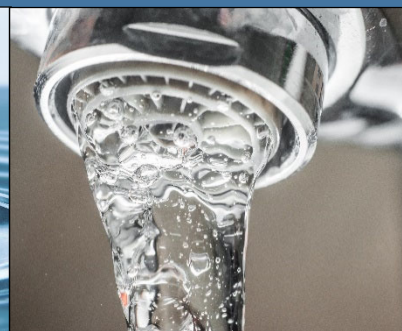


2023 Summary Report



**Water and
Wastewater
Services**

**Region of
Waterloo**



Region of Waterloo

Presented to Regional Council

March 5, 2024

This document is available in alternate formats upon request

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1. OVERVIEW & BACKGROUND

This summary report represents all the drinking water supply and transmission systems in the Region of Waterloo and the distribution systems in North Dumfries and Wellesley Townships, and addresses the requirements as defined under the Safe Drinking Water Act and the Drinking Water Quality Management System.

1.1 SAFE DRINKING WATER ACT

Schedule 22-2 of Ontario Regulation 170/03 states that owners of municipal drinking water systems shall ensure that, no later than March 31 of each year, a summary report is prepared for the preceding calendar year and presented to the members of municipal council. This report includes:

- (1) A list of the requirements in the Act, the regulations, the system's approval, drinking water works permit, municipal drinking water license, and any order applicable to the system that was not met at any time during the period covered by the report;
- (2) for each requirement in (1), specify the duration of the failure and the measures that were taken to correct the failure;
- (3) a summary of the quantities of flow rates of water supplied during the period covered by the report, including monthly average and maximum flows;
- (4) a comparison of the summary referred in (3) to the rated capacity flow rates in the system's approval, drinking water works permit, or municipal drinking water license.

This report captures non-compliance issues and corresponding corrective action(s) or mitigating measure(s).

1.2 DRINKING WATER QUALITY MANAGEMENT SYSTEM (QMS) CONFORMANCE AND MUNICIPAL DRINKING WATER LICENSING PROGRAM

To obtain and maintain a Municipal Drinking Water License (MDWL), the Region must hold: a valid Drinking Water Works Permit (DWWP), a valid Permit to Take Water (PTTW) for each water source, operational plans as approved by the Ministry of the Environment, Conservation and Parks (MECP), operating authority accreditation (based on a third party audit of the Drinking Water Quality Management Standard (DWQMS) 21 Elements), and financial plans approved by Regional Council. Each Municipal Drinking Water License and each Financial Plan must be renewed every 5 years. Eleven (11) new MDWL were issued to the Region in 2021.

MANAGEMENT REVIEW

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

The QMS annual management review was conducted on November 30, 2023 and included discussion of non-compliance issues and corresponding corrective/preventative action(s). The 2023 management review minutes, identified deficiencies, decisions and action items, are included in Appendix A. There were no major non-conformances identified with the QMS.

INFRASTRUCTURE REVIEW

DWQMS (Element 14 and 15) requires that the operational plan document a summary, and monitor the effectiveness of the Operating Authority's infrastructure maintenance, rehabilitation and renewal programs and to communicate these programs and any updates to the Owner. Asset management and maintenance programs are established and maintained to ensure repair and replacement of water system infrastructure. An overview of the infrastructure maintenance is found in section 5.

2. HEALTH RELATED NOTIFICATIONS – BOIL WATER ADVISORIES (BWA)/DRINKING WATER ADVISORIES (DWA)

The Region of Waterloo Water and Wastewater Services Division, in collaboration with the Public Health Department, ensures a safe water supply. There were no BWA or DWA issued during 2023.

3. REGULATORY COMPLIANCE

The MECP's annual drinking water system inspections focus on compliance with the SDWA and related regulations. The following legislative requirements apply to municipally owned and operated drinking water systems:

- proper documentation;
- sampling and analytical testing;
- adverse water quality incident reporting (AWQI);
- proper treatment and maintenance;
- corrective actions;
- Municipal Drinking Water Licenses;
- Drinking Water Works Permits;
- accreditation;
- continuous water quality monitoring;
- flow monitoring;
- calibration/verification of flow meters and instrumentation and,
- certified operators.

A summary of the non-compliances related to the above can be found in Table 1.

The 2022-23 MECP Chief Drinking Water Inspector's report, released in December 2023, identifies 19 inspection reports with an average compliance rating of 99.4% for the Region of Waterloo, with 16 of 19 inspections receiving 100%. Chart 1 below compares the average MECP

inspection compliance ratings over the past 5 years and Appendix B summarizes the most recent ratings for Region owned systems.

CHART 1 – MECP AVERAGE INSPECTIONS RATINGS

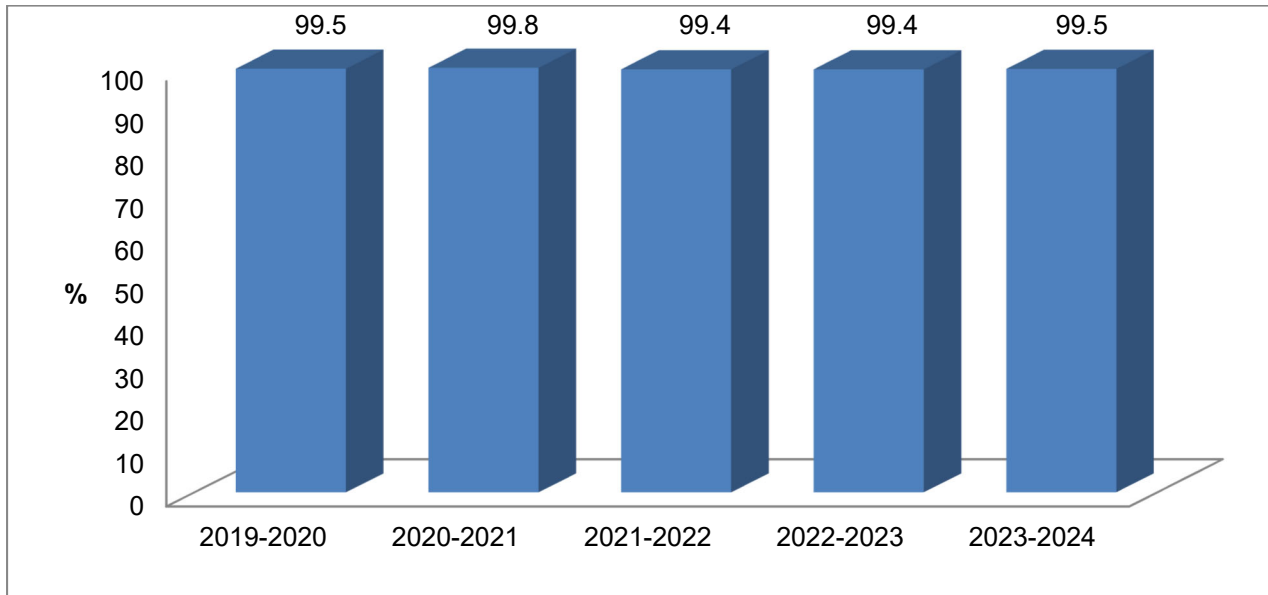


TABLE 1 – SUMMARY OF NON-COMPLIANCE ISSUES UNDER THE SAFE DRINKING WATER ACT (SDWA), MUNICIPAL DRINKING WATER LICENSES (MDWL), DRINKING WATER WORKS PERMITS (DWWP), PERMITS TO TAKE WATER (PTTW) AND THE ONTARIO WATER RESOURCES ACT (OWRA)

Date	Description	Root Cause	Preventative/ Corrective Action
O. Reg. 128/04 – Schedule 26 & 27, Records			
March 3, 2023	<p><u>IUS Distribution System</u></p> <p>Logbooks did not contain the required information.</p>	Previously provided logbook and record keeping training was ineffective.	Provide record keeping training to relevant staff, as directed by MECP.

SDWA Section 12 (1), O. Reg 170/03, 1-2(2) – Operator’s certificate			
November 6, 2023	<u>Heidelberg WTP</u> Discharge piping failed, resulting in significant flow into the environment. An unlicensed contractor, operating in the interests of health and safety and to minimize the environmental impact, closed the valve to that piping.	Improper coupling installation by contractor.	Improve communication between Operations and Maintenance staff, project managers, and contractors to ensure unlicensed individuals do not adjust treatment equipment. Investigate improved methods to both communicate and document this requirement. Investigate improving the procurement process for projects.
Municipal Drinking Water Licence (MDWL) - Schedule C, Monitoring			
April 29, 2023 15:16 (duration – 32 hours, 12 minutes) May 2, 2023 18:41 (duration – 12 hours, 21 minutes)	<u>Foxboro WTP</u> Following water damage to flow meter equipment, discharge flow readings were inaccurate.	No alarms were generated to identify the flow meter failure.	Repaired faulty flow meter. Relevant flow alarms were added, and newer replacement flow meters feature improved waterproof sealing. For existing sites with similar equipment, alarm setpoints will be reviewed for accuracy, and confirmed to be enabled.

<p>Oct 26, 2023 13:32 (duration 165 hours, 12 minutes)</p>	<p><u>Strange Street WTP</u> Discharge flow values flatlined following failure of the associated input/output (I/O) card. The data was not retrievable.</p>	<p>I/O card failure went undetected as alarming was not enabled.</p>	<p>Faulty I/O card replaced. Clarify/revise alarm naming and definitions, and communicate expected alarm responses with staff.</p>
<p>Nov 21, 2023 01:16 (duration 91 hours, 34 minutes)</p>	<p><u>Well K23</u> UV dosage readings flatlined following failure of the associated communications module. The data was not retrievable.</p>	<p>A legacy Programmable Logic Controller (PLC) program was being utilized that did not alarm or shutdown on loss of communication between devices.</p>	<p>Faulty equipment replaced. Station to be upgraded to new PLC standards. Review other sites to ensure alarming logic is in place.</p>

4. HYDRAULIC PERFORMANCE

A summary of the monthly average and maximum flow rates of water supplied are identified in Appendix C. There were zero non-compliances attributed to MDWL or PTTW flow limit exceedances in 2023.

The Region of Waterloo Drinking Water systems have 37 Permits to Take Water (PTTW), 11 Municipal Drinking Water Licenses (MDWL) and 11 Drinking Water Works Permits (DWWP). Refer to Appendix D for a full list of PTTW, MDWLs and DWWPs.

5. PREVENTATIVE MAINTENANCE PROGRAMS

Elements 14 and 15 of the DWQMS require that the operational plan document a procedure for the annual review of infrastructure necessary to operate and maintain the system. Element 14 requires that the operating authority carry out the review and report to the owner. This reporting ensures that the owner is regularly informed of infrastructure needs and can plan accordingly. Element 15 is about documenting a summary of the maintenance, rehabilitation and renewal programs for the infrastructure. These summaries must be updated as changes occur, and must

be communicated to the owner. Monitoring the effectiveness of the maintenance program is achieved by periodically reviewing the maintenance program and confirming the effectiveness of the program.

In 2019, the Water and Wastewater Services Division adopted a Corporate wide Enterprise Asset Management System (Lucity) which replaced the previous computerized maintenance management software. Lucity is a system that manages the installation, maintenance and replacement of infrastructure, equipment and components at water facilities. The system is used to develop, monitor, and report on preventative maintenance plans for the equipment. Preventative maintenance is based on industry standards, regulatory requirements, past history, manufacturers' recommendations and risk analysis. The following preventative maintenance programs are in place:

- As per the MDWL and/or Reg. 170/03, instrumentation is calibrated and/or verified in accordance with manufacturer's instructions with the exception of the billing meters; a third party calibrates and/or verifies the billing meters annually.
- Instrumentation such as ultraviolet sensors, ultraviolet transmittance, chlorine, and turbidity analyzers, ozone monitors, and other equipment are calibrated and/or verified in-house as per manufacturer's recommendations.
- A software program monitors the status of the SCADA communication system.
- Process and Instrumentation Diagrams (P&IDs) and Process Flow Diagrams (PFDs) are reviewed, updated and maintained as required.
- Electrically, the UV ballasts are run to failure and the UV lamps are replaced as per manufacturer's instructions.
- Canadian Standards Association (CSA) guidelines have specific requirements for diesel generators, such as an annual load bank test, run under load for rated power, oil changes, coolant, filters, electrical test of alternator, test oil for engine problems and efficiency. There is a contract with a third party to ensure CSA requirements are met.
- In house backup diesel generators are run monthly under load and preventative maintenance is conducted in accordance with CSA guidelines.
- Sub Station Maintenance, involving visual inspections, are performed several times per year.
- All other electrical components are replaced as required.
- Mechanically, sodium hypochlorite injectors are rebuilt monthly at all sites, booster pumps are maintained as required, chemical pumps are checked monthly and rebuilt as required. Piping and valve work is done as required. Air chambers are checked yearly and pumped out as required.
- Distribution system maintenance for North Dumfries and Wellesley Townships includes annual water main flushing and hydrant maintenance. All valves are operated over a 5-year span. Water main repairs, service leaks, meter replacement, and locates occur as required.

- Distribution maintenance, including water main repairs on the trunk mains are performed by the cities, townships or a third party contractor. Programs exist and vary by city for leak detection analysis, locates, and flushing. A more enhanced program continues to be developed to ensure that valves are exercised and remain operational.

6. WELL MAINTENANCE

Wells are maintained in accordance with Reg. 903, (Ontario Water Resources Act) and O. Reg. 170/03 (Schedule 1). Routine well inspections indicated that production wells and monitoring wells were in compliance.

7. ASSET MANAGEMENT AND CAPITAL INFRASTRUCTURE REPLACEMENT PROGRAM

The Region's overall objective is to support the achievement of service levels goals, and manage risk, while minimizing lifecycle costs. Risk events, such as an asset failure, are events which may compromise the delivery of the Region's strategic objectives.

The Region's asset risk framework takes into account potential losses to services, financial loss, and potential safety hazards. All assets are considered according to the impact of asset failure against these criteria and the likelihood of that failure occurring based on asset age, condition and performance.

Renewal work involves replacing or rehabilitating assets or components of assets to avoid service failure or interruption. For those assets with a higher risk profile, renewal works are timed to minimize any risk of failure, while obtaining the longest economic and service life from the assets. The objective is to replace critical assets before condition deteriorates into a poor or very poor state (which would increase the risk of failure).

The predominant drivers of renewals investment are as follows:

- **Current condition and performance:** The Region regularly inspects its assets to monitor their condition and performance, according to Water and Wastewater Service's Inventory, Condition, and Capital Planning Assessment Protocol and supporting Template. Asset specific programs, targeting assets that have higher replacement values, higher consequence of failure and/or are more challenging to inspect are also being developed to help further refine requirements for renewal investment.
- **Rate of deterioration:** Examination of the rate of deterioration over time based on current condition, compared to expected service life.
- **Renewals intervention point:** Establishing a renewals intervention point based on the level of service required and its risk categorization.
- **Coordination with other planned capital work** such as upgrades or expansion, or coordination with other business units or local municipalities.

Asset renewal requirements are bundled into capital projects based on the type of renewal required and the required timing. Asset Management has also defined a prioritization framework to help define capital project priority. Project prioritization criteria include the following:

- Project to address capacity deficiency or to support planned growth
- Project to address compliance requirements (Design / Regulatory)
- Project with funding from higher orders of government with defined timelines
- Project to address health and safety concern
- Project to provided needed redundancy
- Project to address asset condition / end-of-life
- Project to undertake a time-sensitive rehab to extend service life
- Project to address a performance deficiency or opportunity to improve process performance
- Project that addresses corrective maintenance requirements / reliability concerns
- Project that will reduce energy consumption / greenhouse gases
- Project that improves climate change resiliency

The above framework has established the foundation upon which asset management and capital infrastructure investment decisions are made. In addition, regular preventative maintenance is also performed to maintain the condition of assets and help ensure expected service lives are achieved.

In 2023, key asset management activities are summarized below.

- **Corporate Asset Management System Program Development**

The Corporate Asset Management System includes the following:

1. Work Management System (Lucity) - an enterprise level software product to be used by all asset-owning Divisions at the Region of Waterloo to perform maintenance and all other work on assets. Water and Wastewater Services' Implementation of Lucity was completed in early 2019. Continuous improvements are on-going.

In 2023, an upgrade to Version 22.1 was completed to ensure the version of software in use by the Region continues to be supported by the vendor. Further, it enables the Region to take advantage of any improvements made to the software since the last upgrade. A 2023 staff resourcing review identified the need for additional staffing resources to utilize the Lucity system to its maximum potential.

2. Decision Support System acquisition and implementation (PowerPlan) - a set of correlated tools intended to work with the Lucity in an integrated fashion to facilitate decision making for determining the appropriate rehabilitation, restoration, replacement, or maintenance strategies for optimal Asset performance. Initial stages of implementation began in 2019 and are on-going. Additional training was provided to staff in 2023 and

further development and progress was made within the Transportation Services, and Facilities Management Teams.

- **Asset Management Planning**

The Asset Management Plan (AM Plan) is a long-range planning document that is used to provide a rational framework for managing the Region's assets. The Region's AM Plan contains consolidated information that is currently available for the Region's assets to provide both a short term (10 years) and a long term (50 years) focus. The AM Plan is a written representation of proposed risk reduction programs and strategies for the Region's assets based on understanding of customer requirements, regulatory compliance, and the ability of the assets to meet required levels of service. This AM Plan forecasts future costs and assists in predicting future problems that may hinder service delivery. This creates opportunities for the Region's asset managers and operators to remove physical, financial and political barriers before they negatively affect customer levels of service.

Ontario Regulation 588/17, Asset Management Planning for Municipal Infrastructure, requires that Asset Management Policy be reviewed and updated as required at least every five years. That asset management policy establishes the framework and guiding principles and process for asset management practice. The asset management policy is based on the following:

- Corporate strategies, organization and culture
- Customer and stakeholder requirements
- Industry and Regional asset management practice maturity including process, people and technology.

In 2023 the Asset Management Policy review and update was completed and approved by Council (November 2023). Updates to the policy included alignment with the Region's current Strategic Plan.

The regulation also requires that every municipality prepare an asset management plan for all of its municipal infrastructure assets by July 1, 2025. In 2023, ongoing efforts were made in developing the corporate asset management system in support of the 2025 Asset Management Plan.

- **Lucity Data Standardization and Data Uploads**

Lucity, in addition to being a corporate work management system (WMS) is also the Region's asset registry: a single source of data for the Region's vertical and linear infrastructure assets. The goal is to have a single asset repository that will also support the corporate decision support system (DSS), regulatory asset management reporting, and other required reporting through Power BI.

In 2021 a data standardization initiative was initiated. This ongoing initiative has the following objectives:

- Develop consistent data standard
- Establish a process for data uploading in Lucity

- Apply a data standard to data already loaded into Lucity from previous work management systems
- Pair and load data collected through Water and Wastewater Services' Inventory, Condition, and Capital Planning Assessments

In 2021 existing data within Lucity was updated according to the defined data standard, and a process for bulk updates of asset data in Lucity was established. The focus in 2022 was to begin the process of pairing and loading data collected from recent Water Inventory, Condition, and Capital Planning Assessments (2018 or more recent) in Lucity. The process was completed in 2023 with more than 15,000 new equipment assets added in Lucity. Numerous updates were also made through the data cleansing process. A similar process is now in progress for wastewater assets.

Inventory Management Protocol

In 2022, a project to formalize the workflow for inventory management associated with capital and Operation & Maintenance work was initiated. The objective of this project was to identify and define improvements to the Inventory Management Protocol (IMP) and develop clear workflow(s) for implementation. The goal is to ensure changes to assets resulting from all types of work, both capital and operations and maintenance, are accurately and efficiently reflected in Lucity, in support of data management and effective lifecycle management of Water and Wastewater assets. The project, continued into 2023 and included consultation with all stakeholders that oversee capital or operation and maintenance work. Collaboration with stakeholders and documentation of workflow(s) were completed, increasing alignment on the “what”, “why”, and “how” to manage assets within Lucity, as well as improve the timeliness of updating asset data, consistency, and completeness within Lucity.

A training program for staff is now in development to support use of the protocol and template. Training sessions are scheduled in January/February 2024.

- **Project Tracking Tool: “PeTey”**

PeTey is a web-based application used to identify and track water and wastewater projects. Project Managers within Water and Wastewater Services and Design and Construction have been provided access to this tool to track project scope, budget, spending and prioritization of capital projects. PeTey provides a consolidated list of capital projects: completed projects, projects that are in progress, as well as planned future projects. This tool is used to support Project Status Reporting (PSR), preparation of the capital program each year, as well as to monitor project spend against capital budgets.

The following summarizes the improvements made to the system in 2023:

- PeTey 2.5 Upgrades
 - This update added functionality to identify a project tier based on risk scoring on a range of categories (i.e. Scope complexity, Service delivery disruption, political impact, budget, etc.) to aid in the assignment of a capital project sponsor and define tier-appropriate communication plans. Each project can

have a project tier (Tier 1, Tier 2, Tier 3) and sponsor assigned based on the total risk score.

- Continued administrative support of the PeTey web-based tool as well as providing ongoing training and support to staff.
- Continued support of the Power BI PSR Dashboard.
- Addition of 290 capital projects, 171 of which are future year projects.

- **Project Requests Tracking System: Bitrix**

Bitrix is an online application used to track water and wastewater capital project requests, with the objective of improving consistent and transparent review of new capital project requests as well as communication. In 2023, 90 project requests were submitted by staff, 60 were reviewed and recommended for the capital budget as required, eight were not recommended for capital planning, 22 requests are still in review. Project requests approved in Bitrix are incorporated into the Project Tracking Tool – PeTey, for input into the capital program.

- **Annual Project Prioritization**

Each year a meeting is conducted to review and prioritize capital infrastructure projects identified to start the following year. Meeting stakeholders include representation from Engineering & Planning, Infrastructure Management, Water Operations, SCADA & Operational Technology, Hydrogeology & Water Programs, and others as required. The objectives of the prioritization meeting are as follows:

- Review the water capital project list
 - Consistent with DWQMS – Element 15, 4.8.5 “In collaboration with the Manager, Engineering and Planning a long term forecast for infrastructure maintenance, rehabilitation, and renewal programs are reviewed at least every calendar year.”
- Confirm Project Prioritization
 - Consistent with DWQMS – Element 14, 4.1.3: “The Manager, Engineering and Planning shall ensure a capital works priority projects list is developed and updated annually, in collaboration with Hydrogeology and Water Programs”
 - New asset renewal projects are prioritized based on a number of criteria, ranked between 1 to 10, and assigned an overall project priority of High, Medium, Low.
 - Project prioritization will inform the order of execution as well as support decision making related to budget, supply, and/or resource constraints.

The annual meeting serves to create increased project awareness, provides an opportunity for open dialogue and identify if changes or alternative actions are required to projects such as risk mitigation measures or modified project scope.

- **Water Facility Inventory, Condition, and Capital Planning Assessments**

These assessments are performed to recognize/update all major building, process, and site works assets and components, as well as to assess the current physical and performance (capacity,

suitability, quality, quantity, and cost or energy efficiency). This information is then used to support a 10-year capital renewal plan and long term renewal forecast (50-year) for the facility/system.

The following assessments were ongoing in 2023 include the following:

- Howard Spheroid & Pumping Station
 - Northfield Pumping Station
 - St Andrews Pumping Station
 - Mannheim Water Treatment Residual Management Plant
 - Mannheim WTP Chambers
 - Mannheim Reservoir and Pumping Station Chambers
 - Shades Mill, Turnbull WTP Filter Wall Cracks Study
 - Environmental Enforcement and Laboratory Facility
 - Petersburg Communal Water System
- **Annual Review and Coordination of Watermain Replacements:**

Watermain replacement requirements are reviewed based on the age, material, and condition (break history and leakage reports where available) and are coordinated with both Regional and Local transportation capital programs. Coordination meetings with area municipalities occurred in June 2023 in support of capital budgeting processes.

- **Elevated Tank Program**

- Elevated Tank Inspections: The Region undertakes an annual tank inspection program to examine ladders, landings, handrails, appurtenances, venting and overflow screens. These inspections meet or exceed the recommended requirements set out in the AWWA Standard M42-Steel Water Storage Tanks. In addition to annual safety inspections, ROV (Remotely Operated Underwater Vehicle) inspections were carried out for selected tanks as part of the ongoing inspection program while storage facilities are kept online. Cathodic protection inspections were also completed where applicable.
- Reservoir cleaning and re-coating: The Region is continuing to optimize the capital and O&M program for elevated water storage tanks, with consideration of levels of service, alignment of maintenance or warranty inspections, coating replacement/rehabilitation or maintenance work with other capital projects. The overall program objective is to define service levels goals, managing risk, minimize lifecycle costs, and improved alignment with other capital projects to minimize downtime.

- **In-Ground Reservoir/Tank Inspection Program**

The Region's Water System includes many underground or at grade water storage structures (raw water storage tanks, potable water storage tanks, chlorine contact chambers, ozone contact chambers, backwash feed and storage tanks, other storage tanks). The physical condition of these assets and the assets located within are difficult to inspect. Assessment of these structures is facilitated by either ROV (Remotely Operated Underwater Vehicle) while the asset is in service, or physical inspection through person entry. Inspection requires significant advanced planning and may require isolation, draining, cleaning and confined space entry to undertake the inspection. The objective for the reservoir inspection program is to develop a consistent approach to reservoir inspections and renewal to ensure that all assets (i.e. structural, process, electrical, and instrumentation) are captured, and quality information is generated for capital planning.

In 2022 a document to support site-specific Terms of Reference for reservoir inspection and renewal was developed. The document identifies three (3) phases that can be executed as a single project or multiple projects as required:

Phase I is an in-services assessment:

- Inspection undertaken via a Remotely Operated Underwater Vehicle (ROV)
- Accompanied by exterior inspection and chamber inspection
- Minimal operational interruption / involvement required

A Phase I assessment provides an initial look at condition of the reservoir and indication of renewal requirements. This is used to prioritize when the Phase II inspection should be planned.

Phase II is an offline assessment followed by immediate renewal before the reservoir is put back in service:

- Before the reservoir is taken out of service, the necessary planning is completed to ensure efficient project delivery and minimized downtime.
- Reservoir isolation, draining, cleaning, and inspection via person entry (structural and process specialists).
- Following the inspection, a scope of work recommended to be completed prior to putting the reservoir back online is developed. The goal is to undertake the necessary repairs such that there is not a need to take the reservoir offline again for a least 5 years.
- Contractor retained & repairs completed.
- Disinfection, sampling, and reservoir put back in service.
- Standardized deliverables, including future recommended works.

Phase III is a tender for renewal (if required):

Phase III, will be planned and undertaken if additional future renewal work was recommended by the consultant at a later date (ideally a minimum of 5 years following Phase II).

Reservoir Inspection and Renewal that occurred in 2023 included the following:

- Wellesley Water Treatment Plant – Initiated in 2022, in coordination with upgrades to the Water Treatment Facility, Phase II inspection and renewal was completed in 2023. Final documentation and future recommendations are expected in 2024.
- Greenbrook Water Treatment Plant –In coordination with upgrades to the Water Treatment Facility, Phase II inspection and renewal of Reservoirs and Tanks was initiated in 2022. Recommended renewal for Treated Reservoir 2, and the treatment tanks was completed in 2023. Inspection of the Raw Water Reservoir and Treated Water Reservoir 1 resulted in recommendations to decommission both reservoirs. By-passes for both reservoirs are currently in construction to enable the plant to return to service in 2024. A future reservoir replacement project is identified in the capital program.
- Conestogo Plains Water Treatment Plant – A Phase II Inspection and minor immediate renewal was completed in 2023.
- Turnbull Reservoir - A Phase I in service reservoir assessment was undertaken in 2023. This project is ongoing in 2024.
- Mannheim Reservoir (5 Cells) – A Phase I in service reservoir assessment was undertaken in 2023. The scope of work also included interior investigation of the Concrete Pressure Pipe within the reservoir. This project is ongoing with recommendations anticipated in 2024.
- **Water Filters Asset Program Development**

Initiated in late 2021, the key objectives of this initiative is to refine the filtration system asset hierarchy in the corporate work management system, Lucity, and recommend best practice life-cycle management strategies for filtration assets. The deliverable of the program will include a 10-year capital program for filter assets, a 50 year forecast, operation and maintenance recommendations, as well as technical levels of service and key performance indicators. Draft results were submitted late 2023 and are currently under review.

- **Facility/Asset Imaging**

LiDAR (light detection and ranging) is a technology that is being used by Water and Wastewater Services to generate virtual imagery of the Region's water and wastewater facilities.

This technology is used to facilitate discussion during meetings and project planning activities, assist design, tendering and construction activities. The imaging of the water and wastewater facilities enables staff, consultants, and contractors to view the sites, without the need for in-person site visits. The imaging is a widely and routinely used resource for staff for many purposes, and has the added benefit of reducing Greenhouse Gas (GHG) emissions by reducing the travel to sites.

The library of virtual tours includes 266 active spaces at both water and wastewater sites. Imaging has been expanded to include assets when they are taken out of service for inspection such as chambers, reservoirs, and tanks.

APPENDIX A – QMS MANAGEMENT REVIEW

DATE: November 30, 2023

TIME: 12:30pm – 4:30pm

PLACE: Mannheim Training Room

PRESENT: Peter Clarke, Dale Wiens, Kathy Taylor, Mark Chen, Ryan Snider, Mari MacNeil, Jennifer Rose, Aldo Franco (Public Health), Rebecca Piovesan (Public Health), Frank Kosa (Design & Construction), Phil Bauer (Design & Construction)

REGRETS: None

1) **QMS MANAGEMENT REVIEW PROCESS**

A summary was provided of the Management Review purpose and objectives - to evaluate the effectiveness and appropriateness of the QMS and to address any deficiencies.

2) **QMS POLICY REVIEW AND APPROVAL**

The QMS policy was reviewed and continues to be appropriate.

3) **DWQMS MANAGEMENT REVIEW REQUIREMENTS**

Required Management Review agenda items were discussed in accordance with the procedure.

4) **ROUNDTABLE DISCUSSION**

Management Review discussion conducted as per presentation and agenda.

5) **PREVIOUS ACTION ITEMS - FOLLOW-UP**

Reviewed 2022 Management Review action items and status:

I. **REVIEW/IMPLEMENT 2022 INTERNAL AND EXTERNAL AUDIT FINDINGS**

One (1) non-conformance issue was identified. Thirteen (13) opportunities for improvement (OFI) were identified. Implementation to be assessed and decided by management staff.

Action: QMS Team, Operations & Maintenance (O&M) Supervisors

Status: Ongoing - 3 OFI implemented, 8 in progress, 1 closed, 1 to revisit. The Corrective Action Plan for the non-conformance was submitted and accepted by external auditor.

II. PROVIDE QMS TRAINING TO THE DESIGN & CONSTRUCTION AND ENGINEERING & PLANNING GROUPS

Including Municipal Drinking Water Licence (MDWL) and Drinking Water Work Permit (DWWP) training.

Action: QMS Team

Status: Complete. Two training sessions provided.

III. PROVIDE STANDARD OF CARE TRAINING TO COUNCIL

Including the 20 questions in the 'Check Your Knowledge' section of the MECP "Taking Care of Your Drinking Water: A Guide for Members of Municipal Councils".

Action: Commissioner, EES

Status: Complete

IV. PROVIDE ADDITIONAL IN-HOUSE TRAINING SESSIONS TO ASSIST WITH ACHIEVING REQUIRED ON THE JOB TRAINING HOURS

Will be beneficial for new staff and supervisors.

Action: QMS Team, O&M Supervisors

Status: Ongoing. Several additional training sessions provided in 2023.

6) INCIDENTS OF REGULATORY NON-COMPLIANCE REVIEW

Five (5) regulatory non-compliance issues occurred in 2023. For non-compliance issues a corrective/preventative action plan was implemented.

7) OPERATIONAL PLANS AND MUNICIPAL DRINKING WATER LICENSES

- Organizational changes in Water Operations & Maintenance including the addition of the Technical Operations and Project Management Group, Revisions to SCADA & Operating Technology Group, Overall Responsible Operator (ORO) duties removed from Manager, O&M and added to rotating supervisory positions, and general updates made to Roles, Responsibilities and Authorities Tables for several positions.
- Transportation and Environmental Services (TES) changed to Engineering and Environmental Services (EES)
- Water Services (WS) changed to Water and Wastewater Services (WWS)
- Form 2 generated for the following:
 - Minor revisions to well and booster pump rated capacities
 - Addition of redundant sodium hypochlorite pumps
 - Addition of variable frequency drives (VFD) at several wells
 - Significant upgrades at the Roseville WTP
 - Significant upgrades at the Wellesley WTP

- Schedule C received for the following:
 - New wells K13B, W6C
 - Laurel WTP and well W25
 - Pinebush WTP and new wells P10A, P10B and P19
 - Reservoir upgrades at the Greenbrook WTP
- Operational Plans updated to reflect 2023 Risk Assessment Outcomes

8) **General Discussion**

- The Ministry of Environment Conservation and Parks (MECP) is in the process of revising the GUDI Terms of Reference and associated Procedure for Disinfection of Drinking Water in Ontario. New facilities and system wells require 4 log virus inactivation vs. current 2 log inactivation. New groundwater wells classified as provisional groundwater may require additional monitoring for potential surface water influence.
- MECP has a working group in place to review and revise the disinfection requirements for water treatment plants, storage facilities and wells in Ontario. Currently, O&M must follow American Water Works Association (AWWA) Standards.
- Discussed the requirement for the Region to take over the ownership and operation of a small non-municipal water treatment system in Petersburg.
- Clarified that the number of sodium adverse water quality incidents (AWQI) reported in 2023 were higher than previous years due to the planned five year sampling and reporting requirement. This approach is preferred by O&M, Public Health and the MECP to reduce administrative burden.
- Discussed benefits of providing QMS/Compliance training to the Design and Construction Group, as well as Engineering and Planning Groups on a regular basis. Could be provided annually, and included as part of the onboarding process.
- Discussed developing issues management papers and water quality fact sheets. Public Health to share existing resources.
- Detailed review and discussion on the status of the sixteen (16) Opportunities for Improvement (OFI) received during the 2023 QMS Audits.
- Future plans for O&M include a focus on operational activities while investigating alternate methods to deliver programs such as backflow preventer inspections and locate services. An opportunity exists for the Design and Construction group to assist with locates.
- Discussed resources needed to maintain and improve the QMS, including:
 - Additional staff (administrative, operational, maintenance, and health and safety)

- Additional equipment
- Increased internal and external training hours due to staff turnover and retirements

9) ACTION ITEMS

I. REVIEW/IMPLEMENT 2023 INTERNAL AND EXTERNAL AUDIT FINDINGS

- Zero (0) minor non-conformance identified.
- Sixteen (16) opportunities for improvement were identified, implementation to be assessed and decided by management staff.

Action: QMS Team, O&M Supervisors

Timeline: Fall 2024

II. PROVIDE QMS TRAINING TO THE DESIGN AND CONSTRUCTION AND ENGINEERING AND PLANNING GROUPS

- Include Compliance requirements as well.

Action: Supervisor, Process and Compliance

Timeline: Spring 2024

III. DEVELOP A MEMO SUMMARIZING POTENTIAL WATER QUALITY REGULATORY CHANGES AND ASSOCIATED IMPACTS TO O&M CAPITAL PROJECTS

Action: Manager, O&M

Timeline: December 2023

IV. CONTINUE THE DEVELOPMENT AND PROVISION OF IN-HOUSE TRAINING SESSIONS TO ASSIST WITH ACHIEVING REQUIRED ON THE JOB TRAINING HOURS

- Particularly beneficial for new staff and supervisors.

Action: QMS Team, O&M Supervisors

Timeline: 2024

10) NEXT STEPS

- Prepare for External (NSF) Surveillance Audit, scheduled for February 12-16, 2024.
- Review and implement previous audit findings and staff suggestions as applicable.
- Continue development and provision of in-house training presentations.

APPENDIX B – MECP INSPECTION COMPLIANCE RATINGS

Drinking Water System	Water Works #	Inspection Period	Compliance Rating %
Ayr	220004199	Oct 16, 2022 to Oct 15, 2023	100
Branchton	260002538	June 15, 2022 to May 31, 2023	100
Cambridge	220000166	April 1, 2022 to March 31, 2023	100
Integrated Urban Water Distribution System	260097331	September 1, 2022 to September 13, 2023	98.31
Foxboro	220009210	November 1, 2022 to September 30, 2023	100
Heidelberg	220007310	November 25, 2022 to November 8, 2023	97.24
Kitchener	220003092	October 3, 2022 to October 5, 2023	100
Linwood	220000102	November 16, 2022 to December 20, 2023 (current report not received at time of issue)	100
Lloyd Brown	260002759	July 1, 2021 to January 15, 2023 (current report not received at time of issue)	100
Mannheim WTP	220006981	August 11, 2022 to July 31, 2023	97.02
Mannheim Village	260002668	August 1, 2022 to July 31, 2023	100
Maryhill	220004171	January 6, 2023 to January 4, 2024	100
New Dundee	220004180	October 1, 2022 to October 31, 2023	100
New Hamburg/Baden	220000111	August 1, 2022 to August 31, 2023	100
Roseville	220007301	August 16, 2022 to July 15, 2023	100
Shingletown	260002707	September 1, 2022 to October 31, 2023	100
St. Clements	220005811	November 1, 2021 to December 15, 2022 (current report not received at time of issue)	100
Waterloo	220000157	November 1, 2022 to October 31, 2023	100
Wellesley	220004215	August 1, 2022 to September 15, 2023	100

APPENDIX C – TREATED WATER FLOW DATA

The following tables summarize the flow rates for 2023, including MDWL Schedule C- Table 1 flow limits and treated water monthly average daily volumes.

Cambridge Drinking Water System – Wells G4/G4A			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 1900 m ³ /day)	Monthly Average (m ³ /d)
January	16.32	1390	1369
February	16.39	1390	1383
March	16.38	1389	1378
April	16.94	1385	1351
May	16.44	1380	1356
June	16.52	1387	1366
July	16.36	1381	1364
August	16.58	1384	1376
September	16.55	1387	1363
October	16.55	1391	1349
November	17.81	1482	1403
December	17.59	1478	1349
Average			1367
Maximum	17.81	1482	

Cambridge Drinking Water System – Wells G5/G5A			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 4320 m ³ /day)	Monthly Average (m ³ /d)
January	18.37	1555	1555
February	18.61	1557	1555
March	18.44	1556	1552
April	34.84	1555	1349
May	19.16	1555	1540
June	18.76	1520	1398
July	16.99	951	950
August	11.79	951	932
September	11.76	951	926
October	12.80	1037	972
November	13.05	1080	989
December	15.45	1261	1231
Average			1246
Maximum	34.84	1557	

Cambridge Drinking Water System – Well G9			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 3,280 m ³ /day)	Monthly Average (m ³ /d)
January	17.93	1371	497
February	0	0	0
March	25.04	1638	181
April	21.02	1593	1520
May	20.26	1649	1570
June	20.71	1679	1574
July	22.15	1566	1408
August	20.50	1565	1525
September	19.89	1578	1515
October	19.84	1546	1480
November	20.19	1535	1429
December	19.27	1499	1414
Average			1176
Maximum	25.04	1679	

Cambridge Drinking Water System – Well H3/H3A			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 1642 m ³ /day)	Monthly Average (m ³ /d)
January	13.46	940	904
February	12.26	921	908
March	12.33	939	887
April	15.21	940	704
May	9.53	778	774
June	11.16	778	777
July	12.24	778	701
August	9.57	778	774
September	9.67	778	775
October	9.69	778	777
November	15.28	810	716
December	15.36	779	750
Average			787
Maximum	15.36	940	

Cambridge Drinking Water System – Well H4A			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 2074 m ³ /day)	Monthly Average (m ³ /d)
January	18.05	1037	1009
February	16.70	1038	1008
March	13.58	1037	1026
April	13.99	1037	1036
May	15.56	1037	1030
June	18.12	1037	997
July	20.12	1037	1017
August	13.31	1037	986
September	12.88	1037	1035
October	14.02	1037	1036
November	16.36	1080	1032
December	14.01	1038	1015
Average			1019
Maximum	20.12	1080	

Cambridge Drinking Water System – Well H5/H5A			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 1987 m ³ /day)	Monthly Average (m ³ /d)
January	11.70	870	854
February	12.22	864	835
March	12.18	870	835
April	17.14	867	780
May	13.53	917	826
June	12.15	882	798
July	12.80	913	853
August	15.46	1037	977
September	13.10	1037	1036
October	13.19	1037	1035
November	13.88	1080	1029
December	12.96	1038	1036
Average			908
Maximum	17.14	1080	

Cambridge Drinking Water System – Middleton Wells (G1, G1A, G2, G3, G14, G15)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 40349 m ³ /day)	Monthly Average (m ³ /d)
January	347.63	21401	19750
February	402.70	21109	18339
March	409.67	23014	19390
April	347.73	20559	18725
May	384.44	23327	20476
June	390.93	23328	20775
July	404.38	21447	19634
August	397.53	20991	18910
September	397.53	21556	19609
October	340.38	21632	19247
November	402.90	21079	18259
December	398.06	20546	18474
Average			19299
Maximum	409.67	23328	

Cambridge Drinking Water System – Pinebush Wells (P10B, P11, P17)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 10368 m ³ /day)	Monthly Average (m ³ /d)
January	60.00*	0	0
February	47.63*	0	0
March	0	0	0
April	49.92*	0	0
May	66.33	3594	279
June	52.49	3304	2949
July	93.12	2903	2475
August	47.70	3073	2803
September	48.93	3108	2243
October	52.20	3100	498
November	50.52	3105	2669
December	67.47	3102	2669
Average			2073
Maximum	93.12	3594	

*Wells running to waste.

Cambridge Drinking Water System – Well P16			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 1961 m ³ /day)	Monthly Average (m ³ /d)
January	0	0	0
February	0	0	0
March	0	0	0
April	0	0	0
May	0	0	0
June	0	0	0
July	0	0	0
August	0	0	0
September	0	0	0
October	0	0	0
November	0	0	0
December	0	0	0
Average			0
Maximum	0	0	

Cambridge Drinking Water System – Well P9			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 2592 m ³ /day*)	Monthly Average (m ³ /d)
January	20.51	1728	1727
February	20.28	1728	1570
March	18.55	1556	1553
April	18.47	1555	1555
May	21.52	1555	1551
June	19.68	1555	1540
July	18.45	1555	1528
August	18.46	1556	1548
September	18.40	1556	1555
October	18.45	1556	1555
November	19.56	1620	1537
December	18.45	1557	1527
Average			1562
Maximum	21.52	1728	

*New MDWL with limit of 1728 m³/day received January 2023.

Cambridge Drinking Water System – Well P15A			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 1728 m ³ /day)	Monthly Average (m ³ /d)
January	14.83	1210	1209
February	16.70	1384	1364
March	16.65	1383	1371
April	16.64	1383	1365
May	17.61	1383	1378
June	16.60	1383	1382
July	16.53	1383	1372
August	16.60	1383	1375
September	16.52	1383	1382
October	16.51	1383	1081
November	17.78	1440	1214
December	17.10	1384	1307
Average			1317
Maximum	17.78	1440	

Cambridge Drinking Water System – Shades Mill Wells (G7, G8, G38, G39, G40)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 12960 m ³ /day)	Monthly Average (m ³ /d)
January	109.63	4638	3311
February	109.43	8194	5169
March	108.88	7857	4738
April	110.16	6923	4882
May	110.73	8006	5396
June	115.76	7688	3942
July	115.11	5734	3744
August	103.45	5661	3811
September	104.30	5870	3255
October	103.46	5879	4131
November	102.73	5670	3853
December	102.88	6013	3336
Average			4131
Maximum	115.76	8194	

Cambridge Drinking Water System – Turnbull Wells (G6, G16, G17, G18)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 10368 m ³ /day)	Monthly Average (m ³ /d)
January	105.62	4125	2583
February	108.44	4407	2784
March	110.55	4324	3027
April	108.56	3724	2393
May	103.49	4504	3083
June	100.50	6631	3457
July	99.34	5679	3281
August	98.86	4087	3012
September	101.06	4863	3469
October	101.70	4564	3241
November	101.45	4679	2297
December	104.52	3958	2087
Average			2893
Maximum	110.55	6631	

Kitchener Drinking Water System – Greenbrook Wells (K1A, K2A, K4C, K5A, K8)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 12269 m³/day)	Monthly Average (m³/d)
January	100.11*	0	0
February	77.43*	0	0
March	83.13*	0	0
April	91.52*	0	0
May	100.52*	0	0
June	29.88*	0	0
July	82.35*	0	0
August	47.91*	0	0
September	67.01*	0	0
October	183.35*	0	0
November	113.14*	0	0
December	36.77*	0	0
Average			0
Maximum	183.35	0	

*Wells running to waste.

Kitchener Drinking Water System – Wells K34/K36			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 6868 m³/day)	Monthly Average (m³/d)
January	51.66	3884	3436
February	49.95	3782	3745
March	50.08	3776	3554
April	51.84	3868	3584
May	58.62	3968	3873
June	87.06*	4056	3937
July	58.70	4031	3978
August	58.07	4040	4012
September	57.45	4021	3838
October	57.82	3951	3758
November	60.35	3939	3850
December	59.66	3802	3566
Average			3761
Maximum	87.06	4056	

*Less than 5 minute flow spike.

Kitchener Drinking Water System – Parkway Wells (K31, K32, K33)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 13737 m³/day)	Monthly Average (m³/d)
January	60.80	6472	4427
February	58.99	6228	4505
March	62.35	7665	4412
April	62.64	7083	4663
May	57.14	7608	4570
June	60.75	7625	4507
July	58.73	6601	4201
August	58.61	6329	4319
September	58.80	7435	4587
October	58.84	6249	4340
November	61.88	6036	4657
December	60.14	5985	3713
Average			4408
Maximum	62.64	7665	

Kitchener Drinking Water System Strange St. Wells (K10A, K11A, K13B, K18, K19)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 15854 m³/day)	Monthly Average (m³/d)
January	85.78	7459	7254
February	86.95	7305	7174
March	82.74	7207	6965
April	83.47	7217	3824
May	84.23	7319	6091
June	85.97	7446	6848
July	83.78	7274	6964
August	82.68	7209	6870
September	129.00	9049	7905
October	127.81	8947	8103
November	105.39	8385	7631
December	120.14	8336	8175
Average			6984
Maximum	129.00	9049	

Kitchener Drinking Water System – Woolners Wells (K80, K81, K82)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 11146 m³/day)	Monthly Average (m³/d)
January	0	0	0
February	0	0	0
March	0	0	0
April	0	0	0
May	0	0	0
June	0	0	0
July	0	0	0
August	0	0	0
September	0	0	0
October	0	0	0
November	0	0	0
December	0	0	0
Average			0
Maximum	0	0	

Mannheim WTP Drinking Water System – Well K21			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 2765 m³/day)	Monthly Average (m³/d)
January	25.39	2160	2122
February	27.72	2163	2158
March	27.49	2161	2157
April	25.34	2160	2160
May	25.39	2160	2160
June	26.02	2160	2150
July	25.95	2160	2157
August	25.30	2160	2160
September	25.26	2160	2145
October	25.27	2161	2154
November	25.76	2250	2163
December	25.15	2163	2160
Average			2154
Maximum	27.72	2250	

Mannheim WTP Drinking Water System – Well K21A			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 2160 m³/day)	Monthly Average (m³/d)
January	20.47	1728	1684
February	23.08	1730	1726
March	23.19	1729	1725
April	20.43	1728	1728
May	20.45	1728	1728
June	20.80	1728	1720
July	22.90	1728	1726
August	20.42	1728	1728
September	22.46	1728	1716
October	21.67	1729	1724
November	20.94	1800	1730
December	20.19	1730	1728
Average			1722
Maximum	23.19	1800	

Mannheim WTP Drinking Water System – Well K25			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 6826 m³/day)	Monthly Average (m³/d)
January	49.44	4049	3943
February	48.92	3976	3739
March	49.00	3990	3863
April	46.69	3930	3912
May	49.23	4003	3909
June	56.66	4768	4682
July	64.43	4758	4712
August	56.60	4742	4706
September	60.02	4752	4698
October	65.26	5160	5066
November	61.62	5339	4747
December	54.97	4596	4568
Average			4379
Maximum	65.26	5339	

Mannheim WTP Drinking Water System – Well K29			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 5270 m³/day)	Monthly Average (m³/d)
January	44.17	3056	2949
February	48.15	3148	2982
March	46.54	3154	2934
April	39.81	2975	2959
May	40.16	2963	2871
June	40.07	2965	2811
July	41.38	2829	2796
August	43.21	2813	2789
September	40.31	2835	2790
October	45.66	2797	299
November	46.14	3598	2225
December	46.30	3670	3576
Average			2665
Maximum	48.15	3670	

Mannheim WTP Drinking Water System – ASR1			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 5010 m³/day)	Monthly Average (m³/d)
January	21.36	1154	183
February	21.89	602	191
March	21.19	969	324
April	18.90	811	261
May	15.01	872	306
June	18.77	902	425
July	18.87	897	238
August	20.45	591	134
September	18.86	897	281
October	14.92	188	17
November	18.99	493	68
December	21.66	88	10
Average			203
Maximum	21.89	1154	

Mannheim WTP Drinking Water System – ASR2			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 3283 m ³ /day)	Monthly Average (m ³ /d)
January	15.48	1080	190
February	14.74	634	231
March	14.19	1137	375
April	13.87	1111	366
May	16.16	1107	396
June	16.44	1082	535
July	15.82	1057	304
August	16.58	645	162
September	16.40	1070	348
October	16.57	1052	79
November	16.71	566	90
December	16.63	476	37
Average			259
Maximum	16.71	1137	

Mannheim WTP Drinking Water System – ASR3			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 3974 m ³ /day)	Monthly Average (m ³ /d)
January	20.84	1210	201
February	20.63	292	60
March	43.17	1123	378
April	15.41	1123	372
May	21.85	1123	410
June	15.72	1123	566
July	15.34	1123	320
August	15.07	688	169
September	15.20	1123	370
October	15.76	1123	75
November	17.99	23	3
December	0	0	0
Average			266
Maximum	43.17	1210	

Mannheim WTP Drinking Water System – ASR4			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 5443 m ³ /day)	Monthly Average (m ³ /d)
January	37.56	2160	369
February	47.45	1188	431
March	51.35	2160	726
April	45.28	2160	717
May	57.91	2160	788
June	30.11	2160	1089
July	30.18	2160	616
August	29.56	1322	324
September	40.60	2160	731
October	49.13	2160	157
November	28.93	1062	140
December	0	0	0
Average			507
Maximum	57.91	2160	

Mannheim WTP Drinking Water System – ASR5			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 5504 m ³ /day)	Monthly Average (m ³ /d)
January	32.32	1941	313
February	35.87	1415	473
March	31.55	2592	869
April	32.27	2592	854
May	31.77	2592	941
June	30.22	2592	1157
July	31.86	2160	614
August	31.77	1317	323
September	40.63	2160	730
October	27.52	2160	159
November	33.37	1348	217
December	29.95	1797	110
Average			563
Maximum	40.63	2592	

Mannheim WTP Drinking Water System – RCW2			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 5443 m ³ /day)	Monthly Average (m ³ /d)
January	46.80	2081	524
February	46.83	2134	763
March	46.56	3888	1285
April	41.81	3456	1140
May	41.77	3456	1239
June	41.61	3456	1633
July	38.22	3110	885
August	38.53	1897	465
September	37.90	3111	1033
October	38.47	3085	225
November	37.59	2276	305
December	37.36	2520	174
Average			806
Maximum	46.83	3888	

Mannheim WTP Drinking Water System – RCW3			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 2592 m ³ /day*)	Monthly Average (m ³ /d)
January	30.23	2592	440
February	30.20	1187	431
March	28.69	2160	726
April	28.74	2160	709
May	30.78	2160	790
June	29.16	2160	1088
July	30.41	2160	615
August	30.09	1318	323
September	30.23	2160	728
October	25.56	2160	158
November	29.48	1652	237
December	28.08	1851	126
Average			531
Maximum	30.78	2592	

*New well. MDWL with limit of 2592 m³/day received January 2023.

Mannheim WTP Drinking Water System – RCW4			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 3888 m³/day)	Monthly Average (m³/d)
January	41.40	3456	588
February	40.65	1898	684
March	41.17	3456	1160
April	44.26	3456	1140
May	40.70	3456	1255
June	41.81	3456	1736
July	43.67	3456	982
August	44.18	2102	515
September	43.55	3456	1154
October	40.35	3456	253
November	42.46	2580	376
December	42.46	2871	197
Average			837
Maximum	44.26	3456	

Mannheim WTP Drinking Water System – Well K91			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 4492 m³/day)	Monthly Average (m³/d)
January	40.54	2582	1011
February	40.76	3023	1261
March	39.78	3006	1105
April	39.92	3000	1238
May	40.31	2683	877
June	40.19	2834	1042
July	40.11	2917	1116
August	39.82	2438	1141
September	40.29	2779	1053
October	39.77	2940	553
November	39.58	2931	777
December	40.10	2938	1154
Average			1027
Maximum	40.76	3023	

Mannheim WTP Drinking Water System – Well K92			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 4492 m ³ /day)	Monthly Average (m ³ /d)
January	40.82	2706	1011
February	45.16	2987	1341
March	48.26	2954	1085
April	39.91	2938	1210
May	40.14	2623	860
June	38.28	2693	588
July	41.77	2967	873
August	42.28	2493	1165
September	41.84	2847	1077
October	42.00	3146	571
November	41.83	3044	795
December	42.52	2990	1172
Average			979
Maximum	48.26	3146	

Mannheim WTP Drinking Water System – Well K93			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 4492 m ³ /day)	Monthly Average (m ³ /d)
January	30.57	1668	570
February	31.23	2221	389
March	0	0	0
April	38.98	341	11
May	41.79	2116	640
June	46.63	2920	1117
July	43.12	2966	1192
August	45.79	2471	1158
September	46.43	2860	1086
October	47.69	3251	699
November	44.27	3133	814
December	43.73	3172	1185
Average			738
Maximum	47.69	3251	

Mannheim WTP Drinking Water System – Well K94			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 4492 m³/day)	Monthly Average (m³/d)
January	41.75	2234	787
February	41.92	2959	1341
March	41.79	3059	1125
April	44.20	3068	1259
May	39.49	2577	727
June	47.01	2984	1119
July	45.97	3032	1219
August	43.71	2533	1185
September	44.29	2878	1003
October	44.00	3179	691
November	43.76	3069	804
December	41.53	3164	1181
Average			1037
Maximum	47.01	3179	

Mannheim WTP Drinking Water System – Grand River Intake (Mannheim WTP)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 72576 m³/day)	Monthly Average (m³/d)
January	561.11	43466	34680
February	681.51	43489	35421
March	717.18	45951	38170
April	984.80	53169	43006
May	643.57	68170	50891
June	512.28	71836	54416
July	783.32	62952	47247
August	946.90*	50220	42795
September	860.81	59414	45354
October	807.29	49463	39838
November	856.24	44380	37348
December	740.06	46574	37107
Average			42189
Maximum	984.80	71836	

*Less than 5 minute flow spike.

Mannheim Village Drinking Water System – Well K22A			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 6566 m ³ /day)	Monthly Average (m ³ /d)
January	0	0	0
February	0	0	0
March	0	0	0
April	0	0	0
May	0	0	0
June	0	0	0
July	0	0	0
August	0	0	0
September	0	0	0
October	0	0	0
November	0	0	0
December	0	0	0
Average			0
Maximum	0	0	

Mannheim Village Drinking Water System – Well K23			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 6566 m ³ /day)	Monthly Average (m ³ /d)
January	19.41	1639	1579
February	19.36	1630	1612
March	19.61	1636	1610
April	20.13	1632	1592
May	20.23	1671	1177
June	25.86	2175	1115
July	25.99	2186	2114
August	25.64	2177	2167
September	25.81	2177	2154
October	25.99	2192	2126
November	25.88	2263	1780
December	26.57	2216	2183
Average			1767
Maximum	26.57	2263	

Mannheim Village Drinking Water System – Well K24			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 6566 m ³ /day)	Monthly Average (m ³ /d)
January	41.64	3457	3421
February	45.84	3460	3456
March	41.20	3458	3448
April	44.55	3457	3452
May	41.73	3456	3444
June	41.52	3457	3456
July	48.53	3457	3392
August	42.47	3457	3456
September	40.94	3457	3433
October	40.54	3457	2704
November	31.55	2700	2582
December	35.07	2595	2592
Average			3236
Maximum	48.53	3460	

Mannheim Village Drinking Water System – Well K26			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 9850 m ³ /day)	Monthly Average (m ³ /d)
January	93.06	7777	7775
February	93.29	7787	7776
March	91.85	7780	7750
April	91.80	7777	7652
May	91.80	7777	7776
June	100.02	8468	8435
July	100.63	8468	8441
August	100.22	8468	8467
September	101.21	8468	8435
October	106.96	8469	8151
November	99.37	8820	7839
December	97.18	7778	6269
Average			7897
Maximum	106.96	8820	

Shingletown Drinking Water System – Wells K50/K51			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 13651 m ³ /day)	Monthly Average (m ³ /d)
January	158.16	11234	11216
February	147.29	11238	11132
March	156.99	11351	11153
April	149.90	11240	11132
May	147.49	11237	11196
June	154.40	11665	11248
July	147.93	11243	10978
August	148.86	11226	11196
September	151.32	11222	11194
October	155.48	11250	11211
November	156.64	11672	11207
December	143.44	11232	7781
Average			10887
Maximum	158.16	11672	

Waterloo Drinking Water System – Erb Street Wells (W6B, W6C, W7, W8)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 24139 m ³ /day)	Monthly Average (m ³ /d)
January	118.85	9833	8837
February	114.44	11070	8773
March	116.72	10691	8917
April	117.77	12128	8071
May	119.51	10977	8681
June	125.33	10494	8788
July	126.03	9827	8684
August	106.32	9924	8327
September	104.26	10509	8318
October	103.31	9676	8268
November	149.34	12446	8703
December	150.25	12943	12085
Average			8871
Maximum	150.25	12943	

Waterloo Drinking Water System – William Street Wells (W1B, W1C, W2, W3)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 16753 m³/day)	Monthly Average (m³/d)
January	51.94	4055	3858
February	51.13	3969	3894
March	47.72	3903	3798
April	50.09	3777	3678
May	49.41	3589	500
June	0	0	0
July	0	0	0
August	0	0	0
September	0	0	0
October	0	0	0
November	0	0	0
December	0	0	0
Average			3146
Maximum	51.94	4055	

Waterloo Drinking Water System – Well W10			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 2160 m³/day)	Monthly Average (m³/d)
January	22.57	1901	1885
February	22.52	1901	1891
March	22.58	1900	1875
April	22.68	1901	1695
May	22.67	1901	1652
June	22.54	1901	1859
July	22.78	1901	1854
August	22.78	1901	1801
September	22.78	1901	1894
October	22.67	1901	1893
November	22.67	1980	1821
December	22.68	1903	1887
Average			1834
Maximum	22.78	1980	

New Hamburg/Baden Drinking Water System – Wells (NH3, NH4)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 3542 m ³ /day)	Monthly Average (m ³ /d)
January	37.47	1905	1729
February	30.52	1894	1723
March	44.21*	1882	1732
April	50.00*	2160	1642
May	29.88	2160	1964
June	40.78	2533	2005
July	48.47*	2137	1783
August	45.26*	1981	1763
September	43.18*	2180	1800
October	44.09*	1922	1721
November	45.93*	1903	1698
December	43.71*	1864	1720
Average			1773
Maximum	50.00	2533	

*Less than 5 minute flow spike.

Ayr Drinking Water System – Wells (A1, A2, A3)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 5478 m ³ /day)	Monthly Average (m ³ /d)
January	48.27	1975	1622
February	75.36	1947	1585
March	44.27	2103	1610
April	71.65	2410	1707
May	74.45	3289	2200
June	66.04	3606	2879
July	67.20	3202	2458
August	67.90	3007	2514
September	67.30	3060	2470
October	67.34	3010	2054
November	64.43	2204	1923
December	67.98	2269	2017
Average			2087
Maximum	75.36	3606	

Branchton Drinking Water System – Wells (BM2, BM3)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 130 m ³ /day)	Monthly Average (m ³ /d)
January	1.67*	32	24
February	1.63*	29	23
March	1.55*	29	23
April	1.84*	39	27
May	1.62*	118	40
June	2.00*	61	39
July	1.62*	39	28
August	1.55*	41	31
September	1.40	39	30
October	1.44	39	30
November	1.31	33	28
December	1.31	57	33
Average			29
Maximum	2.00	118	

*Less than 5 minute flow spike.

Roseville Drinking Water System – Wells (R5, R6)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 357.7 m ³ /day)	Monthly Average (m ³ /d)
January	3.64	97	81
February	3.55	99	84
March	4.39*	93	84
April	3.32	126	95
May	3.33	185	119
June	3.35	192	140
July	3.34	142	108
August	3.33	127	104
September	3.36	129	77
October	3.35	71	48
November	3.71	56	42
December	3.64	57	45
Average			86
Maximum	4.39	192	

*Less than 5 minute flow spike.

Heidelberg Drinking Water System – Wells (HD1, HD2)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 1373.8 m³/day)	Monthly Average (m³/d)
January	9.27	179	144
February	9.28	175	143
March	9.38	165	136
April	9.41	184	151
May	9.22	356	208
June	9.36	345	225
July	9.26	269	172
August	9.28	201	169
September	9.32	250	173
October	9.26	181	150
November	9.28	226	143
December	9.28	211	155
Average			164
Maximum	9.41	356	

Maryhill Drinking Water System – Maryhill WTP- Wells (MH1, MH2)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 157 m³/day)	Monthly Average (m³/d)
January	1.42	42	32
February	1.46	44	32
March	1.44	35	30
April	1.43	40	32
May	1.44	80	42
June	1.41	59	41
July	1.36	81	40
August	1.38	88	66
September	1.37	51	38
October	1.26	61	42
November	1.18	76	62
December	1.18	38	31
Average			41
Maximum	1.46	88	

Maryhill Drinking Water System – Maryhill Heights- Wells (MH4A, MH5)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 812 m³/day)	Monthly Average (m³/d)
January	5.43	47	28
February	5.27	37	27
March	5.83	32	25
April	6.15	42	32
May	5.61	139	62
June	6.25	179	85
July	6.84	113	66
August	6.75	112	63
September	6.99	101	70
October	5.62	98	46
November	6.93	74	32
December	7.22	37	29
Average			47
Maximum	7.22	179	

Linwood Drinking Water System – Wells (L1A, L2)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 604.8 m³/day)	Monthly Average (m³/d)
January	7.57	247	226
February	7.57	248	227
March	7.56	244	225
April	7.54	260	235
May	7.59	372	263
June	7.54	335	276
July	7.52	360	324
August	7.53	365	321
September	7.53	291	256
October	7.48	287	257
November	7.53	273	258
December	7.59	269	257
Average			260
Maximum	7.59	372	

St. Clements Drinking Water System – Wells (SC2, SC3, SC4)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 1771.2 m³/day)	Monthly Average (m³/d)
January	16.47	358	204
February	16.32	222	200
March	16.37	219	194
April	16.44	257	212
May	16.46	418	273
June	16.48	446	306
July	16.36	352	243
August	16.38	288	231
September	16.35	481	252
October	16.42	234	208
November	16.37	239	205
December	16.40	259	204
Average			228
Maximum	16.48	481	

Wellesley Drinking Water System – Wells (WY1, WY5, WY6)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 3006 m³/day)	Monthly Average (m³/d)
January	17.17	732	642
February	17.02	744	659
March	17.07	699	612
April	17.03	793	644
May	17.09	1023	763
June	16.98	1045	793
July	17.09	783	686
August	16.96	754	668
September	16.93	801	604
October	20.28	862	610
November	20.24	659	581
December	20.83*	681	605
Average			656
Maximum	20.83	1045	

*Less than 5 minute flow spike.

Foxboro Drinking Water System – Wells (FG1, FG2A, FG4)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 288 m³/day)	Monthly Average (m³/d)
January	2.13	91	79
February	2.88	99	82
March	2.42	105	86
April	2.54	108	89
May	2.36	216	89
June	5.16	105	89
July	2.64	83	76
August	3.46	88	78
September	4.71	95	77
October	2.45	94	80
November	3.44	88	75
December	3.16	97	81
Average			82
Maximum	5.16	216	

New Dundee Drinking Water System – Wells (ND4, ND5)			
Month	Raw Peak Flow Rate (L/s)	Treated – Max Day (MDWL Limit= 982.2 m³/day)	Monthly Average (m³/d)
January	6.58	339	243
February	6.55	271	246
March	6.60	262	240
April	6.47	371	255
May	7.98	539	315
June	7.58	618	479
July	6.86	451	335
August	7.05	241	186
September	6.76	233	191
October	6.70	210	180
November	6.69	205	185
December	10.25*	196	171
Average			252
Maximum	10.25	618	

*Less than 5 minute flow spike.

APPENDIX D – SYSTEM INFORMATION

Municipality	Location	Water Source	MDWL# / DWWP#	PTTW #	Sub-System Class /Number	System Type
Cambridge Drinking Water Supply System (IUS)	Galt Wells	G4/G4A	012-102 / 012-202	5134-BW6LJX	WT Class III #8125	Large
		G5/G5A		P-300- 6117976847		
		G9		Grandfathered		
	Hespeler Wells	H3/H3A		1438-97BM7N		
		H4A		1008-BW6L62		
		H5/H5A		P-300- 1161883172		
	Middleton WTP	G1, G1A, G2, G3, G14		7214-AMGR5G		
		G15		6132-AKURBN		
	Pinebush WTP	P10, P10A, P10B, P11 P17, P19		7858-BXUUUH		
	Preston Wells	P16		2004-AKXNEB		
	Rahmans Wells	P9 P15/P15A		7600-A27N5B		
Shades Mill WTP	G7, G8, G38, G39, G40	3004-A9GHYU				
Turnbull WTP	G6, G16, G17, G18, G19	5552-BUKM94				
Kitchener Drinking Water Supply System (IUS)	Greenbrook WTP	K1A, K2A, K4C, K5A, K8	012-102 / 012-202	0071-BUKPU5	WT Class III #8126	Large
	Kitchener WTP	K34 K36		6732-A3FJYA		
	Parkway WTP	K31, K32		Grandfathered		
		K33		3115-AMHXXH		
Strange Street WTP	K10A K11A K13B K18, K19	P-300- 6221899077				

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Municipality	Location	Water Source	MDWL# / DWWP#	PTTW #	Sub-System Class /Number	System Type
	Woolners Wells	K80, K81, K82		0288-BA8LR8		
Mannheim Drinking Water Supply System (IUS)	Mannheim WTP	Grand River	012-102 / 012-202	Hidden Valley 0366-AYCP5A (Mannheim WTP supply only) Mannheim Consolidated P-300-3130244509 (Mannheim Wells, Peaking Wells and ASRs)	WT Class IV #1843	Large
	ASR Wells	ASR1 ASR2 ASR3 ASR4 ASR5 RCW2 RCW3 RCW4				
	K90 Peaking Wells	K91 K92 K93 K94				
	Mannheim Wells	K21/K21A K25 K29				
Waterloo Drinking Water Supply System (IUS)	Erb Street Wells	W6B W6C W7 W8	012-102 / 012-202	1541-AWGPZR	WT Class II #8127	Large
	Waterloo Wells	W10 W25 W5A		0061-BLHQ45		
	William Street Wells	W1B W1C W2 W2A W3		P-300-5049623280		
Integrated Urban Water Distribution System	Cambridge, Kitchener, Waterloo, Wilmot and Woolwich	IUS Sources	012-102 / 012-202	N/A	WD Class IV #8128	Large

2023 Water and Wastewater Services Summary Report

Municipality	Location	Water Source	MDWL# / DWWP#	PTTW #	Sub-System Class /Number	System Type
North Dumfries Township Drinking Water Supply Systems	Ayr WTP	A1 A2 A3	012-113 / 012-213	P-300- 2094925631	WT Class II #2591 & WD Class II #362	Large
	Branchton WTP	BM2 BM3	012-111 / 012-211	2577-9TPMWL	Limited Groundwater	Small
	Lloyd Brown Distribution		012-102 / 012-202	N/A	Limited Groundwater	Small
	Roseville WTP	R5 R6	012-101 / 012-201	P-300- 3116859114	Limited Groundwater	Small
Wellesley Township Drinking Water Supply Systems	Heidelberg WTP	HD1 HD2	012-104 / 012-204	2437-B8FR7E	WT Class II #3101 Class II WD 3610	Large
	Linwood WTP	L1A L2	012-108 / 012-208	2680-B8HT58	WT Class II #3594 WD Class II #1951	Large
	St. Clements WTP	SC2 SC3 SC4	012-110 / 012-210	P-300- 5118893858	WT Class II #2598 WD Class II 1952	Large
	Wellesley WTP	WY1 WY5 WY6	012-115 / 012-215	0345-94UQ6A	WT Class II #2601 WD Class II 1953	Large

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Municipality	Location	Water Source	MDWL# / DWWP#	PTTW #	Sub-System Class /Number	System Type
Wilmot Township Drinking Water Supply Systems	Foxboro	FG1 FG2A FG4	012-105 / 012-205	2544-BBHP4S	WT Class I #2599	Large
	Mannheim Village Wells	K22A K23 K24 K26	012-102 / 012-202	P-300- 3130244509	WT Class I #3603	Large
	New Dundee Wells	ND4 ND5	012-107 / 012-207	5581-B84PGT	WDS Class I #3595	Large
	New Hamburg WTP	NH3 NH4	012-102 / 012-202	7021-AQRK39	WT Class II #2930	Large
	Shingletown Wells	K50 K51	012-102 / 012-202	4874-9SGL5L	WDS Class I #3593	Large
Woolwich Township Drinking Water Supply Systems	Maryhill Village Heights Wells	MH4A MH5	012-106 / 012-206	1746-BBWLJR	WT Class I #8867	Large
	Maryhill WTP	MH1 MH2		2613-BBKR76	WT Class I #8867	Large