

2015 Annual and Summary Report

Jan. 1, 2015 – Dec. 31, 2015

Guelph Drinking Water System

Corporation of the City of Guelph

Gazer Mooney Subdivision Distribution System

Township of Guelph/Eramosa



Water Services

Environmental Services Department

Revision Date: February 17, 2016

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Executive Summary

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).

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.

Source

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.

Incidents in 2015

There were four incidents of non-compliance (described in Section A of this report) associated with the Guelph DWS and no incidents of non-compliance associated with the Gazer Mooney SDS from Jan. 1 to Dec. 31, 2015. Non-compliance items brought by Water Services' staff to the Ministry of Environment and Climate Change's (MOECC) attention during the Guelph DWS inspection included the following:

- Failure to perform a monthly verification test of the City's ultraviolet disinfection (UV) equipment. This equipment continued to perform to regulatory standards during this period;
- Two instances of failure to record continuous chlorine residuals at 5-minute intervals as a result of recording equipment failure. Chlorine addition met regulatory standards during these incidents and safe water was delivered to customers; and

- The measurement of an instance of low free chlorine residual in the Distribution system (<0.05 mg/L, Adverse Water Quality Incident (AWQI) #123338). Localized flushing of the water distribution system returned the chlorine residual levels to normal. Other chlorine residuals and sample results confirmed the provision of safe water during this incident.

All response actions to these items were completed prior to the MOECC Annual Inspection and approved by the Inspector. 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).

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 Dec. 31, 2015, Guelph Water Services reported two AWQIs in the Guelph Drinking Water System: one of the incidents involved the detection of Lead at a well site above regulatory limits; and the next incident was related to the detection of low secondary disinfection free chlorine residual in the distribution system (see non-compliance items above). There were no AWQIs in the Gazer Mooney Subdivision Distribution System from Jan. 1 to Dec. 31, 2015. 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 processes and systems 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 Dec. 31, 2015, a total of 17,108,611 (17.1 billion litres) of water was treated and pumped to the system. The average daily water demand was 46,873 cubic metres (46.9 million litres). The highest daily use of water occurred on Mar. 13, when 59,737 cubic metres (59.7 million litres) of water was pumped. The minimum day production of water was 34,637 cubic metres (34.6 million litres) and occurred on Dec. 26, 2015.

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, 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 2,724 properties with 6,252 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.

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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 Dec. 31, 2015 (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:
 - a brief description of the drinking water systems;
 - a list of water treatment chemicals used;
 - 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;
 - a summary of adverse test results and other issues reported to the Ministry including corrective actions taken;
 - a description of major expenses incurred to install, repair or replace required equipment;
 - the locations where this report is available for inspection.

And;

- Schedule 22, Summary Report which includes:
 - 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;

- for each requirement that was not met, the duration of the failure and the measures that were taken to correct the failure;
- 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
- 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;
- **Guelph City Hall**, 1 Carden St., Guelph – Service Guelph counter;
- **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 provides and promotes 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 Dec. 31, 2015, thirty-four water operators and 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 2015 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.

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

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

filtration” (GUDI-WEF) sources (i.e. Carter Well field, Arkell 1 and the Glen Collectors). The Guelph Drinking Water System uses 12 per cent 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, 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 Dec. 31, 2015, a total of 17,108,611 (17.1 billion litres) of water was treated and pumped to the system. The average daily water demand was 46,873 cubic metres (46.9 million litres). The highest daily use of water occurred on Mar. 13, when 59,737 cubic metres (59.7 million litres) of water was pumped. The minimum day production of water was 34,637 cubic metres (34.6 million litres) and occurred on Dec. 26, 2015.

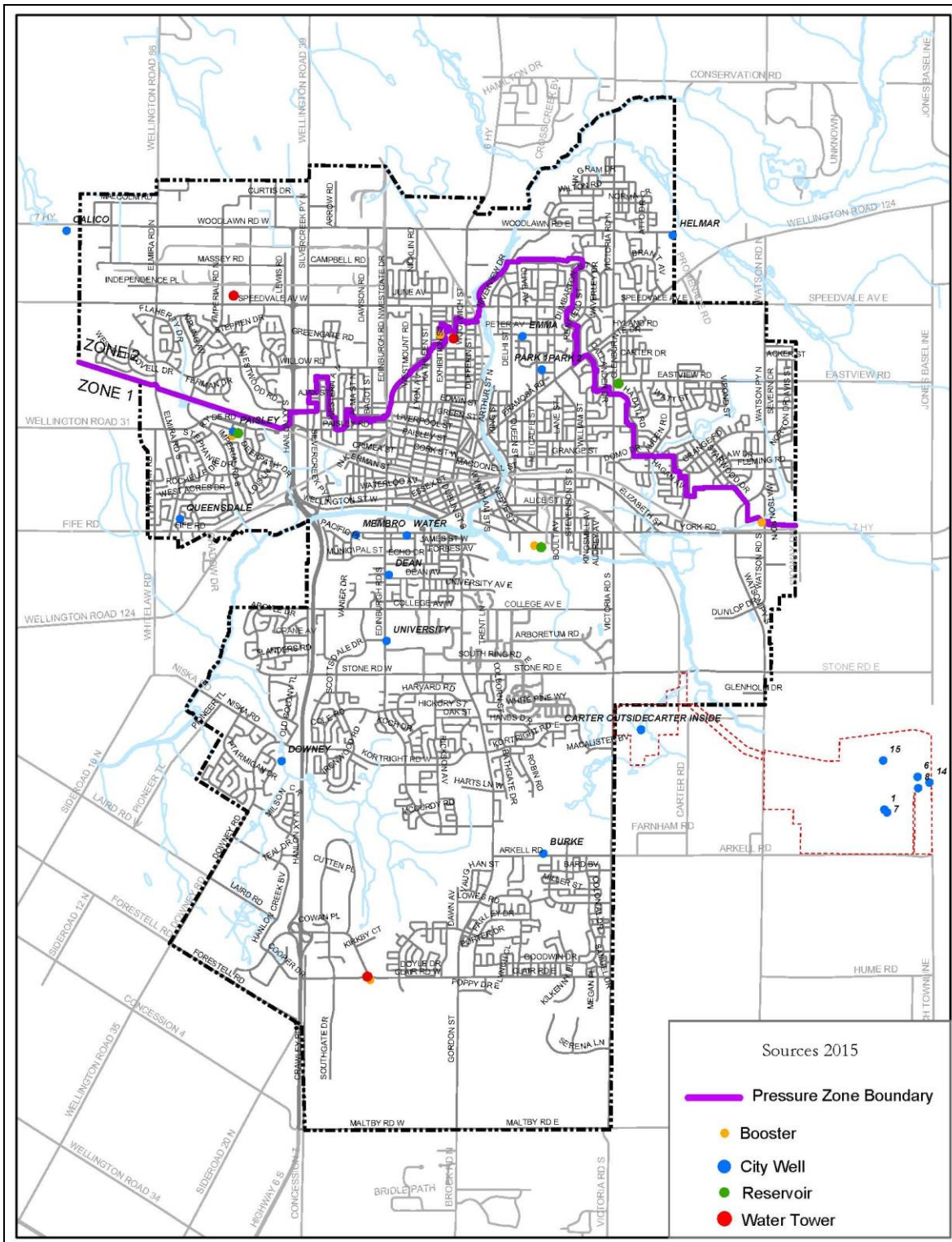
From Jan. 1 to Dec. 31, 2015, all regulatory microbiological and chemical quality samples were taken by certified operators and tests performed by accredited, licensed laboratories on water samples collected throughout the drinking water system. These tests include both regulatory and operational testing – 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.

Figure 1 shows the locations of the Guelph Drinking Water System facilities that were active in 2015.

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:

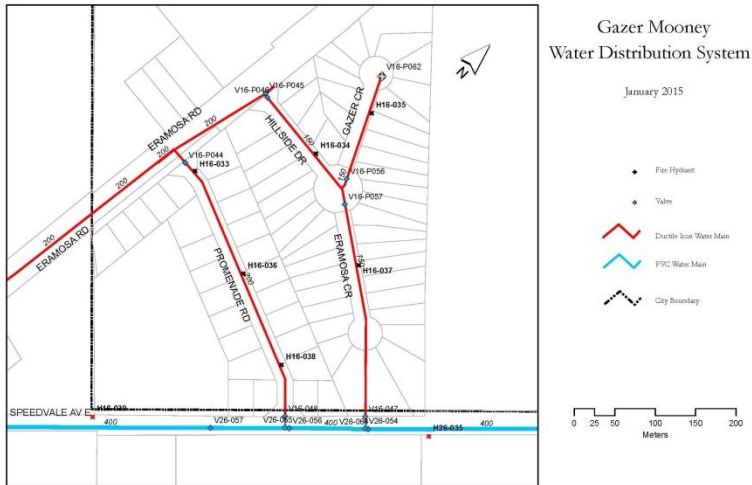
- approximately two kilometres of buried watermain with a diameter < 900 mm;
- approximately six watermain valves;
- approximately six fire hydrants; and
- approximately 72 water services and water meters.

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 four incidents of non-compliance associated with the Guelph Drinking Water System in 2015 (Jan. 01 to Dec. 31) that were identified by Water Services staff and corrected prior to the MOECC Annual Inspection. The MOECC Drinking Water Inspector endorsed the City's prudent corrective action in response to these incidents and requires no further action.

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 <math><0.05\text{ mg/L}</math> (also listed as AWQI #123338). 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 2015 (Jan. 01 to Dec. 31).

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 for contaminants; these results can be caused by contaminated sampling containers and equipment, sampling technique, sample handling and transportation, and sample analysis. 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 – Dec. 31, 2015 there were two adverse water quality incidents (AWQI’s #123135, #123338) and a summary of these is included below: Summary of Guelph Drinking Water System Adverse Water Quality Incidents.

Summary of Guelph Drinking Water System Adverse Water Quality Incidents (Jan. 01 to Dec. 31, 1015)

1. Date: Apr. 10
 - a. AWQI #:123135
 - b. Location: Paisley Inlet Sample Tap (D218)
 - c. Description: Lead (Pb) result of 12.4 ppb at the Paisley Inlet Sample Tap (D218)
 - d. Corrective Action: Wellington-Dufferin-Guelph Public Health (WDGPH), MOECC, and Spills Action Centre (SAC) were notified. Re-samples showed non-detect results for Lead (Pb) at D218 plus upstream and downstream locations (D0248 and S045 respectively). Sampling at D218 continues quarterly until 2 consecutive samples have results below the ½ Mac (5 ppb).
 - e. Re-sample Results Good: Yes
 - f. Deviation from Critical Control Point³: No
2. Date: Apr. 21

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

- a. AWQI #:123338
- b. Location: College Ave. Sample Station (D0249)
- c. Description: Secondary Disinfection Free Chlorine Residual <0.05 mg/L
- d. Corrective Action: Wellington-Dufferin-Guelph Public Health (WDGPH), MOECC, and Spills Action Centre (SAC) notified. Flushed the local Distribution System; raised the secondary disinfection residual at 2 local treatment facilities; performed free residual and bacti sampling over a period of 4 days – all results were good. No further action required.
- e. Re-sample Results Good: Yes
- f. Deviation from Critical Control Point: Yes

Gazer Mooney Subdivision Distribution System

From Jan. 1 – Dec. 31, 2015 there were no adverse water quality incidents.

Summary of Gazer Mooney Subdivision Distribution System Adverse Water Quality Incidents (Jan. 01 to Dec. 31, 2015)

1. Date: n/a
 - a. AWQI #: n/a
 - b. Location: n/a
 - c. Description: n/a
 - d. Corrective Action: n/a
 - e. Re-sample Results Good: n/a
 - f. Deviation from Critical Control Point: 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 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 was one confirmed deviation from CCP Limits in 2015 (described in AWQI #123338).

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 Jan. 20, 2015, subsequently approved at a Management Review Meeting on Jan. 27, 2015 and presented in T (in summary format) within this report.

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 will form part of the January 2016 record.

The following hazardous events will be added: drought, aqueduct infrastructure failure, frozen services, cross-connection of Guelph and Gasport Aquifers impacting source water quality, terrorism, and vandalism.

Table 1: Executive Summary of Risk Assessment Outcomes

Process	Hazardous Event	Risk Rating ⁴	City Physical Control Measures ⁵	City Operational Control Measures	External Control Measures (if applicable)
Water Supply	Source Degradation & Contamination: non-City Sources	Moderate	Not Within City Control		Ontario Environmental Protection Act, Clean Water Act, Source Protection Plans
Water Supply	Source Degradation & Contamination: City Sources	Moderate			Ontario Environmental Protection Act, Clean Water Act, Source Protection Plans
Water Supply	Source Water Infrastructure Failures	Low			-

4 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 5; "Moderate" risk: 6 to 11; "High" risk: 12 or higher. "QMS 21 Continual Improvement" describes how continual improvement actions are tracked, measured and evaluated for effectiveness.

5 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.

Process	Hazardous Event	Risk Rating ⁴	City Physical Control Measures ⁵	City Operational Control Measures	External Control Measures (if applicable)
Water Supply	Water Supply / Demand (current supply meeting current / future demand)	Low			-
Treatment (Chlorination at all site + UV disinfection where applicable)	Inadequate Chemical Supply	Low			Chemicals' NSF Certification
Treatment (Chlorination at all site + UV disinfection where applicable)	Treatment Infrastructure Failure	Low			-
Treatment (Chlorination at all site + UV disinfection where applicable)	Reservoir / Contact Chamber Failure	Low			-
Treatment (Chlorination at all site + UV disinfection where applicable)	PLC Failure	Low			-

Process	Hazardous Event	Risk Rating ⁴	City Physical Control Measures ⁵	City Operational Control Measures	External Control Measures (if applicable)
Storage	Insufficient Secondary Disinfection	Low	+ ⁶	+	-
Storage	Storage Infrastructure Failure	Moderate	+	+	-
Distribution	Distribution Infrastructure Failure	Moderate	+		-
Distribution	Cross-connection or backflow	Moderate	+	+	-
Distribution	Deterioration of Secondary Disinfection	Moderate	+	+	-
Distribution	Infrastructure Damage from Construction	High	+	+	Ontario One Call (ON1Call)
Security	Unauthorized Entry	Low			-
Monitoring & Reporting	Failure of Monitoring Equipment	Low			-

⁶ + Improvements are being made

Process	Hazardous Event	Risk Rating ⁴	City Physical Control Measures ⁵	City Operational Control Measures	External Control Measures (if applicable)
Monitoring & Reporting	Failure of Communications Equipment	Low	+		-
Power	Power Failure	Low			Mutual Aid Agreements
Power	MCC Failure	Low			

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.

The 2015 internal process audits were completed on Jan. 14-16 and on Dec. 4-15. 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 2015 third-party external on-site audit was completed on Jun. 9 to Jun. 11, 2015. There was one nonconformity identified during this audit related to document and records control (QMS 05). Noted opportunities for improvement by the auditor were related to improving the following processes: QMS awareness (QMS 04); internal audits (QMS 19) and tracking improvement items (QMS 21). The corrective action issued and opportunities for improvement will be followed-up on by the auditor at the next on-site audit to begin on June 8, 2016.

f) Results of Emergency Response Testing

Emergency response testing is regularly completed as a component covered by the Water Services' Quality Management System (QMS) to ensure that Water Services maintains a reasonable readiness to deal with emergencies and abnormal operations events. The ability to deal with emergencies is critical in demonstrating that Water Services has taken a diligent approach to operating the Guelph Drinking Water System.

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

2015's frozen services emergency was an extraordinary event that contributed a record number of frozen City-owned and customer-owned pipes. In 2014, 85 customers experienced frozen services, the largest impact since 1993. In 2015, the City prevented those and other customers with a history of frozen services (over 140 in total) from freezing through proactive communications and outreach. Then unprecedented and consistently cold temperatures left a record 376 customers without potable running water for up to nine weeks. More than 275 temporary lines were installed throughout this year's emergency event.

Water Services staff continue to work on closing corrective actions initiated from debriefing sessions related to Winter 2014-2015's frozen services. Council approved the Frozen Water Pipe Policy on Nov. 23rd. More information is available at: http://guelph.ca/wp-content/uploads/council_agenda_112315.pdf

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

Completed Emergency Response Tests

Hazardous Event/Hazard⁷

2013

- Long-term impacts of climate change: n/a
- Source water supply shortfall: n/a
- Extreme weather events (e.g. tornado, ice storm): Apr. 12 and Dec. 22
- Sustained extreme temperatures (e.g. heat wave, deep freeze): n/a
- Chemical spill impacting source water: n/a
- Sustained pressure loss: n/a
- Backflow / Cross-connection: n/a
- Terrorist threat: n/a
- Vandalism: n/a
- Sudden changes to raw water characteristics (e.g. turbidity, pH): n/a
- Failure of equipment or process associated with primary disinfection (e.g. UV, chlorination): Apr. 12/Dec. 22 (Power); Aug. 2 (SCADA)
- Failure of equipment or process associated with secondary disinfection (e.g. chlorination): Apr. 12/Dec. 22 (Power); Aug.2 (SCADA)
- City of Guelph Corporate-Level Test by the EOCG: Jun. 21, 2013

2014

- Long-term impacts of climate change: n/a
- Source water supply shortfall: n/a
- Extreme weather events (e.g. tornado, ice storm): n/a
- Sustained extreme temperatures (e.g. heat wave, deep freeze): Feb-Mar, 2014
- Chemical spill impacting source water: n/a
- Sustained pressure loss: n/a
- Backflow / Cross-connection: Feb. 11, 2014
- Terrorist threat: n/a

⁷ 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.

- Vandalism: n/a
- Sudden changes to raw water characteristics (e.g. turbidity, pH): n/a
- Failure of equipment or process associated with primary disinfection (e.g. UV, chlorination): n/a
- Failure of equipment or process associated with secondary disinfection (e.g. chlorination): n/a
- City of Guelph Corporate-Level Test by the EOCG: Jul-Aug, 2014

2015

- Long-term impacts of climate change: n/a
- Source water supply shortfall: Feb-Apr, 2015
- Extreme weather events (e.g. tornado, ice storm): n/a
- Sustained extreme temperatures (e.g. heat wave, deep freeze): Feb-Apr, 2015
- Chemical spill impacting source water: n/a
- Sustained pressure loss: n/a
- Backflow / Cross-connection: n/a
- Terrorist threat: n/a
- Vandalism: n/a
- Sudden changes to raw water characteristics (e.g. turbidity, pH): n/a
- Failure of equipment or process associated with primary disinfection (e.g. UV, chlorination): n/a
- Failure of equipment or process associated with secondary disinfection (e.g. chlorination): n/a
- City of Guelph Corporate-Level Test by the EOCG: Nov. 23, 2015

g) Operational Performance and Statistics

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

- 2015 Totalized Pumpages as per the Municipal Drinking Water Licence and Permits to Take Water;
- 2015 Instantaneous Flows as per Permit to Take Water requirements;
- Water Production and Population;
- 2015 Collector Flows; and
- System Maintenance and Updates.

2015 Totalized Pumpages and Instantaneous Flows (Jan. 01 to Dec. 31).

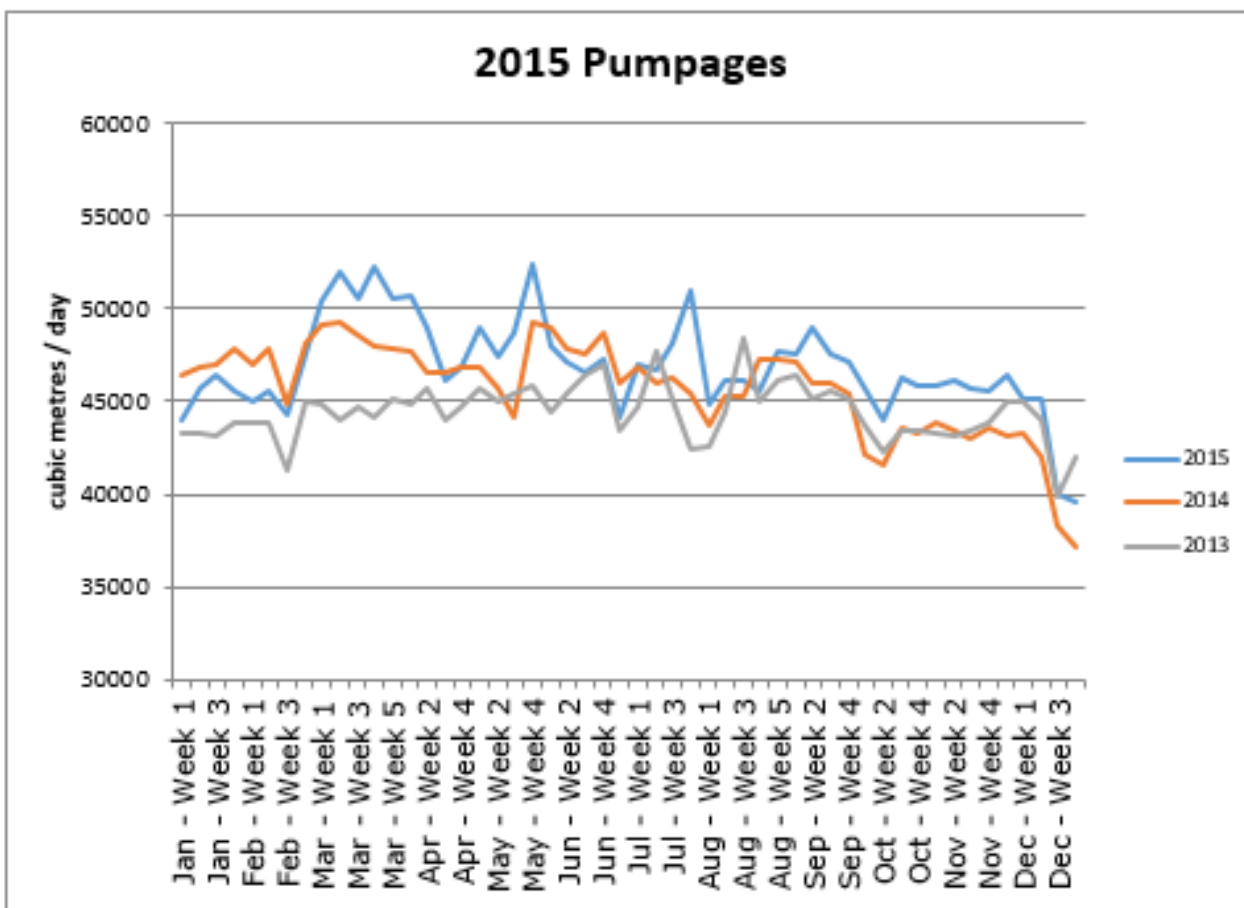
The Safe Drinking Water Act (SDWA) and the Ontario Water Resources Act (OWRA) each require that operating authorities record and report both water takings as governed by Permits to Take Water (PTTWs), and water being supplied to the City of Guelph.

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 "C" – Total Water Pumped and Instantaneous Flows.

2015 Totalized Pumpages (Jan. 01 to Dec. 31).

Figure 3 below depicts the water pumpage rate in cubic metres per day (m³/day) that is averaged each week.

Figure 3: 2015 Totalized Pumpages (Jan. 01 to Dec. 31)



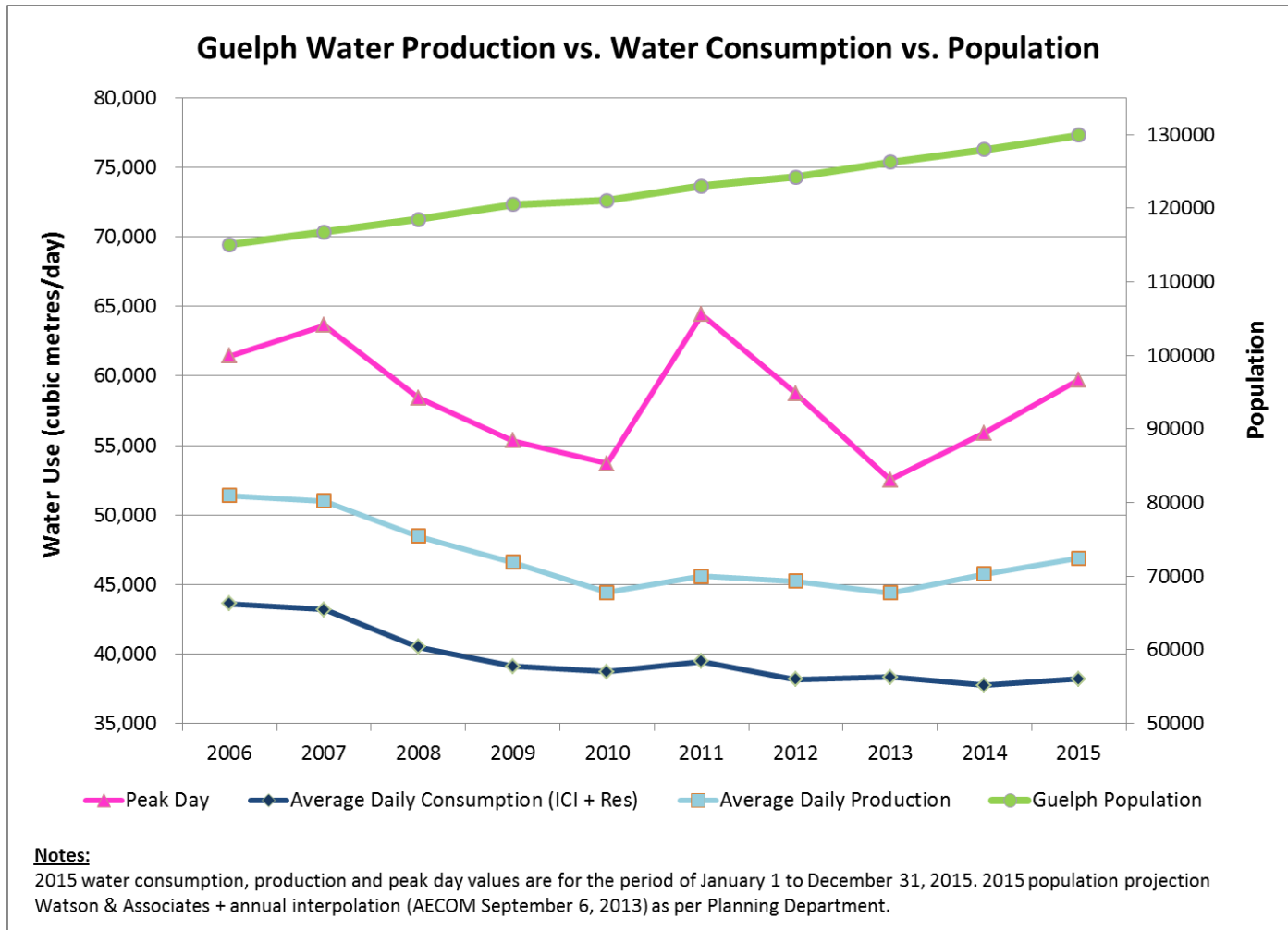
Water Services processed 17,108,611 cubic metres (17.1 billion litres) of water to the distribution system in 2015 (Jan. 01 to Dec. 31). This represents 2.4 per cent more water being supplied to the distribution system in 2015 as compared to the same time period in 2014 and 5.3 per cent more water than in 2013. The average daily water demand was 46,873 cubic metres (46.9 million litres). The maximum day production of water in 2015 was 59,737 cubic metres (59.7 million litres) and occurred on Mar. 13, 2015. The minimum day production of

water in the same time period was 34,637 cubic metres (34.6 million litres) and occurred on Dec. 26, 2015.

Explanations for increased annual water use include system losses associated with frozen and leaking services during an unseasonably cold winter. Prolonged cold temperatures and the penetration of frost to increased soil depths resulted in service leaks and water main breaks, while over 400 homes and businesses were instructed to run a constant stream of water to prevent frozen water services (including those connected to temporary lines) for a period of up to nine weeks. From January 1 to March 31, 2015, there were 49 reported watermain breaks stemming from these severe winter conditions which topped a record-setting 45 reported breaks for the same period in 2014. Further to the above production drivers, other factors influencing production over Q3 & Q4 2015 include increased demands from community growth and water use associated both planned and unplanned infrastructure maintenance activities.

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 (m³/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 is a condition of the Arkell Well Field PTTW (Permit to Take Water). The Recharge System was returned to service for the 2015 season.

The productivity of the Collectors can also be used as a predictive tool. 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 3,137,775 cubic metres (3.1 billion litres) of water in 2015 (Jan. 01 to Dec. 31). This represents 2.0 per cent more water as compared to the same time period in 2014 and 13.7 per cent more water than in 2013.

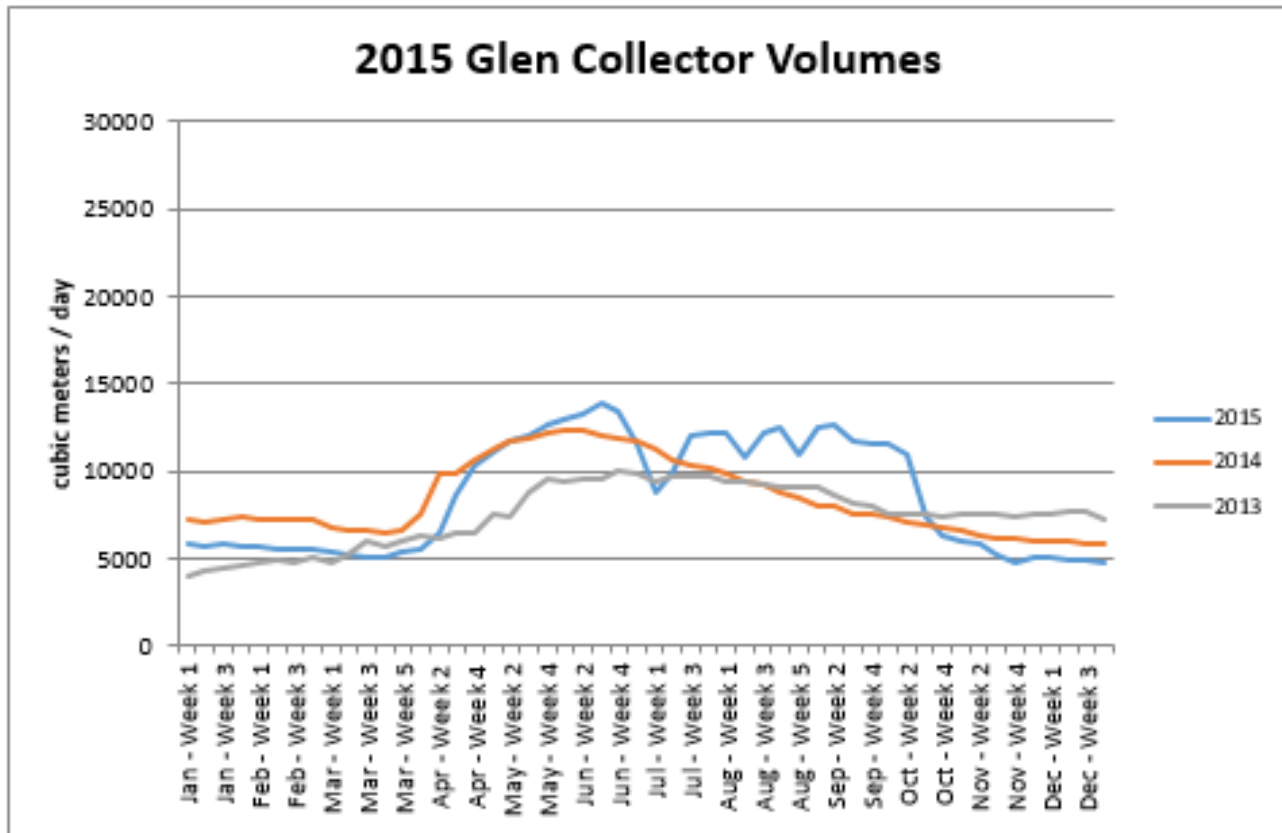
Note: This information should not be used in isolation as a predictive tool.

For a visual representation, please refer to Figure 5: 2015 Glen Collector Volumes (Jan. 01 to Dec. 31):

2015 Glen Collector Volumes (Jan. 01 to Dec. 31).

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

Figure 5: 2015 Glen Collector Volumes (Jan. 01 to Dec. 31)



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

System Maintenance and Updates

The table that follow summarize Water Services’ maintenance work – for Distribution (Table 2)

Table 2: Distribution Maintenance Activity

Job Type	2013 Q1&2	2013 Q3&4	2013 Total	2014 Q1&2	2014 Q3&4	2014 Total	2015 Q1&2	2015 Q3&4	2015 Total
Acoustic Leak – Dry	0	0	0	0	3	3	0	1	1
Blow Off Install	0	1	1	0	2	2	0	0	0
Dig to find leak	0	0	0	1	2	3	1	0	1
Hi/Low Jumper Install	0	0	0	0	0	0	0	0	0
Hydrant Install (WW)	0	0	0	0	0	0	0	0	0
Hydrant Remove	0	0	0	1	0	1	0	0	0
Hydrant Repair	1	84	85	2	31	33	2	7	9
Hydrant Repair Hit	1	1	2	0	2	2	0	0	0
Hydrant Replace (WW)	0	0	0	0	6	6	0	1	1
Hydrant Replace Hit	0	0	0	1	1	2	0	0	0
Main Break	24	14	38	58	19	77	57	14	71
Other (e.g. exploratory excavations, miscellaneous repairs, etc.)	5	4	9	3	7	10	2	2	4
Re-route Watermain	0	6	6	0	0	0	0	0	0

Job Type	2013 Q1&2	2013 Q3&4	2013 Total	2014 Q1&2	2014 Q3&4	2014 Total	2015 Q1&2	2015 Q3&4	2015 Total
Sample Station Install	0	0	0	0	0	0	0	0	0
Sample Station Replace	0	0	0	0	0	0	0	0	0
Service Cut Off	0	0	0	5	7	12	0	5	5
Service Lowered	0	0	0	3	0	3	0	0	0
Service New Install	0	0	0	0	0	0	0	0	0
Service Repair	30	38	68	47	69	116	54	45	99
Service Replace Lead (City-side)	5	6	11	1	2	3	1	1	2
Service Replace Non-Lead	13	15	28	2	16	18	9	16	25
Valve Install (WW)	0	7	7	0	2	2	0	6	6
Valve Remove	0	1	1	0	0	0	0	0	0
Valve Repair	1	3	4	4	10	14	1	4	5
Valve Replace (WW)	3	9	12	8	14	22	9	5	14
Meters New	254	324	578	217	200	417	141	412	553
Meters Exchanged	384	345	729	373	244	617	202	423	625
Items reported annually:	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Job Type	2013 Q1&2	2013 Q3&4	2013 Total	2014 Q1&2	2014 Q3&4	2014 Total	2015 Q1&2	2015 Q3&4	2015 Total
Hydrants new/replaced by Eng.	-	-	24	-	-	24	-	-	52
Total City Hydrants	-	-	2,674	-	-	2,698	-	-	2,749
Leak Detection (km of metallic watermains)	-	-	140	-	-	287	-	-	287
Valves new/replaced by Eng.	-	-	36	-	-	28	-	-	122
Total City Main Valves	-	-	4,034	-	-	4,062	-	-	4,135
Watermains new/replaced by Eng. (km)	-	-	3.2	-	-	3.25	-	-	9.13
Total Watermains Excluding Aqueduct (km)	-	-	539.2 ⁸	-	-	542.1	-	-	548.5
Watermains Cleaned (km)	-	-	180.75	-	-	195.3	-	-	107.1
Watermains Re-lined (m)	-	-	0	-	-	0	-	-	0

⁸ Improved mapping has corrected this total # km watermains figure (previous mapping indicated an exaggerated number).

Below includes water supply-related major maintenance activities and expenditures (may include programs that have a series of projects) that may exceed \$5,000 and/or involves an extensive amount of program and/or project time

Major Water Supply Maintenance Activity

Major Maintenance Activity/Expenditure

1. Diesel Generator Rentals. Well Site(s): Burkes, Arkell #14
2. Diesel Generator Service. Well Site(s): F.M Woods
3. Diesel Generator Service and Load Test. Well Site(s): All sites
4. Fence Repair. Well Site(s): F.M Woods
5. HVAC Preventive Maintenance (annual). Well Site(s): F.M Woods
6. Instrumentation Calibrations and Verifications. Well Site(s): Various sites
7. Pump & Head Replacement – Booster Pump. Well Site(s): Downey
8. Pump & Motor Rebuild. Well Site(s): Robertson (pump #1)
9. Pump Motor (75HP) – Purchase of Spare. Well Site(s): Various sites
10. Reliability-Centered Maintenance Program (RCMP, ongoing). Well Site(s): All sites
11. Reservoir Cleaning. Well Site(s): Queensdale, Downey
12. Shower and Eyewash Station Installations. Well Site(s): Various sites
13. Snow Removal (seasonal). Well Site(s): Various sites
14. UV Maintenance. Well Site(s): F.M. Woods, Emma and Water Street Wells
15. Well Pump Replacement. Well Site(s): University
16. Well Rehabilitation. Well Site(s): Carter, Downey, Queensdale

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.

Water Distribution Operators provided utility locate services for water infrastructure in 2015 and Water Services Administration staff processed the completion feedback process for all of City of Guelph's locate service providing departments. Table 3 includes locate requests received and responded to in 2015.

Table 3: Water Distribution Locates: Number of locate requests received by month

Territory	Jan	Feb	Mar	Apr	Ma y	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot al
City of Guelph	310	310	543	1,2 22	1,3 12	1,1 05	1,1 11	897	851	689	540	281	9,1 71
Arkell Spring Grounds & Carter Well properties	0	1	1	18	4	8	13	6	4	2	4	1	62
Gazer Mooney Subdivision	0	0	1	2	2	3	2	5	4	3	0	0	22
Total	310	311	545	1,2 42	1,3 18	1,1 16	1,1 26	908	859	694	544	282	9,2 55

The total number of locate requests in 2014 was 8,943 and in 2013 this number was 7,884.

Below depicts the summary of 2015 Form 1's and Form 2's includes the summary of Form 1's and Form 2's completed over the course of 2015 (Jan. 01 to Dec. 31). 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.

Summary of 2015 Form 1's and Form 2's

Form # - Description of Authorized and/or Minor Modifications

- Form 1 - Extension of a 300 mm diameter watermain on Paisley Road from Elmira Road to 100 m past the City limits. Date: January
- Form 1 - New watermain: 300 m of 200 mm and 285 m of 150 mm for new subdivision at 11 Starwood Drive. Date: January
- Form 1 - New Pressure Zone 3 watermain and appurtenances on Hawkins Drive (Poppy Drive to Clair Road East), and Clair Road East (Hawkins Drive to 230 m East of Dallen Drive). Date: February
- Form 2 - The addition of a 10" HDPE raw water bypass of the Carter Aqueduct complete with a combination valve at its high elevation point and three drain valves. Date: March

- Form 2 – The addition of a 6” Static Injection Mixer at Emma to allow for thorough mixing of the sodium hypochlorite with the UV disinfected water. The removal of a redundant 12”butterfly isolation valve was required to accommodate the mixer. Date: March
- Form 1 – Replacement of existing 200 mm watermain on Elizabeth Street between Victoria Road and Industrial Avenue. Date: April
- Form 1 – New watermain connected to existing 150 mm watermain on Kirvan Court and 300 mm watermain on MacAlister Boulevard. Date: May
- Form 2 – Addition of a 24” butterfly valve on the 24” concrete watermain at Dodds and Bell Avenue. This allows for the ability of improved main isolation. Date: June
- Form 1 – New watermain constructed in the McCann St., Kirvan Dr. and McAlister Blvd right-of-ways (Kortright Subdivision Phase 3B). Date: August
- Form 2 – New 6” gate valve installed on the 6” cast iron watermain on Mary Street in front of #82 Water Street. Date: September
- Form 2 – New 6” gate valve installed on the 6” cast iron watermain on Palmer Street in front of #262. Date: September
- Form 2 – New 12” gate valve installed on the 12” PVC watermain on Edinburgh Road South in the north side of the intersection with McCurdy Road. Date: September
- Form 2 – New 6” gate valve installed on the 6” cast iron watermain on Oak Street in front of #34 Oak Street. Date: October
- Form 2 – Replacement and extension of existing 100 mm watermain with 150 mm watermain on Wheeler Ave., from Elizabeth St. to Ferguson Street. Date: November
- Form 2 – New 6” gate valve installed on the 6” cast iron watermain on Dumbarton Street in front of #109 Dumbarton Street. Date: November
- Form 2 – New 6” gate valve installed on the 6” cast iron watermain on Hickory Street in front of #27 Hickory Street. Date: November
- Form 2 – New contact chamber re-circulation and wasting system at Burke Well and Treatment Facility. Date: November
- Form 2 – New contact chamber re-circulation and wasting system at Downey Well and Treatment Facility. Date: November

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 2015 (Jan. 01 to Dec 31).

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 Dec. 31, 2015. 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. All acronyms and initialisms included in tables are described in Appendix "E" – 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 Dec. 31, 2015. 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 2015 (Jan. 01 to Dec. 31) associated with these sampling sites. However, there was one adverse result from another location (described in AWQI #123338):

Table 4: O. Reg. 170/03 Schedule 7-2, City of Guelph - Distribution Manual Free Chlorine Residual Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQS Criteria	Total Analyses	Total Samples above	Total Outside ODWQS	Range	Units
Free Chlorine Residual – Zone One	0.05 – 4.0	365	365	0	0.45 – 1.10	mg/L
Free Chlorine Residual – Zone Two	0.05 – 4.0	365	365	0	0.51 – 1.01	mg/L

Table 5 summarizes raw bacteriological sampling and test results required by O. Reg. 170/03 Schedule 10-4 for the period of Jan. 01 to Dec. 31, 2015.

- Number of raw samples taken: 971
- Number of raw analyses: 2,913

Table 5: O. Reg. 170/03 Schedule 10-4, City of Guelph - Raw Bacteriological Sampling Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQS Criteria	Total Analyses	Total Outside ODWQS Criteria	Range	Units
Raw - E. coli	n/a	945	n/a	0 - 1	cfu/100 mL
Raw - Total Coliform	n/a	945	n/a	0 - 3	cfu/100 mL
Raw - HPC	n/a	0	n/a	n/a	cfu/mL
Raw - Background	n/a	945	n/a	0 - 470	cfu/100 mL
Raw River Source (prior to in situ filtration) - E. coli	n/a	26	n/a	2 - OG ⁹	cfu/100 mL
Raw River Source (prior to in situ filtration) - Total Coliform	n/a	26	n/a	46 - OG	cfu/100 mL
Raw River Source (prior to in situ filtration) - Background	n/a	26	n/a	92 - OG	cfu/100 mL

Table 6 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 Dec. 31, 2015.

- Number of POE samples taken: 581
- Number of POE analyses: 2,866
- Number of Distribution samples taken: 1637
- Number of Distribution analyses: 8,037

9 OG = overgrown

Table 6: O. Reg. 170/03 Schedule 10-2, 10-3 and 6-3, City of Guelph - Treated Bacteriological Sampling Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQS Criteria	Total Analyses	Total Outside ODWQS Criteria	Range	Units
POE - E. coli	0	581	0	0	cfu /100 mL
POE - Total Coliform	0	581	0	0	cfu /100 mL
POE - HPC	n/a	577	n/a	0 - 6	cfu /mL
POE - Background	n/a	581	n/a	0 - 1	cfu /100 mL
POE - Free Chlorine Residual	0.05 to 4.0	546 ¹⁰	0	0.60 - 1.40	mg/L
Distribution - E. coli	0	1637	0	0	cfu /100 mL
Distribution - Total Coliform	0	1637	0	0	cfu /100 mL
Distribution - HPC	n/a	781	n/a	0 - 97	cfu /mL
Distribution - Background	n/a	1637	n/a	0 - 610	cfu /100 mL
Distribution - Free Chlorine Residual	0.05 to 4.0	2,345 ¹¹	0	0.25 - 1.25	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 Dec.31, 2015. Schedule 7-3 requires a

10 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).

11 Total number of samples taken to satisfy both the requirements of O.Reg. 170/03 Schedule 10-3 and 6-2 as well as for Operational purposes.

“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 7: O. Reg. 170/03 Schedule 7-3, City of Guelph - Raw Source Turbidity Sampling Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQS Criteria	Total Analyses	Total Samples above Detection Limit	Total Outside ODWQS Criteria	Range	Units
Raw Source Turbidity	n/a	977	977	n/a	0.04– 0.40	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 2015. The source continues to meet the GUDI-WEF source water characteristics.

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 2015** (Jan. 01 to Dec. 31).

Table 8: O. Reg. 170/03 Schedule 6-5, "Continuous Monitoring" Results Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQS 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 2015, 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 and Clair Tower 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 average value for THM's for all related Distribution System samples in 2015 (Jan. 01 to Dec. 31) is below the ½ MAC (half of the maximum allowable concentration).

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 2015.** Raw sampling results are also shown in Table 9 (ODWQS do not apply to these values).

Table 9: O. Reg. 170/03 Schedule 13-6 and 13-7, City of Guelph - "Three Month" Sampling Results Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQS MAC	½ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Trihalomethanes	0.100 ¹²	n/a	7	7	0	0.0242	0.0534	0.0386
Nitrate + Nitrite (as nitrogen)	10	5	50	39	0	< 0.10	5.17	1.25
Nitrate + Nitrite (as nitrogen) – Woods' Raw Sources (Operational Sampling)	n/a	n/a	35	35	n/a	0.28	6.22	1.69
Nitrate + Nitrite (as nitrogen) – University Raw Source (Operational Sampling)	n/a	n/a	2	2	n/a	0.21	0.35	0.28
Nitrate + Nitrite (as nitrogen) – Paisley Raw Source (Operational Sampling)	n/a	n/a	4	4	n/a	1.73	1.83	1.77

12 This standard is expressed as a running annual average.

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 “B” 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 2015 (Jan. 01 to Dec. 31, 2015). Table 10 (below), highlights specific VOC parameters due to their presence / significance within the water supply. There was no instance of an adverse result in 2015.

Table 10: City of Guelph Operational VOC Scan Selected Results Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQS MAC	½ MAC	Total Sampl es	Sampl es Above MDL	Total Above ODWQ S Criteri a	Min (mg/L)	Max (mg/L)	Avera ge (mg/L)
Tetrachloroethylene (perchloroethylene)	0.03	0.015	136	0	0	< 0.0001	<0.00 01	n/a
Trichloroethylene	0.005	0.0025	136	52	0	< 0.0001	0.0021 9	0.0007 2
Trihalomethanes ¹³	0.100 ¹⁴	n/a	142	49	0	< 0.0002	0.0534	0.0151 7

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

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.

In 2013, 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).

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

14 This standard is expressed as a running annual average.

The results of the Schedule 23 inorganic parameter analysis in 2013 were all under the ½ MAC (half of the maximum allowable concentration) 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 "B" for more information.

The next scheduled "Three Year" Schedule 23 sampling event takes place in the third quarter of 2016.

The results of the Annual Schedule 23 inorganic parameter analysis in 2015 for F.M. Woods' Station were all under the ½ MAC (half of the maximum allowable concentration) and the majority were under the laboratory's MDL (minimum detection level).

Table 11: O. Reg. 170/03 Schedule 23, 13-2a, City of Guelph - Annual Schedule 23 Sampling Results Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQS MAC	½ MAC	Total Samples	Sample s Above MDL	Total Above ODWQ S Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Antimony	0.014	0.007	1	0	0	<0.0005	<0.0005	n/a
Arsenic	0.025	0.0125	1	0	0	< 0.001	< 0.001	n/a
Barium	1.0	0.5	1	1	0	0.046	0.046	0.046
Boron	5.0	2.5	1	1	0	0.021	0.021	0.021
Cadmium	0.005	0.0025	1	0	0	0.00011	0.00011	0.00011
Chromium	0.05	0.025	1	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	1	0	0	< 0.002	< 0.002	n/a
Uranium	0.02	0.01	1	1	0	0.00068	0.00068	0.00068

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

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.

In 2013, all "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 2013 were all under the ½ MAC (half of the maximum allowable concentration) 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 "B" 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 Water. 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 feed 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 2016.

The results of the Annual Schedule 24 organic parameter analysis in 2015 for F.M. Woods' Station were all under the ½ MAC (half of the maximum allowable concentration) and the laboratory's MDL (minimum detection level)

Table 12: O. Reg. 170/03 Schedule 24, 13-4a, City of Guelph - Annual Schedule 24 Sampling Results Summary (Jan. 01 to Dec. 31, 2015)

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
Aldicarb	0.009	0.0045	1	0	0	< 0.005	< 0.005	n/a
Aldrin + Dieldrin	0.0007	0.00035	1	0	0	< 0.000006	< 0.000006	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
Bendiocarb	0.04	0.02	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

Parameter	ODWQS MAC	½ MAC	Total Samples	Samples Above MDL	Total Above ODWQS Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Carbon Tetrachloride	0.005	0.0025	3	0	0	< 0.0001	< 0.0001	n/a
Chlordane (Total)	0.007	0.0035	1	0	0	< 0.000006	< 0.000006	n/a
Chlorpyrifos	0.09	0.045	1	0	0	< 0.001	< 0.001	n/a
Cyanazine	0.01	0.005	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
(DDT) + metabolites	0.03	0.015	1	0	0	< 0.00006	< 0.00006	n/a
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
Dichloromethane	0.05	0.025	3	0	0	< 0.0005	< 0.0005	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)
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
Dinoseb	0.01	0.005	1	0	0	< 0.001	< 0.001	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
Heptachlor + Heptachlor Epoxide	0.003	0.0015	1	0	0	< 0.000006	< 0.000006	n/a
Lindane (Total)	0.004	0.002	1	0	0	< 0.000006	< 0.000006	n/a
Malathion	0.19	0.095	1	0	0	< 0.005	< 0.005	n/a
Methoxychlor	0.9	0.45	1	0	0	< 0.00002	< 0.00002	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)
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
Monochlorobenzene	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
Parathion	0.05	0.025	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
Prometryne	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
Temephos	0.28	0.14	1	0	0	< 0.01	< 0.01	n/a
Terbufos	0.001	0.0005	1	0	0	< 0.0005	< 0.0005	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)
Tetrachloroethylene_(PCE)	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
Trichloroethylene	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
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	0.28	0.14	1	0	0	< 0.001	< 0.001	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

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.

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) was detected at all treated sources; the analytical results were all under the MAC (maximum allowable concentration). The values in Table 13 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 14: City of Guelph General Chemistry Selected Results Summary. This data is provided to Wellington-Dufferin-Guelph Public Health.

Table 13: 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 ¹⁵	n/a	27	27	27	21	150	58.037
Fluoride	1.5 and 2.4 ¹⁶	n/a	20	20	0	0.13	0.77	0.292

¹⁵ 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.

¹⁶ 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.

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 “B” 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 2015.

In 2015, all operational “Treated Sources” were sampled and analyzed for general chemistry parameters. Please refer to the “General Chemistry Results Summary” in Appendix “B” for the full list of parameters.

Table 14 **highlights specific parameters due to their presence / significance within the water supply.**

Table 14: City of Guelph General Chemistry Selected Results Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQ S MAC	ODWQ S AO	ODWQ S 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	11	0	n/a	< 0.05	< 0.05	n/a
Chloride	n/a	250	n/a	11	11	0	92	230	128.3
Hardness (Calculated as CaCO ₃)	n/a	n/a	80-100	11	11	11	340	550	454.5
Iron	n/a	0.3	n/a	11	2	0	< 0.1	0.26	0.26
Lead	0.01	n/a	n/a	11	1	0	<0.0005	0.00084	0.00084
Manganese	n/a	0.05	n/a	11	8	1	<0.002	0.064	0.0164
Sodium	n/a	20 and 200	n/a	12	12	12	22	180	94.583

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 2015 (Jan. 01 to Dec. 31, 2015). For regulatory sampling schedules that do not occur in 2015 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 Dec. 31, 2015. 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 "E" – 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 Dec. 31, 2015. **There was no instance of an adverse result in 2015 between Jan. 01 and Dec. 31:**

Table 15: O. Reg. 170/03 Schedule 7-2, Gazer Mooney - Distribution Manual Free Chlorine Residual Summary (Jan. 01 to Dec. 31, 2015)

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	365	0	0.48	1.16	0.83	mg/L

Table 16 summarizes bacteriological sampling and test results required by O. Reg. 170/03 Schedule 10 for the period of Jan. 01 to Dec. 31, 2015. **There was no instance of an**

exceedance for a Regulatory microbiological parameter in 2015 between Jan. 01 and Dec. 31:

- Number of Distribution samples taken: 52
- Number of Distribution analyses: 573

Table 16: O. Reg. 170/03 Schedule 10-2, Gazer Mooney Treated Bacteriological Sampling Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQS Criteria	Total Analyses	Total Outside ODWQS Criteria	Range	Units
Distribution - E. coli	0	52	0	n/a	cfu/100 mL
Distribution - Total Coliform	0	52	0	n/a	cfu/100 mL
Distribution - HPC	n/a	52	n/a	0 - 5	cfu/mL
Distribution - Background	n/a	52	n/a	n/a	cfu/100 mL
Distribution- Free Chlorine Residual	0.05 - 4.0	365	0	0.48 - 1.16	mg/L

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

In 2015, 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 2015 (Jan. 01 to Dec. 31) is below the ½ MAC (maximum allowable concentration).

Table 17: O. Reg. 170/03 Schedule 13-6, Gazer Mooney - "Three Month" Sampling Results Summary (Jan. 01 to Dec. 31, 2015)

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)
Trihalomethanes	0.100 ¹⁷	n/a	4	4	0	0.0174	0.0419	0.0244

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 18** in order to gather additional data and answer common inquiries from the public.

Table 18: Gazer Mooney General Chemistry Results Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQ S MAC mg/L	ODWQ S AO	½ MAC mg/L	Total Sampl es	Sampl es Above MDL	Total Above ODWQ S Criteri a	Min (mg/L)	Max (mg/L)	Avera ge (mg/L)
Sodium	20 and 200 ¹⁸	n/a	n/a	1	1	1	22	22	22
Chloride	n/a	250	n/a	1	1	0	39	39	39

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

¹⁷ This standard is expressed as a running annual average.

¹⁸ 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.

- Lead Reduction Plan.

Water Conservation and Efficiency

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 2015 Water Conservation and Efficiency Program for the period of January 1 to December 31, 2015. Details and additional activities are presented in Appendix "D".

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 reaching 3,564 students in 2015.

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.

Rebate Programs: Operation and optimization of existing conservation rebate programs continued during 2015. 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**. As part of these programs approximately 183 m³/day in daily water servicing capacity has been reclaimed in 2015. For more information on the City's Water Conservation Rebate Programs please visit guelph.ca/rebates.

Water Conservation and Efficiency Strategy Update: In April 2015, an update to the Water Conservation and Efficiency Strategy (WCES) was initiated. The 2015 Water Efficiency Strategy Update (WESU) aims to identify preferred program alternatives, associated water savings, program implementation forecasts, and the resources required to support these programs. Significant completion of the WESU and presentation of the final strategy to Guelph City is anticipated within Q2 2016 with additional information on the update available via the City's website at guelph.ca/wesu.

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. The City of Guelph celebrated Canada Water Week with the third 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 1,000 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.

As part of Canada Water Week, Water Services also partnered with the Guelph Public Library for the third year in a row to host 'Water Wednesdays' throughout the Month of March at four 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. In concert with Water Wednesday, the Guelph Public Library also hosted an Aqua Lauti art exhibit during Canada Water Week,

which gave patrons 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/>.

Programs

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 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 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.

Outdoor Water Use Program: 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 Eramosa River sub-watershed conditions stemming from a period of significant rainfall. Due to the reoccurrence of decreasing river flows in the Eramosa River after periods of limited 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.

Guelph Transit Rainwater Harvesting System: 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.

Leak Detection Program: The annual Leak Detection Program was launched in April 2015. This program included sounding and correlation of all metallic water mains within City's distribution system, encompassing 287 km of linear infrastructure. In total, 22 potential system leaks were identified and repaired 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.

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/>.

Healthy Landscapes Home Visit Program: This annual program was initiated in May 2015 with 384 home visits completed by August 31, 2015, equal to 28.4 m³/day savings. 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.

The annual **Water Services Open House** was held on May 23, 2015. This popular community event showcased Water Services' programs and resources and included a plant, rain barrel and composter sale. It is estimated that over 500 members of the local public attended the annual open house, with a total of 300 rain barrels sold at the event.

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 25 to 29, 2015, celebrated its 20th year in 2015. 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 800 students from the City of Guelph attended the 2015 festival.

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 19,500 trees on 18 acres, and Bartram Woodlands (on-site contractor) has planted 23,150 trees on another 16 acres. In addition, funding was secured through the Ontario Ministry of Natural Resources' 50 Million Tree Program—part of the United Nations Billion Tree Campaign. The Ontario portion of the fund is committed to planting 50 million trees by 2025. This funding allowed the City to plant 6,050 seedlings in fields adjacent to Watson Road.

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 Lake Erie Source Protection Committee submitted the Proposed Grand River Source Protection Plan to the Ministry of the Environment and Climate Change (MOECC) for review and approval in 2015. The Plan includes a number of proposed policies to manage significant drinking water threats (identified in the Assessment Report) for the City of Guelph. The Grand River Source Protection Plan was approved by the Minister on November 26, 2015 with an effective date of July 1, 2016.

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 assessing the data management and information needs that will be required to administer the program once the Source Protection Plan is in effect.

For more information on [Guelph's Source Water Protection Program](http://guelph.ca/sourcewater) 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 Dec. 31, 2015:

Table 19: Lead Reduction Plan Lead Sampling – Guelph Drinking Water System 2015¹⁹

Number of Locations	Location Type	Number of Samples	Lead Range (mg/L)	pH Range	Alkalinity Range (mg/L)	Temperature Range (oC)
4	Distribution	9	0.0000 – 0.045	7.3-7.6	n/a	8.5-9.5
15	Lead Verification	19	0.0000 - 0.053	n/a	n/a	n/a

¹⁹ Includes all samples as required by the MDWL or Lead Reduction Plan.

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

Table 20: Lead Reduction Plan – Gazer Mooney Subdivision Distribution System 2015²⁰

Number of Locations	Location Type	Number of Samples	Lead Range (mg/L)	pH Range	Alkalinity Range (mg/L)	Temperature Range (oC)
2	Distribution	6 ²¹	Below detection	7.6	270	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 Dec. 31, 2015, 15 locations were sampled under the Lead Verification program. Of these sample results, 6.7% were above 5 µg/L indicating presence of a lead service line. Of all verification samples, 6.7% also exceeded the ODWQS of 10 µg/L. Lead samples are collected before and after a LSL replacement has been undertaken. There were 9 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 14 Lead Service Line (LSL) replacements undertaken in the City between Jan. 1 to Dec. 31, 2015. 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 2015 up to Dec. 31.

Table 21: Lead Service Line Replacements 2015 (Jan. 1 to Dec. 31)

Type of Replacement	#
Full LSL Replacement: Funded under Grant Program ²²	2
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	1

²⁰ Includes all samples as required by the MDWL or Lead Reduction Plan.

²¹ At each location three (3) samples are taken - one (1) for lead, one (1) for alkalinity and one (1) for pH.

²² The LSL Replacement Grant Program provides eligible property owners funding to off-set the cost of replacing an LSL on private property.

Type of Replacement	#
Partial LSL Replacement: Lead - Connected back to lead on Private side	1
Private LSL Replacement: Replacement by private contractor	1
Private LSL Replacement: Funded under Grant Program	9
TOTAL	14

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 Dec. 31, 2015, 194 privately owned lead service lines were replaced through the grant programs.

Table 22: Private Lead Service Line Replacement Grant Programs (2010 – Dec. 31, 2015)

Grant Program	2010	2011	2012	2013	2014	2015
Full Water Service Replacement Grant Program	15	21	7	2	1	2
Private Water Service Replacement Grant Program	45	42	23	19	8	9
Yearly Total	60	63	30	21	9	11
Cumulative Total	60	123	153	174	183	194

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

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 anticipates implementation of procedure by May 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 are currently working 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.

Gazer Mooney Municipal Drinking Water Licence Renewal

The application deadline for licence renewal for the Gazer Mooney Subdivision Distribution System was Aug. 2, 2015. Water Services submitted to the Township of Guelph / Eramosa an updated Operational Plan and Raw Water Assessment early July. Gazer Mooney's Municipal Drinking Water Licence is anticipated to be renewed by Feb. 1, 2016.

Permits to Take Water (PTTWs)

Three PTTWs were renewed in 2015 (Jan. 1 to Dec. 31):

1. Arkell Well No. 1 PTTW (exp. 2015-05-31)
2. Burke Well PTTW (exp. 2015-05-31)
3. Carter Wells PTTW (exp. 2015-05-31)

Six PTTWs are scheduled for review and/or renewal in 2016:

1. Arkell Infiltration Gallery PTTW (exp. 2016-10-31)
2. Carter Wells PTTW (exp. 2016-05-31)
3. Emma Well and Park Wells 1 & 2 PTTW (exp. 2016-10-31)
4. Helmar Well PTTW (exp. 2016-05-31)
5. Paisley Well PTTW (exp. 2016-10-31)
6. Water St. Wellfield (Water, Dean, University, Membro) PTTW (exp. 2016 -10-31)

Staff Certification

Table 23, Table 24 and Table 25 describe staff (Operators, Management, and other Technical staff) with various classes of provincial operator certificates and years' experience.

Table 23: Water Services Staff with Certificates

Certificate Class	Number of Employees (not including management)
OIT	4
Class I	1

Certificate Class	Number of Employees (not including management)
Class II	3
Class III	12
Class IV	10

Table 24: Competency & Years' Experience of Management Directly Affecting Drinking Water

Role	Minimum Competency Required ²³	Competency Achieved	Years' Experience
Plant Manager Overall Responsible Operator (ORO)	Class IV Certificate	Class IV Certificate	26+
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 Class 1 exam (certificate pending)	7+

²³ Minimum competency includes the certification requirements listed here, plus the completion of ongoing training requirements of O. Reg. 128/04.

Table 25: 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	2	3	2	0	1
Technical Services Staff	1	0	1	0	1	0

Table 26: Legal and Other Requirements Update

Date - 2015	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Dec. 27, 2014	<u>Canada Gazette</u>	<p>Performance Indicators and National Targets for the Code of Practice for the Environmental Management of Road Salts in Canada - The <u>Code of Practice for the Environmental Management of Road Salts</u> was developed in 2004 to assist municipal and provincial road authorities to better manage their use of road salts in a way that reduces the harm to the environment while maintaining roadway safety.</p> <p>The <u>Code</u> specifies road organizations that use over 500 t/year of salt or who have salt-vulnerable areas in their territory to review their existing winter maintenance operations to improve practices and reduce adverse impacts of salt releases in the environment.</p> <p>One of the program's improvement actions is to set <u>national targets</u> for the implementation of best practices against which performance of the road organizations and the success of the Code can be evaluated.</p>	No action required.

Date - 2015	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Jan. 5	MOECC E-mail	<p>Updated Watermain Disinfection Procedures - Draft for Comments – 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. The province has worked with stakeholders to clarify the requirements of C651, and to develop alternative procedures to be used during emergency repairs.</p> <p>The Watermain Disinfection Procedure will result in some changes to the procedures. The document 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.</p>	<p>Forwarded internally to all Top Management, Compliance, Technicians, Supply staff.</p> <p>Confirmed at Management Review Meeting on Jan. 27, 2015 that no additional comments are required.</p>
Jan. 12	Environmental Registry	<p>The MOECC is seeking stakeholder input on the “Technical Discussion Paper on Proposed Ontario Drinking Water Quality Standards” that proposes regulatory amendments to Schedule 2 of Ontario Regulation 169/03 to adopt new Ontario Drinking Water Quality Standards for chlorate, chlorite, 2-methyl-4-chlorophenoxyacetic acid (MCPA), and, haloacetic acids (HAAs) and to revise the existing Ontario Drinking Water Quality Standards for arsenic, benzene, carbon tetrachloride, and vinyl chloride. The Technical Discussion Paper on Proposed Ontario Drinking Water Quality Standards provides an overview of the process used by the ministry for the proposed changes for each contaminant and seeks stakeholder input for questions related to the proposed numerical value, benefits of adopting the proposed standard, impacts to municipalities and drinking water system owners, and the time-frame for implementation.</p>	<p>No action required. E-mail forwarded to Top Management and Technical Staff.</p>

Date - 2015	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Jan. 16	UW – NSERC e- mail	<p>Over 200,000 residents on Montreal’s South Shore told not to drink their tap water-day 2 - The City of Longueuil, Quebec confirmed this morning that its drinking water advisory will remain in effect as officials continue to test the quality of the water after a diesel fuel spill earlier this week. For more details see:</p> <p>CBC news: Longueuil water consumption ban still in effect</p> <p>Global news: Longueuil water ban lifted: tap water safe to drink after diesel spill</p> <p>National Post: Longueuil can’t drink tap water after 28,000 litres of diesel spills into sewage system and St. Lawrence River</p>	No action required. E-mail forwarded to Top Management.
Jan. 27	OWWCO website	<p>NEW – Guide to Drinking Water Operator Training Requirements in O. Reg. 128/04 - The ministry has introduced a new Guide to Drinking Water Operator Training Requirements. This guide explains the training requirements for renewal of Drinking Water Operator and Water Quality Analyst certificates under Ontario Regulation 128/04. It also provides information on the certificate renewal process.</p> <p>Please note this new guide replaces Guideline 4.1 Six Month Operator Certificate Renewal, Guideline 4.2 ‘Director Approved’ Continuing Education Training Requirements and Guideline 4.3 On-the-Job Practical Training Criteria.</p>	No action required. E-mail forwarded to all staff.

Date - 2015	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Feb. 1	AWWA	<p>ANSI/AWWA C651-14 – Disinfecting Water Mains released Feb. 1, 2015. This standard describes methods of disinfecting newly constructed potable water mains, mains that have been removed from service for planned repairs or for maintenance that exposes them to contamination; mains that have undergone emergency repairs because of physical failure; and mains that, under normal operation, continue to show the presence of coliform organisms.</p>	No action required. E-mail distributed to Top Management.
Feb. 4	OWWCO website	<p>Guidance on Drinking Water and Wastewater OITs Working Alone in a Subsystem/Facility – The Ministry of Environment and Climate Change (MOECC) is seeking input into a new guideline to explain when it is appropriate for Drinking Water and Wastewater Operators-in-Training (OITs) to work alone.</p> <p><u>Click HERE</u> for more information. Click the following link to download <u>Discussion Paper: Drinking Water and Wastewater Operators-in-Training Working Alone in a Subsystem/Facility</u></p>	No action required. OITs work under supervision of other certified staff at Water Services.
Feb. 4	OWWCO website	<p>NEW – Guideline 4.4: Director Approved Continuing Education Guide for Training Providers – The Ministry of the Environment and Climate Change has released a new <u>Director Approved Continuing Education Guide for Training Providers</u>. The new guide explains the criteria that continuing education training must meet in order to be considered Director Approved for the purpose of Drinking Water Operators and Water Quality Analysts meeting their training requirements under O. Reg. 128/04. The guideline also includes information for training providers on the process for having continuing education training assessed.</p> <p>This guideline replaces the sections of Guideline 4.2 'Director Approved' Continuing Education Training Requirements regarding training providers and continuing education training approval.</p>	No action required. This information is for staff responsible for CEU-training.

Date - 2015	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Feb. 10	UW – NSERC e- mail	<p>WHO Technical Brief on Boil Water-great information in 2 page document – The WHO has just released a two page 'Technical Brief on Boil Water'. They conclude that "...the process of heating water to a rolling boil, as recommended in the WHO Guidelines for Drinking-water Quality (WHO, 2011), is sufficient to inactivate pathogenic bacteria, viruses and protozoa." What many people don't realize is that temperatures above 70°C for 15 seconds or more provide a substantial level of protection. Table 1 on page 2 provides a summary of studies of thermal inactivation of bacteria, viruses and protozoa.</p>	No action required. Forwarded e-mail to Top Management, Technical Staff and WDGPH.
Feb. 20	UW – NSERC e- mail	<p>Province orders probe after Winnipeg's 48-hour boil-water advisory. "The Manitoba government has ordered an investigation into the vulnerability of Winnipeg's drinking water after an E. coli test result prompted a boil-water advisory last month for the capital's 700,000 residents. City staff said Wednesday they were confident the water system was not contaminated with bacteria and that the result was a false positive. But Manitoba's office of drinking water was not convinced. "We have no evidence at all to suggest there was a false positive at this point," said office director Kim Philip in an interview. "This is an independent, accredited lab and we're confident in the results from the lab, so we are very concerned with the use of the term false positive." "We certainly don't want the laboratory to be pinned with this as an analytical error when there's nothing that we've identified that would lead one to conclude that."</p> <p>Hours earlier, Winnipeg's waste and water director Diane Sacher told a city council committee that a false E. coli result, either from a sampling or lab error, was to blame for the citywide boil-water advisory.</p>	No action required. Forwarded e-mail to Top Management and Technical Staff.

Date - 2015	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Feb. 20	UW – NSERC e-mail	<p>The <u>USEPA</u> released its 6th National Contaminant Occurrence Database of analytical results for its UCMR 3 which requires monitoring for 30 contaminants including 28 chemicals and 2 viruses. UCMR 3 samples are being collected at entry points to the distribution system (EPTDS). See pages 11 and 12 of the summary document for the latest data at this link: http://water.epa.gov/lawsregs/rulesregs/sdwa/ucmr/upload/epa815s15001.pdf</p> <p>Chlorate (37.3%), 1,4-dioxane (6.8%), and strontium (5.3%) continue to be the most commonly detected in US public water supply systems based on values greater than their reference concentrations. UCMR 3 monitoring will continue through December 2015, and final data are expected to be reported to EPA in the summer of 2016.</p>	No action required. Forwarded e-mail to Top Management and Technical Staff.
Mar. 18	MOECC E-mail	<p>Issue 6 of the Municipal Drinking Water Licensing Program Bulletin In this issue: Upcoming DWQMS Workshop in Orillia, Updated Watermain Disinfection Procedures, Air Release and Vacuum Relief Valves, Climate Change and your Quality Management System, New Schedule E for Municipal Drinking Water Licences.</p>	No action required. Forwarded e-mail to Top Management and Technical Staff.
Mar. 25	MOECC E-mail	<p>The updated <u>Your Septic System: Protecting Your Investment and the Environment</u> brochure is now available as part of the Source Water Protection Education and Outreach Resource Catalogue.</p> <p>This brochure includes information on septic system maintenance, safe operation and the mandatory inspection program. The brochure will help meet the intent of some source protection policies related to the Clean Water Act, which also supports the province’s efforts to prepare for climate change.</p>	No action required. Forwarded e-mail to Risk Management Official, Building Services, Wastewater, WDGP and Technical Staff.

Date - 2015	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Apr. 13	MOECC E-mail	<p>A Guide for Drinking Water System Owners Seeking to Undertake a Backflow Prevention Program. This guide provides comprehensive information and suggested approaches that drinking water system owners/operators can use to develop a backflow prevention program.</p> <p>It presents owners and operators with a consistent approach to protecting drinking water from backflow. This will help safeguard Ontarians and further strengthen the drinking water safety net. Download the guide.</p>	No action required. Forwarded e-mail to Building Services, Water Services' Top Management and Technical Staff. Building Services confirmed that we exceed the requirements in the guide.
Apr. 14	MOECC E-mail	<p>Ministry of the Environment and Climate Change Chief Drinking Water Inspector's Annual Report 2013-2014 – Notice of Release. Today, Minister Glen Murray released the 2013-14 Chief Drinking Water Inspector's Annual Report. The report provides an overview of the ministry's progress during 2013-14 and includes in-depth information on the performance of Ontario's drinking water systems and licensed and eligible laboratories.</p> <p>The report highlights that Ontario's drinking water continues to be of high quality and is well protected. These findings are supported by our drinking water quality and inspection results. The ministry and its partners are working together and remain committed to protecting the province's drinking water.</p>	No action required. Forwarded e-mail to Top Management and Technical Staff.
May 22	MOECC E-mail	New! Heating and Liquid Fuels pages added to Source Protection Education and Outreach Catalogue - Do you use heating oil or store fuel on your property? Then you have legal responsibilities to make sure it does not leak into water sources. Use the new heating and liquid fuels catalogue pages to find out how to protect your drinking water from fuel.	No action required.

Date - 2015	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Jun. 6	Canada Gazette	<p>Proposed Regulations Amending the Transportation of Dangerous Goods Regulations (Part 8 – Reporting Requirements)</p> <p>- The proposed amendment requires a person to report a release or an anticipated release in excess of a trace amount of dangerous goods, except for dangerous goods included in Packing Group III of the following classes for which the threshold is an amount greater than 30 L or 30 kg: ...Class 8, Corrosives. Since dangerous goods included in Packing Group III pose a lower risk in transport, the threshold aims to exclude the reporting of small releases or small anticipated releases resulting from routine operations involving pumps, compressors and connectors that connect and disconnect during the loading and unloading of dangerous goods.</p>	No action required. Water Services' transport of dangerous goods includes Sodium hypochlorite (Packing Group III; Class 8, Corrosives; UN1791); which is considered lower risk in transport, as per the text in the proposed regulations.
Jun. 30	MOECC E-mail	<p>NEW! Campaign in a Box toolkit now available on Conservation Ontario's website Use the new "Campaign in a Box" toolkit to educate your community about source water protection. Plan a campaign using the template and ideas provided. Or develop new materials using content available in the Source Protection Education and Outreach Resource Catalogue.</p>	No action required.

Date - 2015	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Aug. 20	MOECC E- mail	<p>EBR consultation on Ontario's Drinking Water Quality Standards. In December 2014, the MOECC posted a discussion paper on the environmental registry outlining proposed changes to drinking water standards and testing procedures for specific substances: chlorate, chlorite, 2 methyl-4-chlorophenoxyacetic acid and haloacetic acids, and to revise the existing standards for arsenic, benzene, carbon tetrachloride, and vinyl chloride.</p> <p>The ministry is now seeking input on a more specific proposal to amend Ontario Regulation 169/03 (Ontario Drinking Water Quality Standards) and Ontario Regulation 170/03 (Drinking Water Systems) made under the Safe Drinking Water Act, 2002, as well as any municipal licences as appropriate in order to update the drinking water standards, and testing and reporting requirements. The following link will take you to the EBR Consultation (Number 012-4213). Comment period until Sep. 28, 2015.</p>	Reviewed the changes. Forwarded e-mail to Top Management and Technical Staff for review / comment if needed.
Sep. 25	MOECC E- mail	<p>New fees for the Water and Wastewater Operator Certification Program. Starting January 1, 2016, the MOECC will be increasing fees for the Water and Wastewater Operator Certification Program to recover the costs associated with the program. Existing operator certification program fees have remained unchanged since 2004 and account for only half of the true cost to deliver the program. By adjusting fees and adopting the new fee structure, the ministry will recover close to 100 per cent of program costs. In addition to increases to the current fees, the ministry is introducing new fees, also effective January 1, 2016. The list of all new fees and additional information is available on the Ontario Water Wastewater Certification Office's website at www.owwco.ca.</p>	No action required.

Date - 2015	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Oct. 31	Ontario Gazette	Source Protection Committees Regulation (O. Reg. 288/07) amended with changes to minimum and maximum number of committee members. The "Number of Members" table included in section 1 of the regulation outlines the minimum and maximum number of members for each of the Source Protection Areas or Regions.	No action required.
Nov. 9	MOECC E- mail	Revisions to the DWQMS have been posted for comment on the Environmental Registry. The MOECC is proposing revisions to the Drinking Water Quality Management Standard (DWQMS). The revisions are administrative in nature and intended to clarify existing requirements. Environmental Registry posting: <u>Env. Registry Number 012-5530</u> .	Reviewed the changes. Forwarded e-mail to Top Management and Technical Staff. No follow-up necessary.
Dec. 1	UW NSERC E-mail	Health Canada Guidance for Issuing and Rescinding Boil Water Advisories. Health Canada has just posted a guidance document titled ' <u>Guidance for Issuing and Rescinding Boil Water Advisories in Canadian Drinking Water Supplies</u> ' at: http://www.healthycanadians.gc.ca/publications/healthy-living-vie-saine/water-advisories-avis-eau/index-eng.php	Emergency procedure related to water advisories will be updated to reflect guidance material as applicable.

Date - 2015	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Dec. 8	MOECC E-mail	<p>Watermain Disinfection Procedure. The final version of the MOECC's Watermain Disinfection Procedure document is provided. Our Drinking Water Works Permit will be revised to reflect the requirements outlined in the Watermain Disinfection Procedure document, with a planned implementation date of no earlier than May 1 2016. The following popular stakeholder comments were considered in the finalization of the procedure:</p> <p>Clarification or modification of the reporting requirements to the local public health unit and the imposition of boil water advisories;</p> <p>Clarification or modification of the reporting requirements to the MOECC;</p> <p>Required disinfectant concentrations and contact times to ensure adequate disinfection;</p> <p>The requirement for backflow prevention devices as referenced in AWWA Standard C651;</p> <p>The requirements for an Operator-in-Charge (OIC) to be present and make decisions regarding the disinfection procedure to be followed.</p>	<p>Reviewed the changes. Forwarded e-mail to Top Management and Technical Staff. Staff review of requirements against the practices we have in place for disinfecting watermains as part of an addition, modification, replacement, extension, planned maintenance, or emergency repair.</p>

Date - 2015	Source of Posting / Reference	Title of Legal & Other Requirement Highlights of posting	Action and Status Update
Dec. 15	MOECC E- mail	<p>EBR Decision Notice on Ontario's Drinking Water Quality Standards, Testing and Reporting Requirements. The MOECC has approved changes to Ontario Regulations 170/03 and 169/03. The details of the changes can be found in the EBR Decision Notice.</p> <p>The amendments:</p> <p>Strengthen standards for arsenic, carbon tetrachloride, benzene and vinyl chloride;</p> <p>Adopt new standards for chlorate, chlorite, 2-methyl-4-chlorophenoxyacetic acid (MCPA) and haloacetic acids (HAAs);</p> <p>Clarify/optimize testing, sampling and reporting requirements for trihalomethanes (THMs) and HAAs; and</p> <p>Remove 13 pesticides from testing requirements.</p>	<p>Reviewed the changes. Forwarded e-mail to Top Management and Technical Staff. Staff reviewed existing processes to reflect changes.</p>

Changes Affecting the Quality Management System (QMS)

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

In November, the MOECC posted the updated DWQMS on the Environmental Bill of Rights for comment, highlighting revisions included to clarify existing DWQMS requirements. Most significant revisions are:

- Throughout: added definition for "Calendar Year" and revised previous language of "once every year" and "once every 12 months" throughout the Standard to read "once every Calendar Year".
- Element 7: Addition of new PLAN a) that requires 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."
- Element 12: Revised PLAN c) to require that suppliers identified by an Operating Authority under PLAN a) of Element 13 should be considered in the procedure for communications.
- Element 14: Addition of new PLAN a) requiring the outcomes of the risk assessment documented under Element 8 to be considered in the procedure for reviewing the adequacy of the infrastructure necessary to operate and maintain the Subject System.

- Element 15: Addition of new PLAN b) requiring the inclusion of a long term forecast of major infrastructure maintenance, rehabilitation and renewal activities.
- Element 21: Addition of a PLAN requirement that includes:
 - A requirement to consider BMP's in the context of continual improvement;
 - A requirement to document a process for identification &
 - management of corrective actions;
 - implementation of preventive actions.

QMS 03 – Water Services conducted an orientation session for Council in May and hosted site tours in September to satisfy the Safe Drinking Water Act requirements related to Statutory Standard of Care.

QMS 05 – Water Services continues to implement initiatives to improve compliance with the City's Records Retention By-law (No. (2014)-19770).

The nonconformity identified in this past external audit related to QMS 05 Documents & Records Control has resulted in an improved QMS 05 procedure.

A corporate initiative for using an alternate resource to the City's existing Electronic Document Management System (EDMS) may be implemented this year.

QMS 07/08 – 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 in December, Water Services initiated a more detailed review and update of its risk assessment procedure, ratings and tables that will form part of the January 2016 record.

The following hazardous events will be added: drought, aqueduct infrastructure failure, frozen services, cross-connection of Guelph and Gasport Aquifers impacting source water quality, terrorism, vandalism.

QMS 09 – Organizational update – The job title for Supervisor of Water Supply Operations & Maintenance has been replaced with two job titles: Supervisor of Water Supply Maintenance and Supervisor of Water Supply Operations. The following new positions also exist: General Manager of Environmental Services, Meter Installer, Lead Hand – Locates, and Locates Technician.

QMS 18 – A Frozen Water Services Policy was presented to Council in the fall that takes into account all noted opportunities for improvement from experiences of the past two winters' frozen services events.

QMS 21 – Working on improved tracking and progress reporting on noted opportunities for improvement from various sources (e.g. emergency debriefs, internal audits, external audits, meetings, etc.).

New Element 21 requirements of the DWQMS have expanded to include a more formal process for identification of, tracking of, and verifying effectiveness of corrective and preventive actions taken to prevent occurrence and/or recurrence of non-conformities.

I) Consumer Feedback

The table below represents all customer calls received:

Table 27: Customer Calls Received

Type	# Calls 24 2013	# Calls 2014	# Calls 2015
Billing	-	-	9
Discoloured Water	-	-	160
Distribution	-	-	72
Flushing	22	32	27
Frozen	-	-	695
Hydrant - Accident Report	-	-	2
Hydrant - Investigation	18	46	38
Hydrant Out-of-Service	-	-	65
Lead	-	-	9
Leak	-	-	52
Meter	-	-	36
Other	93	199	127
Pressure	85	146	95
Private Issue	146	306	18
Service Box Repairs	-	-	254
Swabbing	22	32	47
Trench Investigation	-	-	9
Valve	-	-	27
Water Quality / Appearance	113	144	47
Watermain	56	124	67
Watermain Break Investigation	-	-	54
Well Interference Inquiries	6	2	2

24 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),
- 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 Q4 2015, Water Services released a public request for proposals for a Water Service 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 2016. 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.

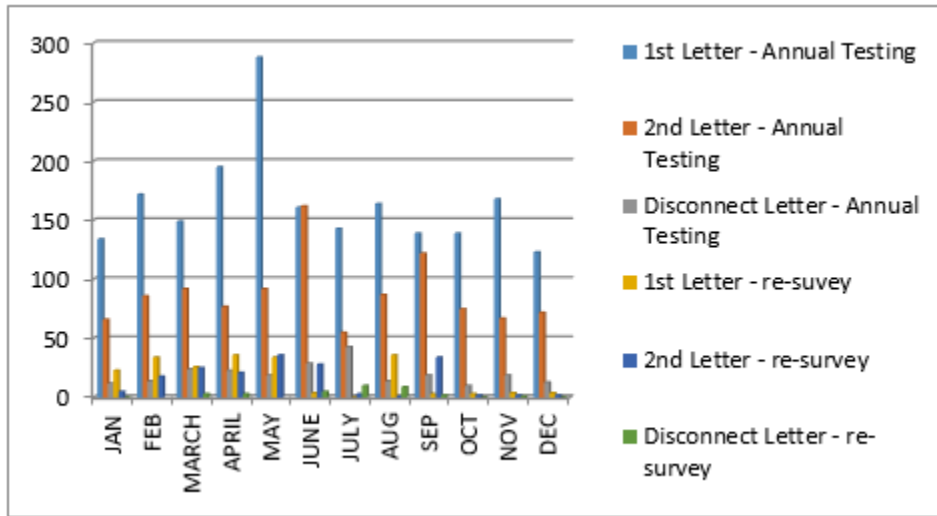
On a regular basis, Building Services provides the following "Backflow Report" included in the table below that tracks the number of letters sent out regarding annual testing and re-surveying requirements of the By-law.

The City of Guelph has a total of 2,724 properties (2,628 active and 96 inactive properties) that have a total of 6,252 backflow prevention devices installed. Of the total, 1,894 buildings have premise isolation and 960 buildings are without premise isolation (e.g. residential irrigation systems, plaza facility – plaza owner has premise isolation). New properties from Jan. 01 to Dec. 31: 38 with premise and 34 without premise isolation.

Table 28: 2015 Backflow Report - Number of Letters Sent out for Annual Testing and Re-survey

Letter Type	Ja n	Fe b	Ma r	Ap r	Ma y	Ju n	Jul	Au g	Se p	Oc t	No v	De c	Tot al
Annual Testing – 1 st Letter	13 4	17 2	14 9	19 5	28 8	16 1	14 3	16 4	13 9	13 9	16 8	12 3	19 75
Annual Testing – 2 nd Letter	66	86	92	77	92	16 2	55	87	12 2	75	67	72	10 53
Annual Testing – Disconnect Letter	12	14	24	23	19	29	43	14	19	10	19	13	23 9
Re-survey – 1 st Letter	23	34	26	36	34	4	0	36	3	3	4	4	20 7
Re-survey – 2 nd Letter	5	18	25	21	36	28	3	1	34	2	2	2	17 7
Re-survey – Disconnect Letter	0	0	3	3	0	5	10	9	2	0	1	0	33
Water Service Disconnected	0	0	0	0	0	0	0	0	0	1	0	0	1
Number of new devices installed	n/ a	n/ a	n/ a	n/ a	n/ a	90	n/ a	n/ a	n/ a	n/ a	n/ a	69	15 9

Figure 6: Annual Backflow Prevention Device Re-Survey and Testing Letters from Building Services to Customers in 2015



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. Below includes a listing of various improvement items that were implemented by staff and communicated across Water Services in Jan. 1 to Dec. 31, 2015.

Table 29: Improvement Actions Summary

OFI #	Suggestion Title	Improvement Action Description
15-01	Waste line at Arkell #15	Arkell # 15 – flanges were welded to the 10” waste line and the lay flat hose.
15-02	Arkell #15 Sampling Plan	Increased water quality sampling at Arkell #15 to help determine the source characterization of the source water.
15-03	Supply Benchmark List	Water Supply now tracking power use vs. treated water produced.
15-04	WaterTrax Data Entry Improvement	Operators now add results to existing monthly “Submitted Sheets” in WaterTrax, specific to each section. This will help improve data quality by quickly identifying duplicate and gaps in information.

OFI #	Suggestion Title	Improvement Action Description
15-05	UVT Spectrophotometer	100%T solution for zero calibration and instructions on using the Spectrophotometer for measuring UVT in the lab are now available.
15-06	Daily Chlorine Residuals	Water Supply Operations now inputting the Verney Tower residual in WaterTrax and in a new column of the North Residual book, so it is easily brought back to Woods to input into WaterTrax. Three residuals that now need to be inputted into WaterTrax daily are Gazer Mooney, Verney Tower and Speedvale Tower.
15-07	Emma Static Injection Mixer	The Static Injection Mixer was installed by Dean-Lane @ Emma. Station operations are no different with the exception that the 12" butterfly isolation valve has been removed (to allow space for the Static Injection Mixer).
15-08	Sample Taps	The sample tap at Gazer Mooney was upgraded. Lift station sample taps are being replumbed upstream of the backflow preventer to improve sample quality.
15-09	Weekly Distribution Sample Split	<p>Distribution Chains of Custody and related Compliance Record Sheet have been updated to accommodate the following changes:</p> <p>Now each section of the City has the requirement of 10 weekly Distribution Micro Samples.</p> <p>In the East, Woods' Sample Tap has been removed. Guelph Hydro and the Library @ Watson Road (previously 'Alternates') have replaced Barton and Gordon Lift Stations (now 'Alternates').</p> <p>In the North, Bowen Dr., Big Bear-Grange and Hasty Market-Eastview have been removed. Victory Sample Tap has been moved to the 'Alternate' section.</p> <p>In the West, College sample Tap and Terraview have been moved out of the 'Alternates' to bump up the total from 8 to 10 samples per week.</p> <p>The WDGPH contact phone number and extension updated to reflect a recent change.</p>

OFI #	Suggestion Title	Improvement Action Description
15-10	SCADA Trend Screen Updates & Additional Signal Error Alarms	Signal error alarms: added for Membro and Arkell 15 turbidity values. (also temperature, pressure and conductivity signal error alarms at Membro) – these are all call-out alarms. To SCADA Trend Screens: turbidity was added to Arkell 15’s trend screen and turbidity, water temperature, conductivity and discharge pressure was added to Membro’s trend screen. Arkell 15’s and Membro’s turbidity was added to the East Turbidities trend screen. Historian recording was also confirmed for all of the above.
15-11	Alarm improvements to address nuisance alarms	The LO and LOLO flow delay timer was extended in the PLC at Arkell 14 to 60 seconds each – to prevent nuisance low flow alarms when the well starts up. The stop timers on Paisley’s horizontal booster pumps were extended to 60 seconds to reduce nuisance “fail to stop” alarms. Installed alarm keypads to replace key switches at F.M. Woods’ chlorine building.
15-12	Applying the Province’s Drinking Water Haulage Guidance Document to the Water Wagon	Using Ontario’s Drinking Water Haulage Guidance Document, Water Supply’s SOP for the Water Wagon was revised to include: Disinfection of the Water Wagon tank using an AWWA Standard (Method 1, 2 or 3) followed by a verification micro sample at the beginning of the season. Create 2 one-week sampling appointments in Outlook in 2-month increments from the date of the verification sample and include all of Supply Operations and the Compliance Coordinator in the appointment. All of the samples will have to be timed so that the filling of the tanker, sampling and verification analysis is all accomplished in between events.
15-13	Security Improvements and Keypads at Well Sites	Building-wide security alarm was implemented for Woods’ Chlorine Building. Security keypads were installed at Clair, Clythe, Paisley, Robertson, Woods (Chlorine, UV Buildings)

OFI #	Suggestion Title	Improvement Action Description
15-14	GRCA Identifies Alternate Source of River Flow Information	<p>Due to a communications outage, Eramosa River flows were unavailable through the GRCA. GRCA provided the following alternate source of information:</p> <p>Using the GRCA website, go to GRCA River Data > River Flows > Flow Summary (where the Eramosa River flow value exists if available).</p> <p>Take the Speed River at Edinburgh value (the sum of the Speed and the Eramosa) and subtract the Victoria value (this is the Guelph Dam discharge and the flow of the Speed at this monitoring station).</p> <p>In effect, you take the combined Speed and Eramosa flows at one location and subtract the upstream Speed flow. This calculation is quite accurate in dry conditions, rain can elevate the calculated Eramosa value due to the City's storm sewer contributions to river flow.</p>
15-15	Recharge Sample Tap at Arkell	There is now a sample tap for the recharge line located inside the fence where the flow meter is located.
15-16	Pump Impeller Replaced in Sodium Hypochlorite Tank	The pump impeller for the sodium hypochlorite tote pump was replaced. Staff will track how long impellers are in service and implement a preventive maintenance program so that a breakdown event is prevented.
15-17	Giant Hogweed Removal at Arkell Spring Grounds	Giant Hogweed plants discovered on the north side of the river at Arkell Wellfield was removed by a specialized contractor.
15-18	Move to Monthly Customer Billing	<p>With Guelph Hydro moving to monthly billing for December 2015, Water Services is also moving to monthly billing. This change only affects residential customers as most business customers are already billed monthly. Benefits are:</p> <ul style="list-style-type: none"> identifying problems like leaks and high water use sooner; making household budgeting simpler and more accurate; applying conservation rebates including Smart Wash and Royal Flush sooner; improving cash flow; reducing bill arrears and write-offs associated with leaks; and faster recovery of valuable groundwater supply by identifying leaks sooner.

OFI #	Suggestion Title	Improvement Action Description
15-19	University Well Operation	Recommended mode for operation for University Well is WELL SUPPLY MODE 1 (except in high storage or maintenance mode). Disabled Mode 3 operation through SCADA.
15-20	Notification of Fire Calls via Dispatch	A new notification process is implemented whereby Water Services will now receive fire alert notices via email. Implemented auto-forwarding of the notice to all of Water Services' Supervisors and Administration Staff.
15-21	Upgrade to Telephone system	During business hours, (8am-4pm, Mon to Fri) callers to Water Services will be greeted by a voice prompt and then moved into a call queue. Callers have the option to stay on the line for the next available staff or to leave a message. Outside business hours, (4pm-8am, Mon to Fri, weekends and stats) callers can leave a voice mail for next business day follow-up, or in emergencies, opt to be directly connected to the after-hours call centre.
15-22	Security at F.M. Woods	To improve site security at F.M. Woods, non-public facing doors will be kept locked, requiring access cards to open at all times of day (except Reception).

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 January 2016 and September 2016.

Appendix "A" – Summary of Critical Control Points and Critical Control Limits

The section below contains descriptions of three critical control points.

Critical Control Point (CCP) - Multi-Barrier Primary Disinfection

- To remove or inactivate pathogens potentially present in the source water

Hazard Description

Low Chlorine Dosage

- 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

- UV Treatment system failure (e.g. UV and Turbidity analyzers, high flow, reactor, PLC, power, flow meters)

Critical Control Limit (CCL)

Free Chlorine

- 0.05-4.0 mg/L (PDDW²⁵, SDWA, O. Reg. 170/03)
- 0.2 mg/L (PDDW recommended optimal)

UV dose

- at FM Wood: 24 mJ/cm² (Drinking Water Works Permit, DWWP)
- at Emma and Water Street wells: 40 mJ/cm² (DWWP)

Monitoring Process & / or Procedures

- 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

²⁵ PDDW – Procedure for Disinfection of Drinking Water in Ontario as adopted by reference by O. Reg. 170/03 under the Safe Drinking Water Act.

- Robust communication systems
- Receiving process for chemicals – Certificates of Analysis required for essential chemicals

Response Procedures

- Supply Standard Operating Procedures
- Water Services Emergency Plan procedures

Critical Control Point (CCP) - Secondary Disinfection

- To ensure the maintenance of a disinfectant residual throughout the distribution system

Hazard Description

Deterioration of chlorine residual, from:

- Reduced water flows
- Occurrence of dead ends
- Increased water temperature (causing low chlorine residual)

Critical Control Limit (CCL)

Free Chlorine

- 0.05-4.0 mg/L (PDDW, SDWA, O. Reg. 170/03)
- 0.2 mg/L (PDDW recommended optimal)

pH

- 6.5-8.5 (operational criteria)

Turbidity

- 5 NTU (operational criteria)

Monitoring Process & / or Procedures

- 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

Response Procedures

- Distribution Standard Operating Procedures
- Response to customer calls

- Repair and system rehabilitation
- Use of appropriately certified and competent contractors and suppliers

Critical Control Point (CCP) - Backflow Prevention

- To prevent cross-contamination that can result from the flowing back of or reversal of the normal direction of flow of water.

Hazard Description

System contamination from negative or reduced pressure

- Lack of backflow prevention device
- Main breaks or blow-outs
- Large services
- Temporary connections
- Firefighting drawdown
- Depressurization from residential usage
- Pipe failure (deterioration)

Critical Control Limit (CCL)

System pressure

- 275-550 kPa (industry standard for operating pressure)

Consumer complaints

- Related to system pressure or water characteristics (odour, colour, taste other).

Monitoring Process & / or Procedures

- Backflow Prevention program
- Where possible, implementation of backflow prevention devices and small mains
- Proactive Watermain and substandard service replacement program

Response Procedures

- Distribution Standard Operating Procedures
- Response to customer calls
- Water Services Emergency Plan procedures

Appendix "B" – Treated Water Quality Statistics

Table 30: O. Reg. 170/03 Schedule 23, 13-2b – "Three Year" Results Summary (Jan. 01 to Dec. 31, 2015)

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)
Antimony	0.014	0.007	21	11	0	< 0.0005	0.0013	0.00089
Arsenic	0.025	0.0125	21	0	0	< 0.001	< 0.001	n/a
Barium	1.0	0.5	21	21	0	0.033	0.076	0.058
Boron	5.0	2.5	21	21	0	0.016	0.058	0.035
Cadmium	0.005	0.0025	21	5	0	< 0.0001	0.00026	0.00020
Chromium	0.05	0.025	21	0	0	< 0.005	< 0.005	n/a
Mercury	0.001	0.0005	12	0	0	< 0.0001	< 0.0001	n/a
Selenium	0.01	0.005	21	0	0	< 0.002	< 0.002	n/a
Uranium	0.02	0.01	21	19	0	< 0.0001	0.0050	0.00176

Table 31: O. Reg. 170/03 Schedule 24, 13-4b – “Three Year” Results Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQS MAC mg/L	½ MAC mg/L	Total Sampl es	Samples Above MDL	# Above ODWQS Criteri a	Min (mg/L)	Max (mg/L)	Averag e (mg/L)
Alachlor	0.005	0.0025	12	0	0	< 0.0005	< 0.0005	n/a
Aldicarb	0.009	0.0045	12	0	0	< 0.005	< 0.005	n/a
Aldrin + Dieldrin	0.0007	0.00035	12	0	0	< 0.00001	< 0.00001	n/a
Atrazine + N-dealkylated metabolites	0.005	0.0025	12	0	0	< 0.001	< 0.001	n/a
Azinphos-methyl	0.02	0.01	12	0	0	< 0.002	< 0.002	n/a
Bendiocarb	0.04	0.02	12	0	0	< 0.002	< 0.002	n/a
Benzene	0.005	0.0025	64	0	0	< 0.0001	< 0.0001	n/a
Benzo(a)pyrene	0.00001	0.000005	12	0	0	< 0.000009	< 0.000009	n/a
Bromoxynil	0.005	0.0025	12	0	0	< 0.0005	< 0.0005	n/a
Carbaryl	0.09	0.045	12	0	0	< 0.005	< 0.005	n/a
Carbofuran	0.09	0.045	12	0	0	< 0.005	< 0.005	n/a

Parameter	ODWQS MAC mg/L	½ MAC mg/L	Total Sampl es	Samples Above MDL	# Above ODWQS Criteri a	Min (mg/L)	Max (mg/L)	Averag e (mg/L)
Carbon Tetrachloride	0.005	0.0025	64	0	0	< 0.0001	< 0.0001	n/a
Chlordane (Total)	0.007	0.0035	12	0	0	< 0.0000 1	< 0.0000 1	n/a
Chlorpyrifos	0.09	0.045	12	0	0	< 0.001	< 0.001	n/a
Cyanazine	0.01	0.005	12	0	0	< 0.001	< 0.001	n/a
Diazinon	0.02	0.01	12	0	0	< 0.001	< 0.001	n/a
Dicamba	0.12	0.06	12	0	0	< 0.001	< 0.001	n/a
1,2-Dichlorobenzene	0.2	0.1	64	0	0	< 0.0002	< 0.0002	n/a
1,4-Dichlorobenzene	0.005	0.0025	64	0	0	< 0.0002	< 0.0002	n/a
Dichlorodiphenyltrichloroethane (DDT) + metabolites	0.03	0.015	12	0	0	< 0.0000 2	< 0.0000 2	n/a
1,2-dichloroethane	0.005	0.0025	64	0	0	< 0.0002	< 0.0002	n/a
1,1-Dichloroethylene (vinylidene chloride)	0.014	0.007	64	0	0	< 0.0001	< 0.0001	n/a
Dichloromethane	0.05	0.025	64	0	0	< 0.0005	< 0.0005	n/a

Parameter	ODWQS MAC mg/L	½ MAC mg/L	Total Sampl es	Samples Above MDL	# Above ODWQS Criteri a	Min (mg/L)	Max (mg/L)	Averag e (mg/L)
2,4-Dichlorophenol	0.9	0.45	12	0	0	< 0.0005	< 0.0005	n/a
2,4-Dichlorophenoxy acetic acid (2,4-D)	0.1	0.05	12	0	0	< 0.001	< 0.001	n/a
Diclofop-methyl	0.009	0.0045	12	0	0	< 0.0009	< 0.0009	n/a
Dimethoate	0.02	0.01	12	0	0	< 0.003	< 0.003	n/a
Dinoseb	0.01	0.005	12	0	0	< 0.001	< 0.001	n/a
Diquat	0.07	0.0035	12	0	0	< 0.007	< 0.007	n/a
Diuron	0.15	0.075	12	0	0	< 0.01	< 0.01	n/a
Glyphosate	0.28	0.14	12	0	0	< 0.002	< 0.002	n/a
Heptachlor + Heptachlor Epoxide	0.003	0.0015	12	0	0	< 0.0000 1	< 0.0000 1	n/a
Lindane (Total)	0.004	0.002	12	0	0	< 0.0000 06	< 0.0000 06	n/a
Malathion	0.19	0.095	12	0	0	< 0.005	< 0.005	n/a
Methoxychlor	0.9	0.45	12	0	0	< 0.0000 2	< 0.0000 2	n/a

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)
Metolachlor	0.05	0.025	12	0	0	< 0.0005	< 0.0005	n/a
Metribuzin	0.08	0.04	12	0	0	< 0.005	< 0.005	n/a
Monochlorobenzene	0.08	0.04	64	0	0	< 0.0001	< 0.0001	n/a
Paraquat	0.01	0.005	12	0	0	< 0.001	< 0.001	n/a
Parathion	0.05	0.025	12	0	0	< 0.001	< 0.001	n/a
Pentachlorophenol	0.06	0.03	12	0	0	< 0.0005	< 0.0005	n/a
Phorate	0.002	0.001	12	0	0	< 0.0005	< 0.0005	n/a
Picloram	0.19	0.095	12	0	0	< 0.005	< 0.005	n/a
Polychlorinated Biphenyls (PCB)	0.003	0.0015	12	0	0	< 0.00005	< 0.00005	n/a
Prometryne	0.001	0.0005	12	0	0	< 0.0003	< 0.0003	n/a
Simazine	0.01	0.005	12	0	0	< 0.001	< 0.001	n/a
Temephos	0.28	0.14	12	0	0	< 0.01	< 0.01	n/a
Terbufos	0.001	0.0005	12	0	0	< 0.0005	< 0.0005	n/a

Parameter	ODWQ S MAC mg/L	½ MAC mg/L	Total Samples	Samples Above MDL	# Above ODWQ S Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
Tetrachloroethylene (perchloroethylene)	0.03	0.015	64	0	0	< 0.0001	< 0.0001	n/a
2,3,4,6-Tetrachlorophenol	0.1	0.05	12	0	0	< 0.0005	< 0.0005	n/a
Triallate	0.23	0.115	12	0	0	< 0.001	< 0.001	n/a
Trichloroethylene	0.005	0.0025	64	34	0	< 0.0001	0.00209	0.00102
2,4,6-Trichlorophenol	0.005	0.0025	12	0	0	< 0.0005	< 0.0005	n/a
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	0.28	0.14	12	0	0	< 0.001	< 0.001	n/a
Trifluralin	0.045	0.0225	12	0	0	< 0.001	< 0.001	n/a
Vinyl Chloride	0.002	0.001	64	0	0	< 0.0002	< 0.0002	n/a

Table 32: Operational VOC Scan Results Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQ S MAC mg/L	½ MAC mg/L	Total Samples	Samples Above MDL	# Above ODWQ S Criteria	Min (mg/L)	Max (mg/L)	Average (mg/L)
1,1-Dichloroethane	n/a	n/a	135	0	n/a	< 0.0001	< 0.0001	n/a

Parameter	ODWQS MAC mg/L	½ MAC mg/L	Total Sampl es	Samples Above MDL	# Above ODWQS Criteri a	Min (mg/L)	Max (mg/L)	Averag e (mg/L)
1,1-Dichloroethylene	0.014	0.007	135	0	0	< 0.0001	< 0.0001	n/a
1,1,1-Trichloroethane	n/a	n/a	135	1	n/a	< 0.0001	0.00018	n/a
1,1,2-Trichloroethane	n/a	n/a	135	0	n/a	< 0.0002	< 0.0002	n/a
1,1,2,2-Tetrachloroethane	n/a	n/a	135	0	n/a	< 0.0001	< 0.0001	n/a
Ethylene Dibromide	n/a	n/a	135	0	n/a	< 0.0002	< 0.0002	n/a
1,2-Dichlorobenzene	0.2	0.1	136	0	0	< 0.0002	< 0.0002	n/a
Cis-1,2-Dichloroethylene	n/a	n/a	135	55	n/a	< 0.0001	0.00276	0.00156
Trans-1,2-Dichloroethylene	n/a	n/a	135	1	n/a	< 0.0001	0.00011	0.00011
1,2-Dichloropropane	n/a	n/a	135	0	n/a	< 0.0001	< 0.0001	n/a
1,3-Dichlorobenzene	n/a	n/a	135	0	n/a	< 0.0002	< 0.0002	n/a
1,4-Dichlorobenzene	0.005	0.0025	136	0	0	< 0.0002	< 0.0002	n/a
Acetone	n/a	n/a	135	0	n/a	< 0.01	< 0.01	n/a
Benzene	0.005	0.0025	136	0	0	< 0.0001	< 0.0001	n/a

Parameter	ODWQS MAC mg/L	½ MAC mg/L	Total Sampl es	Samples Above MDL	# Above ODWQS Criteri a	Min (mg/L)	Max (mg/L)	Averag e (mg/L)
Bromodichloromethane	0.1	0.05	142	42	0	< 0.0001	0.0183	0.005 520
Bromoform	0.1	0.05	142	41	0	< 0.0002	0.0030 1	0.001 395
Carbon Tetrachloride	0.005	0.0025	136	0	0	< 0.0001	< 0.0001	n/a
Chloroethane	n/a	n/a	135	0	n/a	< 0.0002	< 0.0002	n/a
Chloroform	0.1	0.05	142	63	0	< 0.0001	0.0268	0.003 610
Dibromochloromethane	0.1	0.05	142	45	0	< 0.0002	0.0114	0.005 082
Dichloromethane	0.05	0.025	135	1	0	< 0.0005	0.0006 6	0.000 66
Ethylbenzene	0.0024	n/a	135	0	0	< 0.0001	< 0.0001	n/a
Methyl Ethyl Ketone	n/a	n/a	135	0	n/a	< 0.0005	< 0.0005	n/a
Styrene	n/a	n/a	135	0	n/a	< 0.0002	< 0.0002	n/a
Tetrachloroethylene (perchloroethylene)	0.03	0.015	136	0	0	< 0.0001	<0.000 1	n/a
Tolulene	0.024	n/a	136	0	0	< 0.0002	< 0.0002	n/a
Trichloroethylene	0.005	0.0025	136	52	0	< 0.0001	0.0021 9	0.000 72

Parameter	ODWQS MAC mg/L	½ MAC mg/L	Total Sampl es	Samples Above MDL	# Above ODWQS Criteri a	Min (mg/L)	Max (mg/L)	Averag e (mg/L)
Trichlorofluoromethane	n/a	n/a	135	0	0	< 0.0002	< 0.0002	n/a
Vinyl Chloride	n/a	n/a	136	0	0	< 0.0002	< 0.0002	n/a
o-Xylene	n/a	n/a	135	0	0	< 0.0001	< 0.0001	n/a
m- + p- Xylene	n/a	n/a	135	1	0	< 0.0001	0.0001 3	0.000 13
Total Xylene	0.3	n/a	135	1	0	<0.000 1	0.0001 3	0.000 13
Trihalomethanes	0.100	n/a	142	49	0	< 0.0002	0.0534	0.015 17

Table 33: General Chemistry Results Summary (Jan. 01 to Dec. 31, 2015)

Parameter	ODWQS MAC	ODWQS AO	ODWQS OG	Total Sampl es	Sampl es Above MDL	# Above Criteri a	Min (mg/L)	Max (mg/L)	Averag e (mg/L)
Aluminum	n/a	n/a	0.1	11	0	0	< 0.005	0.005	n/a
Alkalinity (as CaCO ₃)	n/a	n/a	30- 500	11	11	0	250	330	290.9
Ammonia-N	n/a	n/a	n/a	11	1	n/a	< 0.05	0.052	n/a

Parameter	ODWQ S MAC	ODWQ S AO	ODWQ S OG	Total Sampl es	Sampl es Above MDL	# Above Criteri a	Min (mg/L)	Max (mg/L)	Averag e (mg/L)
Anion Sum	n/a	n/a	n/a	11	11	n/a	7.54 ²⁶	16.0 ²³	12.464 ₂₃
Antimony	0.014	n/a	n/a	11	5	0	< 0.000 5	0.001 1	0.0007 7
Arsenic	0.025	n/a	n/a	11	1	0	< 0.001	0.001 3	0.0013
Barium	1.0	n/a	n/a	11	11	0	0.034	0.088	0.064
Beryllium	n/a	n/a	n/a	11	0	n/a	<0.00 05	<0.00 05	n/a
Boron	5.0	n/a	n/a	11	11	0	0.021	0.048	0.035
Cadmium	0.005	n/a	n/a	11	4	0	< 0.000 1	0.000 13	0.0001 1
Calcium	n/a	n/a	n/a	11	11	0	92	160	123.09
Cation Sum	n/a	n/a	n/a	11	11	n/a	7.72 ²³	17.3 ²³	12.921 ₂₃
Chloride	n/a	250	n/a	11	11	0	92	230	128.2
Chromium	0.05	n/a	n/a	11	0	0	< 0.005	< 0.005	n/a
Cobalt	n/a	n/a	n/a	11	3	n/a	< 0.000 5	.0042	.00263
Copper	n/a	1	n/a	11	4	0	< 0.001	0.002 4	0.0018

26 Units in mEq/L

Parameter	ODWQ S MAC	ODWQ S AO	ODWQ S OG	Total Sampl es	Sampl es Above MDL	# Above Criteri a	Min (mg/L)	Max (mg/L)	Averag e (mg/L)
Dissolved Organic Carbon (DOC)	n/a	5	n/a	11	11	0	0.69	2.5	1.287
1,4 Dioxane	n/a	n/a	n/a	7	0	0	<0.00 01	<0.00 01	n/a
Hardness (Calculated as CaCO ₃)	n/a	n/a	80- 100	11	11	11	340	550	454.5
Ion Balance (% difference)	n/a	n/a	n/a	11	11	n/a	0.45 ²⁷	4.83 ²⁴	1.714 ²⁴
Iron	n/a	0.3	n/a	11	2	0	< 0.1	0.26	0.26
Langelier's Index at 4°C	n/a	n/a	n/a	11	11	n/a	0.398 ₂₈	0.945 ² ₅	0.639 ²⁵
Langelier's Index at 20°C	n/a	n/a	n/a	11	11	n/a	0.465 ² ₅	0.711 ² ₅	0.579 ²⁵
Lead	0.01	n/a	n/a	11	1	0	<0.00 05	0.000 84	0.0008 4
Magnesium	n/a	n/a	n/a	11	11	n/a	26	49	36.1
Manganese	n/a	0.05	n/a	11	8	1	<0.00 2	0.064	0.0164
Molybdenum	n/a	n/a	n/a	11	10	n/a	<0.00 05	0.004 3	0.0018 6
Nickel	n/a	n/a	n/a	11	8	n/a	<0.00 1	0.001	0.0059 8

27 Units in %

28 Units in Langelier's Index

Parameter	ODWQ S MAC	ODWQ S AO	ODWQ S OG	Total Sampl es	Sampl es Above MDL	# Above Criteri a	Min (mg/L)	Max (mg/L)	Averag e (mg/L)
o-Phosphate	n/a	n/a	n/a	11	0	n/a	<0.01	<0.01	n/a
pH	n/a	n/a	6.5- 8.5	11	11	0	7.64	8.00	7.79
Phosphorus	n/a	n/a	n/a	11	0	n/a	<0.1	<0.1	n/a
Potassium	n/a	n/a	n/a	11	11	n/a	1.6	3.2	2.245
Saturation pH at 4°C	n/a	n/a	n/a	11	11	n/a	7.13	7.33	7.209
Saturation pH at 20°C	n/a	n/a	n/a	11	11	n/a	6.88	7.08	6.96
Selenium	0.01	n/a	n/a	11	11	0	<0.00 2	< 0.002	n/a
Silicon	n/a	n/a	n/a	11	11	n/a	3.6	7.7	5.027
Silver	n/a	n/a	n/a	11	0	n/a	<0.00 01	<0.00 01	n/a
Sodium	n/a	20 and 200	n/a	12	12	12	22	180	94.583
Strontium	n/a	n/a	n/a	11	11	n/a	0.370	5.40	2.587
Sulphate	n/a	550	n/a	11	11	0	52	230	105.36 4
Thallium	n/a	n/a	n/a	11	6	n/a	<0.00 005	0.000 078	0.0000 66
Titanium	n/a	n/a	n/a	11	0	n/a	<0.00 5	<0.00 5	n/a
Total Dissolved Solids	n/a	n/a	n/a	11	11	n/a	410	910	700.9

Parameter	ODWQ S MAC	ODWQ S AO	ODWQ S OG	Total Sampl es	Sampl es Above MDL	# Above Criteri a	Min (mg/L)	Max (mg/L)	Averag e (mg/L)
Uranium	0.02	n/a	n/a	11	10	0	<0.00 02	0.002	0.0013 5
Vanadium	n/a	n/a	n/a	11	0	n/a	<0.00 05	<0.00 05	n/a
Zinc	n/a	5	n/a	11	10	0	<0.00 5	0.16	0.0748

Appendix “C” – 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

Table 34: Pumpage to System – Jan. 01 – Dec. 31, 2015

	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
	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
Jan	Maximum	5,340	826	1,356	4,022	2,689	993	0	0	9,525	0	210	1,795	26,816	49,027
	Average	3,937	759	374	3,987	2,561	977	0	0	5,462	0	22	1,681	24,885	44,645
	Total	122,055	23,524	11,587	123,591	79,404	30,296	0	0	169,332	0	675	52,107	771,440	1,384,010
Feb	Maximum	5,218	857	1,400	4,028	2,705	989	0	0	9,007	0	790	1,650	24,862	50,235
	Average	3,929	813	1,192	4,006	2,534	822	0	0	6,314	0	131	1,595	24,272	45,609
	Total	110,002	22,765	33,376	112,158	70,963	23,005	0	0	176,800	0	3,667	44,674	679,629	1,277,040
Mar	Maximum	5,725	846	1,396	4,286	2,581	726	0	899	8,866	0	2,223	2,644	32,137	59,737
	Average	4,621	826	1,379	4,125	2,332	714	0	210	6,800	0	1,285	1,717	27,373	51,382
	Total	143,262	25,592	42,739	127,889	72,301	22,134	0	6,498	210,809	0	39,826	53,229	848,552	1,592,831
Apr	Maximum	4,447	842	1,508	4,292	2,555	720	0	1,034	8,588	0	1,448	2,406	31,294	54,117
	Average	3,897	789	1,436	4,248	2,295	712	0	981	4,287	0	149	2,077	27,446	48,318
	Total	116,902	23,662	43,087	127,447	68,861	21,357	0	29,416	128,604	0	4,482	62,317	823,391	1,449,526
May	Maximum	5,035	859	1,519	3,825	2,567	736	0	1,026	7,581	0	9	2,601	33,786	56,406
	Average	3,715	676	1,509	3,773	2,514	714	0	998	3,943	0	0	1,480	29,786	49,108
	Total	115,156	20,964	46,785	116,965	77,919	22,142	0	30,942	122,240	0	9	45,869	923,351	1,522,342
Jun	Maximum	5,119	844	1,525	3,805	2,568	792	0	1,000	7,573	0	1,420	2,553	34,717	51,437
	Average	3,953	828	1,512	1,308	2,511	713	0	990	3,600	0	109	1,428	30,059	47,010

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	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
	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
Jun	Total	118,592	24,841	45,353	39,237	75,332	21,388	0	29,707	107,985	0	3,281	42,830	901,764	1,410,311
Jul	Maximum	5,145	891	1,524	0	2,547	864	0	1,029	8,757	0	2,456	2,603	32,870	55,231
	Average	5,091	802	1,492	0	2,447	813	0	992	5,816	0	214	1,320	28,815	47,800
	Total	157,808	24,864	46,246	0	75,846	25,195	0	30,748	180,281	0	6,627	40,924	893,273	1,481,812
Aug	Maximum	5,101	901	1,517	4,720	2,556	890	0	1,029	8,643	0	735	2,473	34,119	49,420
	Average	4,022	875	1,483	2,379	2,359	821	0	1,011	3,892	0	55	929	27,818	45,644
	Total	124,669	27,124	45,959	73,753	73,129	25,466	0	31,337	120,649	0	1,710	28,790	862,371	1,414,958
Sept	Maximum	4,579	859	1,505	4,015	2,552	861	0	1,048	8,713	0	1,465	2,427	31,451	52,515
	Average	3,311	838	708	3,839	2,460	821	0	1,014	4,444	0	123	1,245	29,439	48,242
	Total	99,317	25,151	21,228	115,181	73,790	24,634	0	30,415	133,334	0	3,685	37,344	883,182	1,447,261
Oct	Maximum	3,677	899	0	4,040	2,564	868	0	1,048	5,638	0	2,447	2,408	32,235	48,977
	Average	3,024	822	0	3,875	2,513	849	0	1,005	2,974	0	1,423	1,301	27,835	45,620
	Total	93,749	25,472	0	120,116	77,915	26,328	0	31,143	92,185	0	44,105	40,317	862,880	1,414,210
Nov	Maximum	5,018	891	0	4,016	2,509	825	0	1,008	7,010	0	2,457	2,518	29,468	48,663
	Average	3,195	857	0	3,700	2,389	767	0	976	4,845	0	1,540	1,251	26,081	45,602
	Total	95,841	25,715	0	111,014	71,678	23,023	0	29,280	145,344	0	46,205	37,541	782,435	1,368,075
Dec	Maximum	3,517	865	0	4,004	2,550	927	0	1,052	6,117	0	1,976	2,498	29,865	50,105
	Average	2,841	841	0	3,943	2,514	553	0	1,002	2,577	0	1,250	1,041	26,866	43,427
	Total	88,068	26,056	0	122,237	77,922	17,134	0	31,072	79,897	0	38,745	32,257	832,849	1,346,236

	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
	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
2015 Year	Maximum	5,725	901	4,004	4,720	2,705	993	1,052	1,052	9,525	1,976	2,498	29,865	50,105	59,737
	Average	3,795	810	924	3,265	2,452	773	0	765	4,580	0	525	1,422	27,556	46,867
	Total	1,385,421	295,731	336,360	1,189,588	895,059	282,102	0	280,559	1,667,460	0	193,017	518,197	10,065,117	17,108,611
	Average Capacity	58%	15%	40%	62%	79%	24%	0%	n/a	44%	0%	n/a	42%	42%	n/a

City of Guelph Water Services

Table 35: Permit to Take Water Pumpages – Jan. 01 – Dec. 31, 2015

Month	Facility	Admiral Well	Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #1	Arkell Wellfield (#6,7,8,14,15) Total	Arkell - Recharge Pump	Arkell Spring Collector System	Burke Well	Calico Well	Carter Wells #1 and #2
	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
Regulatory Limit		N/O ²⁹	3,273	9,600	9,600	9,600	9,600	9,600	28,800	9,092	25,000	6,546	5,237	6,547
Jan	Maximum	N/O	6	6,302	6,306	2,572	6,422	6	21,074	0	6,824	5,171	832	0
	Average	N/O	0	6,257	6,278	383	6,306	0	19,225	0	5,753	3,856	760	0
	Total	N/O	6	193,980	194,623	11,858	195,500	6	595,967	0	178,356	119,531	23,572	0
Feb	Maximum	N/O	544	6,424	6,387	2,786	6,362	6,459	25,632	0	5,821	5,139	876	255
	Average	N/O	74	6,171	6,274	147	6,200	5,638	24,429	0	5,587	3,849	826	10
	Total	N/O	2,063	172,780	175,669	4,105	173,609	157,859	684,021	0	156,425	107,775	23,122	272
Mar	Maximum	N/O	896	6,597	6,531	6,618	6,507	6,426	28,198	0	6,067	5,744	862	4,750
	Average	N/O	414	6,277	6,312	3,246	6,103	4,518	26,457	0	5,216	4,546	830	658
	Total	N/O	12,841	194,600	195,685	100,628	189,197	140,062	820,172	0	161,704	140,934	25,734	20,404
Apr	Maximum	N/O	244	6,528	6,540	6,418	6,488	6,474	28,513	8,965	10,656	4,356	861	5,993
	Average	N/O	14	6,086	6,268	1,604	6,357	4,711	25,028	4,628	7,219	3,854	792	5,274
	Total	N/O	421	182,586	188,052	48,133	190,719	141,338	750,828	138,845	216,563	115,631	23,753	158,219
May	Maximum	N/O	143	6,226	6,624	3,335	6,626	5,989	24,152	8,941	13,123	4,955	891	6,008

29 N/O – not operational

Month	Facility	Admiral Well	Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #1	Arkell Wellfield (#6,7,8,14,15) Total	Arkell - Recharge Pump	Arkell Spring Collector System	Burke Well	Calico Well	Carter Wells #1and #2
	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
	Regulatory Limit	N/O ²⁹	3,273	9,600	9,600	9,600	9,600	9,600	28,800	9,092	25,000	6,546	5,237	6,547
May	Average	N/O	12	4,653	6,178	941	6,304	665	18,741	8,601	11,811	3,650	676	5,990
	Total	N/O	363	144,244	191,510	29,168	195,436	20,627	580,986	266,629	366,145	113,163	20,964	185,697
Jun	Maximum	N/O	213	6,762	7,354	5,003	6,802	0	23,839	8,743	14,624	5,049	856	5,981
	Average	N/O	9	4,165	6,772	811	5,530	0	17,278	8,263	13,441	3,894	814	2,886
	Total	N/O	262	124,962	203,159	24,325	165,887	0	518,333	247,890	403,216	116,806	24,423	86,572
Jul	Maximum	N/O	18	7,048	7,328	6,610	6,839	188	23,091	23,091	14,371	5,087	909	0
	Average	N/O	2	4,268	7,082	2,099	4,963	6	18,418	18,418	10,583	5,008	814	0
	Total	N/O	54	132,307	219,535	65,079	153,855	188	570,963	570,963	328,062	155,245	25,238	0
Aug	Maximum	N/O	326	7,259	7,401	7,071	6,579	0	23,385	8,121	12,930	4,988	918	413
	Average	N/O	12	5,065	7,083	1,451	3,075	0	16,674	6,525	11,795	3,934	892	23
	Total	N/O	362	157,007	219,574	44,973	95,336	0	516,889	202,261	365,646	121,964	27,661	711
Sept	Maximum	N/O	662	7,321	7,320	2,029	5,277	0	20,426	8,062	14,151	4,543	894	5,531
	Average	N/O	41	7,057	6,975	736	2,972	0	17,741	7,519	11,944	3,266	867	2,019
	Total	N/O	1,223	211,722	209,247	22,093	89,163	0	532,225	225,565	358,328	97,977	26,014	60,557
Oct	Maximum	N/O	27	7,222	7,379	7,273	7,326	0	21,877	7,447	11,803	3,669	955	6,163

Month	Facility	Admiral Well	Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #1	Arkell Wellfield (#6,7,8,14,15) Total	Arkell - Recharge Pump	Arkell Spring Collector System	Burke Well	Calico Well	Carter Wells #1and #2
	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
	Regulatory Limit	N/O ²⁹	3,273	9,600	9,600	9,600	9,600	9,600	28,800	9,092	25,000	6,546	5,237	6,547
Oct	Average	N/O	3	5,058	7,074	1,423	4,863	0	18,418	3,560	9,272	2,994	874	5,962
	Total	N/O	79	156,783	219,296	44,114	150,768	0	570,962	110,350	287,418	92,813	27,090	184,809
Nov	Maximum	N/O	1,094	7,251	7,266	5,065	6,574	6,207	26,616	0	6,175	5,055	940	6,158
	Average	N/O	534	5,661	7,093	1,471	3,438	3,719	21,382	0	5,419	3,203	914	5,744
	Total	N/O	16,015	169,836	212,803	44,121	103,129	111,583	641,472	0	162,580	96,083	27,428	172,333
Dec	Maximum	N/O	394	7,281	7,317	5,322	6,093	6,682	24,691	0	5,515	3,522	894	6,071
	Average	N/O	24	5,185	7,074	1,024	3,221	5,537	22,040	0	4,946	2,851	845	6,058
	Total	N/O	752	160,734	219,289	31,738	99,844	171,641	683,246	0	153,332	88,376	26,193	187,796
2015 Year	Maximum	N/O	1,094	7,321	7,401	7,273	7,326	6,682	28,513	23,091	14,624	5,744	955	6,163
	Average	N/O	95	5,492	6,705	1,278	4,944	2,066	20,486	4,793	8,582	3,742	825	2,885
	Total	N/O	34,441	2,001,542	2,448,443	470,334	1,802,442	743,305	7,466,065	1,762,502	3,137,775	1,366,299	301,192	1,057,370
	Average Pumped	N/O	3%	57%	70%	13%	51%	21%	71%	47%	34%	57%	16%	44%

Table 36: Permit to Take Water Pumpages – Jan. 01 – Dec. 31, 2015 continued

Month	Facility	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
	Regulatory Limit	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
Jan	Maximum	N/O	1,390	4,031	N/O	2,689	998	2,101	0	9,490	0	N/O	N/O	210	2,033
	Average	N/O	385	3,998	N/O	2,561	958	1,825	0	5,421	0	N/O	N/O	22	1,027
	Total	N/O	11,937	123,923	N/O	79,404	29,695	56,579	0	168,051	0	N/O	N/O	675	31,828
Feb	Maximum	N/O	1,429	4,037	N/O	2,705	983	2,091	0	8,960	0	N/O	N/O	790	1,801
	Average	N/O	1,189	4,011	N/O	2,534	804	2,087	0	6,271	0	N/O	N/O	136	381
	Total	N/O	33,301	112,317	N/O	70,963	22,519	58,438	0	175,583	0	N/O	N/O	3,667	10,658
Mar	Maximum	N/O	1,443	4,295	N/O	2,581	731	2,092	899	8,821	0	N/O	N/O	2,223	1,706
	Average	N/O	1,387	4,135	N/O	2,332	699	2,086	210	6,747	0	N/O	N/O	1,285	341
	Total	N/O	42,994	128,186	N/O	72,301	21,683	64,656	6,498	209,168	0	N/O	N/O	39,826	10,562
Apr	Maximum	N/O	1,489	4,303	N/O	2,555	725	2,234	1,034	8,417	0	N/O	N/O	1,448	1,935
	Average	N/O	1,425	4,259	N/O	2,295	697	2,175	981	4,249	0	N/O	N/O	149	604
	Total	N/O	42,756	127,755	N/O	68,861	20,901	65,236	29,416	127,480	0	N/O	N/O	4,482	18,128
May	Maximum	N/O	1,523	3,835	N/O	2,567	732	2,239	1,026	7,432	0	N/O	N/O	9	1,895
	Average	N/O	1,480	3,783	N/O	2,514	700	2,226	998	3,911	0	N/O	N/O	0	523
	Total	N/O	45,885	117,274	N/O	77,919	21,698	68,994	30,942	121,245	0	N/O	N/O	10	16,214

Month	Facility	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
	Regulatory Limit	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
Jun	Maximum	N/O	1,529	3,808	N/O	2,568	800	2,252	1,000	7,585	0	N/O	N/O	1,420	2,038
	Average	N/O	1,496	1,309	N/O	2,511	706	2,241	990	3,568	0	N/O	N/O	110	1,046
	Total	N/O	44,866	39,275	N/O	75,332	21,166	67,238	29,707	107,050	0	N/O	N/O	3,287	31,377
Jul	Maximum	N/O	1,550	257	N/O	2,547	865	4,154	1,029	8,720	0	N/O	N/O	2,456	31,377
	Average	N/O	1,484	19	N/O	2,447	798	3,197	992	5,772	0	N/O	N/O	214	1,320
	Total	N/O	45,992	589	N/O	75,846	24,733	99,117	30,748	178,946	0	N/O	N/O	6,627	40,927
Aug	Maximum	N/O	1,520	4,715	N/O	2,556	884	4,140	1,029	8,555	0	N/O	N/O	735	2,473
	Average	N/O	1,454	2,441	N/O	2,359	805	4,117	1,011	3,858	0	N/O	N/O	55	929
	Total	N/O	45,059	75,665	N/O	73,129	24,963	127,625	31,337	119,606	0	N/O	N/O	1,710	28,792
Sept	Maximum	N/O	1,489	4,014	N/O	2,552	861	4,087	1,048	8,689	0	N/O	N/O	1,465	2,427
	Average	N/O	695	3,836	N/O	2,298	806	4,022	1,014	4,420	0	N/O	N/O	123	1,245
	Total	N/O	20,841	115,075	N/O	68,945	24,172	120,665	30,415	132,595	0	N/O	N/O	3,685	37,345
Oct	Maximum	N/O	0	4,036	N/O	2,564	860	4,027	1,048	5,550	0	N/O	N/O	2,447	2,408
	Average	N/O	0	3,907	N/O	2,513	832	1,975	1,005	2,953	0	N/O	N/O	1,423	1,301
	Total	N/O	0	121,127	N/O	77,915	25,796	61,234	31,143	91,528	0	N/O	N/O	44,105	40,320

Month	Facility	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
	Regulatory Limit	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
Nov	Maximum	N/O	0	4,068	N/O	2,509	827	0	1,008	6,938	1,482	N/O	N/O	2,457	2,518
	Average	N/O	0	3,731	N/O	2,389	763	0	976	4,817	950	N/O	N/O	1,540	1,251
	Total	N/O	0	111,925	N/O	71,678	22,901	0	29,280	144,512	28,499	N/O	N/O	46,205	37,544
Dec	Maximum	N/O	0	4,059	N/O	2,550	910	0	1,052	6,027	600	N/O	N/O	1,976	2,498
	Average	N/O	0	3,997	N/O	2,514	526	0	1,002	2,552	20	N/O	N/O	1,250	1,041
	Total	N/O	0	123,920	N/O	77,922	16,307	0	31,072	79,117	635	N/O	N/O	38,745	32,262
2015 Year	Maximum	N/O	1,550	4,715	N/O	2,705	998	4,154	1,052	9,490	1,482	N/O	N/O	2,457	31,377
	Average	N/O	916	3,285	N/O	2,439	758	2,163	765	4,545	81	N/O	N/O	525	917
	Total	N/O	333,631	1,197,031	N/O	890,214	276,534	789,782	280,559	1,654,880	29,134	N/O	N/O	193,023	335,958
	Average Pumped	N/O	40%	63%	N/O	79%	23%	36%	21%	44%	2%	N/O	n/O	16%	27%

City of Guelph Water Services

Table 37: Instantaneous Flows Summary (PTTW) – Jan. 01 – Dec. 31, 2015

Month	Facility Units Regulatory Limit	Admiral Well	Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #15	Arkell Wellfield (#6,7,8,1 4,15)	Arkell - Recharge System	Arkell Spring Collector System	Burke Well	Calico Well	Carter Wells	Clythe Well
		L/s 6.4	L/s 37.9	L/s 111.0	L/s 111.0	L/s 111.0	L/s 111.0	L/s 111.0	L/s 111.0	L/s n/a	L/s 157.8	L/s 290.0	L/s 75.8	L/s 60.6	L/s 90.1
January	Maximum	N/O	10.6	73.9	74.0	83.4	74.8	27.3	333.2	0.0	79.0	67.7	13.0	0.0	0.0
	Average	N/O	0.0	72.5	72.7	4.4	73.0	0.0	222.6	0.0	66.6	44.7	8.8	0.0	0.0
February	Maximum	N/O	10.5	75.5	75.3	82.0	75.1	76.1	384.1	0.0	67.4	67.6	12.8	50.0	0.0
	Average	N/O	0.9	71.7	72.9	1.7	71.7	65.3	283.3	0.0	64.7	44.7	9.5	0.1	0.0
March	Maximum	N/O	10.5	81.2	80.9	81.4	79.8	77.2	400.5	0.0	70.2	71.8	12.8	53.3	0.0
	Average	N/O	4.8	72.9	73.0	37.6	70.5	52.2	306.2	0.0	60.4	52.5	9.5	7.6	0.0
April	Maximum	N/O	10.5	76.5	76.9	77.7	76.6	79.6	387.3	106.3	123.3	74.5	13.0	69.7	0.0
	Average	N/O	0.2	70.5	72.8	18.5	73.5	54.5	289.8	52.6	83.6	44.3	9.1	60.9	0.0
May	Maximum	N/O	10.0	76.2	77.4	72.2	80.9	70.8	377.5	377.5	151.9	72.6	15.2	69.8	0.0
	Average	N/O	0.1	53.8	71.6	10.9	73.0	7.7	217.0	217.0	136.7	42.5	7.8	69.3	0.0
June	Maximum	N/O	9.7	84.8	85.9	84.8	84.4	0.0	340.0	101.4	169.3	65.6	12.5	69.9	0.0
	Average	N/O	0.1	48.1	77.8	9.3	63.7	0.0	199.0	22.5	155.6	45.1	9.4	33.4	0.0
July	Maximum	N/O	13.8	85.2	85.6	85.7	84.0	73.7	414.3	100.8	166.3	65.5	12.7	0.0	0.0
	Average	N/O	0.0	49.3	81.9	24.3	57.4	0.1	213.0	71.6	122.5	58.3	9.4	0.0	0.0

Month	Facility Units Regulatory Limit	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
		L/s 6.4	L/s 37.9	L/s 111.0	L/s 111.0	L/s 111.0	L/s 111.0	L/s 111.0	L/s 111.0	L/s n/a	L/s 157.8	L/s 290.0	L/s 75.8	L/s 60.6	L/s 90.1
August	Maximum	N/O	13.3	87.2	86.4	86.5	87.8	0.0	347.9	96.7	149.7	64.9	12.6	55.3	0.0
	Average	N/O	0.1	58.4	81.6	16.8	35.6	0.0	192.4	75.5	136.5	45.8	10.5	0.3	0.0
September	Maximum	N/O	13.0	86.2	85.8	84.2	86.8	0.0	343.1	94.4	163.8	65.1	12.8	64.9	0.0
	Average	N/O	0.5	81.3	80.4	8.5	34.4	0.0	204.7	87.0	138.2	37.9	10.0	22.3	0.0
October	Maximum	N/O	12.8	86.5	86.3	85.5	88.9	1.5	348.8	88.6	136.6	64.5	13.0	71.7	0.0
	Average	N/O	0.0	60.4	81.6	16.5	56.3	0.0	214.8	41.2	107.3	34.7	10.1	69.0	0.0
November	Maximum	N/O	12.7	86.8	85.7	77.9	88.6	76.9	415.8	0.0	71.5	72.3	12.8	71.5	0.0
	Average	N/O	6.1	65.4	82.1	17.1	39.8	43.2	247.6	0.0	62.7	36.9	10.6	66.4	0.0
December	Maximum	N/O	12.8	86.2	85.4	77.8	88.2	80.6	418.2	0.0	63.8	97.3	13.0	70.4	0.0
	Average	N/O	0.3	59.7	82.1	11.9	37.2	64.1	255.0	0.0	57.2	32.9	9.7	70.0	0.0

Table 38: Instantaneous Flows Summary (PTTW) – Jan. 01 – Dec. 31, 2015 continued

Month	Facility Units Regulatory Limit	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
		L/s 26.6	L/s 60.6	L/s n/a	L/s 35.8	L/s 37.9	L/s 70	L/s 37	L/s 178.8	L/s 61	L/s n/a	L/s n/a	L/s 38	L/s 59.03
January	Maximum	24.6	54.7	N/O	32.5	13.6	25.0	0.0	128.0	0.0	N/O	N/O	27.7	22.7
	Average	4.5	46.9	N/O	29.6	11.2	21.3	0.0	62.6	0.0	N/O	N/O	0.3	19.4
February	Maximum	19.6	48.2	N/O	33.1	14.9	24.6	0.0	116.4	0.0	N/O	N/O	27.6	23.1
	Average	13.8	47.1	N/O	29.2	9.4	24.4	0.0	72.6	0.0	N/O	N/O	1.5	18.5
March	Maximum	19.7	56.2	N/O	31.4	10.8	24.6	13.1	105.8	0.0	N/O	N/O	26.7	32.0
	Average	16.1	48.5	N/O	27.0	8.2	24.4	2.5	78.0	0.0	N/O	N/O	14.8	19.9
April	Maximum	26.0	55.0	N/O	30.2	11.6	26.2	12.2	111.4	0.0	N/O	N/O	36.0	34.9
	Average	16.5	49.9	N/O	26.5	8.1	25.4	11.3	49.2	0.0	N/O	N/O	1.7	24.0
May	Maximum	21.2	49.4	N/O	30.4	13.0	26.3	12.7	111.1	0.0	N/O	N/O	31.6	36.5
	Average	17.3	44.4	N/O	29.0	8.2	26.0	11.6	45.3	0.0	N/O	N/O	0.0	17.1
June	Maximum	21.9	46.1	N/O	30.9	13.9	26.5	12.2	111.2	0.0	N/O	N/O	29.8	40.3
	Average	17.2	15.3	N/O	29.0	8.2	25.8	11.4	41.1	0.0	N/O	N/O	1.3	16.4
July	Maximum	21.8	47.6	N/O	30.3	14.1	50.1	12.9	109.6	0.0	N/O	N/O	29.8	36.6
	Average	17.1	0.2	N/O	28.3	9.3	37.4	11.5	66.7	0.0	N/O	N/O	2.5	15.3
August	Maximum	21.7	57.9	N/O	31.5	14.3	48.6	13.5	110.7	0.0	N/O	N/O	29.8	39.1

Month	Facility Units Regulatory Limit	Dean Well L/s 26.6	Downey Well L/s 60.6	Edinburgh Well L/s n/a	Emma Street Well L/s 35.8	Helmar Well L/s 37.9	Membro Well L/s 70	Paisley Well L/s 37	Park Wells L/s 178.8	Queensdale Well L/s 61	Sacco Well L/s n/a	Smallfield Well L/s n/a	University of Guelph Well L/s 38	Water Street Well L/s 59.03
August	Average	16.9	28.7	N/O	27.2	9.4	48.2	11.7	44.7	0.0	N/O	N/O	0.6	10.7
September	Maximum	20.4	59.4	N/O	30.7	13.5	48.2	12.9	109.9	0.0	N/O	N/O	29.4	34.9
	Average	8.0	45.0	N/O	26.4	9.4	47.1	11.7	51.1	0.0	N/O	N/O	1.4	14.4
October	Maximum	0.0	61.0	N/O	30.9	14.2	48.7	13.3	110.3	19.9	N/O	N/O	29.5	38.0
	Average	0.0	45.9	N/O	29.1	9.7	23.1	11.6	34.2	0.0	N/O	N/O	16.5	15.0
November	Maximum	0.0	60.2	N/O	29.2	13.6	0.0	12.9	107.2	20.8	N/O	N/O	29.6	38.2
	Average	0.0	43.8	N/O	27.7	8.7	0.0	11.3	55.7	11.0	N/O	N/O	17.8	14.5
December	Maximum	0.0	51.9	N/O	30.1	23.5	0.0	13.1	109.8	16.3	N/O	N/O	24.2	38.7
	Average	0.0	46.9	N/O	29.1	6.4	0.0	11.6	29.6	0.2	N/O	N/O	14.5	12.0

Appendix “D” – 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.

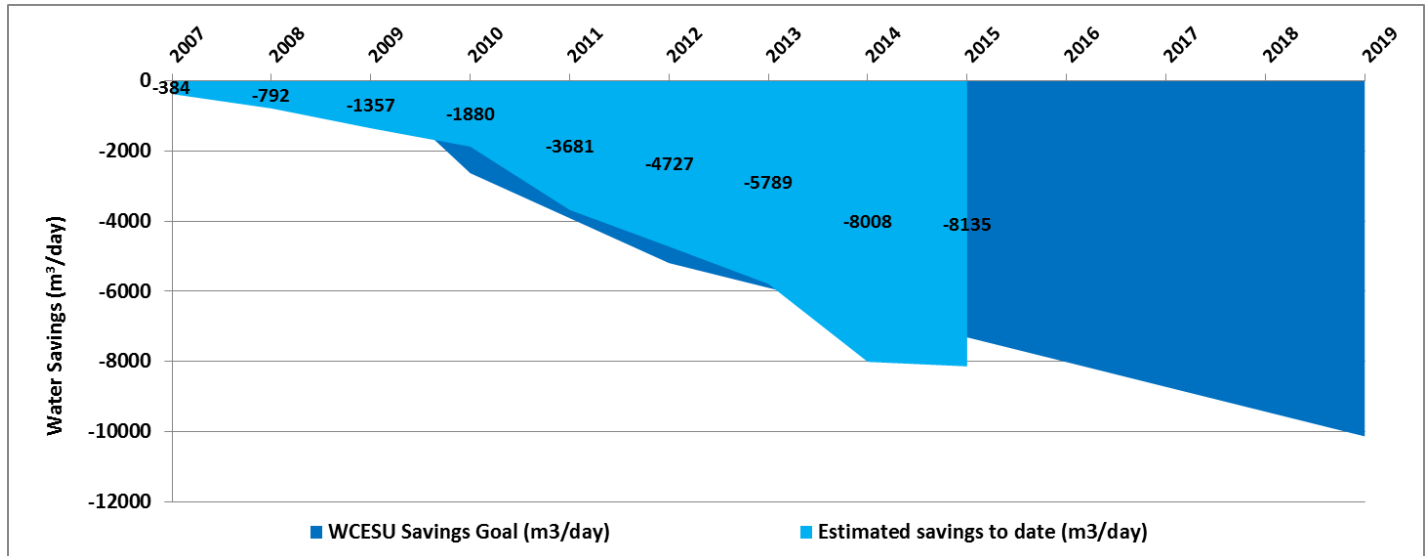
In July of 2014, Guelph City Council endorsed the Water Supply Master Plan Update. Through this update, servicing capacity reclaimed through Water Conservation and Efficiency continued to be a top priority in achieving a sustainable and cost effective community water supply, with a new reduction target 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 watermain 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

This 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 produces 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 Lauta 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.](http://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](http://guelph.ca/outside-water-use) 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](http://www.watr.io/) 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](http://www.watersoftnerfacts.ca) to date can be found at www.watersoftnerfacts.ca.

For more information:

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Appendix “E” – Glossary

Below is an index of terms used throughout this report.

Terms and Descriptions

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

Term	Description
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)
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
m³	Cubic metres = 1,000 litres water
m³/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

Term	Description
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
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

Term	Description
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