

Water Services' Summary Report

January 1 to December 31, 2021

Guelph Drinking Water System

Corporation of the City of Guelph

Gazer Mooney Subdivision Distribution System

Township of Guelph/Eramosa



Water Services

Environmental Services Department

Last Revision: March 7, 2022

As per the Accessibility for Ontarians with Disabilities Act (AODA), this document is available in an alternate format by e-mailing waterservices@guelph.ca or by calling 519-837-5627; TTY: 519-837-5688 or text 226-821-2132.

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Water Services' Summary Report

Purpose

This report is intended to provide the Mayor and Members of Council, as “Owners” of the drinking water system, an understanding of the status of the City of Guelph’s drinking Water system for the reporting period of January 1, 2021 to December 31, 2021.

Second, the Safe Drinking Water Act (SDWA) (2002) mandates that it is the responsibility of the municipality to:

- Recognize that the people of Ontario are entitled to expect their drinking water to be safe; and,
- Provide for the protection of human health and the prevention of drinking water health hazards through the control and regulation of drinking water systems and drinking water testing.

Finally, this report has also been prepared to satisfy the requirements of Schedule 22, O. Reg. 170/03 (Summary Reports for Municipalities).

For the 2021 reporting period, a separate Annual Report, which contains data related to annual testing and sampling parameters, was prepared to fulfill Section 11 of O. Reg. 170/03. This report will be posted on the City’s website by February 28, 2022.

Scope

This Water Services Summary Report includes information from both the **Guelph Drinking Water System** and the **Gazer Mooney Subdivision Distribution System** for the period of January 1 to December 31, 2021, unless otherwise noted. The information is required to be reported to the following:

- the Drinking Water System Owners:
 - Guelph City Council
 - Township of Guelph/Eramosa (Council and CAO);
- Senior officials of Guelph Environmental Services and Township of Guelph/Eramosa; and
- the general public and interested stakeholders.

A copy of this report is available for viewing at:

- **Online** at guelph.ca/water-testing.

Due to the global pandemic, we encourage the online version of this report be accessed for review.

Any inquiries can be made to:

- City of Guelph Water Services by e-mailing waterservices@guelph.ca or by calling 519-837-5627.
- Township of Guelph/Eramosa Public Works – Water / Wastewater by e-mailing general@get.on.ca or by calling 519-856-9596.

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

Water Services at the City of Guelph is committed to providing consumers with a safe, consistent supply of high-quality drinking water while meeting or exceeding, and continually improving on legal, operational, and quality management system requirements. Water Services strives to provide reliable and cost-effective water treatment and distribution systems for the safe production and delivery of high-quality water. Established in 1879, Water Services and is a municipally owned and operated water utility.

The Guelph Drinking Water System is classified as a Class II Water Treatment Subsystem and a Class IV Water Distribution Subsystem. All necessary licences have been obtained by staff to operate the Guelph Drinking Water System. As of December 31, 2021, 35 team members held drinking water certificates to operate and maintain the water system.

In 2021, Water Services maintained full accreditation to the DWQMS Version 2.0 after a successful on-site verification audit, conducted by the third-party accreditation body - NSF International Strategic Registrations. This accreditation satisfies part of the requirements under the Municipal Drinking Water Licensing Program.

Water Distribution System

The distribution system (including watermains, valves, fire hydrants, water services, and meters) serves a population of approximately 131,794¹ within the City of Guelph. All new system components meet NSF 61² and NSF 372³ requirements, or approved equivalents, and are installed and maintained in accordance with approved industry standards. Water system customers are fully metered and billed in accordance with the Water and Wastewater Customer Rates and Charges by-law.

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

- 6.44 kilometres of a 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 561.8 kilometres of buried watermain with a diameter < 900 mm,
- 4,319 watermain valves,
- 2,817 fire hydrants; and
- approximately 44,000 water services and water meters.

Guelph Source Water and Treatment Facilities

The source of Guelph's drinking water is a series of 21 operational groundwater wells and a shallow groundwater collector system. The drinking water sources consist primarily of true groundwater, with some "groundwater under the direct influence of surface water with effective in-situ filtration" (GUDI-WEF) sources. The GUDI-WEF sources include: Carter Well 1 and 2; Arkell 1; Arkell 15; and the Arkell Springs Glen Collector System.

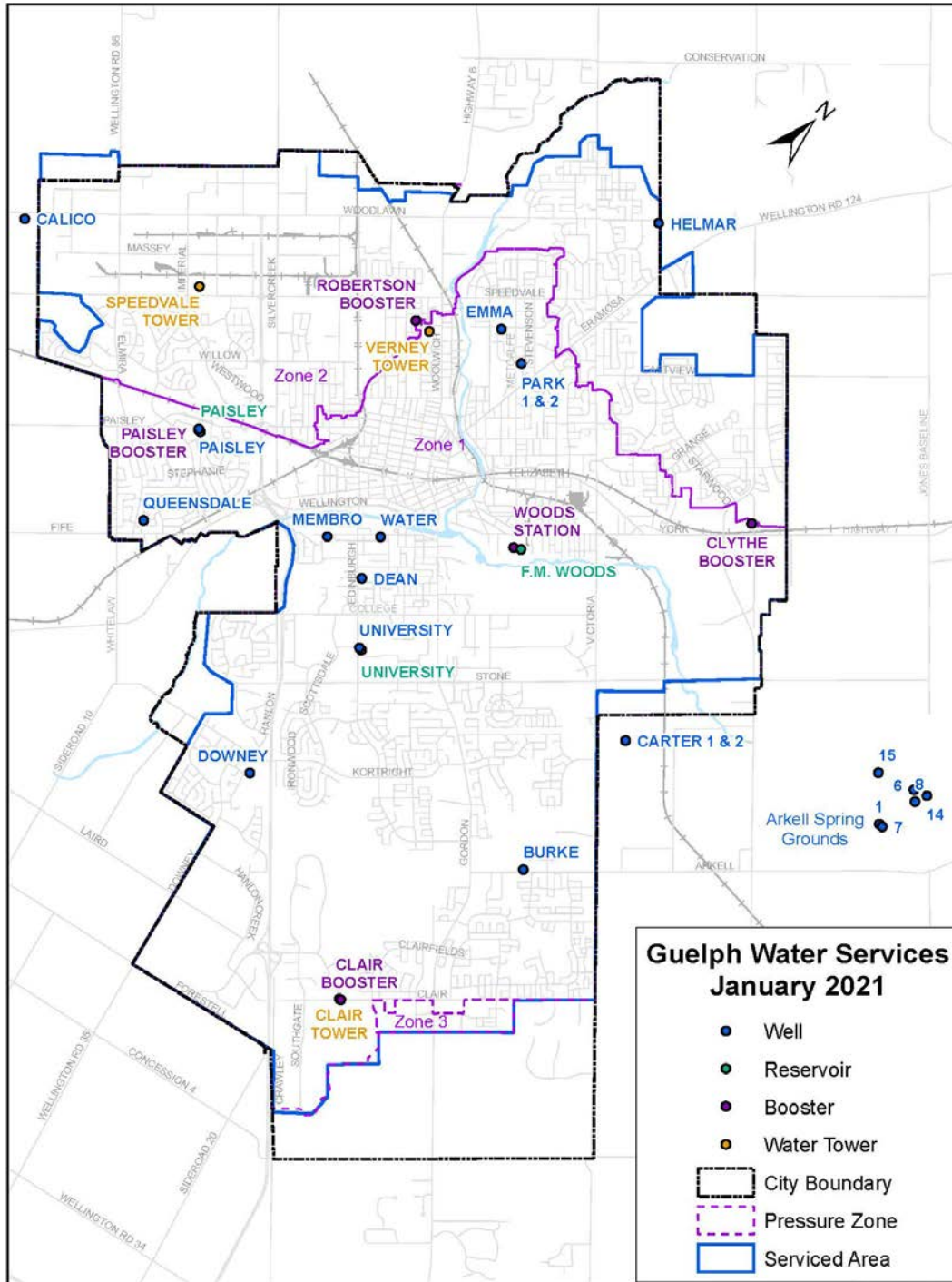
Figure 1: Guelph Drinking Water System shows the locations of the Guelph Drinking Water System facilities in 2021.

¹ Statistics Canada, 2016 Census of Population.

² NSF/ANSI Standard 61: Drinking Water System Components – Health Effects

³ NSF/ANSI Standard 372: Drinking Water System Components – Lead Content

Figure 1: Guelph Drinking Water System



Gazer Mooney Subdivision Distribution System

The Gazer Mooney Subdivision Distribution System is a Class 1 Distribution Subsystem that serves approximately 209⁴ people and is owned by the Township of Guelph/Eramosa. The system is operated by Guelph Water Services through a legal agreement that was signed by representatives of the City of Guelph and the Township of Guelph/Eramosa. The current agreement came into effect on March 1, 2019 and will continue until February 29, 2024 and will be automatically renewed and extended to February 28, 2029, unless terminated earlier.

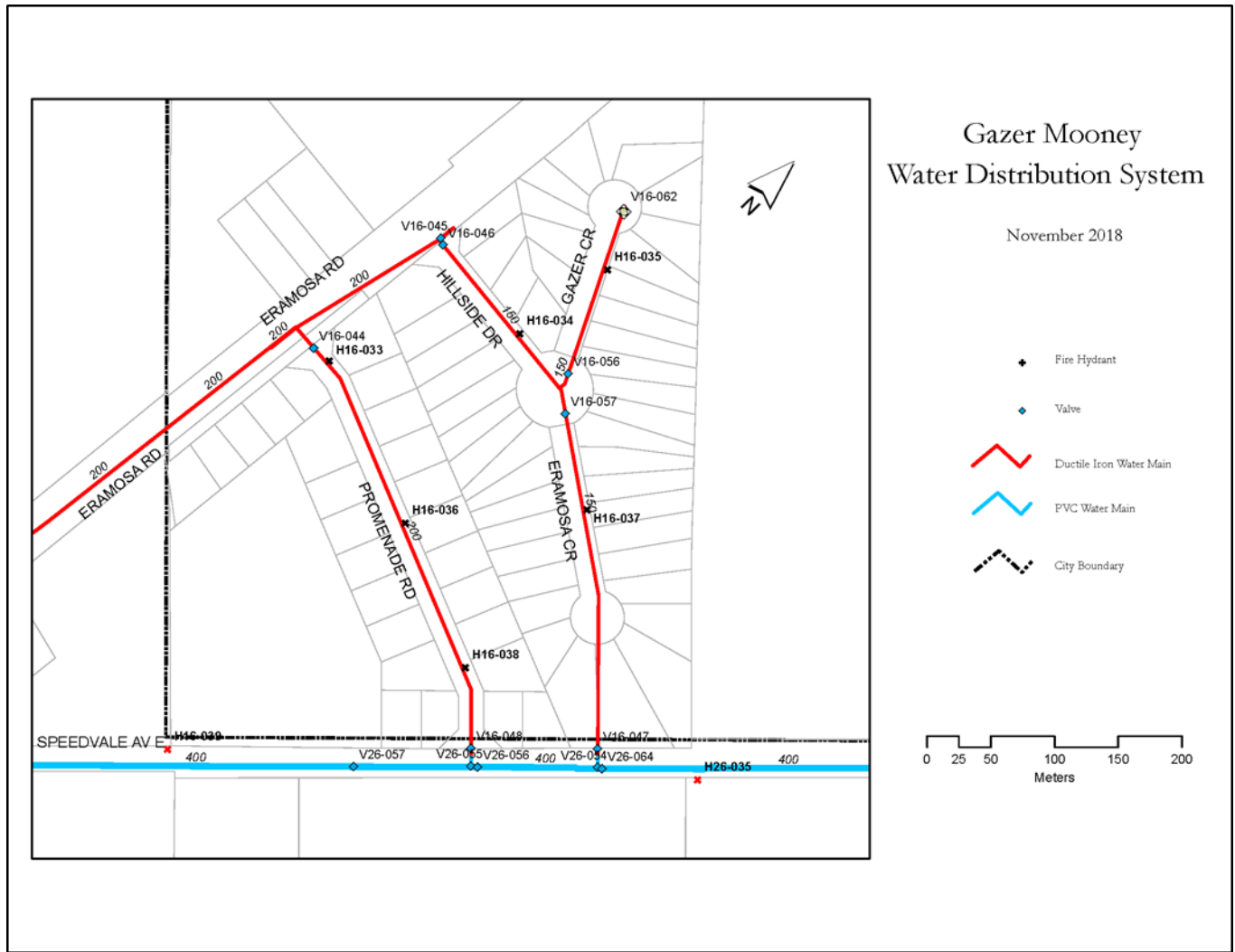
All of the water for the Gazer Mooney Subdivision Distribution System is supplied from the Guelph Drinking Water System. All water is treated to provincial standards in the Guelph Drinking Water System and no further treatment chemicals are added to the Gazer Mooney Subdivision Distribution System.

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

- approximately 650 meters of 200mm diameter watermain;
- approximately 600 meters of 150mm diameter watermain;
- six watermain valves;
- six fire hydrants;
- one sampling station; and
- approximately 72 water services and water meters.

⁴ Estimated, based on 72 water connections multiplied by 2.9 people per household (as per Statistics Canada for low density residential).

Figure 2: Gazer Mooney Water Distribution System



Regulatory Compliance

Management Review

A management review must be conducted annually to evaluate the adequacy and effectiveness of the Quality Management System (QMS) with the results being communicated to Council as the system owners. The management review provides evidence of continued endorsement and commitment to the QMS from Top Management.

The QMS annual management review was conducted on February 14, 2022 and included discussion of non-compliance and corresponding corrective/preventative action(s). The 2021 management review minutes, identify deficiencies, decisions and action items, are included in Appendix A. There were no major non-conformances identified with the QMS.

Compliance with Terms and Conditions of System Approval and Other Orders

The City of Guelph fulfilled the requirements of the Act, the regulations and the terms and conditions of all approvals documents for its drinking water system, with the exception of the events detailed in the Table 1 entitled Summary of Non-compliance events and actions taken within this report. These occurrences were found non-compliant with the conditions of the Ontario drinking water legislation and/or supplementary legislative approvals documents.

Guelph Drinking Water System

As the Operating Authority for both the Guelph DWS and Gazer Mooney SDS, Guelph Water Services is annually inspected by the Ministry of the Environment, Conservation and Parks (MECP) for compliance with regulatory requirements.

In 2021, there were three incidents of non-compliance associated with the Guelph Drinking Water System in 2021.

The three incidents are described below:

1. A secondary disinfection free chlorine residual in the distribution system was found to be below 0.05 mg/L on June 22, 2021 which is discussed further in section b) Summary of non Compliance events, item 1.
2. A secondary disinfection free chlorine residual in the distribution system was found to be below 0.05 mg/L on July 31, 2021 which is discussed further in section b) Summary of non compliance events, item 2.
3. A secondary disinfection free chlorine residual in the distribution system was found to be below 0.05 mg/L on November 3, 2020 which is discussed further in section b) Summary of Non Compliance Events, item 3.

Gazer Mooney Subdivision Distribution System

There were no incidents of non-compliance in the Gazer Mooney Subdivision Distribution System.

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

A critical control point in the drinking water system is where control can be applied to prevent or eliminate a drinking water hazard, or to reduce it to an acceptable level. Water Services utilizes three Critical Control Points (CCP) in the drinking water system:

- 1) Multi-Barrier Primary Disinfection - To remove or inactivate pathogens potentially present in the source water.
- 2) Secondary Disinfection - To ensure the maintenance of a disinfectant residual throughout the distribution system.
- 3) Backflow Prevention - To prevent cross-contamination that can result from the flowing back of or reversal of the normal direction of flow of water.

Any deviations from the CCPs are reported to both the Owners and Top Management.

There were three deviations from the Critical Control Points in 2021. The deviations were all related to secondary disinfection. Information about these incidents and actions taken to resolve the issues are outlined in Table 1 Summary of Non-compliance Events.

Additional information (e.g. critical control limits and response actions) is included in [Appendix B: Summary of Critical Control Points and Critical Control Limits](#).

Table 1: Summary of Non-compliance Events

#	Date	AWQI #	Location	Description	Corrective Action	Re-sample Results Good	Deviation from Critical Control Point ⁵
1	2021/07/22	154798	Bishop Court	Adverse secondary disinfection free chlorine residual of 0.00 mg/L.	Flushed Bishop Court to achieve a compliant residual value / increased flushing frequency to maintain a compliant residual value.	Yes	Yes
2	2021/07/31	154927	Bishop Court	Adverse secondary disinfection free chlorine residual of 0.00 mg/L.	Flushed Bishop Court to achieve a compliant residual value / increased flushing frequency to maintain a compliant residual value.	Yes	Yes

⁵ Please see Section c) Deviations from Critical Control Point (CCP) Limits and Response Actions of this report for a description of “critical control points”.

#	Date	AWQI #	Location	Description	Corrective Action	Re-sample Results Good	Deviation from Critical Control Point ⁵
3	2021/09/30	155750	Heath Road	Adverse secondary disinfection free chlorine residual of 0.03 mg/L.	Flushed Heath Road to achieve a compliant residual value / increased flushing frequency to maintain a compliant residual value.	Yes	Yes

Operational Performance

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

- 2021 Totalized Pumpages as per the Municipal Drinking Water Licence and Permits to Take Water;
- 2021 Instantaneous Flows as per Permit to Take Water requirements:
- Water Production, Consumption and Population;
- Water Supply Capacity.

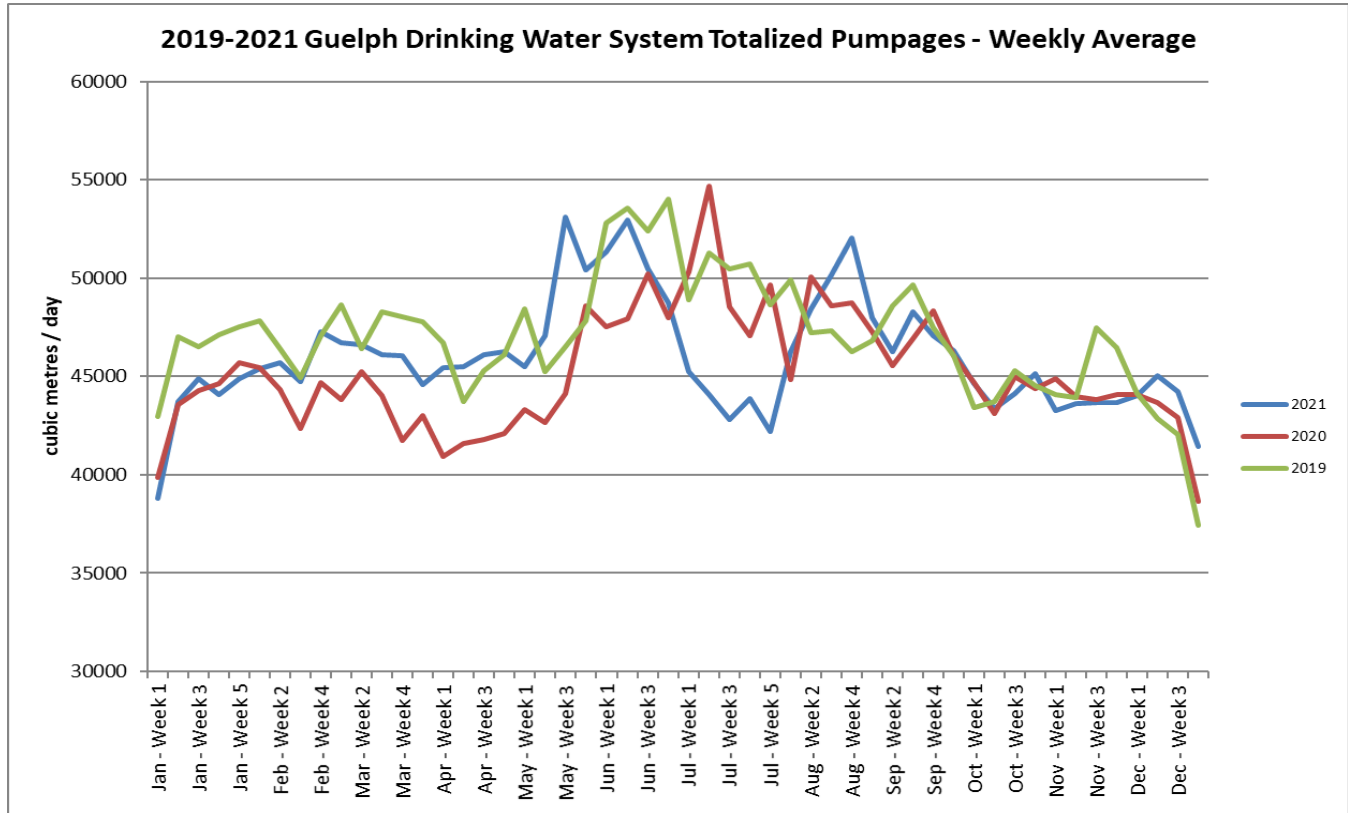
2021 Totalized Pumpages and Instantaneous Flows

The Safe Drinking Water Act and the Ontario Water Resources Act each require that operating authorities record and report both water takings as governed by Permits-to-Take-Water 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.

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

Figure 3: Totalized Pumpages, 2019-2021



Water Services processed 16,780,411 cubic metres (16.8 billion litres) of water to the distribution system in 2021, equivalent to 6,712 Olympic-sized swimming pools. This represents 1.5 per cent more water being supplied to the distribution system in 2021 as compared to 2020 and 2.2 per cent less water than in 2019.

The 2021 average daily water demand was 45,980 cubic metres (46.0 million litres). The maximum daily production of water in 2021 was 59,914 cubic metres (60.0 million litres) and occurred on May 19, 2021. The minimum daily production of water in 2021 was 33,366 cubic metres (33.4 million litres) and occurred on December 27, 2021.

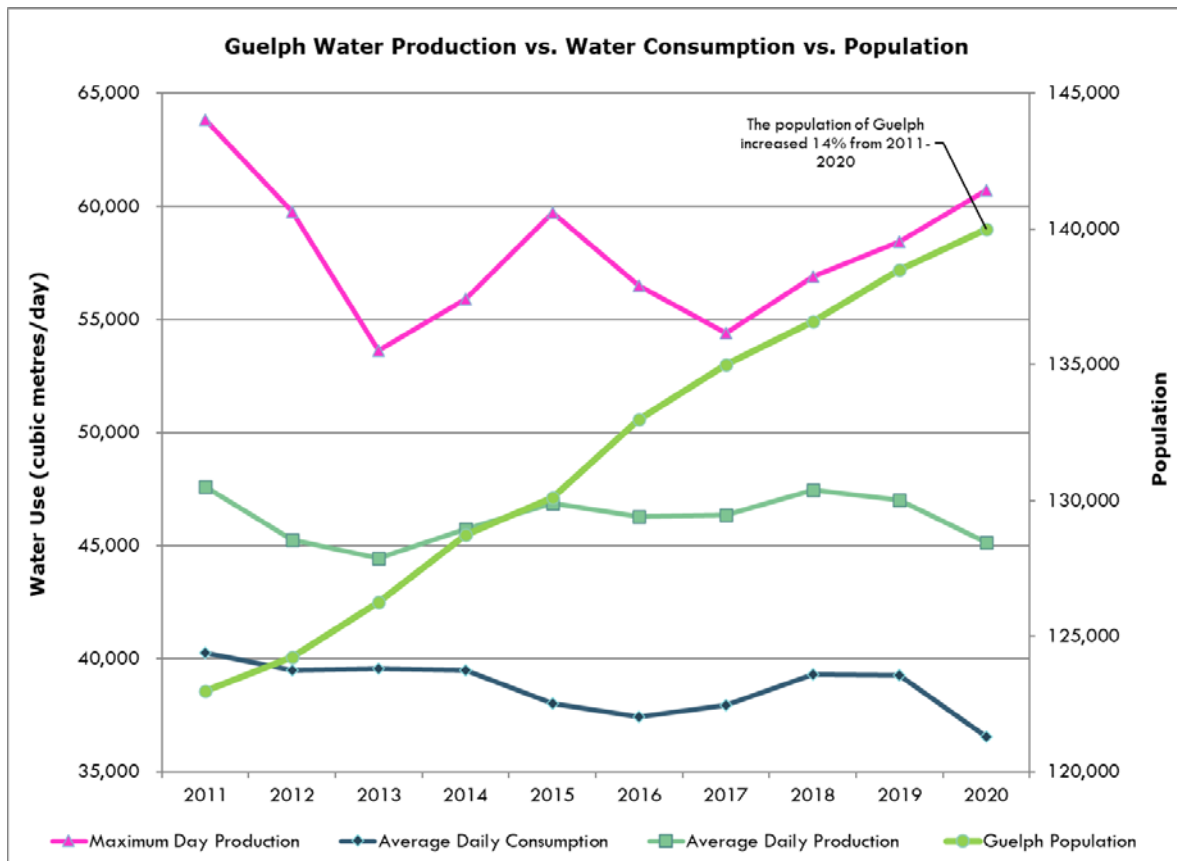
Water Production, Consumption and Population

Figure 4, below, shows the City of Guelph’s annual average daily water production, annual average daily consumption, annual peak day demand, and population from 2011 to 2020. Consumption data for 2021 was not available at the time of publication.

During this time, the City of Guelph’s population increased 14 per cent while at the same time annual average daily water production and consumption decreased 9 per cent.

Fluctuation in water production and consumption is anticipated to occur, year to year, based on a number of factors, including seasonal temperatures and annual precipitation, system demands (including planned and unplanned maintenance) and steady population growth; however, the steady reduced water consumption (and production) rates year over year are attributed to Guelph’s Water Efficiency Strategy, Water Loss Management Plan, and resulting programming, as described later in this section. Further, the impacts to consumption (and production) across sectors varied throughout the 2020 year, which can likely be attributed to changes in societal behaviour as a result of the pandemic. While residential consumption increased through 2020 across all three residential sectors (low, medium and high-density), industrial, commercial and institutional consumption was decreased. A significant portion of the precipitous drop in 2020 can be attributed to these changes.

Figure 4: Guelph Water Production vs. Water Consumption vs. Population, 2011-2020



Water Supply Capacity

In order to more accurately address the questions of system firm capacity, Water Services staff annually review the operational water demand data for water supply facilities under maximum demands. Values used for permitted pumping rate and firm capacity calculations by well are provided below in Table 2. The permitted pumping rate is the rate of pumping allowed as identified in the Permits to Take Water. The firm capacity rate is the actual rate of pumping that can be sustainably achieved at each well.

Table 2: Permitted Rates and Point of Entry Firm Capacities of Water Supply Wells

Well Name	Permitted Daily Maximum (m ³ /day)	Permitted Rate (L/s)	Point of Entry Firm Capacity ⁶ (m ³ /day)	Point of Entry Firm Capacity (L/s)
Arkell 1	3,273	37.9	1,640	19.0
Arkell Springs Wellfield⁷	28,800	333.3	28,800	333.3
Arkell Infiltration Gallery (Glen Collector)	25,000	290	7,011	81
Burke	6,546	75.8	5,790	67.0
Carter 1 and Carter 2	7,855	75.8	5,184	60.0
Membro⁸	6,050	78.0	3,200	37.0
Water St.	3,400	44.4	2,500	28.9

⁶ The firm capacity rate is the actual rate of pumping that can be achieved at each well.

⁷ The Arkell Springs Wellfield consists of five (5) municipal drinking water production wells: Arkell 6, Arkell 7, Arkell 8, Arkell 14 and Arkell 15. All of the aforementioned Arkell Wells are contained within the same Permit to Take Water (No. 5061-9ZKKWV). Notwithstanding the specified maximum permitted taken per day, any combination of these wells can be used to obtain the permitted rate.

⁸ Capacity is total for site (Membro Well and Membro Replacement Well)

Well Name	Permitted Daily Maximum (m3/day)	Permitted Rate (L/s)	Point of Entry Firm Capacity ⁶ (m3/day)	Point of Entry Firm Capacity (L/s)
Dean	2,300	34.6	1,500	17.4
University	3,300	38.2	2,400	27.8
Downey	5,237	60.6	5,000	57.9
Park 1 and Park 2	10,300	119.2	9,500	110.0
Emma	3,100	35.9	2,330	27.0
Helmar	3,273	37.9	1,300	15.0
Paisley	3,200	37.0	1,300	15.0
Calico	5,237	60.6	1,040	12.0
Queensdale	5,237	60.6	1,210	14.0

Water Services staff use the calculated firm capacity values in order to aid planning of scheduled shutdowns and maintenance of the water supply wells. Staff hold monthly meetings to review project and programming activities that affect firm capacity. The purpose of the monthly meetings are to ensure adequate servicing capacity is available to meet the City's water demands while maintenance and capital upgrades are undertaken to maintain the system in a fit state of repair.

Appendix A: Management Review Minutes

Meeting Minutes



Meeting	2022 Management Review – 2021 Annual Report and Summary Report
Location	Teams mtg. Meeting Recording
Time	10 am – 12 pm
Present	Jennifer Rose, Wayne Galliher, Mari MacNeil, John-Paul Palmer, Harjeet Sehgal, Steven Snopkowski, Chris Vanderveen, Mike Taylor, Euston Verwey, Anita Petrov, Nathan McFadden, Kelly Berines, Nathan Sinowski, Tim Spence, Heather Yates, Mathew Newman, Emily Stahl
Regrets	Peter Rider, Graham Nasby, Dawn Hamilton

Discussion Items

[Meeting Agenda](#)

[Meeting Info Package](#)

Meeting Minutes

1.	<p>Systems Overview</p> <ul style="list-style-type: none"> - Guelph Drinking Water System - Management review is requirement under RDWQMS, an operation plan review under annual basis. - Last year information from Jan. 01 to Dec. 31st, 2021. - Guelph is Class 2 treatment system and class 4 water distribution system - As per the 2020 Asset management plan current estimates cost of replacement of Guelph Drinking water system is \$773.9 million - Gazer Mooney Subdivision Distribution System - It is Class 1 Distribution and serves 209 persons - No changes since last year.
	<p>a) Incidents of regulatory non-compliance</p> <ul style="list-style-type: none"> - 3 Incidence of Non-compliance recorded in 2021 - 2 at Bishop Crt and 1 at Heath Rd and all are related to secondary disinfection residual - Can be controlled by target residual system leaving treatment sites & by flushing - (Detailed information in Table 1) - AWQI and Non-Compliance are not necessarily the same thing - Ability is with operating authority to prevent a secondary disinfection residual AWQI /Non-Compliance - Any sample below 0.05 mg/L is an adverse result and a Non-compliance

	<ul style="list-style-type: none"> - Guelph Drinking Water System - Incidences which are AWQI are Non-Compliance and are related to an adverse secondary disinfection residual in distribution system finish by large part to be 0.05 or above - Anything below 0.05 is an adverse result is Non-compliance - Issues with water quality that are chemical or micro-biological with treatment system such as chlorination, UV for micro-biological and if there is adverse result, these are not non-compliance, could be issue sampling error/condition or issue with lab - Gazer Mooney Subdivision Distribution System
	<p>b) Adverse Water Quality Incidents (AWQIs)</p> <ul style="list-style-type: none"> - Please see Table 1
	<p>c) Deviations from Critical Control Point (CCP) and limits (CCL) and response actions</p> <ul style="list-style-type: none"> - Three critical control points identified in 2021 - i) Multi Barrier Primary Disinfection - ii) Secondary Disinfection – With Deviation (Low Chlorine residuals in Distribution System) - iii) Back Flow Prevention
	<p>d) The effectiveness of the risk assessment process</p> <ul style="list-style-type: none"> - Meeting Minute Documentation: SD: 103548 (EDMS) - Risk assessment meeting was held in May 2021 and outcomes approved in management meeting in June 2021 - 3 Risked added in 2021 <ul style="list-style-type: none"> a. Staff shortages b. Staff competencies – Modification/suggestion from Jennifer/Wayne to be looked after. Anita provided detailed comments on staff competencies c. Glen Collector - 65 Risks identified in the drinking water system
	<p>e) Internal and third-party audit results</p> <ul style="list-style-type: none"> - Internal Audit Report: SD-103698 (EDMS) - 1 Minor Non- Conformance identified in 2021 Internal audit in Element 12 for M-SOP Incident Notification Procedure - Corrective action plan was taken in Re-cause analysis meeting - Many/various improvement opportunities were included in Internal Audit Report <p>External Audit Report</p> <ul style="list-style-type: none"> - Was held in October 2021, conducted by NFS International Strategic Registrations - One minor non-conformance was identified in Element 17 (Measurement and recording Equipment calibration & maintenance)

	<ul style="list-style-type: none"> - RCARCA was completed to identify corrective and implemented as well - Current year external audit will be in Nov. 2022
	<p>f) Results of emergency response testing</p> <ul style="list-style-type: none"> - WS-After Action Report 2021 - Emergency Response training and testing was completed in Dec. 2021 with limited staff due to COVID 19 - After action report was produced and shared with Water Services
	<p>g) Operational performance and statistics</p> <ul style="list-style-type: none"> - Pumpages & Instantaneous Flows - Figure 1 depicts Totalized Pumpage from 2019 – 2021 - Total of 16,780,400 cubic meters of water was processed by distribution system in 2021 - Highest production was 59,914 cubic meter on May 19 & lowest was 33,366 cubic meters on Dec. 27th - Average daily demand was 45,980 cubic meters - In 2021 1.5% more water was pumped as compared to 2020 <p>- Water Production, Consumption and Population</p> <ul style="list-style-type: none"> - 2021 consumption data will be available by March/April of 2022 - Figure 2: Shows Guelph water production, consumption & Population from 2011 to 2020 - Non-residential water consumption was reduced due to COVID Pandemic - 14% increase of population was recorded between 2011 -2020 - Water consumption increased by 9 % during this period <p>Water Supply Capacity</p> <ul style="list-style-type: none"> - Nothing new added this year <p>Program Activities</p> <ul style="list-style-type: none"> - Heather requested that Water Conservation and Efficiency program performance be referenced within the Program Activities section of the Management Review Info package – summary table from the WES report section - Table 2 provides information of Water distribution Maintenance Program Activities, 2021 - Table 3 provides information for Water Treatment maintenance Program Activity, 2021 - Table 4 provides information for Scada and security maintenance Program Activity, 2021 - Jennifer commented to add target set for Maintenance activities so that percentage achieved can be ascertained - Modification or Additions, - Table 5 is self explanatory in nature for Modifications or Additions to the Drinking water system, 2021 and are self approved - It reflects Forms 1 & 2 used in 2021

	<ul style="list-style-type: none"> - Forms 1 are for new water main infrastructure either newly replaced or new in terms of water extension systems - Form 2 are for Distribution & Scada - No addition for Form 3 in 2021 - Backflow Devices, - Table 6 depicts Backflow devices Installed by type I in 2021 (Provided by Building Department) - Building department will report it in their own reports
	<p>h) Raw and treated water quality and drinking water trends – Guelph Drinking Water System and Gazer Mooney Subdivision Distribution System</p> <ul style="list-style-type: none"> - Annual Report - Annual reports are in EDMS and posted on City website in PDF module - Adverse Report – 1 Issue of total coliform hit - 560 Samples treated with range from 0 to 3900 HPC - Lead Reduction Plan - Includes all samples as required by MDWL or Lead Reduction Plan - Table 7 shows Lead Reduction Plan, Lead sampling in Guelph Drinking water system, 2021 - Table 8 shows Lead Reduction Plan for Gazer Mooney Subdivision distribution system in 2021 - All conditions were met under Municipal Drinking Water Regulatory Relief
	<p>i) Follow-up on action items from previous management reviews</p> <ul style="list-style-type: none"> - 4 Action Items reported from last year from management review, 3 are closed now - One is to preform a debrief, will be done after the pandemic
	<p>j) The status of management action items identified between reviews</p> <ul style="list-style-type: none"> - Information in Table 10 - Majority are closed
	<p>k) Changes that could affect the DWS</p> <ul style="list-style-type: none"> - Municipal Drinking Water Licensing Documents - Table 11 specifies Municipal drinking water licencing documentation with issue dates and expiry dates with permits - Legal and other requirements - Table 13 Legal & Other Requirements - Ongoing list maintained in past posted as ERO or EBR - Now onwards ERO will be for Environmental services as whole, so will be reduced to ERO posting - Will be summarised as a summary of ERO posting in management review meeting, if approved - MDWL Renewal

	<ul style="list-style-type: none"> - PTTW Renewals (John Paul) - Carter, Edinburgh, Sacco and Smallfield to be renewed in 2022 - Sentry Monitoring Wells - Table 14 shows Membro Sentry Wells - Chemistry Results Summary, 2021 - Table15 shows EMMA Sentry Wells Chemistry Results summary 2021 - Staff Certification - Table 16 summarising Drinking water system as of December 2021 (complementary staff)
	<p>l) Customer Feedback</p> <ul style="list-style-type: none"> -Table 17 specifies Number of customer calls received from 2019 – 2021 - In 2021 meeting it was suggested for calls to be added to GIS - Currently CISCO FINNESE is being used to track call types, but GIS will be added in future course - Coordination for customer service strategy with other departments
	<p>m) Resources needed to maintain the DWS and QMS</p> <ul style="list-style-type: none"> - Same as earlier year, additional resources needed as always - Changes in staff profile due to re-organization & new Staff joining <p>Jennifer advised to add as we will be doing multi-year budgeting, to ask for FTES in drinking water system & quality management system</p>
	<p>n) Results of the infrastructure review</p> <ul style="list-style-type: none"> - Infrastructure review happens annually & brought forward through Capital Budget and Corporate Asset Management Plan - Distribution Infrastructure Needs - Detailed information in Water Supply Master Plan for information - Updates are forwarded to top management for their review on regular basis - Supply & Facilities Infrastructure Needs - Is in Water Supply Master Plan Website - Is in Water Services Capital Budget website
	<p>o) Operational plan currency, content and updates</p> <ul style="list-style-type: none"> - Ongoing process with top management and staff informed by emails - Brought to Council in 2019 - Will be submitted new Council in 2023
	<p>p) Staff suggestions</p>

<p>2.</p>	<p>Water Efficiency Program -2021 Progress Report</p> <ul style="list-style-type: none"> - Water Reduction Target Progress - 206 cubic per day was reclaimed in 2021, is lower than target (Due to impact of COVID) - Figure 3 explains Water supply master Plan (2014) and Water Efficiency Strategy (2016) Production Rates - Overall water production has decreased significantly -2020 Production was low, however residential demand high due to the impact of COVID - Figure 4 shows Residential Water use between 2011 – 2020 - Water Loss Management Program – Water Loss Strategy Detailed explanation in the report - Will be putting for water award nomination for the work <p>Leak Detection Program</p> <ul style="list-style-type: none"> - Program stated in 2011 by the city - Details are included in the report - Detailed summary in Table 19 <p>Water Efficiency Incentive and Rebate Programs</p> <ul style="list-style-type: none"> - 206 cubic per day was reclaimed in 2021, is lower than target (Due to impact of COVID) - Detailed explanation added in the report for various programs - Table 19 shows Water Efficiency Strategy Update <p>Program Progress for target set and actual achievements and with descriptions</p> <ul style="list-style-type: none"> - Previously all-season rainwater harvesting rebate program not embedded as no specific saving goals are set for the program in WES. Have addressed this with savings in the 2021 report <p>Outside Water Use Program</p> <ul style="list-style-type: none"> - Ran between May and October 2021 – Program driven by City Outside water use Bylaw - About 3,500 participants took part in 2021 speaker series; - 1,392 individuals participated in annual Landscape Design Course - Indirect Water Saving Program – Staff continues to offer various programs in schools (Virtual) to bring awareness for water saving <p>Healthy Landscapes</p> <ul style="list-style-type: none"> - Backyard visits were conducted with 50% capacity - Organized virtual speaker series design course with more than 1000 participants <p>Water Use Home Visit and Audit Program</p> <ul style="list-style-type: none"> - Blue Built Homes - Multi-Residential Audit <p>Water Smart Business Program</p> <ul style="list-style-type: none"> - Was paused till May 2021 due to COVID Pandemic - Continued offering business community with unique ways Such as hosting speaker series and individual work shops - Table 19 provides more specific information
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	<ul style="list-style-type: none"> - Youth and Public Outreach and Education Programming - Guelph Water Wagon - Paused due to COVID Pandemic - Peak Season Water Demand Management - Cooling Tower - Water Softener Alternatives Testing and Market Research - Continued project since 2019
3.	<p>Source Water Protection</p> <ul style="list-style-type: none"> - Risk Management Official update - Detailed information added in summary reports - Any short comings are due to short staff
4.	<p>New or other business</p> <ul style="list-style-type: none"> - No
5.	Next meeting dates

Appendix B: Summary of Critical Control Points and Critical Control Limits

A critical control point is an essential step or point in the subject system at which control can be applied by the operating authority to prevent or eliminate a drinking water health hazard or to reduce it to an acceptable level. A critical control limit is the point at which a critical control point response procedure is initiated.

Water Services has identified three critical control points: multi-barrier primary disinfection, secondary disinfection and backflow prevention. Their critical control points and limits are described below.

1. Multi-Barrier Primary Disinfection

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

Hazard Descriptions and Critical Control Limits

a) 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

Critical Control Limits

- Low Low and High High alarm limit range for all stations: 0.40 to 1.9 mg/L
- Programmed auto shutdown range for all stations: 0.40 to 2.5 mg/L

b) High Turbidity

- Sudden changes to raw water quality characteristics
- Failure of aqueduct infrastructure

Critical Control Limits

- Turbidity alarm ranges for all stations that monitor turbidity: 0.3 to 0.8 ntu
- Auto diversion at the Glen Diversion Chamber based on turbidity: 0.15 ntu

c) Inadequate UV Dosage

- UV Treatment system failure (e.g. UV, UVT and turbidity analyzers, high flow, reactor, PLC, power, flow meters)
- High turbidity event

Critical Control Limits

- UV Dose auto shutdown alarm setpoints
- FM Woods
 - (alarm only, does not shutdown) $<40\text{mJ}/\text{cm}^2$

- Water Street Well
 - $<45\text{mJ/cm}^2$ (Trojan controller programmed low)
 - 42mJ/cm^2 (redundant PLC programmed low)
- Membro Well
 - $<25\text{ mJ/cm}^2$ (Trojan controller programmed low)
 - $<22\text{ mJ/cm}^2$ (redundant PLC programmed low)

d) Operating a Station in Manual

- Inadequate CT (Concentration x Time)
- Low reservoir level
- Insufficient chlorine residual
- Low contact time due to POE pump flow rate

Critical Control Limits

- Manual calculations must show that the minimum CT achieved is 4

2. Secondary Disinfection

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

Hazard Descriptions and Critical Control Limits

a) Deterioration of Chlorine Residual

- Reduced water flows based on demand, pipe size, etc.
- Occurrence of dead ends and District Metered Areas
- Increased water temperature (temporary mains)
- Reaction with organic matter in watermains
- Water age in the distribution system
- Water age in storage facilities

Critical Control Limits

- Free Chlorine
- Target residual in the distribution system: $>0.20\text{ mg/L}$ (operational minimum)
- Reportable under the Safe Drinking Water Act: 0.05 mg/L
- Consumer Complaints
- Related to water quality characteristics (taste, odour, colour, other)

3. 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 Descriptions and Critical Control Limits

a) System contamination from negative or reduced pressure

- Lack of backflow prevention device (including unauthorized connections)
- Main breaks or blowouts
- Large services (high usage causing reduced pressure)
- Temporary connections
- Firefighting connections
- Depressurization from residential usage
- Pipe failure (deterioration)

Critical Control Limits

- System pressure
- Alarm set point ranges for pressure: 210 to 900 kPa
- Consumer Complaints
- Related to system pressure or water quality characteristics (taste, odour, colour, other)

Appendix C: Total Water Pumped and Instantaneous Flows

This section summarizes the amount of water pumped and instantaneous flows in 2021.

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 – Pumpages to System, January 1 – December 31, 2021

Table 3 below shows the amount of water pumped to system from each facility in 2021 in cubic meters.

Table 3: Pumpages (Discharge) to System, January 1 to December 31, 2021

Facility	Burke	Calico	Dean	Downey	Emma	Helmar	Membro	Paisley Net	Park	Queensdale	University Net	Water Street	F.M. Woods	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	Average	5,798	0	1,367	4,178	2,014	742	0	1,014	1,230	619	1,481	1,771	23,707	43,920
	Maximum	6,025	0	1,379	4,227	2,523	748	0	1,015	1,710	658	1,877	1,851	26,665	47,133
	Total	179,723	0	42,392	129,512	62,439	23,016	0	31,422	38,116	19,180	45,914	54,890	734,930	1,361,533
Feb	Average	5,810	0	1,333	4,214	2,336	739	0	1,010	789	657	1,418	1,814	25,710	45,830
	Maximum	5,935	0	1,383	4,234	2,518	748	0	1,013	2,230	664	1,846	1,839	28,195	48,303
	Total	162,683	0	37,314	117,989	65,402	20,705	0	28,287	22,088	18,389	39,708	50,793	719,893	1,283,250
Mar	Average	5,111	0	1,238	4,063	1,963	732	0	947	1,328	656	1,596	1,811	26,985	46,362
	Maximum	5,920	0	1,388	4,306	2,535	745	0	1,017	4,647	663	1,847	1,858	32,774	51,036
	Total	158,445	0	38,379	125,944	60,848	22,700	0	29,371	41,174	20,330	49,475	56,148	836,532	1,437,211
Apr	Average	5,834	0	1,357	3,190	1,725	683	0	987	1,065	658	1,571	1,534	26,813	45,568
	Maximum	5,892	0	1,381	4,339	2,562	736	0	1,013	2,637	668	1,855	1,877	30,790	52,205
	Total	175,008	0	40,716	95,691	56,300	20,492	0	29,614	31,958	19,744	47,127	46,012	804,386	1,367,049
May	Average	5,834	0	1,315	4,051	2,466	725	0	1,006	2,033	660	1,500	1,779	27,464	48,833
	Maximum	5,884	0	1,380	4,099	2,530	743	0	1,011	5,945	670	1,825	1,841	34,234	59,914
	Total	180,847	0	40,763	125,594	76,434	22,486	0	31,182	63,015	20,470	46,512	55,144	851,377	1,513,823
Jun	Average	5,796	0	1,348	3,878	1,137	716	0	978	3,109	497	1,412	1,772	30,057	50,701
	Maximum	5,856	0	1,372	4,019	2,493	739	0	1,007	5,713	664	1,830	1,841	36,757	58,372
	Total	173,890	0	40,446	116,343	34,110	21,466	0	29,334	93,284	14,901	42,374	53,159	901,715	1,521,022
Jul	Average	5,764	0	271	271	1,840	684	0	984	2,041	464	1,550	1,804	27,381	43,055
	Maximum	5,802	0	1,361	1,361	2,506	718	0	991	2,533	541	1,838	1,844	32,110	48,318
	Total	178,689	0	8,398	8,397	57,045	21,196	0	30,518	63,280	14,392	48,063	55,912	848,814	1,334,704

	Facility	Burke	Calico	Dean	Downey	Emma	Helmar	Membro	Paisley Net	Park	Queensdale	University Net	Water Street	F.M. Woods	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
Aug	Average	5,540	0	1,172	3,657	2,437	614	0	973	2,178	469	1,541	1,740	28,749	49,072
	Maximum	5,791	0	1,370	3,903	2,550	701	0	985	5,206	480	1,822	1,847	34,172	55,943
	Total	171,735	0	36,321	113,380	75,561	19,040	0	30,173	67,525	14,549	47,776	53,925	891,234	1,521,220
Sep	Average	5,641	0	1,029	3,247	2,420	683	0	970	2,392	548	1,182	1,793	27,329	47,234
	Maximum	5,720	0	1,371	3,806	2,493	785	0	971	5,182	842	1,806	1,891	35,177	50,799
	Total	169,224	0	30,859	97,400	72,605	20,503	0	29,089	71,768	16,454	35,451	53,788	819,878	1,417,019
Oct	Average	5,616	0	698	1,938	2,441	711	0	957	2,406	760	862	1,799	26,067	44,256
	Maximum	5,717	0	1,366	3,846	2,507	833	0	971	5,811	845	1,807	1,902	33,965	48,464
	Total	174,108	0	21,624	60,084	75,672	22,049	0	29,681	74,575	23,573	26,713	55,783	808,075	1,371,937
Nov	Average	5,490	0	71	3,275	2,192	662	0	952	2,970	475	1,475	1,691	24,351	43,603
	Maximum	5,889	0	1,379	3,967	2,502	837	0	1,008	8,404	755	1,806	1,890	30,014	48,061
	Total	164,713	0	2,115	98,259	65,758	19,867	0	28,547	89,105	14,253	44,237	50,719	730,516	1,308,089
Dec	Average	5,617	0	1,368	3,293	2,338	788	0	960	1,666	399	1,422	1,149	24,340	43,340
	Maximum	5,648	0	1,383	3,854	2,504	807	0	965	2,284	410	1,743	1,806	27,056	47,848
	Total	174,133	0	42,412	102,068	72,478	24,439	0	29,772	51,653	12,373	44,069	35,631	754,525	1,343,554
2021 Year	Average	5,654	0	1,045	3,266	2,106	706	0	977	1,932	571	1,417	1,702	26,541	45,930
	Maximum	6,025	0	1,383	4,339	2,562	837	0	1,017	8,404	845	1,877	1,902	36,757	59,914
	Total	2,063,198	0	381,068	1,188,582	773,406	257,599	0	356,488	706,848	208,282	517,349	620,883	9,687,549	16,761,251
	Average Process Capacity	86%	0%	45%	62%	68%	22%	0%	n/a	19%	11%	n/a	50%	41%	n/a

City of Guelph Water Services – Permit to Take Water Pumpages, January 1 – December 31, 2021

Table 4 and Table 5 presented below, outline the Permit to Take Water Pumpages for 2020. Table 34 includes the following sources: Arkell Well 1, Arkell Well 6, Arkell Well 7, Arkell Well 8, Arkell Well 14, Arkell Well 15, Arkell Recharge Pump, Arkell Springs Glen Collector System, Burke Well, Calico Well, and Carter Well 1 and 2. Table 35 includes the following sources: Dean Well, Downey Well, Emma Well, Helmar Well, Membro Well, Paisley Well, Park Wells 1 and 2, Queensdale Well, University Well and Water Street Well

Table 2: City of Guelph Permit to Take Water Pumpages, 2021

Facility	Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #15	Arkell Wellfield (#6, 7, 8, 14, 15) Total	Arkell - Recharge Pump	Arkell Springs Glen 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	
Regulatory limit	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	Average	77	3,538	6,127	481	5,351	3,288	18,786	0	4,927	6,011	0	0
	Maximum	685	6,380	7,760	4,153	7,795	5,129	21,848	0	5,265	6,245	0	0
	Total	2,390	109,689	189,947	14,923	165,881	101,914	582,354	0	152,740	186,340	0	0
Feb	Average	47	4,992	6,745	1,784	3,709	4,184	21,413	0	4,515	6,028	0	0
	Maximum	372	6,628	7,644	5,375	7,722	5,385	24,299	0	4,663	6,152	0	0
	Total	1,309	139,773	188,871	49,942	103,844	117,148	599,578	0	126,411	168,792	0	0
Mar	Average	42	5,950	7,535	1,037	3,874	4,277	22,674	0	5,300	5,300	0	0
	Maximum	309	7,552	7,648	6,205	6,398	5,752	28,457	0	6,134	6,134	0	0
	Total	1,311	184,444	233,590	32,142	120,109	132,601	702,886	0	164,290	164,290	0	0
Apr	Average	996	4,516	7,378	449	4,443	3,634	20,419	4,361	5,289	6,049	0	0
	Maximum	1,035	7,099	7,677	5,052	7,063	5,532	25,238	8,489	7,240	6,107	0	0
	Total	29,895	135,489	221,333	13,463	133,284	109,012	612,581	130,822	158,666	181,463	0	0
May	Average	477	4,080	7,404	84	4,559	2,762	18,889	8,172	8,129	6,050	0	0
	Maximum	1,037	6,479	7,714	978	7,260	5,260	26,109	8,445	8,803	6,101	0	0
	Total	14,787	126,470	229,527	2,618	141,328	85,611	585,553	253,335	251,998	187,565	0	0
Jun	Average	102	3305.68	7557.68	325.60	5815.21	4081.56	21,086	7,152	9,319	6,020	0	3,076
	Maximum	744	6543.30	7689.40	3378.30	7419.25	6925.28	27,197	7,949	9,911	6,072	0	6,012
	Total	3,049	99170.42	226730.31	9767.92	174456.28	122446.77	632,572	214,555	279,574	180,609	0	92,276
Average	62	2235.68	7629.97	289.57	3588.94	3319.08	17,063	7,590	10,286	5,994	0	5,096	

Facility		Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #15	Arkell Wellfield (#6, 7, 8, 14, 15) Total	Arkell - Recharge Pump	Arkell Springs Glen 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
Regulatory limit		3,273	9,600	9,600	9,600	9,600	9,600	28,800	9,092	25,000	6,546	5,237	6,547
Jul	Maximum	697	4882.46	7910.44	2845.17	6733.02	5367.32	21,985	7,929	11,173	6,031	0	5,129
	Total	1,924	69306.12	236529.01	8976.77	111257.05	102891.37	528,960	235,290	318,860	185,804	0	157,991
Aug	Average	21	4,948	7,549	4,035	0	4,662	21,194	1,230	7,659	5,778	0	2,794
	Maximum	290	7,522	7,915	6,434	0	7,010	28,176	7,763	11,229	5,989	0	5,092
Sep	Total	650	153,388	234,021	125,079	0	144,535	657,024	38,116	237,427	179,132	0	86,617
	Average	40	4,581	7,547	1,746	952	5,744	20,571	4,822	6,751	5,878	0	0
Oct	Maximum	675	6,821	7,693	4,786	5,660	7,320	27,385	7,940	7878.55	5,955	0	0
	Total	1,189	137,437	226,421	52,379	28,551	172,331	617,119	144,668	202517.69	176,327	0	0
Nov	Average	48	4,234	7,469	455	1,855	3,714	17,727	7,702	9,272	5,855	0	0
	Maximum	634	7,109	7,823	5,711	4,955	6,945	25,685	7,872	10,367	5,956	0	0
Dec	Total	1,475	131,269	231,542	14,107	57,497	115,121	549,536	238,773	287,419	181,490	0	0
	Average	18	7,917	7	3,817	5,285	1,937	18,963	2,174	9,285	5,734	0	0
2021	Maximum	269	8,140	222	6,041	7,653	4,056	24,409	7,637	11,199	6,135	0	0
	Total	544	237,498	222	114,520	158,558	58,095	568,894	65,215	278,562	172,025	0	0
Year	Average	4	8,002	299	3,106	4,039	2,582	18,028	0	6,469	5,853	0	0
	Maximum	66	8,123	4,254	5,903	5,641	5,639	20,905	0	6,592	5,882	0	0
2021	Total	125	248,068	9,274	96,271	125,220	80,027	558,860	0	200,549	181,456	0	0
	Average	161	4,850	6,095	1,467	3,616	3,678	19,705	3,600	7,191	5,879	0	914
Year	Maximum	1,037	8,140	7,915	6,434	7,795	7,320	28,457	8,489	11,229	6,245	0	6,012
	Total	58,647	1,768,737	2,224,512	534,190	1,317,377	1,340,259	7,185,076	1,320,773	2,630,950	2,145,292	0	336,883
Average Pumped		5%	50%	63%	15%	38%	38%	68%	13%	25%	90%	0%	14%

Table 3: City of Guelph Permit to Take Water Pumpages, 2021 – Continued

Facility	Dean Well	Downey Well	Emma Well	Helmar Well	Membro Well	Paisley Well	Park Wells #1 and #2	Queensdale Well	University 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	
Regulatory limit	2,300	5,273	3,100	3,273	6,050	3,200	10,300	5,237	3,300	3,400	
Jan	Average	1,382	4,319	2,023	725	16	1,014	1,218	618	1,481	1,772
	Maximum	1,440	4,369	2,523	736	436	1,015	1,695	723	1,877	1,851
	Total	42,829	133,878	62,700	22,468	494	31,422	37,761	19,164	45,914	54,945
Feb	Average	1,341	1,341	2,337	721	4	1,010	783	656	1,418	1,814
	Maximum	1,414	1,414	2,518	737	49	1,013	2,091	710	1,846	1,839
	Total	37,539	37,538	65,447	20,198	99	28,287	21,929	18,358	39,708	50,803
Mar	Average	1,243	4,199	1,968	714	5	947	1,321	652	1,596	1,811
	Maximum	1,418	4,462	2,535	744	50	1,017	4,615	690	1,847	1,858
	Total	38,523	130,160	61,014	22,147	143	29,371	40,961	20,198	49,475	56,156
Apr	Average	1,375	3,296	1,884	665	2	987	1,058	656	1,571	1,539
	Maximum	1,416	4,463	2,562	727	18	1,013	2,728	702	1,855	1,877
	Total	41,258	98,867	56,515	19,963	53	29,614	31,729	19,670	47,127	46,175
May	Average	1,336	4,162	2,466	707	2	1,006	2,015	659	1,500	1,779
	Maximum	1,419	4,209	2,530	732	29	1,011	5,738	731	1,825	1,841
	Total	41,428	129,010	76,434	21,932	63	978	3,085	493	1,412	1,772
Jun	Average	1,368	3,984	1,137	698	4	1,007	5,682	690	1,830	1,841
	Maximum	1,423	4,127	2,493	734	32	29,334	92,558	14,787	42,374	53,159
	Total	41,026	119,530	34,110	20,929	106	978	3,085	493	1,412	1,772
Jul	Average	274	3,921	1,840	666	1	984	2,024	459	1,560	1,804
	Maximum	1,395	4,083	2,506	701	18	991	2,514	553	1,838	1,844
	Total	8,481	121,560	57,045	20,648	26	30,518	62,754	14,226	48,363	55,912

Facility	Dean Well	Downey Well	Emma Well	Helmar Well	Membro Well	Paisley Well	Park Wells #1 and #2	Queensdale Well	University 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	
Regulatory limit	2,300	5,273	3,100	3,273	6,050	3,200	10,300	5,237	3,300	3,400	
Aug	Average	1,188	3,787	2,437	603	0	973	2,160	453	1,541	1,740
	Maximum	1,412	4,032	2,550	694	0	985	5,414	485	1,822	1,847
	Total	36,827	117,390	75,561	18,680	0	30,173	66,952	14,035	47,776	53,925
Sep	Average	1,028	3,363	2,420	669	0	970	2,369	520	1,182	1,793
	Maximum	1,390	3,933	2,493	763	0	971	5,143	825	1,806	1,891
	Total	30,854	100,903	72,605	20,066	0	29,089	71,081	15,606	35,451	53,788
Oct	Average	710	1,997	2,441	700	0	957	2,396	727	862	1,799
	Maximum	1,402	3,957	2,507	827	0	971	5,729	855	1,807	1,902
	Total	22,016	61,908	75,672	21,687	0	29,681	74,284	22,538	26,713	55,783
Nov	Average	72	3,365	2,192	651	0	952	2,939	476	1,475	1,691
	Maximum	1,388	4,078	2,502	803	0	1,008	8,446	765	1,806	1,890
	Total	2,173	100,940	65,758	19,536	0	28,547	88,160	14,287	44,237	50,719
Dec	Average	1,392	3,386	2,338	769	0	960	1,647	406	1,422	1,149
	Maximum	1,445	3,964	2,504	793	0	965	2,261	476	1,743	1,806
	Total	43,167	104,974	72,478	23,825	0	29,772	51,065	12,594	44,069	35,633
2021 Year	Average	1,057	3,421	2,120	690	3	977	1,916	564	1,418	1,703
	Maximum	1,445	4,463	2,562	827	436	1,017	8,446	855	1,877	1,902
	Total	385,443	1,254,650	774,093	251,708	984	356,488	701,128	205,560	517,649	621,120
	Average Pumped	46%	66%	68%	21%	0%	31%	19%	11%	43%	50%

City of Guelph Water Services – Instantaneous Flows Summary (PTTW), January 1 – December 31, 2021

Table 6 and Table 7 presented below, outline the Instantaneous Flow Summary for 2020. Table 36 includes the following sources: Arkell Well 1, Arkell Well 6, Arkell Well 7, Arkell Well 8, Arkell Well 14, Arkell Well 15, Arkell Recharge Pump, Arkell Springs Glen Collector System, Burke Well, Calico Well, Carter Wells 1 and 2. Table 37 includes the following sources: Dean Well, Downey Well, Emma Well, Helmar Well, Membro Well, Paisley Well, Park Wells 1 and 2, Queensdale Well, University Well and Water Street Well.

Table 4: City of Guelph - Instantaneous Flow Summary, 2021

Facility		Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #15	Arkell - Recharge System	Arkell Springs Glen Collector System	Burke Well	Calico Well	Carter Wells
Units		L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s
Regulatory limit		37.8	111.0	111.0	111.0	111.0	111.0	157.8	289.3	83.7	60.6	90.9
Jan	Average	0.9	41.0	71.4	5.6	61.9	38.0	0.0	57.0	69.6	0.0	0.0
	Maximum	12.1	94.2	91.8	87.9	95.4	94.3	0.0	62.3	72.8	0.0	0.0
Feb	Average	0.5	57.9	78.3	20.7	43.0	48.4	0.0	50.3	69.7	0.0	0.0
	Maximum	12.1	94.6	92.6	87.5	93.1	94.0	0.0	55.9	72.3	0.0	0.0
Mar	Average	0.5	68.9	87.5	12.0	44.8	49.5	0.0	50.9	61.4	0.0	0.0
	Maximum	12.3	95.1	91.8	87.1	93.4	95.4	0.0	55.0	72.5	0.0	0.0
Apr	Average	11.6	52.3	88.2	5.2	51.4	42.1	50.6	60.8	70.0	0.0	0.0
	Maximum	12.5	94.9	91.4	87.4	93.9	95.4	106.4	85.9	72.1	0.0	0.0
May	Average	5.6	47.3	86.3	1.0	52.8	32.0	94.6	94.1	70.0	0.0	0.0
	Maximum	12.4	95.3	91.8	88.2	94.4	120.0	98.2	250.0	71.4	0.0	0.0
Jun	Average	1.2	38.3	87.8	3.8	67.3	47.2	82.7	103.5	69.7	0.0	35.6
	Maximum	12.3	92.7	91.3	86.0	92.4	92.1	92.5	117.8	71.6	0.0	85.4
Jul	Average	0.7	25.9	89.0	3.4	41.6	38.4	87.9	119.0	69.4	0.0	59.0
	Maximum	12.3	94.7	91.6	87.7	90.8	92.5	92.0	132.2	70.9	0.0	59.7

Facility		Arkell Well #1	Arkell Well #6	Arkell Well #7	Arkell Well #8	Arkell Well #14	Arkell Well #15	Arkell - Recharge System	Arkell Springs Glen Collector System	Burke Well	Calico Well	Carter Wells
Units		L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s
Regulatory limit		37.8	111.0	111.0	111.0	111.0	111.0	157.8	289.3	83.7	60.6	90.9
Aug	Average	0.2	57.4	87.6	46.8	0.0	53.9	14.2	88.2	66.9	0.0	32.4
	Maximum	12.3	94.9	91.6	87.4	0.0	92.8	90.2	133.0	70.2	0.0	59.8
Sep	Average	0.5	53.0	87.8	20.3	11.0	66.5	55.8	77.9	68.0	0.0	0.0
	Maximum	12.6	94.4	91.5	87.7	100.8	93.0	94.2	94.3	70.4	0.0	0.0
Oct	Average	0.5	49.0	86.9	5.3	21.5	42.9	88.6	120.5	67.8	0.0	0.0
	Maximum	12.9	96.1	91.6	87.0	94.9	93.6	88.7	120.9	70.3	0.0	0.0
Nov	Average	0.2	91.5	0.1	44.3	61.1	22.5	25.1	62.8	66.3	0.0	0.0
	Maximum	12.2	95.2	60.8	87.5	96.8	91.5	89.0	126.8	70.0	0.0	0.0
Dec	Average	0.0	92.2	3.5	36.1	46.8	29.9	0.0	74.9	67.7	0.0	0.0
	Maximum	11.9	95.4	91.0	87.9	96.7	94.3	0.0	78.3	68.9	0.0	0.0

Table 5: Instantaneous Flow Summary, 2021 – Continued

Facility		Dean Well	Downey Well	Emma Well	Helmar Well	Membro Well	Paisley Well	Park Wells	Queensdale Well	University Well	Water Street Well
Units		L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s
Regulatory limit		34.6	60.6	40.8	37.8	78.0	42.0	127.2	60.6	46.2	44.4
Jan	Average	16.0	51.4	23.3	8.6	0.0	11.7	14.1	7.1	17.1	20.6
	Maximum	21.8	55.5	32.5	11.5	0.0	11.8	119.4	10.0	22.3	28.3
Feb	Average	15.6	51.7	27.1	8.5	0.0	11.7	9.1	7.6	16.4	21.0
	Maximum	21.7	55.9	31.3	11.1	30.1	11.8	118.4	9.4	22.0	24.6
Mar	Average	14.3	50.0	22.8	8.5	0.1	11.0	15.3	7.6	18.5	21.0
	Maximum	27.7	58.2	32.1	12.9	29.9	12.2	116.0	10.1	22.0	29.3
Apr	Average	15.8	39.1	21.8	7.9	0.0	11.4	12.2	7.6	18.2	17.8
	Maximum	25.0	59.1	31.9	13.5	30.2	12.0	116.4	10.7	37.4	31.3
May	Average	15.4	49.7	28.6	8.4	0.0	11.6	23.3	7.6	17.4	20.6
	Maximum	22.2	52.2	30.6	11.6	29.9	11.7	116.8	10.2	21.7	37.6
Jun	Average	15.8	47.6	13.2	8.3	0.0	11.3	35.7	5.8	16.3	20.6
	Maximum	20.7	55.3	31.5	11.4	29.9	11.9	117.7	11.9	21.8	28.4
Jul	Average	3.2	46.9	21.4	7.9	0.0	11.4	23.4	5.3	17.9	21.0
	Maximum	20.2	53.8	31.3	11.5	29.3	12.3	118.0	11.9	22.0	24.8
Aug	Average	13.7	45.2	28.3	7.1	0.0	11.3	25.0	5.2	17.8	20.2
	Maximum	19.9	52.3	30.8	11.5	0.0	12.4	116.3	11.8	21.7	28.2
Sep	Average	12.0	40.2	28.1	7.7	0.0	11.2	27.4	6.0	13.7	20.9
	Maximum	21.1	54.5	30.4	13.2	29.6	11.8	115.5	11.1	21.7	28.8

	Facility	Dean Well	Downey Well	Emma Well	Helmar Well	Membro Well	Paisley Well	Park Wells	Queensdale Well	University Well	Water Street Well
	Units	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s	L/s
	Regulatory limit	34.6	60.6	40.8	37.8	78.0	42.0	127.2	60.6	46.2	44.4
Oct	Average	8.2	23.9	28.4	8.3	2.7	11.1	27.7	8.4	10.0	20.9
	Maximum	20.2	58.6	30.6	13.5	30.0	11.9	115.5	10.5	21.9	29.3
Nov	Average	0.8	40.3	25.7	7.7	0.0	11.0	34.1	5.5	17.0	19.7
	Maximum	20.3	58.9	31.4	13.4	0.0	12.4	117.2	12.1	21.6	25.2
Dec	Average	16.0	41.7	28.6	9.1	0.0	11.1	19.0	4.7	16.5	13.5
	Maximum	20.4	52.2	30.7	13.5	0.0	11.9	116.6	12.5	21.0	30.9