8,14,15)	Arkell - Recharge System	Arkell Spring Collector System	Burke Well	Calico Well	Carter Wells	Clythe Well	Dean Well	Downey Well	Edinburgh Well	Emma Street Well	Helmar Well	Membro Well	Paisley Well	Park Wells	Queensdale Well	Sacco Well	Smallfield Well	University of Guelph Well	Water Street Well
Units		L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s
Month	Regulatory Limit	<i>n/a</i>	37.9	111.0	111.0	111.0	111.0	111.0	<i>n/a</i>	157.8	290.0	75.8	60.6	90.1	<i>n/a</i>	26.6	60.6	<i>n/a</i>	35.8	37.9	70	37	178.8	61	<i>n/a</i>	<i>n/a</i>	38	59.03
January	Maximum	N/O	12.8	86.4	85.1	78.8	88.2	82.1	420.7	0.0	57.4	64.8	13.4	71.1	0.0	0.0	58.0	N/O	30.0	15.0	0.0	12.5	109.9	37.1	N/O	N/O	27.0	35.2
	Average	N/O	0.2	65.9	71.7	16.2	32.0	64.7	250.4	0.0	54.7	36.3	9.2	68.7	0.0	0.0	46.9	N/O	28.0	10.4	0.0	8.7	43.0	5.0	N/O	N/O	20.2	13.6
February	Maximum	N/O	12.6	86.7	85.2	77.9	88.3	80.8	418.9	0.0	61.0	68.4	13.3	71.1	0.0	0.0	61.4	N/O	29.3	14.7	0.0	12.9	114.6	50.0	N/O	N/O	26.9	34.8
	Average	N/O	0.2	56.0	82.3	5.6	31.5	77.1	252.6	0.0	57.0	39.7	9.0	69.9	0.0	0.0	50.2	N/O	13.8	11.0	0.0	11.2	62.8	15.9	N/O	N/O	21.6	14.6
March	Maximum	N/O	12.5	102.4	86.7	79.8	89.0	84.3	442.3	0.0	72.9	71.6	13.4	70.2	0.0	0.0	51.9	N/O	33.9	14.5	0.0	12.6	117.1	21.2	N/O	N/O	27.0	41.2
	Average	N/O	0.0	53.6	82.9	20.4	28.9	56.5	242.4	0.0	61.8	42.8	8.7	62.2	0.0	0.0	47.0	N/O	30.3	12.5	0.0	10.7	55.1	0.1	N/O	N/O	20.1	16.4
April	Maximum	N/O	12.9	85.6	87.2	93.7	91.3	85.9	443.8	0.0	125.8	70.9	13.2	60.5	0.0	21.0	49.3	N/O	34.3	14.7	33.3	12.3	122.3	20.9	N/O	N/O	27.0	32.6
	Average	N/O	0.3	39.3	81.8	12.2	33.4	55.1	221.8	0.0	102.3	41.2	9.2	41.6	0.0	0.1	46.7	N/O	31.3	12.5	0.1	11.4	42.6	15.0	N/O	N/O	21.1	13.6
May	Maximum	N/O	13.0	85.3	86.0	84.8	89.7	87.4	433.2	0.0	119.7	75.0	13.2	60.4	0.0	0.0	56.2	N/O	33.8	15.1	58.6	11.9	122.8	21.6	N/O	N/O	27.1	38.9
	Average	N/O	0.5	22.5	83.6	4.0	24.0	61.2	195.2	0.0	114.7	38.9	9.1	54.6	0.0	0.0	47.2	N/O	30.0	10.3	10.9	11.3	62.9	18.9	N/O	N/O	6.8	17.9
June	Maximum	N/O	12.7	84.5	85.1	78.3	89.0	86.0	422.9	0.0	115.3	68.0	13.8	59.8	0.0	0.0	49.6	N/O	32.4	14.7	52.2	12.6	118.6	20.6	N/O	N/O	26.3	38.5
	Average	N/O	0.4	49.0	81.6	11.1	39.4	65.1	246.2	0.0	108.8	44.7	9.6	11.1	0.0	0.0	47.4	N/O	30.6	10.6	26.9	11.4	26.8	15.2	N/O	N/O	0.0	22.5

Appendix "E" – Treated Water Quality Statistics

O. Reg. 170/03 Schedule 23, 13-2b – "Three Year" Results Summary

(Jan. 01 – Jul. 31, 2016)

Parameter	ODWQS MAC mg/L	½ MAC mg/L	Total Samples	Samples Above MDL	# Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
<u>Antimony</u>	0.014	0.007	22	9	0	< 0.0005	0.0011	0.00076
<u>Arsenic</u>	0.025	0.0125	22	3	0	< 0.001	0.0033	0.0029
<u>Barium</u>	1.0	0.5	22	22	0	0.035	0.093	0.062
<u>Boron</u>	5.0	2.5	22	22	0	0.013	0.048	0.028
<u>Cadmium</u>	0.005	0.0025	22	6	0	< 0.0001	0.00016	0.00013
Chromium	0.05	0.025	22	0	0	< 0.005	< 0.005	n/a
Mercury	0.001	0.0005	10	0	0	< 0.0001	< 0.0001	n/a
Selenium	0.01	0.005	22	0	0	< 0.002	< 0.002	n/a
<u>Uranium</u>	0.02	0.01	22	21	0	< 0.0001	0.0024	0.00113

O. Reg. 170/03 Schedule 24, 13-4b – “Three Year” Results Summary

(Jan. 1 – Jul. 31, 2016)

Parameter	ODWQS MAC mg/L	½ MAC mg/L	Total Sample s	Samples Above MDL	# Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Alachlor	0.005	0.0025	10	0	0	< 0.0005	< 0.0005	n/a
Atrazine + N-dealkylated metabolites	0.005	0.0025	10	0	0	< 0.001	< 0.001	n/a
Azinphos-methyl	0.02	0.01	10	0	0	< 0.002	< 0.002	n/a
Benzene	0.005	0.0025	49	0	0	< 0.0001	< 0.0001	n/a
Benzo(a)pyrene	0.00001	0.000005	10	0	0	< 0.000009	< 0.000009	n/a
Bromoxynil	0.005	0.0025	10	0	0	< 0.0005	< 0.0005	n/a
Carbaryl	0.09	0.045	10	0	0	< 0.005	< 0.005	n/a
Carbofuran	0.09	0.045	10	0	0	< 0.005	< 0.005	n/a
Carbon Tetrachloride	0.005	0.0025	49	0	0	< 0.0001	< 0.0001	n/a
Chlorpyrifos	0.09	0.045	10	0	0	< 0.001	< 0.001	n/a
Diazinon	0.02	0.01	10	0	0	< 0.001	< 0.001	n/a
Dicamba	0.12	0.06	10	0	0	< 0.001	< 0.001	n/a
1,2-Dichlorobenzene	0.2	0.1	49	0	0	< 0.0002	< 0.0002	n/a
1,4-Dichlorobenzene	0.005	0.0025	49	0	0	< 0.0002	< 0.0002	n/a
1,2-dichloroethane	0.005	0.0025	49	0	0	< 0.0002	< 0.0002	n/a
1,1-Dichloroethylene (vinylidene chloride)	0.014	0.007	49	0	0	< 0.0001	< 0.0001	n/a
Dichloromethane	0.05	0.025	49	0	0	< 0.0005	< 0.0005	n/a
2,4-Dichlorophenol	0.9	0.45	10	0	0	< 0.0005	< 0.0005	n/a
2,4-Dichlorophenoxy acetic acid (2,4-D)	0.1	0.05	10	0	0	< 0.001	< 0.001	n/a
Diclofop-methyl	0.009	0.0045	10	0	0	< 0.0009	< 0.0009	n/a
Dimethoate	0.02	0.01	10	0	0	< 0.003	< 0.003	n/a
Diquat	0.07	0.0035	10	0	0	< 0.007	< 0.007	n/a
Diuron	0.15	0.075	10	0	0	< 0.01	< 0.01	n/a
Glyphosate	0.28	0.14	10	0	0	< 0.002	< 0.002	n/a
Malathion	0.19	0.095	10	0	0	< 0.005	< 0.005	n/a
MCPA	0.05	0.025	10	0	0	< 0.00012	< 0.00012	n/a
Metolachlor	0.05	0.025	10	0	0	< 0.0005	< 0.0005	n/a
Metribuzin	0.08	0.04	10	0	0	< 0.005	< 0.005	n/a
Chlorobenzene	0.08	0.04	49	0	0	< 0.0001	< 0.0001	n/a
Paraquat	0.01	0.005	10	0	0	< 0.001	< 0.001	n/a
Pentachlorophenol	0.06	0.03	10	0	0	< 0.0005	< 0.0005	n/a
Phorate	0.002	0.001	10	0	0	< 0.0005	< 0.0005	n/a
Picloram	0.19	0.095	10	0	0	< 0.005	< 0.005	n/a

Parameter	ODWQS MAC mg/L	1/2 MAC mg/L	Total Sample s	Samples Above MDL	# Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Polychlorinated Biphenyls (PCB)	0.003	0.0015	10	0	0	< 0.00005	< 0.00005	n/a
Prometryne	0.001	0.0005	10	0	0	< 0.0003	< 0.0003	n/a
Simazine	0.01	0.005	10	0	0	< 0.001	< 0.001	n/a
Terbufos	0.001	0.0005	10	0	0	< 0.0005	< 0.0005	n/a
<u>Tetrachloroethylene</u> (perchloroethylene)	0.03	0.015	49	1	0	< 0.0001	0.00011	0.00011
2,3,4,6-Tetrachlorophenol	0.1	0.05	10	0	0	< 0.0005	< 0.0005	n/a
Triallate	0.23	0.115	10	0	0	< 0.001	< 0.001	n/a
<u>Trichloroethylene</u>	0.005	0.0025	49	18	0	< 0.0001	0.00106	0.00046
2,4,6-Trichlorophenol	0.005	0.0025	10	0	0	< 0.0005	< 0.0005	n/a
Trifluralin	0.045	0.0225	10	0	0	< 0.001	< 0.001	n/a
Vinyl Chloride	0.002	0.001	49	0	0	< 0.0002	< 0.0002	n/a

Operational VOC Scan Results Summary

(Jan. 01 – Jun. 30, 2016)

Parameter	ODWQS MAC mg/L	½ MAC mg/L	Total Sample s	Samples Above MDL	# Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
1,1-Dichloroethane	n/a	n/a	74	0	n/a	< 0.0001	< 0.0001	n/a
1,1-Dichloroethylene	0.014	0.007	76	0	0	< 0.0001	< 0.0001	n/a
1,1,1-Trichloroethane	n/a	n/a	74	0	n/a	< 0.0001	0.00018	n/a
1,1,2-Trichloroethane	n/a	n/a	74	0	n/a	< 0.0002	< 0.0002	n/a
1,1,2,2-Tetrachloroethane	n/a	n/a	74	0	n/a	< 0.0001	< 0.0001	n/a
Ethylene Dibromide	n/a	n/a	74	0	n/a	< 0.0002	< 0.0002	n/a
1,2-Dichlorobenzene	0.2	0.1	76	0	0	< 0.0002	< 0.0002	n/a
Cis-1,2-Dichloroethylene	n/a	n/a	74	29	n/a	< 0.0001	0.00423	0.00168
Trans-1,2-Dichloroethylene	n/a	n/a	74	1	n/a	< 0.0001	0.00011	0.00011
1,2-Dichloropropane	n/a	n/a	74	0	n/a	< 0.0001	< 0.0001	n/a
1,3-Dichlorobenzene	n/a	n/a	74	0	n/a	< 0.0002	< 0.0002	n/a
1,4-Dichlorobenzene	0.005	0.0025	76	0	0	< 0.0002	< 0.0002	n/a
Acetone	n/a	n/a	74	0	n/a	< 0.01	< 0.01	n/a
Benzene	0.005	0.0025	76	0	0	< 0.0001	< 0.0001	n/a
Bromodichloromethane	0.1	0.05	78	25	0	< 0.0001	0.014	0.004684
Bromoform	0.1	0.05	78	24	0	< 0.0002	0.00296	0.001418
Carbon Tetrachloride	0.005	0.0025	76	0	0	< 0.0001	< 0.0001	n/a
Chloroethane	n/a	n/a	74	0	n/a	< 0.0002	< 0.0002	n/a
Chloroform	0.1	0.05	78	63	0	< 0.0001	0.0268	0.003610
Dibromochloromethane	0.1	0.05	78	26	0	< 0.0002	0.0908	0.005006
<u>Dichloromethane</u>	0.05	0.025	76	0	0	< 0.0005	< 0.0005	n/a
Ethylbenzene	0.0024	n/a	74	0	0	< 0.0001	< 0.0001	n/a
Methyl Ethyl Ketone	n/a	n/a	74	0	n/a	< 0.0005	< 0.0005	n/a
Styrene	n/a	n/a	74	0	n/a	< 0.0002	< 0.0002	n/a
<u>Tetrachloroethylene</u> (perchloroethylene)	0.03	0.015	76	0	0	< 0.0001	<0.0001	n/a
Tolulene	0.024	n/a	76	0	0	< 0.0002	< 0.0002	n/a
<u>Trichloroethylene</u>	0.005	0.0025	76	27	0	< 0.0001	0.00108	0.00050
Trichlorofluoromethane	n/a	n/a	74	0	0	< 0.0002	< 0.0002	n/a
Vinyl Chloride	n/a	n/a	76	0	0	< 0.0002	< 0.0002	n/a
o-Xylene	n/a	n/a	74	0	0	< 0.0001	< 0.0001	n/a
m- + p- Xylene	n/a	n/a	74	1	0	< 0.0001	0.00016	0.00016
Total Xylene	0.3	n/a	74	1	0	<0.0001	0.00016	0.00016
<u>Trihalomethanes</u>	0.100	n/a	78	31	0	< 0.0002	0.0392	0.01235

General Chemistry Results Summary

(Jan. 01 – Jun. 30, 2016)

Parameter	ODWQS MAC	ODWQS AO	ODWQS OG	Total Samples	Samples Above MDL	# Above Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Aluminum	n/a	n/a	0.1	14	0	0	< 0.005	0.005	n/a
Alkalinity (as CaCO ₃)	n/a	n/a	30-500	12	12	0	250	340	292.5
Ammonia-N	n/a	n/a	n/a	12	0	n/a	< 0.05	< 0.05	n/a
Anion Sum	n/a	n/a	n/a	12	12	n/a	7.85 ²⁵	15.5 ²⁴	11.49 ²⁴
<u>Antimony</u>	0.014	n/a	n/a	14	5	0	< 0.0005	0.0011	0.00086
<u>Arsenic</u>	0.025	n/a	n/a	14	4	0	< 0.001	0.0033	0.0025
<u>Barium</u>	1.0	n/a	n/a	14	14	0	0.035	0.093	0.066
Beryllium	n/a	n/a	n/a	14	0	n/a	<0.0005	<0.0005	n/a
<u>Boron</u>	5.0	n/a	n/a	14	14	0	0.013	0.045	0.026
<u>Cadmium</u>	0.005	n/a	n/a	14	4	0	< 0.0001	0.00014	0.00013
Calcium	n/a	n/a	n/a	14	14	n/a	93	150	114.071
Cation Sum	n/a	n/a	n/a	12	12	n/a	8.39 ²⁴	16.0 ²⁴	11.925 ²⁴
<u>Chloride</u>	n/a	250	n/a	12	12	0	41	240	124.33
Chromium	0.05	n/a	n/a	14	0	0	< 0.005	< 0.005	n/a
Cobalt	n/a	n/a	n/a	14	5	n/a	< 0.0005	.0023	.00118
Copper	n/a	1	n/a	14	10	0	< 0.001	0.01	0.0039
Dissolved Organic Carbon (DOC)	n/a	5	n/a	26	26	0	0.62	2.4	1.129
<u>1,4 Dioxane</u>	n/a	n/a	n/a	5	0	n/a	<0.0001	<0.0001	n/a
<u>Hardness (Calculated as CaCO₃)</u>	n/a	n/a	80-100	12	12	12	360	550	441.7
Ion Balance (% difference)	n/a	n/a	n/a	12	12	n/a	0.97 ²⁶	3.33 ²⁵	1.859 ²⁵
<u>Iron</u>	n/a	0.3	n/a	14	5	1	< 0.1	0.47	0.306
<u>Langlier's Index at 4°C</u>	n/a	n/a	n/a	12	12	n/a	0.537 ²⁷	0.844 ²⁶	0.705 ²⁶
<u>Langlier's Index at 20°C</u>	n/a	n/a	n/a	12	12	n/a	0.785 ²⁶	1.09 ²⁶	0.952 ²⁶
Lead	0.01	n/a	n/a	14	4	0	<0.0005	0.0020	0.00142
Magnesium	n/a	n/a	n/a	14	14	n/a	29	46	37.8
<u>Manganese</u>	n/a	0.05	n/a	14	11	1	<0.002	0.066	0.0157
Molybdenum	n/a	n/a	n/a	14	13	n/a	<0.0005	0.0042	0.00187
Nickel	n/a	n/a	n/a	14	11	n/a	<0.001	0.0093	0.00446
o-Phosphate	n/a	n/a	n/a	12	10	n/a	<0.01	0.013	0.011
pH	n/a	n/a	6.5-8.5	12	12	0	7.64	8.07	7.93

²⁵ Units in mEq/L²⁶ Units in %²⁷ Units in Langlier's Index

Parameter	ODWQS MAC	ODWQS AO	ODWQS OG	Total Samples	Samples Above MDL	# Above Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Phosphorus	n/a	n/a	n/a	14	0	n/a	<0.1	<0.1	n/a
Potassium	n/a	n/a	n/a	14	14	n/a	1.5	3.0	1.936
Saturation pH at 4°C	n/a	n/a	n/a	12	12	n/a	7.11	7.31	7.224
Saturation pH at 20°C	n/a	n/a	n/a	12	12	n/a	6.86	7.07	6.978
Selenium	0.01	n/a	n/a	14	0	0	<0.002	< 0.002	n/a
Silicon	n/a	n/a	n/a	14	14	n/a	3.7	9.3	5.929
Silver	n/a	n/a	n/a	14	0	n/a	<0.0001	<0.0001	n/a
<u>Sodium</u>	n/a	20 and 200	n/a	15	15	15	24	140	64.6
Strontium	n/a	n/a	n/a	14	14	n/a	0.41	5.30	1.946
Sulphate	n/a	550	n/a	12	12	0	49	240	100.583
Thallium	n/a	n/a	n/a	14	4	n/a	< 0.00005	0.000074	0.000061
Titanium	n/a	n/a	n/a	14	0	n/a	<0.005	<0.005	n/a
Total Dissolved Solids	n/a	n/a	n/a	12	12	n/a	430	880	640.8
<u>Uranium</u>	0.02	n/a	n/a	14	13	0	<0.0001	0.0021	0.00109
Vanadium	n/a	n/a	n/a	13	0	n/a	<0.0005	<0.0005	n/a
Zinc	n/a	5	n/a	14	13	0	<0.005	0.19	0.0807

Appendix "F" – Legal and Other Requirements Update

Date - 2016	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Effective Jan. 1	EBR	<p><u>Regulatory Amendments to Update Ontario Drinking Water Quality Standards, and Testing and Reporting Requirements</u> – changes include:</p> <ol style="list-style-type: none"> 1. The addition of MCPA sampling (added to Schedule 24 and therefore simply an addition to the Schedule 24 bottle set which Maxxam will look after). There is also 13 Pesticide analysis being removed from Schedule 24 so the total number of sample bottles may even be less. This sampling takes place annually at Woods' (GUDIWEF) and every three years at all other treated sources (groundwater). 2. The addition of HAA sampling every 3 months. Sampling will take place at the same locations where TTHM sampling occurs, at the same frequency and using the same methodology. The next 3 Month event is scheduled for the week of January 18th – 22nd <p>Also, the existing standards for carbon tetrachloride; benzene and vinyl chloride are being lowered but this doesn't take effect until January 1, 2017 and for arsenic, January 1, 2018.</p>	<p>Compliance Coordinator forwarded the summary of changes to Water Supply staff.</p> <p>Water Supply Technician updated related Chains of Custody, Compliance Records and 3-month bottle order from lab. She also updated the ½ MAC Alert in WaterTrax.</p>
Feb. 8	MOECC e-mail	<p>Visit the new <u>Source Water Protection Map</u> now available on Ontario.ca.</p> <p>This interactive map provides the first provincial view of the more than 970 wellhead protection areas and 150 intake protection zones within the source protection areas in Ontario. You can access over 20 layers of information every time you do a customised search.</p> <p>For the first time, the public will be able to see the wellhead protection areas and intake protection zones of the lakes, rivers and aquifers that supply their drinking water. This tool provides them with information needed to make informed property-based decisions. As well, this tool will help ministries and other agencies implement source protection plan policies.</p> <p>A link to the map can be found in the updated <u>General Messages page</u> of the Source Water Protection Resource Catalogue available on Conservation Ontario's website.</p> <p>Assist us in promoting the <u>map</u> and <u>catalogue page</u> by posting links on your respective websites and on your social media platform such as Facebook and Twitter.</p>	No action required.
Feb. 26	OMWA newswire	<p><u>Canadian disaster relief to cost \$900M a year over next 5 years, new PBO report says</u> – Storms, hurricanes and floods driven in part by climate change will cost the federal disaster fund \$902 million a year over the next five years, well above past averages, the parliamentary budget officer predicted Thursday. The average cost to the federal disaster fund has risen from \$54 million a year (in adjusted 2014 dollars) for the 1970-94 period to \$291 million between 1995 and 2004 and \$410 million between 2005 and 2014.</p>	No action required.

Date - 2016	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Mar. 10	Willms & Shier e-mail	The Ministry of the Environment and Climate Change has posted the <i>Proposed Excess Soil Management Policy Framework</i> on the Environmental Registry for review and comment. The Framework seeks to address gaps in the management of excess soil, including issues raised since the MOECC introduced <i>Management of Excess Soil – A Guide for Best management Practices</i> in January 2014. Click here to read the full article.	Engineering staff (Prasoon Adhikari) made a submission to the MOECC on behalf of the City of Guelph before the March 25 deadline.
Mar. 21	MOECC e-mail	<p>Keep your eyes open for the new Drinking Water Protection Zone signs! They are appearing across Ontario to protect public health and raise awareness of the sensitivity of our drinking water sources.</p> <p>More information is available in the Drinking Water Protection Zone Road Signs catalogue page in the Source Water Protection Education and Outreach catalogue on Conservation Ontario's website.</p> <p>A page on Water Conservation has also been posted. It helps homeowners and businesses understand their water use and gives tips on how to use less.</p> <p>We encourage you to view the new catalogue pages and promote them through social media at #SourceWaterON.</p>	No action required.
Mar. 23	OMWA newswire	<p><u>Ontario Moves to Track Water Usage in Large Buildings</u> Ontario is pushing to get to large building owners measure and track water usage. The Ontario Ministry of Energy has made a proposal that requires large building owners to collect and submit data on their building's water and energy usage each year.</p>	No action required.
Apr. 5	EBR	<p><u>Regulations prescribing certain short term water takings as EASR activities</u> – MOECC posted a discussion paper on the Environmental Activity and Sector Registry and Short-Term Water Takings on March 6, 2015. On November 20, 2015 the ministry posted a proposal for a regulation under the Environmental Protection Act that would prescribe the following activities for the purposes of section 20.21 of the Act – the Environmental Activity and Sector Registry (EASR):</p> <ul style="list-style-type: none"> ■ Water takings for Construction Site Dewatering ■ Water takings for Road Construction Purposes <p>A decision has been made to prescribe the two activities noted above for the purposes of subsection 20.21 (1) of the Act. The new EASR regulation made under the Environmental Protection Act is O. Reg. 63/16 Registrations Under Part II.2 of the Act –Water Takings.</p>	Forwarded information to Water Services' Manager of Technical Services and Project Manager.
Apr. 5	NSERC e-mail	<p><u>Flint Water Advisory Task Force's final report</u> is now available online at no cost. The task force arrived at 36 findings and has provided 42 recommendations for a variety of agencies/governing bodies.</p> <p>Here are links to the Walkerton and North Battleford inquiries if interested in comparing these to the Flint Water Advisory Task Force findings.</p>	Plant Manager forwarded the e-mail to Top Management, Technicians and Coordinators.

Date - 2016	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Apr. 14	MOHLTC Letter (Jan. 7)	<p><u>Information on Fluoride and Guelph Tap Water</u> - ...recent correspondence from the Provincial Minister of Health requests that municipalities doing so continue to add fluoride to their municipal water supplies to support the dental health of customers.</p> <p>Over the history of Guelph Water Services, fluoride has not been added to the municipal water system. In 1972, the community rejected a proposal for the addition of fluoride to Guelph tap water through a plebiscite that was defeated by 77% of voters.</p> <p>In the absence of direction from either Wellington-Dufferin-Guelph Public Health or the Province on this health issue, staff is not considering the addition of fluoride to Guelph's tap water at this time...</p>	Plant Manager prepared a Memo dated Apr. 14 to Guelph City Council re: Fluoride in Guelph.
Apr. 16	<u>Ontario Gazette</u>	The Government of Ontario has filed new regulations intended to streamline the permitting process for specific types of water takings, including construction site dewatering, in-stream diversions, and road construction. Ontario Regulation 64/16 amends the existing <u>Water Taking and Transfer Regulation</u> (O.Reg. 387/04) to provide additional clarification on activities that are considered to be water takings. <u>Ontario Regulation 63/16</u> identifies specific low-risk water takings eligible for online registration through the Environmental Activity Sector Registry (EASR) system, rather than applying for a Permit to Take Water (PTTW) from the Ontario Ministry of the Environment and Climate Change (MOECC).	Gazette printing of earlier information posted on EBR on Apr. 5. No further action required.
Apr. 20	OMWA newswire	<u>Government officials: 3 to be charged in Flint water crisis</u> – The charges — the first levied in a probe that is expected to broaden — will be filed against a pair of state Department of Environmental Quality officials and a local water treatment plant supervisor, two officials told The Associated Press late Tuesday. They spoke on the condition of anonymity because they were not authorized to discuss the investigation publicly.	QA Coordinator forwarded to Top Management. No other action required.
May 1	Water Services e-mails	<u>MOECC Watermain Disinfection Procedure</u> implemented at the City of Guelph. Water Services' Supervisor of Distribution e-mailed (May 1) all impacted Engineering and Water Services staff regarding a summary of changes. The Compliance Coordinator also e-mailed with the updated "QMS 12-05 Alterations to the DWS and Related DWWP and MDWL Amendments" document.	No further action required.
May 30	Guelph news	<p><u>Council appoints risk management staff to protect Guelph's drinking water</u> - Source water protection policies take effect July 1. Council has officially appointed Guelph's Risk Management Official (RMO) and Risk Management Inspector (RMI). These position appointments will ensure Guelph continues to deliver safe, reliable drinking water.</p> <p>Council appointed Peter Rider, registered Professional Geoscientist, as the City's RMO, and Prasoon Adhikari, registered Professional Engineer and the City's Environmental Engineer, as RMI. RMOs and RMIs have the authority under the Clean Water Act to implement and enforce Source Protection Plan (SPP) policies that protect local drinking water sources.</p>	No further action required.

Date - 2016	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Jun. 2	MOECC e-mail	<p>The <u>2016 Spring Operator Certification Bulletin</u> has just been launched. Some highlights include:</p> <ul style="list-style-type: none"> • Ontario's Water and Wastewater Certification Program receives North American awards • MOECC's new watermain disinfection procedure and implications to operators and system owners • Changes to Ontario's Drinking Water Quality Standards, testing and reporting requirements • OWWCO's new and improved website and Director approved course listing • New easy-to-use 'smart' program forms coming in July 2016 ...and more. <p>Operator bulletins are posted on the program administrator's website at www.owwco.ca.</p>	No action required.
Jun. 2	MOECC e-mail	<p>Clarification on <u>Watermain Disinfection Procedure</u></p> <p>We have received several inquiries regarding the effective date that drinking water system owners will have to implement the new Watermain Disinfection Procedure.</p> <p>As stated in our email of December 8, 2015, your Drinking Water Works Permit (DWWP) will be revised to reflect the requirements outlined in the Watermain Disinfection Procedure. You will be required to implement the Watermain Disinfection Procedure prior to the date listed in condition 2.3.2 of your DWWP.</p> <p>If your DWWP does not already include a condition that references the Watermain Disinfection Procedure, your permit will be updated in the near future to include this information (and your required implementation date).</p> <p>If you have any further questions regarding the document, or its implementation for compliance with your DWWP, please feel free to contact me.</p> <p>Aziz S. Ahmed, P.Eng., Director, Part V, SDWA Tel: 416.314.4625 Fax: 416.314.1037 *: Aziz.Ahmed@ontario.ca</p>	No action required. Guelph Water Services chose to implement the Watermain Disinfection Procedure on May 1, 2016.
Jun. 6	Guelph news	<p><u>City move Outside Water Use to Level 1 Yellow</u> - Enforced watering restrictions now in effect - Due to local weather conditions, the City of Guelph is moving to Level 1 Yellow watering restrictions under the Outside Water Use Program effective immediately.</p>	No further action required.
Jun. 29	Guelph news	<p><u>Policies to safeguard Guelph's drinking water</u> take effect July 1 - City to work with landowners, businesses, developers to ensure compliance. The City's 72 Source Water Protection policies come into effect Friday. The provincially-legislated policies are part of the Lake Erie Source Protection Region's Source Protection Plan designed to identify and manage threats to Guelph's municipal drinking water.</p>	No further action required.

Appendix "G" Management Review Action Items

ITEM #	ASSIGNED TO	STATUS	DESCRIPTION
1	Brigitte Roth / John-Paul Palmer	CIR #398	Check-in EDMS SOP's for A&S Report preparation and MOECC Inspection preparation.
2	Annette Indoe / Brian van Nostrand	CIR #399	With Admin. staff, explore Amanda's ability to link to GIS mapping for customer notifications. Also would be good for emergency preparedness. Through business licensing process, e-mails (among other contact information) is collected.
3	Wayne Galliher	CIR #400 Planned for 2017/2018	Water Services should update Water By-law to better address water use at hydrants; water theft and prevention of cross connections at hydrants.
4	Matthew Phillips	CIR #401, Closed 2016-06-15	Consider pumpage recommendation to use Emma, Calico and Helmar only as seasonal peaking wells to save \$94,000 per year in operating costs.
5	John-Paul Palmer	CIR #402	Consider moving Paisley and University raw water sampling to 5-year sampling (with F.M. Woods, Burkes, Downey, Queensdale, Helmare and Calico) since 1,4 Dioxane has never been detected at these wells (Paisley & University)
6	John-Paul Palmer	CIR #403	Consider reducing the frequency of sampling to once per year of treated sources only for sites not located in industrial / commercial areas and where VOC's have never been detected (prior to seeking Council approval of the VOC Management Plan).
7	Karl Cober	CIR #404 Closed 2016-08-11	Consider VOC Management Plan Level 0 edits. Level 0 currently calls for raw and treated sampling at least once every 3 months for sources with TCE ≤40% of the ODWQS. This statement should be revised to > 0% and ≤40% of the ODWQS.
8	Blair Caldwell	CIR #405	Consider using contractor tender process to address city-side lead issues for 30-40 locations.
9	John-Paul Palmer	CIR #409	Follow-up with an analysis of past years' Glen Collector flows (compare wet seasons vs. "normal" seasons and collector flows – any correlations?)
10	Brian van Nostrand	CIR #410 Closed 2016-03-02	Map locations of all bleeders / blow-offs (eventually to be included in On-Point)
11	John-Paul Palmer	CIR #412	Note any changes that affect data results (e.g. improving the accuracy of sample results by choosing a more representative sample location – which may change the trend of data results).
12	Brigitte Roth / Peter Busatto	CIR #413 Closed 2016-02-26	Add section in the Staff Report to cover Operational Challenges (e.g. Water Supply Issues – e.g. Membro Well, Arkell #15, Carters; and Distribution System Issues – e.g. Frozen Services, Dodds Valve and related expenses; Locates Program, etc.)

ITEM #	ASSIGNED TO	STATUS	DESCRIPTION
13	Brigitte Roth	CIR #414 Closed 2016-02-26	Add "Water Quality on Private Property" section of the annual version of this report.
14	John-Paul Palmer	CIR #415	Schedule annual Water Quality Monitoring Schedule (WQMS) meeting with Water Supply Supervisors.
15	Blair Caldwell	CIR #416 Implementd 2016-05-01	Follow-up on implementation date of Watermain Disinfection Procedure
16	John-Paul Palmer	CIR #417 Closed 2016-02-26	Follow-up with Aziz at MOECC re: possible GUDI WEF designation for Arkell #15
17	Brigitte Roth	CIR #418	...to annual version of A&S Report the New Source Protection Compliance issue with respect to new sewer installations (if in certain wellhead protection zone).
18	Blair Caldwell	CIR #421	Follow-up re: the number of information / service requests from other departments.
19	Brigitte Roth	CIR #423	Place key document expiries in Outlook (with main and back-up people identified).
20	Brigitte Roth	Completed January 2016	To Risk Assessment: Add hazardous events: aquifer cross-connections (potentially linked already to sudden changes in raw water characteristics. Add extra text?); drought, aqueduct infrastructure failure. Also consider dividing the section re: source water to be site-specific.
21	Brigitte Roth	CIR #454 Closed 2016-08-11	Further develop documenting and tracking progress on improvement ideas (from emergency debriefs, internal/external audits, meetings, etc.)
22	Kier Taylor	CIR #503	For 2016 A&S Report, add the following to the report: - % compliance to Locates section - valve turning - hydrant repair - swabbing / flushing - service box repairs
23	Brigitte Roth	CIR #504	For 2016 A&S Report, add SCADA section of the report, including % uptime, categories of SCADA maintenance, etc.
24	John-Paul Palmer	CIR #505	For 2016 A&S Report, explain water pumpages section of the report.
25	Blair Caldwell	CIR #506	In A&S Report, verify source of service repair stats (potentially should be double?)
26	Peter Busatto	CIR #507 Closed 2016-02-05	Change text around Membro. Consider adding Dolime text.

ITEM #	ASSIGNED TO	STATUS	DESCRIPTION
27	Brigitte Roth	CIR #508	For 2016 A&S Report, review that A&S section titles to correspond with updates in DWQMS. Also review that these section titles are correct for the QMS 20-01 agenda document.
28	Brigitte Roth	CIR #509 Closed 2016-02-05	Verify that newest OIT certificates are included in the existing numbers.
29	Blair Caldwell	CIR #510	Schedule Watermain Disinfection Procedure review meeting with staff so that everyone understands latest requirements by May 1st.
30	Brigitte Roth	CIR #511 Closed 2016-06-07	Discuss with Certification Specialist opportunity for technical staff to obtain WQA's or other cert's.
31	Brigitte Roth	CIR #512 Closed 2016-02-05	Include past two years' information for customer feedback section of A&S Report.
32	Brigitte Roth	CIR #513 Closed 2016-02-05	Include link to full Frozen Services report already presented to council.
33	Matt Phillips	CIR #514 Closed 2016-04-20	Consider viability of lowering chlorine residual levels following completion of Burkes upgrade and associated infrastructure.

Appendix "H" Summary of Staff Suggestions

CIR #	Suggestion Title	Description of Staff Suggestion
475-477	Emergency Test Exercise	More time to discuss and more specific facts of the incident as the information unfolds. Site specific.
478-481	Emergency Test Exercise	Practice Emergency Operations Centre set-up as part of the exercise. Include active electronic event logs and online mapping tools. Ensure all staff are participants.
483	Emergency Test Exercise	Other Emergency Test topics to consider: backflow event causing contamination, chemical contamination, failure of F.M. Woods pumping to system, Guelph Lake Dam burst (done corporately, but could do Water-specific?), Climate Change / Severe Drought - level Black (or drought with a large water loss event - loss of water tower - that would bring a large portion of the system close to zero pressure?), frozen services, simple AWQI with poor bacti results from routing sampling
484	Emergency Test Exercise	News stories about water emergencies, especially in Ontario should be e-mailed to staff for awareness that stuff really does happen and possibly more frequently than thought.
489/493	Frozen Services Training	Consider Administration's and Extend Communication's role in pre-screening with customer preparation checklist - to prepare for temporary line installation (and minimize wasted Operator time to attend to sites not prepared).
491	Frozen Services Training	Coordinate meter reads by Guelph Hydro at an earlier-than-frozen trigger of freeze prevention monitoring program.
497	Frozen Services Training	Should identify locations of fill stations (e.g. sheds with sinks and taps) - one at F.M. Woods, one at an alternate site.
501	Fibre Network Failure	A number of opportunities presented, including: 1. An immediate "freeze on changes" has been implemented with the fibre network provider. 2. A new workflow / checklist is being developed for any SCADA network changes or upgrades, to ensure potential impacts are carefully considered and contingency plans are put into place prior to each change. 3. Discussions have started with the fibre provider and City IT to bring about changes in how the fibre provider operates, to make sure that mistakes made during this outage are not repeated. 4. The SLA (Service Level Agreement) with the fibre provider is being reviewed to ensure it clearly reflects Water Services' requirements in terms of uptime and time-to-repair-on-outage for the SCADA system network. 5. A direct support phone number for the fibre provider for SCADA network outages, and an escalation tree, are in the process of being put into place. 6. The service contract with the fibre provider is up for renewal in mid-2017. When negotiations begin in mid-2016, how uptime and problem resolution are handled will be carefully reviewed in the draft contract. 7. A fast-tracked project has been started to update the SCADA network drawings and network documentation. 8. Installation of diagnostic software on our SCADA network. 9. Implementation of network equipment shelf-spares that we can use as a hot replacements. 10. Secondary backup SCADA network is being investigated. 11. Installing another layer of backup data logging is being investigated. 12. The feasibility of deploying a set of continuously-online backup SCADA servers at Clair Booster Station is being explored. 13. Implementing network diagnostic tools and having a set of continuously-online backup servers. 14. Emergency Preparedness: Pre-set BBM Groups; #15. SOP's for "Operating During a SCADA Outage" (including reference to handheld radios, staff call-out rules); "Calculating Verney Tower Levels"; site monitoring checklists - included in emergency plan.
502	Inspection Preparation	Create a 52-week compliance logbook (one for each: North, West, East) that includes all

CIR #	Suggestion Title	Description of Staff Suggestion
		sampling, maintenance, other planned items.
515	Well Improvements	Implement operational (SOP's, WI's, checklist, training, valve exercise program) and physical control measures (e.g. double isolation valving, drain lines for physical confirmation that the valves are holding, install hardwire interlocks) for improved recirculation or wasting processes at any station.
516	Call Logging Database	Track the number of water pressure complaints (high and low); the number of water quality complaints (e.g. taste, odour, colour, temperature). Also track the follow-up action taken, and whether it was a source water issue or not.
517-518, 520-521	Improved Water Use tracking	Consider tracking the total volume of water on inactive accounts, manual back-billing, for certain bulk water accounts, construction projects, temporary lines, special events, etc.
519	Meter tracking	Improve meter tracking for those that are part of demolition projects.
523	Reservoir Overflow	Implement an in-place system that will ensure de-chlorination of overflow water.
524	SCADA Connectivity / Network Failure	An extended power outage at Arkell Spring Grounds caused a Rogers router to "forget" part of its configuration, plus all individual well house routers, to power down and reboot. The UPS battery ran out after 9 minutes and the active configuration of the router had not been saved into the router's backup memory. The UPS in the PLC Panel at the Diversion Chamber has been replaced and updated back-up configuration will now reload to the router in question.
525	Licence Renewal	Write up a licence renewal document that outlines all of the documents and records required for each 5-year licence renewal.
526	Track Licence Document Expiries	Include standard language in the A&S Report (as we do for PTTW's) about aspects of the Licence, locations of files, updates to these documents and their expiries (e.g. Licence, 1. DWWP, 2. PTTW's 3. Operational Plan, 4. Accreditation, 5. Financial Plan)
527	City-owned sampling stations	Move towards City owned, permanent sampling stations for now and future - look to improve existing distribution sampling sites.

Appendix "I" – Water Conservation & Efficiency Program – 2015 Annual Progress Report (updated annually)

Background:

The City of Guelph strives to be a leader in water conservation and efficiency. As one of Canada's largest communities reliant on a finite groundwater source for our drinking water needs, our ability to reclaim precious water and wastewater serving capacity through conservation initiatives offers numerous benefits to our community and local ecosystem.

In 2006, City Council endorsed the *Water Supply Master Plan (WSMP)*. This detailed Master Plan evaluated the projected water demand and preferred sources of new water supply in meeting the needs of anticipated community growth over a 50-year planning horizon. Through this study, servicing capacity reclaimed through water conservation was identified as the most cost-effective and immediately available source of new water supply and was ranked as the top priority, with the following time-based water reduction targets endorsed by Council through the plan to direct **the City's water conservation program**:

- 10 per cent (5,300 m³/day) in 2006 average day water use by 2010;
- 15 per cent (7,950 m³/day) in 2006 average day water use by 2017; and
- 20 per cent (10,600 m³/day) in 2006 average day water use by 2025

Since **Council's approval of the 2006 WSMP, 8,135 m³/day** of average day water/wastewater capacity has **been reclaimed as a result of the City's Water Conservation Programs**, allowing the City to delay the need for close to \$40.6 million in additional water and wastewater infrastructure with an investment of approximately \$10.2 million in water conservation programming.

Water conservation has also led to a reduction in the amount of electricity and water treatment chemical investments used to treat and convey water and wastewater. This results in an annual operational savings of over \$534,000 per year, creating a significant financial benefit to our rate payers. As a result of such **efforts, the City's water and wastewater rates remain close to the median of Council approved Ontario comparator municipalities** responsible for the provision of water and wastewater services.

In July of 2014, Guelph City Council endorsed the Water Supply Master Plan Update. Through this update, servicing capacity reclaimed through Water Conservation and Efficiency continued to be a top priority in achieving a sustainable and cost effective community water supply, with a new reduction target of 9,147 m³ **in average daily production set through this plan to guide the City's Water Conservation Programming** for the planning period of 2015 to 2038.

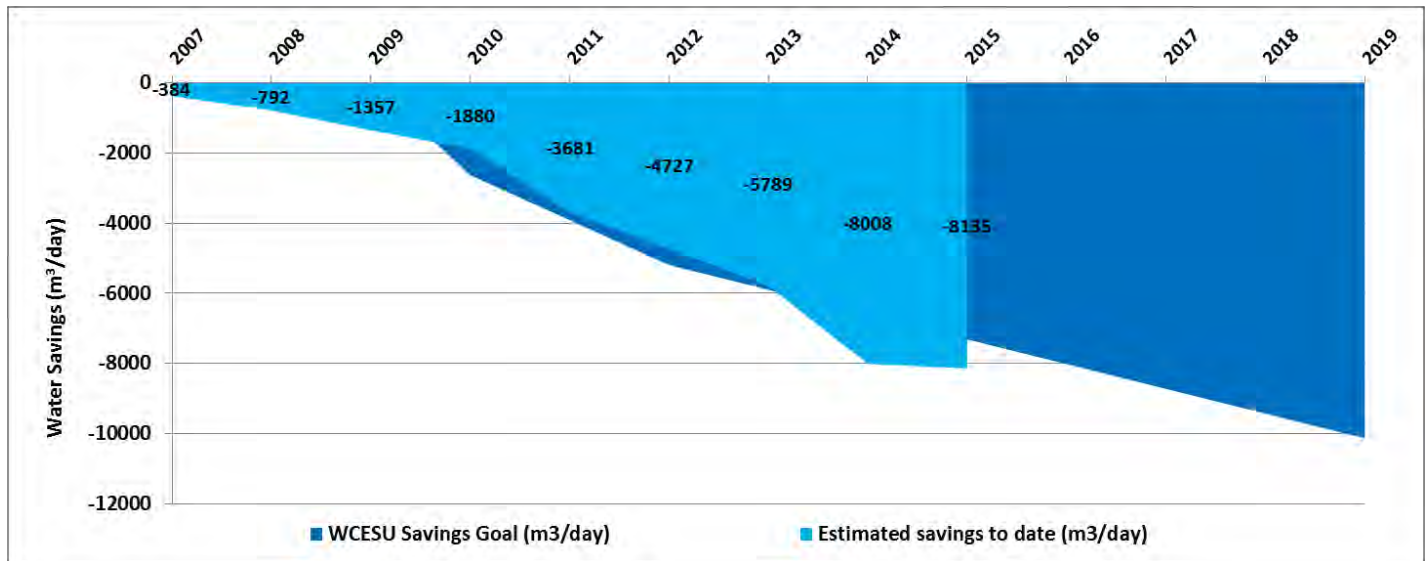
For reference, the following sections provide an overview of Water Conservation and Efficiency Program activities and successes from January 1 to December 31, 2015. **For more information on the City's Water Conservation Program** and individual program resources please visit: guelph.ca/ourstoconserve.

Water Reduction Target Progress:

To date, an estimated water savings of 8,135 m³/day **is attributed to community participation in the City's Water Conservation Programs and Leak Detection Program**. This observed reduction to date places the City in a competitive position to reach its new 2038 water demand reduction target, with Figure 7 below

sharing estimated water savings to date versus the annual conservation program reduction targets as outlined in the 2014 Water Supply Master Plan:

**Figure 7: Water Conservation and Efficiency Strategy Update:
Estimated Annual Savings vs. Program Reduction Targets**



Leak Detection Program: The City's leak detection program aims to reduce the amount of water lost between the time of production and end delivery to customers. The annual Leak Detection Program was launched in April 2015. This program included sounding and correlation of all metallic watermains within City's distribution system, encompassing 287 km of linear infrastructure. In total, 22 potential system leaks identified through this survey with approximately 3,100 m³/day of servicing capacity reclaimed through the location and remediation of ongoing sources of field water loss. The 2015 Leak Detection Program also included the continued detailed design of district metered areas (DMA) within ten separate locations of the Guelph water distribution system as well as ongoing monitoring of six of the City's DMAs. Through employment of this industry best practice for water loss management, permanent underground flow meter(s) and chamber(s) are installed in parallel with isolation of an area of the water distribution system to allow water use in this area to be monitored through a single or multiple metered watermain feed, on a continuous basis. This approach to water loss mitigation will allow staff to define the normal profile of efficient water delivery for defined areas of the water distribution system and provide a baseline to evaluate future demands against, so to assess the occurrence of potential leakage within the area. As an innovative feature of the City's field implementation of DMAs, field information from each flow meter will be transmitted via cellular network to the City's SCADA system where information will be logged and flows assessed versus established control limits to define the occurrence of previously unknown leaks in areas of the distribution system. This approach to water loss management is anticipated to allow for the proactive response to distribution system leaks and support the retention of water savings already reclaimed from prior leakage restoration.

In recognition of benefits offered through this proactive water loss management approach, Guelph Water Services will be working to implement an additional 20 DMAs over the period of 2016 to 2018 with funding provided through local development charges and local user rates. The goal of the DMA program is to

reclaim and sustain 1.5 MLD (approximately 3.3 per cent on 2015 daily system input volume) in water servicing capacity by 2019.

Residential Water Conservation Rebate Programs: During 2015, a total number of 1,414 rebate applications were processed via the City's residential rebate programs. Rebates claimed continue to be largely based in the City's Royal Flush Toilet Rebate and Smart Wash Clothes Washer Rebate Programs, with approximately 157 m³/day of reclaimed water savings anticipated as a result of residential rebate program participation in 2015.

Further to routine promotion of the City's water conservation retrofit programs, Water Services also continued to implement customized engagement within local business sectors in 2015 to increase awareness of program resources and potential water use efficiencies specific to the sector. This included a multi-residential marketing campaign for building owners comparing individual building unit water consumption to multi-residential sector averages, as well as anticipated utility savings and return on investment for buildings pursuing mass retrofit of inefficient toilets. As an outcome of these efforts, program staff are actively working with the County of Wellington and other local non-profit housing providers to begin evaluation of opportunities for water savings within their respective operations. To that end, a pilot study was initiated with Wellington County Social Housing in 2015 which has defined a potential water savings of up to \$70,000 per year if all toilets fixtures were replaced in respective housing facilities. Staff are continuing discussions with the County and other non-profit housing stakeholders at this time in hopes of helping these parties implement such efficiencies in 2016.

Staff plan to further build upon these engagement campaigns in 2016 as well as seek other ways to customize engagement to defined sectors possessing water saving opportunities. For more information on the City's Water Conservation Rebate Programs please visit guelph.ca/rebates.

Institutional, Commercial and Industrial (ICI) Water Capacity Buyback Program: Since introduction of the ICI Water Capacity Buyback Program in 2007, the City has reclaimed over 1,500 m³ per day in water/wastewater servicing capacity, while assisting local business reduce their environmental footprint and ongoing operational utility costs. This program offers financial assistance to local business for the completion of detailed water efficiency process audits and incentives towards capital retrofits which reduce water demand.

From 2007 through 2010, several of the City's top water users had participated in this program, but participation amongst business possessing a smaller water use footprint had been limited due to investment required to undertake process audits and uncertainties of financial efficiencies to be realized as result of participation. In recognition of these challenges, Water Services' ICI Water Efficiency Specialist continued work in 2015 to engage and support all members of the Guelph business, commercial and institutional community. This resource offers the local business community engineering services in conducting detailed preliminary water use audits with the intent of realizing potential efficiencies and limiting financial risk to business due to program participation.

Through this program resource, two detailed facility audits were started in 2015. Furthermore, 2015 also saw the benefit of relationships built through the tenure of the program with local businesses returning to the program to seek support to implement further site-based efficiencies and inform process decisions. This assistance included professional advice for water saving opportunities, support for sub-metering of

process water use, overall operational flow monitoring, etc. For reference, these core works included the following within 2015:

- Implementation of private water treatments system capital retrofit at Polycon Industries accounted for an initial savings of 6,200 m³/year (17 m³/day) in observed water use reduction;
- Financial assistance and technical support towards completion of a leak detection survey of the **University of Guelph's private water distribution system**;
- Technical assistance provided to Graniteworx to optimize operation of their water recycling system, and;
- Ongoing audit and process water use measurement assistance provided to Blount Canada and Cargill Meat Solutions to investigate and support future operational water saving opportunities.

Civic Facility Water Efficiency Upgrades: With the objective of leading by example through the City's own operations, work in support of City operational improvements continued throughout 2015. This included detailed water use audits of sixteen of the City's highest water-using facilities as well as City seasonal facilities (included splash pads and waiting pools) within 2015.

In looking to the renewal of City facility assets, Water Services staff were also involved in design activities for upcoming major renovation at Victoria Road Recreation Centre to support feasible water efficiency upgrades through re-construction in 2016.

Lastly, program staff lead detailed design of a second phase of storage for the rainwater harvesting system at Guelph Transit. Detailed design for **phase 2 of the Guelph Transit's Rainwater Harvesting System** was initiated in April 2015. Through the completion of this next phase, 37 cubic meters of **additional rainwater storage capacity will be established to complement water needs for Guelph Transit's Automated Bus Wash Process**. Construction of phase 2 of this project is set to begin in Q1 2016 with completion anticipated for Q2 2016.

The eMERGE Home Visit and Audit Service Program is an innovative collaboration between the City of Guelph, Guelph Hydro Electric Systems Inc., Union Gas, Transition Guelph, Elora Environment Centre, and other local partners. The eMERGE Guelph Efficient Home Visit service continued with great success in 2015. This service offers a free 1 hour home audit by trained advisors, a complimentary retrofit of common home water use fixtures (such as water efficient showerheads and faucet aerators), and the development of a household-specific action plan, providing information to residents on how to further reduce home resource use and directing homeowners to further resources and tools to assist with the implementation of recommended improvements. This program, recommended through the Council approved 2009 Water Conservation and Efficiency Strategy, is available to all residential households in the City of Guelph with utility servicing from Guelph Hydro Electric System Inc., Union Gas and the City. For more information please visit emergeguelph.ca.

To date eMERGE home visits have engaged over 900 households. In verifying the household water consumption data for 2014, the City has concluded that, on average, the home owner who receives the visit will reduce their water consumption by 2 (only installing faucet aerators) to 20 percent (installing faucet aerators, low flow shower heads and taps, and replacing a leaky toilet) depending on the retrofit measures taken.

Blue Built Home Water Efficiency Standards and Rebate Program: Endorsed by City Council in November 2010, the Blue Built Home Water Efficiency Standards and Rebate Program is a voluntary construction standard designed to outperform the plumbing and water-using fixture requirements of the Ontario Building Code. This certification program for new homes uses an approved set of high-quality home fixtures and appliances designed and third-party tested to save water and reduce water and wastewater utility bills by 15 to 62 per cent. Blue Built Homes are certified according to three water efficiency standards—Bronze, Silver or Gold—and provide home buyers with a one-time rebate on their investment.

From launch in 2010 until year end 2014, a total of 29 local new homes have been certified (27 Bronze, 2 Silver). 2015 was a successful year for this program with an additional 26 homes built by leading local home builders. This included Terra View Homes' construction of an additional 22 Bronze certified Blue Built Homes as part of their Riverview townhouse development and the kick-off of construction of 4 Blue Built Homes by Reid's Heritage Homes in 2015 as part of their Westminster Woods community. These 4 planned Blue Built Homes by Reid's Heritage Homes are part of the National Net Zero Building Program which aims to have demonstration homes produce as much energy as they consume on an annual basis through the use of products that are readily available to the average builder. The City is a partner to this project supporting research on plumbing configuration alternatives to reduce hot water energy losses as well as monitoring detailed water demand to assess performance of these homes within these homes for a 2 year period.

For more information on the Blue Built Home program please visit bluebuilthome.ca.

Youth Education: The City's curriculum based, Grade 2 and Grade 8 in-class water conservation programming continues to be a popular resource for local educators in both the Upper Grand District School Board (UGDSB) and the Wellington Catholic District School Board (WCDSB), encompassing 41 interactive school presentations to 3,564 students conducted in 2015. Overall since the inception of this water conservation educational initiative five years ago, the City has provided a total of 255 school presentations to over 10,500 students.

In partnership with the Grand River Conservation Authority's Guelph Lake Nature Centre, a total of 444 local Grades 7, 8 and high school students, as well as volunteers, participated in **guided educational tours** of the City's Water Services facility in 2015.

Beyond City-led programming, Water Services is proud to be an ongoing partner, sponsor and contributor to the **Waterloo Wellington Children's Groundwater Festival**. This long-standing festival celebrated its 20th year 2015. The Festival annually educates more than 5,000 grade two through five Guelph, Wellington County and Region of Waterloo students. Since 1996, over 85,000 students have participated in the Festival which features fun and interactive activities designed to inform students of the importance of water protection and conservation in their daily lives. In partnership with the Upper Grand District and Wellington Catholic School Boards, staff have worked to increase local awareness and participation in this Festival with upwards of 800 Guelph-based students now participating in the event on an annual basis.

Guelph Water Wagon: In support of the City's Public Promotion Action Plan for City Drinking Water Consumption, the Guelph Water Wagon has been providing tap water to attendees of large, outdoor community events during the summer months of three years. The Water Wagon provides access to tap water where water fountains or taps are not readily available. Continually growing in demand year-after-

year, the Water Wagon attended 27 events in 2015 and provided 27,189 litres of water to event attendees. The Water Wagon continues to provide staff an excellent opportunity to engage with the public to discuss the importance of water for the City of Guelph and the need for efficient use of it, discuss common questions or concerns from residents regarding municipal tap water as well as to solicit public involvement and awareness of opportunities to participation in municipal water based public processes and studies. **Canada Water Week:** Canada Water Week, a national, week-long celebration of water, is held annually during the third week of March to coincide with World Water Day on March 22. In 2015, Canada Water Week was held March 16th to 22nd with the theme: "Know Your H2O."

2015 marked the City's third year of participation in Canada Water Week programming with a number of activities offered locally including a speaker's event, March's Water Wednesdays family education programming at a variety of library locations throughout the City, a school art project, the interactive Aqua Lauti art exhibit housed at the Main Public Library, and the third *H2O Go! Festival* at Old Quebec Street Mall in partnership with the Guelph Ecomarket. The third annual *H2O Go! Festival*, a one-day community event to celebrate water, attracted over 800 participants this year. In total, this successful event featured workshops, information sessions, community booths, performances by local artists and interactive children's activities celebrating the protection, conservation and stewardship of our precious water resources. For more information on Canada Water Week please visit www.canadawaterweek.ca.

H2Awesome: On May 12, 2015, approximately 800 grade 8 students from the Upper Grand District School Board (UGDSB) participated in the second annual H2Awesome event. This day-long learning event was an opportunity to celebrate water, encourage conservation of this precious resource, and provide focus to the importance of water in our daily lives. The event featured well-known speaker Severn Cullis-Suzuki, water youth activist Robyn Hamlyn, as well as Alex and Tyler Mifflin from TVO's *The Water Brothers* eco-adventure documentary series. Key to the event was a variety of 26 different curriculum-linked workshops on various themes, including arts, science, and technology, enabling students to pick their own specific learning venue. The successful event was made possible through collaborative partnership with the Wellington Water Watchers, the UGDSB, University of Guelph and City of Guelph Water Services Department.

Peak Season Water Demand Management: Reduction of peak season water demands continue to be a primary objective of the City's Water Conservation programming. The ability to reduce variations in seasonal water use limits impacts on our finite groundwater supply during times of environmental stress and creates operational efficiencies by reducing capital and operational investment to service our community for only a few days a year. Since 2002, the City's Outside Water Use Program has helped to manage peak season water use via regulatory controls with complementary programs, such as Healthy Landscapes, working to proactively manage potential peak demands by assisting residents and local businesses in establishing low outdoor water use environments.

On June 1, 2015 the City initiated a Level 1 Yellow water restriction under its *Outdoor Water Use Program* due to ongoing local drought and reduced Eramosa River base flow conditions. These restrictions were later lifted on June 18, 2015 following recovery of local conditions stemming from a period of significant rainfall. Due to decreasing river flows in the Eramosa River and low precipitation, Level 1 Yellow water restrictions were re-initiated on August 10.

This program level was sustained throughout the late summer/early fall with the program ending the season in Level 1 on September 30, 2015. **For more information on the City's Outdoor Water Program** please visit guelph.ca/outside-water-use.

In working to proactively manage peak season demand, the *Healthy Landscapes Program* offered various public resources throughout 2015. The annual Healthy Landscapes Workshop/Seminar Series featured numerous free talks on time-of-year appropriate outdoor water conservation topics including water efficient landscape design, plant selection, and proactive maintenance best practices to manage the impact of drought and common turf pests. The Healthy Landscapes assessment program continues to be a popular resource with 384 visits completed in 2015. This service offers a complementary site-based consultation aiming to educate residents on garden design and maintenance practices to significantly curb outdoor demand at their home. Water efficiency studies completed in other Ontario communities have shown a net result of 74 litres per day per household during peak season as a result of similar water efficiency-based landscape consultant services. For more information on the Healthy Landscapes Program please visit guelph.ca/healthylandscapes.

In addition, a *Water Services' Open House*, rain barrel truckload sale, and plant sale was organized in May of 2015 with over 300 rain barrels sold as part of the one day event. Rain barrels offer homeowners the benefit of capturing free volumes of water for outside use but also assist in managing stormwater impacts on private property. The sale of rain barrels are a net zero service to the City as the barrels are sold at the bulk rate attained through an annual rain barrel tender process.

Watr - water conservation Mobile app: In alignment with the open government objectives of the City's 2012 Strategic Plan, Water Services has initiated work on a mobile-based app to increase customer accessibility to information about household water use. The app will use customer water account information to provide users with tailor-based suggestions for conserving water and reducing bills. Users will also be able to view customized information based on known attributes of their household (e.g. age of home construction, conservation program participation, number of people in household) and will have **more immediate access to their household's water use data**. The City is working with Focus21, a local technology start-up company specializing in information engagement systems, to develop this app. It is anticipated that beta testing of this app will commence in Q1 2016 with initial rollout to be within Q2 2016. For more information on Watr please visit <http://www.watr.io/>.

Water Softener Alternatives Testing: With high levels of naturally occurring hardness in the City's groundwater source, the use of residential ion exchange water softener technologies is quite common amongst Guelph households. It is estimated that approximately 77 per cent of local households as part of a 2009 residential call survey use a water softener. The Region of Waterloo and City of Guelph financed ground-breaking research in 2015 to assess the performance of an alternative to ion exchange water softening technology that treats hard water without the need for salt and recharge water. This technology referred to as nucleation assisted crystallization (NAC) employs a combination process to effectively prevent scale buildup in household water heaters and appliances.

To determine the life expectancy of the NAC technology, two locally available NAC models were performance tested between August 2014 and November 2015 at the William Street Pumping Station in Waterloo. The automated test ran flows of five gallons per minute through each of the units for five hours on and one hour off each day, for a total volume of 6,000 gallons (22,712 litres) per day. The average three-person household in Waterloo Region would use that amount of water in 37.8 days. The first test

ran for 44 days and the second test ran for 46 days, which is the equivalent household usage of 4.5 and 4.75 years respectively.

After two rounds of testing, it was concluded that the NAC is a viable technology for softening water in Waterloo Region and the City of Guelph. It is estimated that the NAC media will remain effective in a local household with three people for over approximately four years based on typical usage.

In 2016, it is planned that further study into the performance of NAC in actual pilot households will be completed. Future research is also planned to examine the impacts and sustainability of salt-based water softening in Waterloo Region and the City of Guelph.

Further information about water softeners and research to date can be found at www.watersoftnerfacts.ca.

For more information:

For more information or questions regarding this report please contact:

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Appendix "J" – Glossary

Included below is an index of terms used throughout this report.

Term	Description
<	Less than (used in reference: less than lower detection limit shown)
µg/L	Micrograms per litre = 1 part per billion
½ MAC	half of the maximum allowable concentration
Above Detection Limit	Means the result can be detected using the current level of technology.
AMP	Adaptive Management Plan
AO	Aesthetic Objective
AODA	Accessibility for Ontarians with Disabilities Act
A&S	Annual and Summary
AWQI	Adverse Water Quality Incident
Background	Indicator bacteria group used to monitor general water quality (non -regulatory)
BBH	Blue Built Home program
CAO	Chief Administrative Officer
CAPS	Capital Asset Prioritization System
cfu	colony forming unit
CCL	Critical Control Limit
CCP	Critical Control Point
CELP	Community Environmental Leadership Program
Distribution Samples	Samples taken within the distribution system, post primary disinfection
DMA	District Metered Area
DWQMS	Drinking Water Quality Management Standard
DWS	Drinking Water System
DWWP	Drinking Water Works Permit
EC	E. coli (Escherichia coli)
E. coli	Escherichia coli, indicator bacteria used to determine the presence of fecal contamination
EDMS	Electronic Document Management System
EHV	Efficient Home Visit
Eng.	Engineering Services
EOCG	Emergency Operations Control Group
EPA	Environmental Protection Act
Form 1	Form 1 – Record of Watermains Authorized as a Future Alteration
Form 2	Form 2 – Record of Minor Modification or Replacements to the Drinking Water System
GUDI-WEF	Groundwater Under the Direct Influence of surface water – With Effective Filtration
HPC	Heterotrophic Plate Count, indicator bacteria group used to monitor general water quality (non-regulatory)

Term	Description
ICI	Industrial, Commercial, Institutional
In-situ filtration	Refers to the filtration achieved as river water migrates through the ground and into the Glen Collector System
km	Kilometre
LESP	Lake Erie Source Protection
LRP	Lead Reduction Plan
LSL	Lead Service Lines
L/s	Litres per second
m	Metres
m ³	Cubic metres = 1,000 litres water
m ³ /day	Cubic metres per day = 1,000 litres per day
MAC	Maximum Allowable Concentration
MCC	Motor Control Centre
MDL	Minimum Detection Limit
MDWL	Municipal Drinking Water Licence
mg/L	Milligrams per litre = 1 part per million
MOECC	Ontario Ministry of the Environment and Climate Change
n/a	Not Applicable
NDOG	Non-Detect Overgrown
NSF 60	NSF/ANSI Standard 60: Drinking Water Treatment Chemicals -- Health Effects
NSF 61	NSF/ANSI Standard 61: Drinking Water System Components -- Health Effects
ntu	nephelometric turbidity unit
O. Reg. 170/03	Ontario Regulation 170/03 Drinking Water Systems
OA	Operating Authority
ODWQS	O. Reg. 169/03 Ontario Drinking Water Quality Standards
ODWSP	Ontario Drinking Water Stewardship Program
OG	Operational Guideline
OIC	Operator-in-Charge
OP	Operational Plan
ORO	Overall Responsible Operator
OTP	Operational Testing Plan
OWRA	Ontario Water Resources Act
OWUP	Outside Water Use Program
OWWCO	Ontario Water Wastewater Certification Office
Pb	Lead
PDDW	Procedure for Disinfection of Drinking Water in Ontario
PLC	Programmable Logic Controller
POE	Point of Entry, the point at or near which treated water enters the distribution system

Term	Description
ppm	Parts per million (mg/L)
ppb	Parts per billion (µg/L)
PTTW	Permit to Take Water
Q1	Quarter One (aka first quarter), Q2 (second quarter), etc.
QMS	Quality Management System
Raw	Refers to samples that have not yet received disinfection
RCAp	Rapid Chemical Analysis Package
RCMP	Reliability-Centered Maintenance Program
SAC	Spills Action Centre
SAN	Storage Area Network
SCADA	Supervisory Control and Data Acquisition
SDS	Subdivision Distribution System (as in Gazer Mooney SDS)
SDWA	Safe Drinking Water Act, 2002
TC	Total Coliform, indicator bacteria group used to determine presence of contamination
TCE	Trichloroethylene
THM	Trihalomethane
TOMRMS	The Ontario Municipal Records Management System
Total Coliform	Indicator bacteria group used to determine presence of contamination
Treated	Refers to samples that have received disinfection
UGDSB	Upper Grand District School Board
UV	Ultraviolet
VOC	volatile organic compound
WCDSB	Wellington Catholic District School Board
WCES	Water Conservation and Efficiency Strategy
WCWC	Walkerton Clean Water Centre
WDGPH	Wellington-Dufferin-Guelph Public Health
WSMP	Water Supply Master Plan